

**Fruits and Vegetables in Vietnam:
Adding Value from Farmer to Consumer**

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The following people participated in the data collection, data entry, and data cleaning for the IFPRI-MARD Survey of Commercial Fruit and Vegetable Producers:

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Dr. Nicholas Minot has served as project leader since January 2001 and drafted the final report. Any questions or correspondence related to the report can be addressed to him using the contact information provided below

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Chapter 1

Introduction

This is the final report for the project “Development of Post-harvest Activities and Agroindustry as a Strategy to Improve Rural Livelihoods in Vietnam”, implemented by the International Food Policy Research Institute (IFPRI) in collaboration with the Ministry of Agriculture and Rural Development (MARD) and other Vietnamese institutions, with funding from the Bundesministerium für Wirtschaftliche Zusammenarbeit (BMZ). The study examines the fruit and vegetable sector in Vietnam, focusing on the role of processing and marketing. This chapter begins by providing the context for the interest in agro-industrial development and then proceeds to describe the objectives of the study, the data sources used in carrying out the study, and the organization of the report.

1 Background on agro-industrial development

1.1 Role of agro-industrial development

Agro-industry, defined as the industrial sectors that are closely linked to agriculture¹, plays an important role in economic development. Suppliers of seed, chemicals, and machinery are an important source of increases in agricultural productivity. The development of the agro-processing sector provides new outlets for agricultural production, increasing farmer incomes and providing a more stable outlet for agricultural production. This has positive effects in reducing poverty because farmers in developing countries are almost always poorer than other rural households and urban households. Agro-industrial enterprises are sometimes involved in providing credit, seed, and technical assistance to producers in order to introduce a new crop or obtain raw materials with specific characteristics needed for processing or export. Furthermore, agro-industry (particularly agro-processing) generates employment directly, since it tends to be more labor-intensive than most other manufacturing sub-sectors. In addition, since agricultural processing plants are often located in rural areas, they create jobs for rural households, where poverty is often concentrated. Finally, the food processing sector can play a role in improving nutrition through fortification and the supply of foods with longer shelf-life (Austin, 1996).

On the other hand, agro-industrial development should not be considered the solution to all problems in rural development. Agro-industrial enterprises may prefer to purchase raw materials from larger farmers rather than incur the costs of buying from many small farmers. The employment

¹ We define agro-industry to include the industries that supply inputs and equipment to the agricultural sector, as well as industries that process, market, and transport agricultural output. The focus of this study, however, is on traders and processors that carry out post-harvest value-added activities.

created by the food processing sector is usually relatively low-paying, at least compared to other manufacturing sectors. And processed foods are usually more important in the consumption patterns of high-income than low-income households. Thus, a health, dynamic food processing sector is an important component in the process of agricultural development, but it should not be considered the only, or even the primary, strategy for rural development.

1.2 Distinctive characteristics of the agro-industrial sector

The agro-processing sector differs from other manufacturing sectors in several important respects (see Minot, 1988). First, the supply of the raw material for agro-industry is often highly seasonal. For larger capital-intensive agro-enterprises, this creates a strong incentive to store the commodity for off-season processing when possible. When storage is not possible, food processors often attempt to stagger production to reduce its seasonality. Alternatively, agro-processors may seek other commodities to process in the off-season. In spite of these strategies, agro-processing plants are sometimes idle during part of the year. Thus, excess capacity is not necessarily a sign of poor management, although it does raise the unit processing costs.

Second, the supply of the raw material is difficult to predict and often varies significantly from one year to the next. As a result, prices and profitability may fluctuate. This complicates the procurement of the raw material and can result various types of risk reducing or risk shifting behavior such as fixed-price contracts with suppliers. Skills and flexibility in procurement are critical to the success of agro-processing enterprises.

Third, the quality of the raw material used by agro-processors is quite variable, in large part due to its perishability. This would not be a problem if quality could be observed without cost, but it is often difficult for buyers to assess the quality of the raw material. This leads to the establishment of grading systems and price differences between different grades. The unavoidable subjectivity in the grading process often leads to conflicts between producers and processors.

Fourth, the raw material tends to be “bulky” in the sense that the value per kilogram is low. This means that agro-processors tend to locate their plants in or near producing areas, particularly when the commodity is more perishable or more costly to transport in its unprocessed form than in its processed form.

Fifth, the cost of raw materials accounts for a relatively large share of the total cost of agro-processors, typically 50-80 percent in developing countries. The implication is that procurement of high-quality raw materials at low prices is even more important in food processing than in other manufacturing sectors.

Sixth, agro-processors are subject to special attention by the government because of the importance of the final product in social well-being. Food processors face health and safety regulations to protect the consumer. This is another consequence of the difficulty in observing

quality. In addition, they may face political pressure and/or government controls to pay “fair” prices to farmers or to charge “reasonable” prices to consumers.

1.3 Trends in agro-industrial development

The agro-industrial sector tends to grow faster than the agricultural sector over time. There are several reasons for this (see Goletti and Wolfe, 1999). First, as income rises, the total expenditure on food continues to rise, but it does so more slowly than total expenditure. In addition, there is a shift from staple foods, which are generally the least expensive source of calories, to foods that are more expensive on a per calorie basis. Fruit and vegetable consumption rises more quickly than staple consumption, and meat, fish, and dairy consumption rises the fastest.

As part of this process of diversification of diets, households begin to purchase more processed foods. Some processed foods are easier and quicker to prepare, such as soup packages or canned beans. Higher-income households are willing to pay extra for semi-prepared foods because it saves them time. In a sense, with higher incomes, households can afford to "hire" food processors to assist with food preparation. Other processed foods have the advantage of allowing consumption of a greater variety of foods than are possible from fresh products alone. Canned and frozen goods can be consumed thousands of kilometers from where they were produced.

A second trend affecting the agro-industrial sector is that most countries undergo a demographic change in which the share of the population involved in agriculture declines, as does the share of the population living in rural areas. This implies that the number of households buying food rises relative to the number growing it. The result is growth in the number and type of firms that transport, market, process, and distribute food, linking farmers to urban (and rural non-farm) consumers.

A third trend is that consumers are putting greater priority on food quality and safety, particularly in industrialized countries but also in developing countries. This change in attitude is the result of increased awareness of the risks of food-borne disease and pesticide residues, as well as a number of well-publicized cases of food poisoning in the United States, Europe, and Japan. This provides an additional motivation for consumers to buy packaged goods with a trusted brand rather than buying in bulk, since the reputation behind the label serves as an assurance of quality. Another example is the trend toward "organic" or "clean" fruits and vegetables, responding to the fact that high-income consumers are willing to pay a premium for produce grown with little or no agricultural chemicals.

Finally, trade liberalization also contributes to growth in the agro-industrial sector of developing countries. Since the market for farmers and agro-processors becomes a mix of domestic and international consumers, there is a larger share of high-income consumers that demand processed and semi-processed foods. This argument applies mainly to the agro-processing of exported goods.

Naturally, trade liberalization may also result in greater competition for agro-industries that produce exclusively for the domestic market.

2 Rationale for this study

The fruit and vegetable sector was chosen as the topic of this study because it is an example of a high-value agricultural commodity that is relatively labor-intensive, giving small farmers a comparative advantage in the production of many types of fruits and vegetables. For this reason, fruits and vegetables represent an opportunity for small farmers to increase their income by diversifying out of staple foodcrop production. At the same time, the highly perishable nature of fruits and vegetables poses special challenges in marketing. Either the marketing system must transform the raw material into products with a longer shelf-life or it must get the fresh product to domestic and international markets quickly and with special care to avoid spoilage.

The case of Vietnam was chosen because the fruit and vegetable sector is growing rapidly and it is undergoing structural transformation. As discussed in Chapter 2, the production of citrus fruits and the litchi/longan/rambutan family of fruits is growing at more than 10 percent per year, and the value of vegetable and bean production has grown 7.6 percent annually over the 1990s. In part, the growth of the sector is a response to rising income and resulting demand for greater diversity in the diet. The expansion is also a reflection of export opportunities related to regional income growth and trade liberalization. Vietnamese fruit and vegetable exports have expanded from around US\$ 50 million in the mid-1990s to over US\$ 300 million in 2001.

The rapid growth in the Vietnamese fruit and vegetable sector makes this study relevant in three ways. First, the information base on the Vietnamese fruit and vegetable sector has lagged behind its growing importance in the agricultural sector. Traditionally, the attention of policymakers and researchers has been focused on assuring adequate supplies of staple foods (rice, maize, sweet potatoes, and cassava). Prompted by rising incomes, food self-sufficiency, and the falling price of rice on world markets, the government is giving increasing attention to diversification away from rice into high-value agricultural commodities, such as fruits, vegetables, and livestock products. It is hoped that this report will provide a foundation of empirical data on which to build this diversification strategy.

Second, rapid growth in any agricultural sector rarely entails simply using more land and labor to produce more of the same products. Rather, growth is accompanied by other transformations within the sector including changes the livelihood strategies of farmers, production methods, the relationship between farmers and buyers, the technology of marketing, and consumer purchasing patterns. For example, growth in the fruit and vegetable sector is usually accompanied by an expansion in the number of different fruits and vegetables being produced. The introduction of new crops, such as baby corns or mushrooms, implies that farmers need to be informed of these opportunities, trained in new production methods, and supplied with new seeds and other inputs.

This, in turn, creates an incentive for processors and other buyers to establish closer links with farmers, often in the form of formal and informal contractual relationships. Understanding these structural changes in the sector is critical to designing policies and selecting public investments that will support the continued growth of the sector.

Third, the rapid growth in fruit and vegetable exports is vulnerable to restrictions on international trade. Although tariff and non-tariff barriers are being reduced by multilateral trade agreements, sanitary and phyto-sanitary (SPS) trade regulations are becoming increasingly important, particularly in the trade of fruits, vegetables, animal products, and fishery products. SPS import restrictions are partly a reflection of legitimate concerns of consumers in importing countries and partly a reflection of protectionist pressure from producers in those countries. Vietnam needs to develop a stronger scientific knowledge-base related to SPS issues in order to address legitimate SPS concerns of importing countries, as well as to challenge protectionist use of SPS issues. Although this report is not intended to explore all the SPS issues facing Vietnamese exports, the report does highlight the importance of these issues for the fruit and vegetable sector.

3 Objectives

Given this background, the project was designed to study the fruit and vegetable sector in Vietnam, focusing on the processing and marketing components. The original proposal stated that the goal of the project was to describe the current patterns in fruit and vegetable marketing, identify constraints to growth, and develop recommendations for alleviating those constraints. The proposal identified seven objectives for the project.

- Preliminary assessment of post-harvest constraints and selection of product groups for in-depth study;
- Identification and characterization of household and community management of post-harvest operations and agro-food based rural industrialization;
- Identification and characterization of market structure, marketing, and processing enterprises involved in post-harvest operations and agro-food based rural industrialization;
- Identification and characterization of institutional mechanisms involved in lowering the transaction costs and increase the access of rural households to information, markets, and assets;
- Empirical analysis of economic behavior, adoption of technology and institutional mechanisms;
- Analysis of impact of alternative policies and strategies at the rural household level, at the market level, and at the institutional level;
- Intensive dissemination of results in the country and internationally.

4 Scope of the study

The focus of this study is the post-harvest activities in the fruit and vegetable sector. We define post-harvest activities broadly to include assembly, cleaning, sorting, grading, packaging, transport, and storage, as well as processing activities such as drying, canning, and freezing. Although the focus of the study is on the post-harvest activities in the fruit and vegetable sector, we do not restrict ourselves to fruit and vegetable processors. Instead, we examine the entire supply chain from production to consumption. This approach is based on the fact that post-harvest activities (including processing) are undertaken by a variety of participants in the fruit and vegetable subsector, including farmers, traders, exporters, and processors. Excluding farmers and traders from the analysis would, therefore, give a biased and partial view of the post-harvest activities. In addition, the types of post-harvest activity carried out in a given sector and the division of labor among agents is strongly influenced by both the production characteristics (the size of growers, their geographic location, skills, and so on) and the nature of demand (who the consumers are and how much they are willing to pay for value-added activities). Thus, a solid understanding of the commodity supply chain is important for analyzing the post-harvest activities per se.

Another aspect of the scope of the study is to define “fruits and vegetables,” since there are different definitions for this category. Fruits are generally considered the colorful fleshy parts of a tree or bush that contain the seed(s), while vegetables are a diverse category that includes a variety of other edible parts of the plant including the roots (e.g. potatoes, carrots, and onions), stalks (e.g. celery and rhubarb), and leaves (e.g. lettuce, spinach, cabbage). The definitions used in everyday terminology, however, are cultural rather than botanical, in that they take into account the taste and the way they are traditionally consumed. For example, tomatoes and squash fit the botanical definition of fruit, but are generally considered vegetables because they are less sweet than most fruit and they are consumed like vegetables (cooked or in salads) rather than like fruit (as dessert). Mushrooms are considered to be a vegetable even though botanically they are a fungus rather than a plant.

The Food and Agriculture Organization, for statistical purposes, adopts a very broad definition of fruits and vegetables that includes dried legumes such as beans and lentils, staple root crops such as cassava and sweet potatoes, and nuts including cashew nuts. Similarly, the International Standard Industrial Codes (ISIC) has a code 07 for vegetables and selected root crops such as cassava and sweet potatoes, while 08 includes fruit and nuts (including cashew nuts).

This report adopts the narrower definition of fruits and vegetables, excluding cassava, sweet potatoes, nuts, and cashew nuts. First, this corresponds to the definitions used in Vietnam. In Vietnamese production statistics, cassava and sweet potatoes are considered “food”, not vegetables. In Vietnamese export statistics, cashew nuts are distinct from fruits and vegetables. This narrower

definition is also convenient because it focuses on perishable, high-value commodities which require special post-harvest treatment.

Another question is whether to include processed fruits and vegetables and, if so, which ones. The ISIC includes fresh, dried, and chilled fruits and vegetables in categories 07 and 08, placing canned, frozen, and other processed fruits and vegetables in category 20. Vietnamese production statistics presumably refer to fresh product, but export statistics appear to include both fresh and processed. For the purposes of this report, we are interested in both fresh and processed fruits and vegetables, although data limitations sometimes prevent us from reporting statistics on both.

It is important to recognize, however, that these different definitions sometime cause inconsistencies in the data on the fruit and vegetable sector in Vietnam. Whenever possible, we will highlight these differences in explaining apparent contradictions in the data, but in some cases we were not able to resolve discrepancies. This is particularly true of the statistics on fruit and vegetable exports. As discussed in Chapter 6, there are significant discrepancies between the total fruit and vegetable export statistics reported by the General Department of Customs and the exports of individual fruits and vegetables according to Customs data.

5 Data sources

This study is based on a wide range of sources of information. First, the authors attempted to gather a wide range of reports, documents, and articles in the press regarding the fruit and vegetable sector in Vietnam. Second, we examined statistics collected by the government, particularly data on fruit and vegetable production and international trade. Third, the project carried out three national surveys of different participants in the fruit and vegetable subsector.

- IFPRI-MARD Survey of Fruit and Vegetable Producers. This survey included a sample of 1505 commercial growers of fruits and vegetables in 21 provinces. The survey was carried out in October-November 2000.
- IFPRI-MARD Survey of Fruit and Vegetable Traders. This survey covered 110 traders and exporters who worked primarily in the trade of fruits and vegetables. The survey was carried out between May and August of 2001.
- IFPRI-MARD Survey of Fruit and Vegetable Processors. This survey covered 241 processors, with a focus on private-sector processors since less information is available about these enterprises. This survey was implemented around the same time as the Trader Survey.

More information on the methods used in implementing these surveys can be found in Chapters 3, 4, and 5.

In addition to the three surveys carried out by the project, we analyzed data from the two Vietnam Living Standards Surveys carried out in 1992-93 and 1998. These surveys have less

information about agricultural production methods, marketing, and constraints, but they have the advantage of being based on nationally-representative stratified random sample. These surveys are used here to examine the patterns and trends in fruit and vegetable production (see Chapter 2) and consumption (see Chapter 7).

Finally, the project carried out two smaller informal surveys to supplement the survey data. First, an informal survey of institutions that support the fruit and vegetable sector was carried out in June 2001. This survey involved informal interviews with key informants at research institutes, departments of the Ministry of Agriculture and Rural Development, seed companies, testing and inspections services, and international consultants. The results are reported in Chapter 8. Second, an informal survey of retail outlets was conducted in Hanoi. The results are used to supplement the description of consumption patterns in Chapter 7.

6 Organization of the report

This report is divided into nine chapters. Chapter 2 provides an overview of fruit and vegetable production patterns and trends in Vietnam, based on statistics from the Ministry of Agriculture and Rural Development and the 1992-93 and 1998 Vietnam Living Standards Surveys. Chapter 3 focuses on the production and marketing patterns of specialized fruit and vegetable growers, based on the IFPRI-MARD Survey of Fruit and Vegetable Producers carried out as part of this project. In Chapter 4, we describe the results of the IFPRI-MARD Survey of Fruit and Vegetable Traders, most of whom are involved in some form of post-harvest value-added activities. Chapter 5 summarizes the results of the IFPRI-MARD Survey of Fruit and Vegetable Processors, which provides information on their size, capacity, procurement procedures, marketing, sales and costs of operations, and sources of information. In Chapter 6, we review secondary data regarding the growth and composition of Vietnamese fruit and vegetable exports. Chapter 7 describes fruit and vegetable consumption patterns, based on the Vietnam Living Standards Surveys and an informal survey of retailers. In Chapter 8, we examine the role of government institutions and investments in supporting the fruit and vegetable sector in Vietnam, including research institutes, seed companies, and inspection services. Finally, Chapter 9 summarizes the findings of this study and draws some implications for policies to support the fruit and vegetable sector, with emphasis on the post-harvest activities.

Chapter 2

Patterns and trends in fruit and vegetable production

This chapter reviews the trends and patterns in fruit and vegetable production in Vietnam. First, we use production data to examine the trends in fruit and vegetable production. This section shows that fruit and vegetable production have grown rapidly, but there is wide variation across commodities and regions. Second, we examine nationally representative survey data to describe the characteristics of fruit and vegetable growers. The results suggest that the vast majority of rural Vietnamese households grow fruits and vegetables, and that the share of production that is sold is quite high. At the same time, the number of farms that rely on fruit and vegetable sales for a significant portion of their income is quite small. Third, we review the results of a survey of specialized fruit and vegetable growers carried out this project in 2001. The survey finds that fruit and vegetable production can be quite profitable, but that farmers are constrained by poor genetic material, limited production and marketing information, and difficulties in maintaining a stable market for their output.

1 Trends in fruit and vegetable production

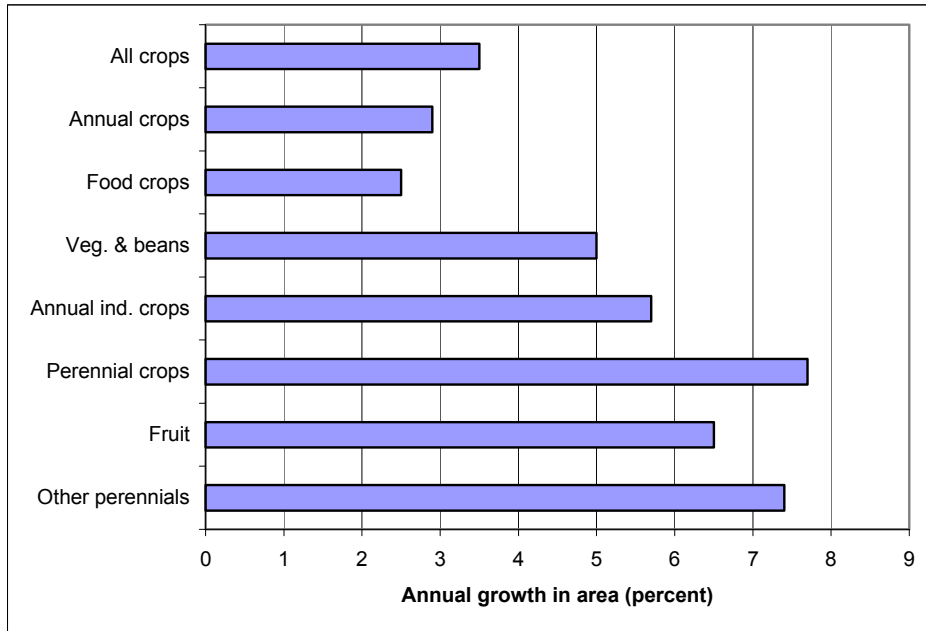
Official statistics indicate that, during 1975-1980, the annual growth in area planted was 5.9 percent for annual crops and 15.1 percent for perennial crops. It is not surprising that perennial crop area would grow rapidly so quickly: the advent of peace provided an opportunity for cooperatives and state farms to make long-term investments. On the other hand, it is difficult to reconcile the rapid growth in annual crop area, with other figures showing that food production declined in per capita terms over this period (Tran Cong Kim, 1996: 203). In any case, annual crop area was almost stagnant over the decade of the 1980s, while perennial crop output grew at 6.3 percent. During the 1990s, annual crop area expanded at 2.9 percent, somewhat higher than the rate of population growth, while perennial crop area grew by 7.7 percent. In spite of the higher growth rate for perennial crops during all three periods, these crops still account for just 15 percent of the 12 million hectares cultivated in Vietnam (see Table 2-1).

Of the 10.4 million hectares planted with annual crops, food crops account for 8.9 million hectares ("food" includes rice, maize, sweet potatoes, and cassava). The area planted with food crops was almost unchanged during the 1980s, while the area with vegetables and beans grew at 3.6 percent. Growth accelerated in the 1990s, with the area planted with vegetables and beans growing at 5 percent per year. Even after this growth, vegetables and beans represent just 6 percent of annual crop area and 5 percent of total crop area (see Table 2-2).

Of the 1.8 million hectares planted with perennial crops, multi-year industrial crops account for 1.2 million hectares or 73 percent of the total. The area planted with multi-year industrial crops has grown more rapidly than that of fruit crops. Much of this growth is due to the dramatic expansion

in coffee area, but tea, sugarcane, and other tree crops have also grown. Currently, fruit crops are planted on 496 thousand hectares, which represents about 27 percent of perennial crop area and 4 percent of the total crop area (see Table 2-3 and **Figure 2-1**).

Figure 2-1. Growth in planted area over 1990-99



The Mekong Delta is by far the most important fruit growing area in Vietnam. In the mid-1990s, it accounted for over half of the total fruit area in the country. Since 1995, the Mekong fruit area continues to expand, but less rapidly than in other regions, so its share of the national total has fallen to 38 percent. The fruit area in the Northern Uplands has grown more quickly in the 1990s, so that its share in the total has risen to 23 percent¹. This expansion reflects the growing demand for fruit in Hanoi and by Chinese consumers. The Southeast has also seen its fruit area grow rapidly (11 percent per year) other region whose fruit area has grown faster than the national average in the 1990s is the Southeast. This area has been the center of dynamic growth in agro-industry, producing fresh and processed fruit products for consumers in Ho Chi Minh City and for export (see Table 2-4).

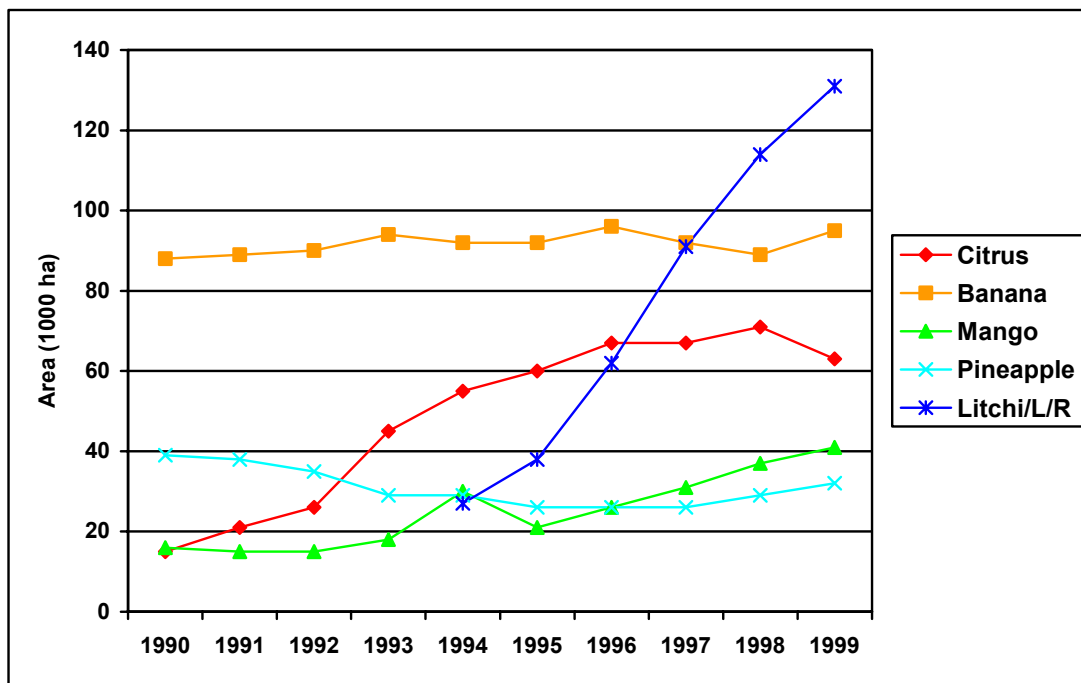
One of the largest and fastest-growing fruit sectors is longan, litchi, and rambutan². As recently as 1993, statistics on these crops were not even reported in the statistical yearbooks. Since 1994, the area planted to these three fruits has grown four-fold or 37 percent per year. These fruits represent 26 percent of the total fruit area. Litchis are primarily grown in the north, rambutan in the

¹ Part of the very high growth rate over the 1990s is due to an unusually low figure for 1990. Given the stability of tree crop area over time, this may reflect a statistical anomaly.

² These three related crops are combined in Vietnamese statistics.

south, and different varieties of longan are grown in the north and south. Bananas are also an important fruit crop, accounting for 19 percent of the fruit area, but banana area remains essentially unchanged since 1990. As will be discussed later, bananas are grown largely for home consumption. Furthermore, the urban demand for bananas is not very income elastic, meaning that as consumer incomes rise, demand for bananas is only moderately affected. Pineapple area has actually declined over the 1990s, perhaps reflecting the collapse of the COMECON market for canned and fresh pineapple around 1989-91. In contrast, the areas allocated to citrus and mango have grown at 18 percent and 11 percent per year, respectively (see Table 2-5 and **Figure 2-2**). These fruit crops (longan, litchi, rambuttan, banana, pineapple, citrus, and mango) account for about 73 percent of the area planted with fruits in Vietnam.

Figure 2-2. Growth in different fruit crops over the 1990s



The trends in the *volume* of fruit production are very similar to the trends in fruit area: longan, litchi, and rambuttan output is growing rapidly, as is production of citrus, while banana production has been stagnant and pineapple output has fallen. It is worth noting that for all the major fruit crops, the growth in area exceeds the growth in output (see Table 2-6). This indicates that yields have fallen in all the major fruit crops over the 1990. Some of the reasons for this decline are discussed later. In addition, the production figures highlight the collapse of pineapple production, which fell from 468 thousand tons in 1990 to 185 thousand tons in 1995. This represents a 60 percent drop in pineapple

production, most of which occurred in the first two years (1990-1992).

Box 2-1. Litchi in Luc Ngan district of Bac Giang

Luc Ngan district of Bac Giang is well known for its litchi production. Litchi was introduced to the district in the 1950s by a demobilized soldier from the lowlands. Litchi production did not take off immediately, however. It was only in the 1980s that local officials identified the litchi has having potential for raising local incomes and earmarked land for its cultivation. In just a few years, litchi output increased dramatically. Today, according to local officials, “nearly all households” in Luc Ngan grow litchi.

Much of the fruit is dried for transport to distant markets, including China. The district has an estimated 2000 driers. The largest drier is the Bac Giang processing plant.

District authorities are said to assist farmers with market information. Likewise, farmers from Luc Ngan district have been recruited to share their expertise with farmers from other provinces.

Source: Vietnam News Service, 2 July 2001.

Note: The article states that the capacity of the Bac Giang processing plant is 400,000 tons per year, but this is almost certainly an error since this is greater than Vietnam’s annual production of litchi.

The value of vegetable and bean output grew at annual rates of 4 percent in the 1980s and 7.6 percent in the 1990s, exceeding by a significant margin the growth rates of food production. The growth in the value of output also exceeds the growth in the volume of output (5 percent), implying that the per-kilogram value of vegetables has increased. This could be due to higher real prices for vegetables or a shift in the mix of vegetables toward the higher-value vegetable crops. Vegetables and beans now account for about 7 percent of the value of crop production in Vietnam (see Table 2-7 and Table 2-8).

The value of fruit production has grown at 3 percent annually over the 1990s, somewhat faster than population growth, but slower than the value of food production. Since the volume of fruit production has grown by 6.5 percent over the period, this implies that either real prices of fruits have fallen or there has been a shift toward lower-value fruit products. Fruit production is also about 7 percent of the total value of crop production, down from 10-11 percent in 1980 (see Table 2-7 and Table 2-8). Given the difficulties of valuing horticultural production in the 1980s before agricultural markets were liberalized and the difficulty in constructing a reliable price index, these results must be interpreted with some caution.

The economic reform process in Viet Nam has stimulated the production of fruits and vegetables in three ways. First, by raising the production and domestic availability of rice, rural households are able to allocate part of their land to fruits and vegetables with some assurance of being able to produce or buy the rice needed for household consumption. Second, by expanding domestic incomes, the reforms have increased the demand for fruits and vegetables as consumers seek to add diversity to their diets. The two largest cities are particularly important as sources of demand for

fruits and vegetables. Because of the perishability of fruits and vegetables, the production zones to supply the city are often located relatively close to the cities. Third, by establishing a realistic exchange rate and liberalizing exports, the reforms have created new outlets for fruit and vegetable processors.

The geographic patterns in fruit and vegetable production reveal that the Mekong Delta accounts for about two thirds of the output of citrus, pineapple, and mango. Banana production is somewhat more dispersed, with important production in the Mekong Delta, Southeast, and the Red River Delta. Concerning vegetables, the Red River Delta has the largest production, accounting for 29 percent of the national output. This is the result of its good soils, cooler climate, and access to the Hanoi market. Temperatures are cool enough in the October-February period to grow temperate vegetables such as cabbage, onions, tomatoes, turnips, and cauliflower. The Mekong Delta is the second most important region, representing 23 percent of national output. Dalat, in the Central Highlands, has specialized in the production of vegetables both for export and for domestic urban consumption. (see Table 2-9).

2 Fruit and vegetable production

This section examines the patterns of fruit and vegetable production in Vietnam using the 1998 Vietnam Living Standards Survey (VLSS). The 1998 VLSS used a detailed 110-page questionnaire and a nationally representative sample of 6000 households. For the purpose of this analysis, we examine only the rural households in the sample, including both agricultural and non-agricultural households in rural areas. With these data, we address the following questions:

- How widespread is fruit and vegetable production in Vietnam?
- What are the characteristics of household that grow fruits and vegetables?
- How important is production for the market compared to production for consumption?
- What purchased inputs are used in fruit and vegetable production?
- What are the economic returns to fruits and vegetables compared to other crops?

2.1 Extent of fruit and vegetable production

Overall, the VLSS data indicate that fruit and vegetable production is quite widespread. Eighty-five percent of all rural households in Vietnam grow fruits and/or vegetables. This implies that approximately 10.2 million rural households produce fruit and/or vegetables. Two-thirds of rural households grow vegetables, and an even larger proportion grow fruit (see Table 2-11).

Most individual fruit and vegetable crops are grown by less than a third of all rural households. Exceptions are bananas, grown by 50 percent, and water morning glory, grown by 39 percent. In terms of the number of Vietnamese farmers growing them, these two crops are followed by “other leafy greens” (26 percent), jack fruit and durian (21 percent), and cabbage and cauliflower (20 percent). Overall, these figures imply that rural households that grow fruits and vegetables grows an average of four of the 20 fruit and vegetable categories for which the VLSS collected data.

Box 2-2. Mushroom production near Ho Chi Minh City

Farmers in Hoc Mon and Binh Chanh districts outside Ho Chi Minh City are making healthy profits growing mushrooms (*peurtus florisda*). With an initial investment of VND 1.2 million (US\$ 80), a farmer can grow 40 m² of mushrooms and earn VND 3-5 million in four months of cultivation.

In the Binh Tay Market alone, five tons of mushrooms are bought and sold every day. The retail price of mushrooms has risen from VND 3000-8000 per kg to VND 12,000-15,000 per kg. This has attracted the interest of local farmers.

To produce mushrooms, farmers must buy the mushroom spores (*meo going*) and learn production methods. The mushrooms must be watered two or three times per day and the temperature must be kept below 28° C. Production methods are often learned through experience or by word of mouth, since there is no official source of information on mushroom production. More experienced mushroom growers are said to keep their methods secret to avoid increasing supply and competition.

Bay Yet is a farmer in Hoc Mon district. In addition to supplying *meo giong* to other farmers, he exports 500 tons of fresh mushrooms to Japan every year.

Source: Vietnam News Service, 8 October 2001.

Looking at the regional patterns, it is clear that vegetable production is more widespread in the north. The percentage of rural households growing vegetables in the three northern regions is 72-85 percent, while the percentage in the southern regions is 39-62 percent. A similar pattern can be seen for fruits, which are grown by over three-quarters of the households in the north, but less than two-thirds of the households in the south. The smallest percentage of farmers growing fruit (57 percent) is found in the Mekong Delta (see Table 2-11). This is unexpected because the Mekong Delta is well-known for supplying a wide range of tropical fruits, but the explanation is that fruit growers in this region tend to be larger and more commercially-oriented than those in other regions.

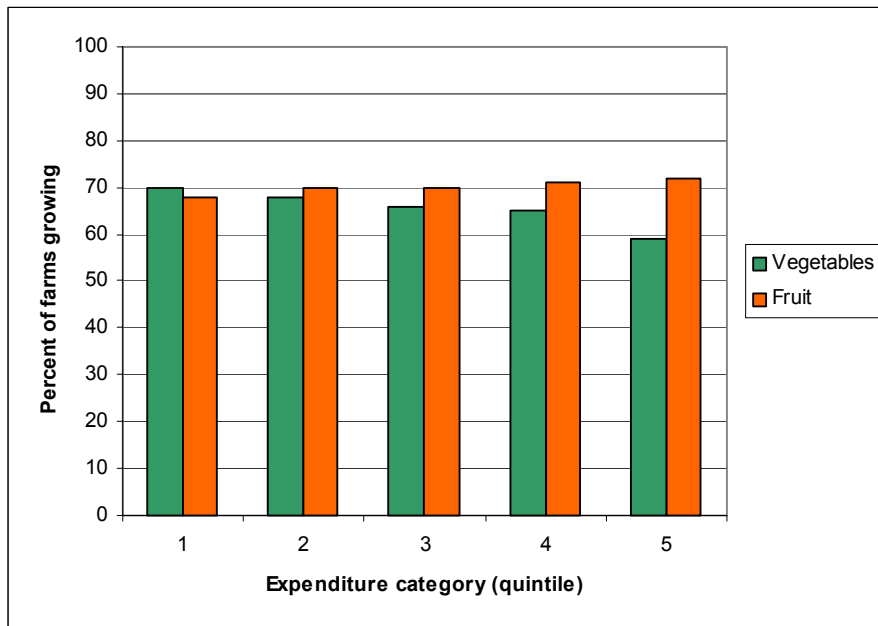
Many individual fruits and vegetables are grown predominantly in the north. For example, potatoes, cabbage and cauliflower, leafy greens, fresh legumes, herbs and spices, and apples are grown primarily in the north, with only small numbers of farmers growing them in the south. Only one, mango, is grown almost exclusively in the south. Of course, these results are partly due to the categories of fruits and vegetables used. For example, although the VLSS combines litchi, longan, and rambuttan into one category, it is well known that rambuttan is grown primarily in the south and litchi in the north (see Table 2-11).

2.2 Characteristics of fruit and vegetable growers

What types of households grow fruits and vegetables? For example, are fruits and vegetables grown primarily by very poor farmers or somewhat better-off farmers? To answer this question, we have divided rural households into five groups according to their level of per capita consumption expenditure³. On the one hand, rich farmers can afford to purchase inputs and take the risks associated with growing a highly perishable commodity, but poor farmers may use fruit and vegetable production as way to compensate for small land holdings and take advantage of available family labor. The results of the VLSS indicate that the percentage of rural households growing vegetables is greater among the poor than the rich. Fully 70 percent of the poorest quintile of rural households grow vegetables, but the proportion declines steadily to 59 percent in the highest expenditure category. Cabbage and cauliflower, leafy greens, and dried legumes, in particular, contribute to this pattern (see Table 2-12 and Figure 2-3).

On the other hand, poor rural households are no more (and no less) likely to grow fruit trees compared to better-off rural households. The percentage remains around 70-72 percent, regardless of the expenditure category. Citrus, litchi/longan/rambutan, and custard apple are grown more often by high-income households than low-income households. On the other hand, bananas are grown somewhat more widely among poor rural households than rich. (see Table 2-12 and Figure 2-3).

Figure 2-3. Percentage of farms growing fruits and vegetable by expenditure category



³ Per capita consumption expenditure is calculated as the sum of cash expenditure on goods and services plus the market value of food produced and consumed by the household divided by the number of members of the households. Per capita consumption expenditure is considered a better measure of household welfare than per capita income because it varies less from year to year and can be measured more accurately.

2.3 Marketed surplus of fruits and vegetables

How much do Vietnamese farmers earn from the sale of their fruits and vegetables?

According to the VLSS, the average gross revenue from fruit and vegetables sales is VND 4.5 million per year, but there is considerable variation across households. One quarter of the growers earn less than VND 500 thousand and three-quarters earn less than VND 5 million. At the other extreme, the top 1.3 percent of commercial fruit and vegetable growers earn more than VND 50 million. (see Table 2-14).

A related but different question is: how important are fruit and vegetable sales to the household budget? To answer this, we calculate the ratio of gross revenue from fruit and vegetable sales to total household expenditure⁴. For more than half the fruit and vegetable growers, sales represent less than 20 percent of household expenditure. On the other hand, almost one quarter of these growers (23 percent) depend on fruit and vegetable sales for at least half of their consumption expenditure. For 11 percent of the growers, fruit and vegetable sales are equivalent to more than 90 percent of household expenditure. These households depend almost entirely on fruit and vegetable production for their livelihoods (see Table 2-15).

Are fruits and vegetables grown primarily for sale or for home consumption? According to the results of the VLSS, fruits and vegetables are grown largely for sale, although this varies across crops and types of households. Overall, more than two-thirds of the volume of fruits and vegetables grown by Vietnamese farmers are sold. Fruits tend to be somewhat more commercialized, with almost three-quarters (74 percent) being sold. Although vegetables are less commercialized than fruits, almost two-thirds (63 percent) are sold (see Table 2-16).

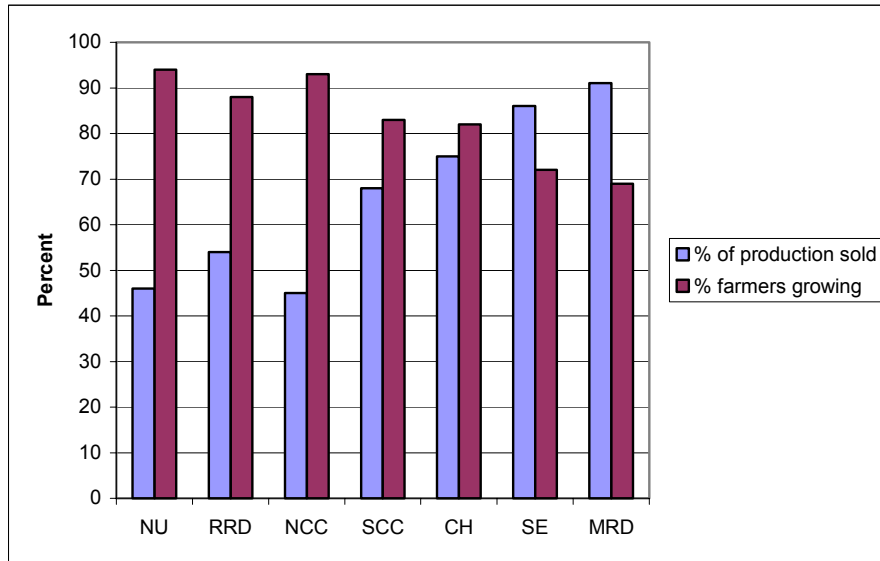
The marketed share of output varies by crop. Only a small share of potatoes (16 percent) and water morning glory (27 percent) are sold by farmers. Similarly, less than half of the papaya and jackfruit/durian harvest is marketed. On the other hand, over half of all the other fruit and vegetable commodity categories are sold by growers. Litchi, longan, and rambutan are the most highly commercialized horticultural products, with 97 percent being sold, followed by citrus, dried legumes, and tomatoes, over 80 percent of which are marketed (see Table 2-16).

The degree of commercialization also varies across regions. For both fruits and vegetables, there is a consistent pattern in which farmers in the north sell smaller shares of their output compared to farmers in the south. For example, in the Northern Uplands and the North Central Coast, less than half of the fruit and vegetable harvest is marketed, whereas the percentage marketed is 91 percent in the Mekong River Delta and 86 percent in the Southeast. This pattern applies to vegetables, for which the marketed share rises from 42 percent in the Northern Uplands to 92 percent in the Mekong Delta,

⁴ Because we are comparing gross revenue to consumption expenditure, this ratio may be greater than one. To use a simple example, a household may have sales of VND 20 million, farm expenses of VND 5 million, leaving a net revenue of VND 15 million for consumption expenditure. In this case, the ratio would be $20/15=1.33$.

and to fruits, for which the corresponding percentages are 53 and 90 percent (see Table 2-16 and Figure 2-4).

Figure 2-4. Regional patterns in fruit and vegetable production and sales



Three factors may contribute to this pattern. First, fruit and vegetable production is more commercialized near major cities such as Ho Chi Minh City and, to a lesser degree, Hanoi. Second, farms tend to be larger in the south, allowing more scope for commercial production. And third, transportation infrastructure is weak in the Northern Uplands and the North Central Coast, limiting the marketing opportunities of many farmers in these regions. Although the road network in the Mekong Delta is less dense than in many other regions, the network of rivers and canals provides a means of getting produce to the market.

Given these patterns, it is worth asking to what degree small-scale and poor farmers are participating in this commercial production of fruits and vegetables. The VLSS data indicate that richer farmers do indeed sell a larger proportion of their fruit and vegetable output. For fruits and vegetables together, farmers in the richest category sell three-quarters of their output, while those in the poorest category sell 56 percent. The patterns are similar for both fruits and vegetables, separately. On the other hand, it is worth noting that even among the poorest 20 percent of Vietnamese farmers, over half of the fruit and vegetable output is destined for market sales. Some crops are highly commercialized among all income categories, such as other leafy greens, dried legumes, citrus, bananas, and litchi, longan, and rambutan. Others crops are grown as cash crops by richer households and for home consumption by poorer households. Examples include cabbage and cauliflower, fresh legumes, apples, and jackfruit and durian (see Table 2-17).

Box 2-3. Diversification into fruit in Ben Tre

The basis of the Ben Tre agricultural economy has been rice, sugarcane, and coconuts, but local authorities are attempting to expand fruit production through the creation of grower cooperatives, the provision of fruit seedlings, and investment in processing facilities.

Currently, Ben Tre has 32,000 hectares of fruit trees. One third of the province's fruit are is found in Cho Lach district. This district is well known for its durian, rambuttan, and grapefruit. Chau Thanh district is also planning to expand its fruit production in the coming years.

On result of the growing demand for fruit and the availability of fruit tree seedlings is that many farmers have experimented with several different fruit trees. For example, Nam Suong, a farmer in Chau Thanh district, started out with coconut trees, before switching to apple production. A year later, the market for apples declined and he uprooted the apple trees to grow lemons. When lemon prices fell, he tore down the lemon trees and planted sapodilla. Most recently, he has planted coconut (again) and cocoa trees.

Source: Vietnam News Service, 17 November 2001.

Similarly, it is useful to know whether fruit and vegetable marketing patterns differ between small and large farms. The data from the VLSS indicate that large farms do sell a larger share of their fruit and vegetable output, but the difference is not very large. Farms in the largest farm-size category (the largest 20 percent of farms) sell somewhat more than three-quarters of their output, while those in the smallest farm-size category (the smallest 20 percent of farms) sell 61 percent (see Table 2-18). The reason that large farms sell a larger share of their output is clear: large farms are more likely to produce a surplus above the needs of home consumption. The relatively weak relationship between farm size and marketed surplus share may be attributed to two offsetting factors. First, small farms are more likely to be irrigated land in high-potential areas, which facilitates commercial horticultural production. Second, a household with a small farm has a high ratio of labor-to-land, making labor-intensive high-value crops particularly appropriate to its economic conditions.

The results given above describe the share of fruit and vegetable production that is sold. It is possible, however, that these results are dominated by a few large growers that sell a large proportion of their output. Another measure of the degree of commercial orientation of Vietnamese fruit and vegetable producers is the proportion of fruit and vegetable growers that sell some part of their output. The VLSS data indicate that about half the vegetable growers (49 percent) and 62 percent of fruit growers sell some of their output. Somewhat unexpectedly, the proportion of commercial fruit and vegetable growers does not vary much across regions, ranging from 55 to 72 percent. In the Northern Uplands, one of the poorest and most remote regions, 69 percent of fruit and vegetable growers sell some output. In the Mekong Delta, one of the more commercialized agricultural areas, the percentage is 72 percent (see Table 2-19). Similarly, the proportion of fruit and vegetable growers that sell some of their output ranges little across the five expenditure categories (between 65 and 73 percent) and across the five farm-size categories (65 to 75 percent).

2.4 Input use

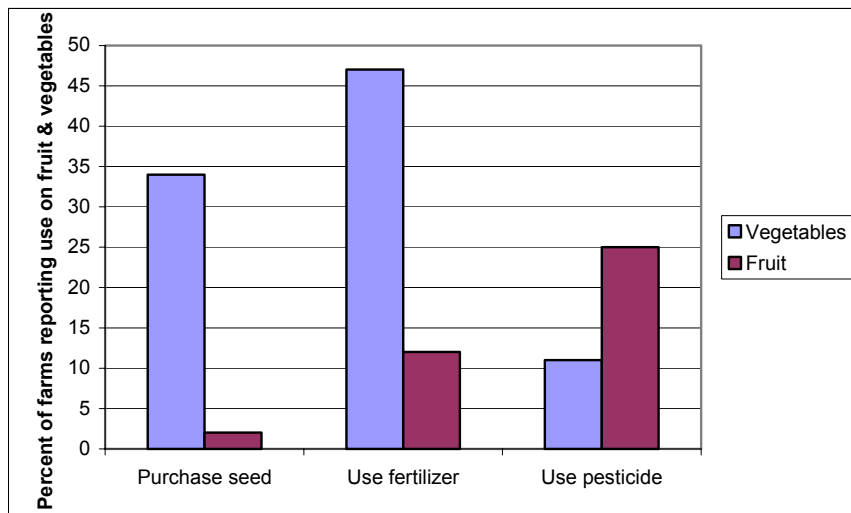
How widespread is the use of purchased inputs in fruit and vegetable production? According to the Vietnam Living Standards Survey, less than half of the fruit and vegetable growers use fertilizer, purchased seed, or pesticides, though the proportion varies by commodity, region, and expenditure category. Experts who work with fruit and vegetable growers believe that the proportion of farms reporting pesticide use is far too low, arguing that a large majority of fruit and vegetable growers use pesticides. It may well be that farmers under-report the use of pesticides, knowing that consumers are concerned about the health impact of pesticide residues. Alternatively, the conventional wisdom may be strongly affected by the practices of larger, commercial growers, who are more likely to use pesticides and other inputs.

Among vegetable growers, 34 percent buy vegetable seed, 47 percent use fertilizer on their vegetables, and 22 percent report using pesticides on their vegetables (see Figure 2-5). Over half the cabbage and cauliflower growers use purchased seed and close to half of the cabbage, cauliflower, and potato growers use fertilizer. The use of purchased seed or planting materials in a given year is rare among fruit growers, as would be expected since most are perennial tree crops. Fertilizer and pesticide use is also relatively rare. Except for litchi, longan, and rambuttan, few fruit growers report using fertilizer or pesticides. In the case of litchi, longan, and rambuttan, about one third of the growers do (see Table 2-20).

The percentage of vegetable growers using purchased vegetable seed varies from 15 percent in the Central Highlands to 41 percent in the Red River Delta. Purchasing power does not seem to be a major issue in seed demand: the share of poor farmers using purchased vegetable seed (28 percent) is not much lower than the percentage of rich farmers (35 percent). This is related to the fact that the cost of seed purchases is usually modest. Small farms are actually more likely to use purchased vegetable seed compared to larger farms (see Table 2-21).

As in the case of seed, the use of chemical fertilizer on vegetables is most common in the Red River Delta, where almost two-thirds (63 percent) of the farmers use it. This is not surprising, given the exceptionally high population density and land values. Under such circumstances, yield increasing technology is most profitable. The lowest rate of fertilizer use on vegetables is in the Central Highlands where land is relatively abundant and increasing yield is less of a priority. For similar reasons, fertilizer use is more common among farmers with small plots than among large farmers. Fertilizer use on both fruits and vegetables is more common among relatively rich farmers than poor farmers, reflecting the fact that fertilizer can be a significant expense (see Table 2-22).

Figure 2-5. Input use on fruits and vegetables



Pesticide use on vegetables is more common in the south than in the north. Pesticide use is also above average in the Red River Delta. These patterns may reflect the greater pest burden associated with the warmer weather in the south. In addition, it is likely that farmers producing for the large urban markets in Hanoi and Ho Chi Minh City have more incentive to use pesticides to maintain a high-quality appearance. Income plays a role in pesticide demand as well. The percentage of farmers in the highest expenditure category using pesticides is more than twice the percentage of poor farmers doing so (see Table 2-23).

2.5 Economic returns to vegetable production

How profitable is fruit and vegetable production compared to other crops? The data from the VLSS allow us to estimate the economic returns to vegetable production, though limitations in the data make it difficult to apply the same analysis to fruit production⁵. We use data from the 1998 Vietnam Living Standards Survey (VLSS) to calculate the gross revenue and net revenue per hectare for various crops. Gross revenue is calculated as the quantity produced multiplied by the sale price. Thus, we implicitly include the value of non-marketed fruits and vegetables. Net revenue is calculated as gross revenue minus the cost of purchased seed, fertilizer, pesticides, and hired labor. Several qualifications need to be made regarding the data:

Using the sale price to value home consumption may over-estimate the value of total production, since farmers may sell the highest quality produce and retain the rest for consumption at home.

⁵ Most fruit growers in the VLSS sample expressed their fruit area in terms of the number of trees, rather than the area. These data were converted into hectares using estimates of tree density from various sources. In addition, the costs do not include the initial investment. In addition, it did not collect information on the investment costs of tree crop production.

- The calculations do not take into account the amount of family labor and land required for production because the VLSS did not collect this information. In any case, identifying the “correct” value for labor and land is difficult.
- The VLSS collected information on the costs of hired labor but did not allocate these costs among crops. We have assumed that hired labor was allocated in proportion to the value of the crops produced by each household.
- Agricultural prices are volatile and have changed since the survey was carried out in 1998. Most notable is the sharp decline in rice prices since that year.
- Finally, these figures represent the *average* values across the sample, but in many cases there is considerable variation across farms in the yield, market price, and use of inputs. There is no single “cost of production”, but rather a continuous range of costs of production across farms.

According to the VLSS data, the average gross revenue from rice production in 1997-98 was 6.8 million Vietnamese dong (VND) per hectare per season. This includes the value of both marketed output and non-marketed output, the latter representing about three-quarters of the total. The monetary costs of production average 1.7 million VND/ha, though it is higher in the deltas than elsewhere. The average net revenue from rice production is 5.1 million VND/ha, which can be considered the returns to family labor and land. In the Northern Uplands and Red River Delta, most farmers grow rice in both the spring and winter seasons, so the *annual* net revenue would be 10.6 million VND/ha. In the Mekong Delta, where most farmers grow rice in the spring and autumn, the annual figure would be 9.7 million VND/ha (see Table 2-24).

By contrast, other food crops (maize, sweet potatoes, and cassava) have net returns in the range of 3.2 to 6.2 million VND/hectare (see Table 2-25). Thus, where double cropping is possible, rice is more profitable, but when only a single crop of rice can be grown, it competes with the other food crops.

The net revenue associated with vegetable production varies widely depending on the crop. According to these data, dried legumes are the least remunerative, earning 5.6 million VND/ha, similar to a single crop of rice. Potatoes generate 10.6 million VND/ha in net revenue, approximately equal to the return to double-cropped rice. All the other vegetables have net revenues of more than 15 million VND/ha, significantly more than the average return to doubled cropped rice. The highest returns (26-34 million VND/ha) are from production of water morning glory, herbs and spices, and “other vegetables” (see Table 2-26).

Although vegetables are considered “high-value” commodities, these data suggest that the value per kilogram is roughly equal to that of rice. Vegetables produce a higher revenue per hectare, not because the price is high but rather because the yields are high. Another somewhat surprising result is that the monetary costs of vegetable production are smaller, as a percentage of gross revenue,

than for rice production.

These results do not imply that vegetables are always more profitable than rice for several reasons. First, vegetable production is more labor-intensive than rice production, so that if the family's labor/land ratio is small, they may not have enough labor. Without sufficient labor, the yields and returns of vegetable production would be lower than the average shown here. Second, the perishability of vegetables limit the ability of many farmers to expand production. In remote locations, the farm-level price of vegetables would be much lower than average. Thus, vegetables are not inherently more profitable than rice; rather the higher net revenue per hectare depends on farming skills, the availability of labor, and proximity to markets.

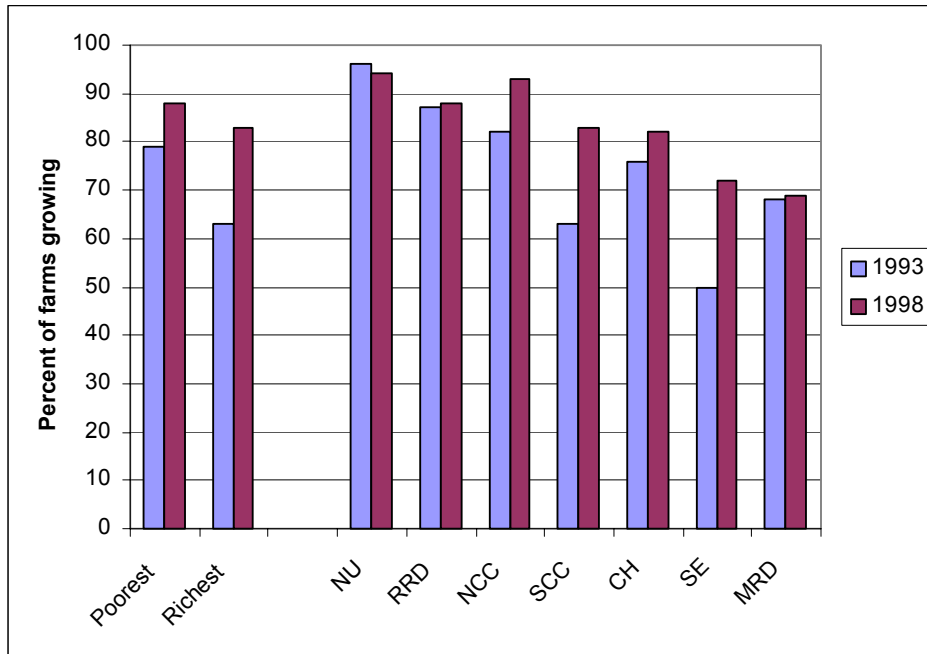
3 Changes in fruit and vegetable marketing over time

Over the past 5-10 years, the fruit and vegetable sector has undergone a dramatic transformation, becoming more market oriented and more export oriented. Some information on the nature of these changes is available by comparing the results of the 1993 Vietnam Living Standards Survey (VLSS) with the 1998 VLSS. The two surveys used similar stratified random samples and the questionnaires were almost identical, thus ensuring a high degree of comparability of results. For example, the section on agricultural production uses the same questions and the same crop classification system. Both surveys collected information on nine vegetables (including potatoes) and fourteen fruits. Of the fourteen fruits, three were merged into "other fruits" because of the small number of observations⁶

The results indicate a gradual but significant increase in the extent of fruit and vegetable production and an increased commercial orientation of this production. For example, the percentage of rural households that grow fruits and vegetables has risen from 78 percent in 1993 to 85 percent in 1998. Similarly, the proportion of growers of fruits and vegetables that sell at least some of their produce has increased from 65 percent to 70 percent. And the share of total fruit and vegetable production that was sold (rather than being retained for home consumption) expanded from 59 percent to 68 percent (see Table 2-28 and Figure 2-6).

⁶ The three fruits were grapes, mangosteen, and sapodilla.

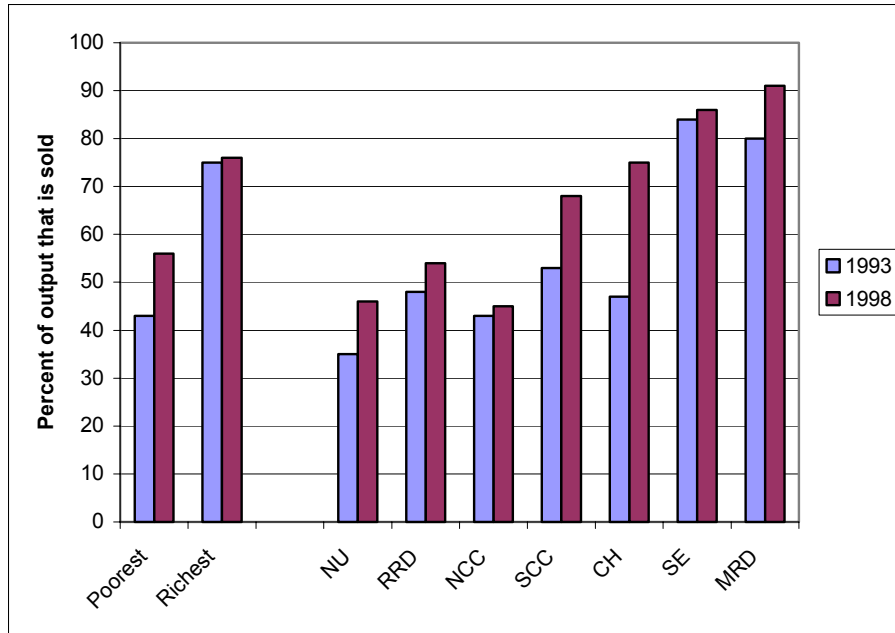
Figure 2-6. Change in the percentage of farms growing fruits or vegetables by region and expenditure category



Are the benefits of this expansion distributed widely in rural areas, or is it just a few larger farmers that have been able to take advantage of market opportunities? The VLSS data indicate that poor households have participated fully in this expansion and commercialization of fruit and vegetable production. For example, among the households in the poorest category, the proportion of household growing fruits and vegetables grew from 79 percent to 88 percent, while the marketed share of output expanded from 43 percent to 56 percent of output. Although the marketed share of output still lags behind that of richer households, who sell three-quarters of their fruit and vegetable production, the percentage-point increase in marketed share ratio was greater for the poorest households. Thus, although richer farmers tend to be more commercial-oriented, the gaps between the poor and rich in commercial orientation appears to be diminishing over time (see Figure 2-7).

Is the average number of fruit and vegetable products grown by rural households growing (as farmers diversify away from rice into horticulture) or diminishing (as farms specialize in just a few fruits and vegetables). The data indicate that the average number of crops grown did not change between 1993 and 1998, remaining at 3.4 of the 20 crop categories used here. Furthermore, there does not seem to be much difference between poor and rich households regarding the number of fruit and vegetable crops grown. (among the (see Table 2-28).

Figure 2-7. Change in percentage of output that is sold by region and expenditure category



These patterns of more widespread production and commercialization apply to all seven regions of Vietnam. In the Northern Uplands, one of the poorest and most remote regions, the percentage of rural households growing fruits and vegetables has not increased, but the share of output marketed rose from 35 percent to 46 percent. Farmers in the Northern Uplands grow an average of 5.0 fruit and vegetable crops. It is interesting to contrast the Northern Uplands with the Mekong River Delta. Farmers in the Northern Uplands grow a large number of fruits and vegetables (averaging 5.0), but their marketed surplus is one of the smallest among the seven regions (46 percent). By contrast, farmers in the Mekong River Delta grow a much smaller number of fruits and vegetables (1.7), but sell a much higher proportion of their fruit and vegetable output (91 percent). (see Table 2-29 and Figure 2-7).

Looking at product-level data, it appears that the percentage of rural households growing vegetables increased only slightly (from 62 to 66 percent), but the percentage growing fruit trees has expanded much more quickly (from 58 to 71 percent). Among the vegetables, herbs and spices and “other vegetables” have grown strongly in terms of the number of growers⁷ Overall, the percentage of fruit and vegetable production that was sold rose from 59 percent to 68 percent. The percentage of output sold has increased for both vegetables (54 to 80 percent) and for fruit (66 to 74 percent). In

⁷ Paradoxically, the percentage of farmers growing fruit has increased strongly, but the percentage growing each type of fruit has not increased, with the possible exception of bananas and papayas. This is possible if fruit production has been spread around among farmers, implying a smaller number of fruit crops per household.

1993, the share of output sold was greater for fruits than for vegetables, but when the survey was repeated in 1998, the reverse was true. Between 1993 and 1998, the share of output sold in the market increased in 12 of the 20 product categories. In general, fruits and vegetables are widely grown and most of the output is sold. Over the period 1993-1998, these patterns have intensified so that fruits and vegetables are now grown by 85 percent of the rural households and over two-thirds of the output is sold (see Table 2-30).

4 Summary

The area planted with fruits and vegetables has grown rapidly in the 1990s. The area planted with vegetables and beans has grown at 5 percent per year, while fruit area has expanded at 6.5 percent per year. These growth rates are twice as high as the growth rate for food crops (2.5 percent), though not as great as the growth rate for multi-year industrial crops.

In spite of this growth, fruits and vegetables still account for a small proportion of total crop area. Vegetables and beans account for just 5 percent of the total cropped area, while fruit trees represent just 4 percent of the total.

Growth rates vary widely across commodities. The fastest growing commodities are the litchi family (litchi, longan, and rambutan) and citrus fruits, while banana area is stagnant and pineapple area has fallen sharply over the 1990s.

The vast majority of rural households in Vietnam grow fruits and vegetables. About 85 percent of the rural households in Vietnam grow at least one fruit or vegetable crop. Bananas, water morning glory, and leafy greens are the most common. The proportion growing fruits and vegetables is higher in the North than in the South. The average rural household grows 3.4 of the 20 categories of fruits and vegetables for which data area available.

Poor rural households are more likely to grow vegetables than richer one. About 70 percent of the households in the poorest income category grow vegetables, compared to just 59 percent in the highest category. This is probably related to the labor-intensity of vegetable production which gives an advantage to households with plentiful labor. The percentage of farmers growing fruit does not vary across income categories.

Fruits and vegetables are grown primarily for sale rather than for home consumption. Two-thirds of the fruit and vegetable output is sold to the market. The marketed share is higher for fruits (74 percent) than for vegetables (63 percent). Furthermore, it is higher in the South (91 percent in the Mekong Delta) than in the North (46 percent in the Northern Uplands). Even among the poorest category of households, over half of the fruit and vegetable output is sold.

About one-quarter of rural Vietnamese household have fruit and vegetable sales that are equivalent to over half their total consumption expenditure. On the other hand, for most rural households is percentage is less than 20 percent.

Although fruits and vegetables production is more widespread in the North, but the degree of

commercialization is greater in the South. The marketed share of fruit and vegetable output is 91 percent in the Mekong Delta and 86 percent in the Southeast, but less than 50 percent in the Northern Uplands and the North Central Coast. In the Red River Delta, just over half (54 percent) of the fruit and vegetable output is marketed. These regional patterns are partly related to the larger average farm size in the South.

There is conflicting evidence regarding the extent of fertilizer and pesticide use among fruits and vegetable producers. According to the Vietnam Living Standards Survey, less than half (47 percent) the vegetable growers apply fertilizer and less than one-quarter (22 percent) use pesticides. The VLSS indicates that the percentage of fruit growers using either product is even less. Yet, agricultural experts insist that fertilizer and pesticides are used by a majority of fruit and vegetable growers. It is not clear if the VLSS under-estimates pesticide use or if the experts are referring more commercial growers rather than the typical grower.

Barely one-third of vegetable growers purchase seed in a given year, implying that the use of recycled seed is widespread. This suggests that agronomic research and improvement of the seed supply system are important avenue for raising productivity in the sector.

Vegetable production is often more profitable than production of rice, but not always. The net revenue of vegetables is often above VND 10 million per hectare. By comparison, the net revenue for rice and other staple food crops is in the range of VND 4-6 million per hectare. On the other hand, vegetable production is significantly more labor-intensive than rice production, and its profitability is subject to problems of market access and price instability.

Over the 1990s, fruit and vegetable production has become more widespread. The percentage of Vietnamese farmers growing fruits and vegetables has increased from 78 percent in 1993 to 85 percent in 1998. Although the percentage has not changed in the Northern Uplands (where 96 percent already grew fruits and vegetables in 1993), nor in the two Deltas, it has grown significantly in the three central regions and in the Southeast. Fruit and vegetable production has become more common among poor farmers, as well as among those with higher incomes.

The degree of commercialization of the fruit and vegetable sector has also increased over the 1990s. The number of fruit and vegetable growers selling part of their output has increased from 65 to 70 percent and the share of output sold has risen from 59 to 68 percent. The increase in the share of output sold is greatest among the poorest farmers and among farmers in the Central Highlands.

Table 2-1: Trends in planted area of crops (1000 ha)

Year	Total	Annual crops	Perennial crops
1975	6,231	5,980	252
1976	7,041	6,746	295
1977	7,633	7,243	399
1978	7,846	7,411	434
1979	8,033	7,546	487
1980	8,281	7,773	508
1981	8,316	7,770	547
1982	8,388	7,818	570
1983	8,282	7,672	611
1984	8,498	7,816	682
1985	8,557	7,840	717
1986	8,606	7,846	761
1987	8,642	7,789	853
1988	8,889	7,999	889
1989	8,978	8,071	907
1990	9,040	8,102	939
1991	9,410	8,475	935
1992	9,753	8,754	999
1993	10,028	8,893	1,135
1994	10,381	9,001	1,381
1995	10,497	9,224	1,273
1996	10,929	9,486	1,443
1997	11,316	9,681	1,636
1998	11,740	10,011	1,729
1999	12,285	10,463	1,822
Annual growth			
1975-80	5.9%	5.4%	15.1%
1980-1990	0.9%	0.4%	6.3%
1990-1999	3.5%	2.9%	7.7%

Source: General Statistical Office; Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. p. 147.

Table 2-2: Trends in planted area of annual crops (1000 ha)

Year	Total	Food	Vegetable & Beans	Annual Industrial crops
1975	5,980	5,551	174	210
1976	6,746	6,193	231	289
1977	7,243	6,641	262	305
1978	7,411	6,780	272	317
1979	7,546	6,922	265	309
1980	7,773	7,049	299	372
1981	7,770	6,984	328	416
1982	7,818	6,968	344	468
1983	7,672	6,775	345	523
1984	7,816	6,817	387	518
1985	7,840	6,843	369	586
1986	7,846	6,813	400	601
1987	7,789	6,710	410	638
1988	7,999	6,968	401	601
1989	8,071	7,090	419	544
1990	8,102	7,111	426	542
1991	8,475	7,448	425	579
1992	8,754	7,707	445	584
1993	8,893	7,789	475	599
1994	9,001	7,809	495	656
1995	9,224	7,972	516	717
1996	9,486	8,218	566	694
1997	9,681	8,330	596	728
1998	10,011	8,587	637	808
1999	10,463	8,868	662	893
Annual growth				
1975-80	5.4%	4.9%	11.4%	12.1%
1980-1990	0.4%	0.1%	3.6%	3.8%
1990-1999	2.9%	2.5%	5.0%	5.7%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. p. 156.

Table 2-3: Trends in planted area of perennial crops (1000 ha)

Year	Total	Multi-year industrial crops	Fruit crops
1975	252	173	78
1976	295	186	93
1977	390	212	153
1978	434	235	176
1979	487	256	191
1980	508	256	211
1981	547	260	246
1982	570	288	236
1983	611	334	224
1984	682	403	238
1985	717	468	213
1986	761	499	261
1987	853	575	278
1988	889	612	272
1989	907	625	282
1990	939	657	281
1991	935	663	272
1992	999	698	261
1993	1,135	759	296
1994	1,381	810	320
1995	1,273	902	346
1996	1,443	1,015	375
1997	1,636	1,135	426
1998	1,729	1,203	447
1999	1,822	1,248	496
Annual growth			
1975-80	15.1%	8.2%	21.9%
1980-1990	6.3%	9.9%	2.9%
1990-1999	7.7%	7.4%	6.5%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000; p. 330.

Table 2-4: Trends in planted area of fruit crops by region (1000 ha)

Year	Total	Northern Uplands	Red River Delta	North Central Coast	South Central Coast	Central High-lands	Southeast	Mekong River Delta
1980	211	20	21	37	19	2	13	100
1981	246	25	27	31	33	3	22	105
1982	236	21	27	33	27	3	23	103
1983	224	21	26	32	25	3	23	93
1984	238	22	26	30	26	3	25	106
1985	213	22	18	30	23	3	26	92
1986	261	25	31	29	22	3	29	122
1987	278	25	31	30	25	3	30	133
1988	272	25	32	30	25	4	30	127
1989	282	26	35	26	25	5	30	135
1990	281	15	31	27	32	5	28	144
1991	272	24	25	27	21	5	29	141
1992	261	23	25	23	21	5	29	135
1993	296	35	31	22	20	6	31	152
1994	320	40	32	25	18	6	34	166
1995	346	48	34	27	16	6	40	176
1996	375	57	39	35	17	7	44	177
1997	426	79	44	39	15	7	55	186
1998	447	98	45	41	18	7	56	183
1999	496	116	46	42	21	7	72	191
Annual growth								
1980-90	2.9%	-2.8%	4.0%	-3.3%	5.6%	10.8%	8.3%	3.7%
1990-99	6.5%	25.4%	4.6%	5.3%	-4.7%	4.5%	11.0%	3.2%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. p. 342- 349.

Note: Northern Uplands includes "North Mountain and Midlands" until 1998 and North East and North West after that date.

Note: The definition of fruit crops used here appears to exclude cashew nuts and coconuts.

Table 2-5: Trends in planted area of main fruit crops (1000 ha)

Year	Orange, lemon, mandarin	Banana	Mango	Pineapple	Longan litchis, rambutan	Coconut	Cashew
1990	15	88	16	39	-	212	-
1991	21	89	15	38	-	214	-
1992	26	90	15	35	-	204	79
1993	45	94	18	29	-	208	123
1994	55	92	30	29	27	183	173
1995	60	92	21	26	38	173	189
1996	67	96	26	26	62	181	195
1997	67	92	31	26	91	170	203
1998	71	89	37	29	114	163	192
1999	63	95	41	32	131	168	190
Annual growth 1990-99	17.8%	0.8%	10.6%	-2.0%	37.0%	-2.6%	13.3%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. Table 2.43; p. 350 and Table 2.39; p.339.

Note: Annual growth rates for longan, litchi, & rambutan and for cashew cover the time period for which data are available.

Table 2-6: Trends in production of main fruit crops (1000 tons)

Year	Orange, lemon, mandarin	Banana	Mango	Pineapple	Longan litchis, rambutan	Coconut	Cashew
1990	119	1,221	173	468	-	894	-
1991	121	1,286	140	420	-	1,053	-
1992	160	1,366	112	264	-	1,140	24
1993	250	1,398	119	258	-	1,184	47
1994	286	1,375	136	235	180	1,078	52
1995	379	1,282	153	185	223	1,165	51
1996	445	1,319	188	185	276	1,318	59
1997	393	1,316	165	199	405	1,318	67
1998	402	1,208	181	244	429	1,106	54
1999	405	1,243	189	263	545	1,134	41
Annual growth 1990-99	14.6%	0.2%	1.0%	-6.2%	24.9%	2.7%	8.2%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. Table 2.43; p. 350 and Table 2.41; p.341.

Note: Annual growth rates for longan, litchi, & rambutan and for cashew cover the period 1994-1999.

Table 2-7: Trends in gross value of crop production

(Billion VND at constant price of 1994)

Year	Total	Food	Industrial crops	Vegetable & Beans	Fruit crops
1985	41,951	28,080	5,718	2,853	4,180
1986	43,471	28,390	6,013	3,254	4,681
1987	42,571	27,247	6,340	3,309	4,627
1988	45,406	30,325	6,505	3,228	4,184
1989	48,900	33,319	6,412	3,476	4,509
1990	49,604	33,290	6,692	3,477	5,029
1991	51,248	33,950	7,858	3,471	4,828
1992	55,133	37,365	7,919	3,556	5,026
1993	58,906	39,466	8,978	3,793	5,325
1994	61,660	40,653	10,299	3,946	5,415
1995	66,183	42,110	12,149	4,984	5,578
1996	69,620	44,654	12,806	5,088	5,688
1997	74,493	46,593	14,551	5,441	6,132
1998	77,298	49,060	15,042	5,682	6,091
1999	82,946	52,738	16,977	5,947	6,193
Annual growth					
1985-90	3.4%	3.5%	3.2%	4.0%	3.8%
1990-99	6.0%	5.0%	11.5%	7.6%	3.0%

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. Table 2.5; p. 139.

Table 2-8: Trends in the structure of gross value of crop production

(Percentage of total value at constant prices of 1994)

Year	Total	Food	Industrial crops	Vegetable & Beans	Fruit crops
1985	100.0	66.9	13.6	6.8	10.0
1986	100.0	65.0	13.8	7.5	10.8
1987	100.0	64.0	14.9	7.8	10.9
1988	100.0	66.8	14.3	7.1	9.2
1989	100.0	68.1	13.1	7.1	9.2
1990	100.0	67.1	13.5	7.0	10.1
1991	100.0	66.2	15.3	6.8	9.4
1992	100.0	67.8	14.4	6.5	9.1
1993	100.0	67.0	15.2	6.4	9.0
1994	100.0	66.0	16.7	6.4	6.8
1995	100.0	64.0	18.3	7.5	8.4
1996	100.0	64.0	18.4	7.3	8.2
1997	100.0	63.0	19.5	7.3	8.2
1998	100.0	63.0	19.5	7.4	7.9
1999	100.0	63.6	20.5	7.2	7.5

Source: General Statistical Office: Statistical Data of Vietnam Agriculture, Forestry and Fishery 1975 - 2000. Statistical Publishing House, 2000. Table 2.5; p. 139.

Table 2-9: Regional composition of the production of selected fruits and vegetables (1999)

	Red River Delta	North-east	North-west	North Central Coast	South Central Coast	Central High-lands	South-east	Mekong River Delta	Total
Vegetables	29.1	13.3	1.6	7.4	6.2	2.1	17.1	23.3	100
Citrus	8.4	8.6	0.6	9.5	1.8	0.2	3.9	66.9	100
Banana	27.7	9.3	2.1	7.4	8.2	2.6	14.5	28.2	100
Mango	0.6	1.1	2.1	0.8	7.6	2.0	32.9	52.8	100
Pineapple	8.8	3.6	0.4	9.3	7.3	0.9	0.6	69.1	100
Longan, litchi, rambuttan	7.0	9.1	0.9	1.0	0.1	0.1	14.7	67.1	100

Source: General Statistics Office, 2001

Table 2-10: Plan for fruit and vegetable export

Product	2005					2010					
	Productivity (tons/ha)	Area (000 ha)	Production (000 tons)	Processed output (000 tons)	Export turnover (mil.US\$)	Area (000 ha)	Total production output (000 tons)	Processed output (000 tons)	Export turnover (mil.US\$)	Investment capital (US\$ m)	Labor demand (1000 people)
A Vegetables, herbs		20.6	400	205	200	69	1340	702	690	408	850
1 Asparagus	10	5.0	50	40	50	20	200	150	200	90	400
2 Bamboo roots	13	5.4	70	50	50	15	200	150	150	45	60
3 Mushrooms	-	-	60	30	30	2 Mil.T	200	100	100	65	100
4 Beans	25	2.5	62.5	40	20	7.5	187.5	120	60	45	120
5 Taro	11	3.2	35	25	10	9	100	80	30	2	45
6 Tomato	40	2.0	80	11	10	6	240	33	30	6	30
7 Pepper	16.5	2.5	42.5	9	30	9	150	29	100	140	55
8 Other herbs	-	-	-	-	-	2.5	62.5	40	20	15	40
B Fruits		17.45	528.5	227.5	120	57	1587	717	350	42	155
9 Pineapple	40	6.5	260	40	50	20	800	120	150	20	60
10 Banana	25	8.4	210	150	30	25	630	500	100	8	60
11 Sectioned fruit	15	1.7	25	10	10	5	75	30	30	5	15
12 Litchi	10	0.35	3.5	2.5	5	1	10	7	10	2	5
13 Mango	12	0.5	6	5	5	1	12	10	10	2	5
14 Other fruits			24	20	20	5	60	50	50	5	10
C Flowers & ornamental trees		1.4		0.2 bil.	10	7		1 bil.	60	5	110
Total		39.45	928.5	432.5	330	133	2927	branches	1100	455	1115

Source: Vietnam Economic News, No 41, 1999; p. 30.

Table 2-11: Percentage of rural households growing fruits and vegetables

	Red		North C Coast	South C Coast	Central Highlands	Mekong	
	Northern Uplands	River Delta				South East	Delta
Potatoes	17	15	5	-	-	-	-
Cabbage, cauliflower	45	35	15	0	1	-	0
Other leafy greens	45	30	41	10	4	5	9
Tomatoes	9	9	10	1	-	0	2
Water morning glory	55	52	52	16	5	15	20
Fresh legumes	19	6	19	2	3	2	3
Dried legumes	30	12	32	18	34	11	5
Herbs and spices	27	17	25	9	1	1	3
Other vegetables	50	41	63	23	39	22	25
Citrus	22	25	31	4	2	8	9
Pineapple	8	1	7	8	8	3	1
Bananas	53	60	58	43	33	36	37
Mango	4	1	5	6	21	14	16
Apple	10	10	9	0	-	1	1
Plum	14	0	1	1	1	1	4
Papaya	21	19	25	16	8	20	5
Litchi, longan & rambuttan	23	14	4	1	1	7	14
Custard apple	12	13	13	3	9	17	3
Jackfruit, durian	26	23	25	24	28	22	5
Other fruit trees	7	9	9	6	7	4	3
Vegetables	85	72	82	49	62	40	39
Fruits	78	75	79	67	68	60	57
Vegetables or Fruits	94	88	93	83	82	72	69
Avg nbr of crops grown	5.0	3.9	4.5	1.9	2.1	1.9	1.7

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-12: Percentage of rural household growing fruits and vegetables by expenditure category

	Expenditure category					Average
	Poorest	2	3	4	Richest	
Potatoes	6	11	9	7	6	8
Cabbage, cauliflower	20	24	21	19	16	20
Other leafy greens	26	31	29	25	21	26
Tomatoes	4	8	6	7	5	6
Water morning glory	36	42	40	41	35	39
Fresh legumes	11	12	8	9	9	10
Dried legumes	23	21	19	17	14	19
Herbs and spices	14	18	16	14	14	15
Other vegetables	44	42	40	40	38	41
Citrus	14	18	18	20	23	18
Pineapple	8	5	3	3	4	5
Bananas	53	51	48	48	49	50
Mango	4	7	9	8	9	7
Apple	3	6	6	7	8	6
Plum	5	6	2	3	3	4
Papaya	17	13	19	18	20	17
Litchi, longan & rambuttan	8	14	12	12	14	12
Custard apple	5	9	11	11	14	10
Jackfruit, durian	22	19	19	20	23	21
Other fruit trees	5	6	6	8	9	7
Vegetables	70	68	66	65	59	66
Fruits	72	70	70	71	72	71
Vegetables or Fruits	88	85	85	83	83	85
Avg nbr of crops grown	3.3	3.6	3.4	3.4	3.3	3.4

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-13: Percentage of rural household growing fruits and vegetables by farm-size category

	Farm-size category					Average
	Smallest	2	3	4	Largest	
Potatoes	4	15	11	5	4	8
Cabbage, cauliflower	12	24	30	17	17	20
Other leafy greens	21	26	32	28	26	26
Tomatoes	4	5	10	6	6	6
Water morning glory	30	44	47	38	36	39
Fresh legumes	6	8	12	12	12	10
Dried legumes	9	15	20	25	28	19
Herbs and spices	14	15	16	14	18	15
Other vegetables	32	38	49	44	41	41
Vegetables	53	69	75	66	65	66
Citrus	12	21	21	19	19	18
Pineapple	2	2	4	6	10	5
Bananas	39	52	58	50	51	50
Mango	5	2	5	11	15	7
Apple	4	8	7	6	6	6
Plum	1	2	3	7	8	4
Papaya	13	18	18	18	20	17
Litchi, longan & rambuttan	7	10	13	14	16	12
Custard apple	9	10	11	9	10	10
Jackfruit, durian	16	17	23	24	25	21
Other fruit trees	6	6	8	7	7	7
Fruits	57	72	77	75	76	71
Vegetables or Fruits	75	86	90	88	87	85

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-14. Distribution of farm households by value of fruit and vegetable sales

Value of fruit and vegetable sales (1000 VND)	Number of households	Percentage of households	Average Sales (‘000 VND)
Less than 500	1,176	27.6	168
500 - 1,000	538	12.6	751
1,000 - 5,000	1,535	36.0	2,373
5,000 - 10,000	461	10.8	6,935
10,000 - 50,000	495	11.6	19,684
50,000 - 100,000	48	1.1	65,842
Greater than 100,000	8	0.2	348,369
Total	4,261	100.0	4,519

Source: Analysis of the 1998 Vietnam Living Standards Survey data.

Table 2-15. Distribution of households by the ratio of fruit and vegetable sales to household expenditure

Value of fruit and vegetable sales as ratio of household expenditure (percent)	Number of households	Percentage of households	Average Sales (‘000 VND)
Less than 10	1,522	35.7	350
10 - 20	725	17.0	1,426
20 - 30	503	11.8	2,409
30 - 40	301	7.1	3,482
40 - 50	226	5.3	4,517
50 - 60	193	4.5	5,973
60 - 70	131	3.1	7,318
70 - 80	88	2.1	8,344
80 - 90	83	1.9	9,947
Greater than 90	487	11.4	26,842
Total	4,259	100.0	4,519

Source: Analysis of the 1998 Vietnam Living Standards Survey data.

Table 2-16: Share of fruit and vegetable output sold by region

	Red		North C Coast	South C Coast	Central Highlands	Mekong Southeast	Delta	All rural areas
	Northern Uplands	River Delta						
Potatoes	18	13	23					16
Cabbage, cauliflower	32	72	50	58	99		56	58
Other leafy greens	31	37	55	64	87	70	91	66
Tomatoes	72	79	59	59		75	95	82
Water morning glory	36	14	32	5	40	29	40	27
Fresh legumes	16	80	16	64	54	81	88	58
Dried legumes	44	51	77	81	90	94	89	83
Herbs and spices	84	82	76	72	89	99	84	79
Other vegetables	49	56	32	57	73	93	96	77
Vegetables	42	52	40	54	80	88	92	63
Citrus	25	32	83	40	20	65	97	85
Pineapple	22	8	26	52	28	3	91	55
Bananas	43	63	54	82	23	80	62	63
Mango	30	39	34	63	78	43	78	73
Apple	35	63	50	100		72	82	74
Plum	61	100	-	83	-	-	52	59
Papaya	26	38	39	58	15	21	71	42
Litchi, longan & rambuttan	92	84	87	94	41	96	98	97
Custard apple	59	72	45	84	58	51	31	62
Jackfruit, durian	25	35	26	45	36	79	37	38
Other fruit trees	57	47	34	94	72	58	93	80
Fruits	53	57	52	82	55	84	90	74
Vegetables and Fruits	46	54	45	68	75	86	91	68

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-17: Share of fruit and vegetable output sold by expenditure category

	Expenditure category					Average
	Poorest	2	3	4	Richest	
Potatoes	17	18	11	7	26	16
Cabbage, cauliflower	22	54	52	62	76	58
Other leafy greens	61	61	65	68	71	66
Tomatoes	81	78	81	87	79	82
Water morning glory	22	19	30	30	31	27
Fresh legumes	21	63	31	77	60	58
Dried legumes	81	74	86	85	84	83
Herbs and spices	84	78	80	73	81	79
Other vegetables	57	77	72	78	83	77
Vegetables	49	59	59	66	73	63
Citrus	88	72	87	89	82	85
Pineapple	77	37	17	26	26	55
Bananas	66	64	63	61	61	63
Mango	74	63	75	76	71	73
Apple	31	84	56	55	80	74
Plum	68	71	59	42	24	59
Papaya	31	61	26	39	45	42
Litchi, longan & rambuttan	94	96	96	97	97	97
Custard apple	58	63	73	57	47	62
Jackfruit, durian	30	23	31	32	64	38
Other fruit trees	62	83	81	70	86	80
Fruits	64	70	74	74	81	74
Vegetables and Fruits	56	63	65	69	76	68

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-18: Share of fruit and vegetable output sold by farm size category

	Farm-size category					Average
	Smallest	2	3	4	Largest	
Potatoes	22	16	12	17	20	16
Cabbage, cauliflower	59	75	47	40	45	58
Other leafy greens	67	61	48	81	60	66
Tomatoes	85	74	83	86	67	82
Water morning glory	40	32	18	30	17	27
Fresh legumes	72	73	48	58	38	58
Dried legumes	77	66	70	87	86	83
Herbs and spices	72	80	88	88	70	79
Other vegetables	67	51	68	83	90	77
Vegetables	65	56	45	56	86	63
Citrus	62	76	87	92	78	85
Pineapple	48	41	27	10	67	55
Bananas	55	53	63	69	68	63
Mango	67	80	83	77	66	73
Apple	87	64	52	84	51	74
Plum	17	60	43	71	55	59
Papaya	50	25	43	52	33	42
Litchi, longan & rambuttan	91	97	96	97	97	97
Custard apple	57	67	68	53	56	62
Jackfruit, durian	37	34	32	36	46	38
Other fruit trees	58	60	64	79	89	80
Fruits	60	64	69	79	79	74
Vegetables and Fruits	61	57	58	74	77	68

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-19: Share of growers selling some of their output by region

	Red		North C	South C	Central	Mekong	All rural
	Northern Uplands	River Delta	Coast	Coast	Highlands	Southeast	Delta areas
Potatoes	19	16	30				19
Cabbage, cauliflower	19	37	38	59	65	100	29
Other leafy greens	15	18	33	61	45	25	26
Tomatoes	50	53	11	55		100	42
Water morning glory	8	16	23	9	46	25	15
Fresh legumes	9	42	14	19	33	64	19
Dried legumes	42	32	56	69	95	89	53
Herbs and spices	40	62	29	85	100	43	45
Other vegetables	24	29	21	46	17	47	28
Vegetables	44	45	55	52	60	56	49
Citrus	20	24	53	33	17	19	37
Pineapple	14	18	20	52	4	17	22
Bananas	46	56	54	67	11	25	50
Mango	28	73	22	47	44	32	43
Apple	21	40	39	100		39	35
Plum	34	100	-	62	-	-	34
Papaya	25	29	28	25	9	14	26
Litchi, longan & rambuttan	81	62	64	100	65	66	75
Custard apple	52	46	34	58	33	20	40
Jackfruit, durian	25	39	36	37	16	47	34
Other fruit trees	42	33	30	55	32	34	39
Fruits	62	64	62	66	32	45	68
Vegetables and Fruits	69	72	73	70	55	57	70

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-20: Percentage of fruit and vegetable growers using different inputs

	Percentage of growers using purchased seed	Percentage of growers using fertilizer	Percentage of growers using pesticides
Potatoes	26	44	10
Cabbage, cauliflower	55	46	17
Other leafy greens	22	20	10
Tomatoes	24	20	20
Water morning glory	15	25	2
Fresh legumes	11	8	7
Dried legumes	11	13	19
Herbs and spices	9	31	16
Other vegetables	13	21	12
Vegetables	34	47	22
Citrus	1	13	11
Pineapple	1	3	-
Bananas	0	3	0
Mango	1	7	7
Apple	2	8	7
Plum	2	1	2
Papaya	0	1	1
Litchi, longan & rambuttan	5	29	33
Custard apple	1	7	3
Jackfruit, durian	0	1	1
Other fruit trees	1	5	4
Fruits	2	12	11
Vegetables and Fruits	28	44	25

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-21: Percentage of fruit and vegetable growers using purchased seed by type of household

	Vegetable growers	Fruit growers	Fruit & veg. growers
Region			
N. Uplands	36	3	34
Red River Delta	41	1	34
N.C. Coast	32	1	29
S.C. Coast	28	1	17
Central Highlands	15	-	11
Southeast	30	6	22
Mekong Delta	29	3	19
Expenditure category			
Poorest	28	2	23
2	35	2	29
3	38	1	30
4	35	1	28
Richest	35	4	27
Farm-size category			
Smallest	34	1	25
2	41	1	33
3	41	2	35
4	25	2	21
Largest	27	4	23
All rural households	34	2	28

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-22: Percentage of fruit and vegetable growers using chemical fertilizer by type of household

	Vegetable growers	Fruit growers	Fruit & veg. growers
Region			
N. Uplands	42	9	41
Red River Delta	63	6	55
N.C. Coast	38	10	39
S.C. Coast	56	13	41
Central Highlands	16	1	13
Southeast	48	10	35
Mekong Delta	41	34	49
Expenditure category			
Poorest	34	6	31
2	46	11	43
3	51	13	48
4	51	14	49
Richest	54	18	50
Farm-size category			
Smallest	51	12	43
2	57	10	52
3	51	12	49
4	38	14	38
Largest	35	14	35
All rural households	47	12	44

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-23: Percentage of fruit and vegetable growers using pesticides by type of household

	Vegetable growers	Fruit growers	Fruit & veg. growers
Region			
N. Uplands	15	13	21
Red River Delta	29	2	26
N.C. Coast	12	8	16
S.C. Coast	24	4	17
Central Highlands	31	0	24
Southeast	44	8	32
Mekong Delta	32	33	43
Expenditure category			
Poorest	13	6	14
2	22	12	26
3	24	10	26
4	26	11	28
Richest	29	14	31
Farm-size category			
Smallest	24	7	22
2	24	8	25
3	19	10	23
4	20	14	25
Largest	26	14	30
All rural households	22	11	25

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 2-24: Gross and net revenue from rice production

	Rice crop				
	Spring	Autumn	Winter	Glutinous	Average
Price (VND per kg)	1,761	1,681	1,767	2,574	1,898
Yield (kg per hectare)	4,333	3,542	3,573	3,339	3,808
Gross revenue (1000 VND/ha)	7,637	5,926	6,345	8,574	6,816
Sales	1,891	2,252	1,247	1,274	1,633
Other	5,747	3,673	5,098	7,300	5,183
Cost of production (1000 VND/ha)	1,782	2,117	1,607	1,223	1,675
Seed	135	78	102	40	111
Chemical fertilizer	938	936	794	481	836
Organic fertilizer	13	23	19	2	17
Pesticides	229	292	177	125	205
Labor (hired)	468	788	515	575	506
Net revenue (1000VND/ha)	5,855	3,809	4,738	7,351	5,141
	(percent of gross revenue)				
Gross revenue	100	100	100	100	100
Sales	25	38	20	15	24
Other	75	62	80	85	76
Cost of production	23	36	25	14	25
Seed	2	1	2	0	2
Chemical fertilizer	12	16	13	6	12
Organic fertilizer	0	0	0	0	0
Pesticides	3	5	3	1	3
Labor (hired)	6	13	8	7	7
Net revenue	77	64	75	86	75

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Note: Gross revenue includes the value of non-marketed output. Cost of production refers to monetary costs and excludes some costs such as irrigation (which could not be allocated among crops). Net revenue refers to the returns to family labor and land.

Table 2-25. Gross and net revenue from other food production

	Crop		
	Maize	Sweet potatoes	Cassava
Price (VND per kg)	1,767	782	550
Yield (kg per hectare)	2,606	7,176	12,596
Gross revenue (1000 VND/ha)	4,518	5,581	6,564
Sales	1,030	191	1,236
Other	3,488	5,391	5,328
Cost of production (1000 VND/ha)	1,243	732	318
Seed	195	97	5
Chemical fertilizer	827	407	193
Organic fertilizer	11	2	2
Pesticides	65	6	-
Labor (hired)	144	223	118
Net revenue (1000VND/ha)	3,275	4,849	6,246
	(percent of gross revenue)		
Gross revenue	100	100	100
Sales	23	3	19
Other	77	97	81
Cost of production	28	13	5
Seed	4	2	0
Chemical fertilizer	18	7	3
Organic fertilizer	0	0	0
Pesticides	1	0	-
Labor (hired)	3	4	2
Net revenue	72	87	95

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Note: Gross revenue includes the value of non-marketed output. Cost of production refers to monetary costs and excludes some costs such as irrigation (which could not be allocated among crops). Net revenue refers to the returns to family labor and land.

Table 2-26: Gross and net revenue from vegetable production

	Type of vegetable									
	Potatoes	Cabbage, cauliflower	Other leafy greens	Tomatoes	Water morning glory	Fresh legumes	Dried legumes	Herbs and spices	Other vegetables	
Price (VND per kg)	1,772	1,353	1,112	1,528	938	1,843	5,875	2,679	1,375	
Yield (kg per hectare)	6,938	16,409	15,022	14,502	40,123	9,505	1,041	10,385	23,214	
Gross revenue (1000 VND/ha)	12,158	21,592	16,930	22,445	37,371	17,081	6,055	26,906	31,011	
Sales	1,226	4,387	3,668	8,585	3,477	2,038	2,261	6,884	5,055	
Other	10,932	17,206	13,261	13,860	33,894	15,043	3,793	20,022	25,957	
Cost of production (1000 VND/ha)	1,553	2,296	1,275	1,121	3,414	1,218	417	1,220	1,571	
Seed	826	1,075	497	273	457	377	80	402	380	
Chemical fertilizer	639	911	388	444	1,168	210	107	559	723	
Organic fertilizer	-	53	3	34	-	20	2	17	29	
Pesticides	47	180	114	310	40	141	91	92	171	
Labor (hired)	41	77	272	59	1,749	470	137	149	269	
Net revenue (1000VND/ha)	10,605	19,296	15,655	21,324	33,957	15,863	5,638	25,686	29,440	
	(percentage of gross revenue)									
Gross revenue	100	100	100	100	100	100	100	100	100	100
Sales	10	20	22	38	9	12	37	26	16	
Other	90	80	78	62	91	88	63	74	84	
Cost of production	13	11	8	5	9	7	7	5	5	
Seed	7	5	3	1	1	2	1	1	1	
Chemical fertilizer	5	4	2	2	3	1	2	2	2	
Organic fertilizer	-	-	-	-	-	-	-	-	-	
Pesticides	-	1	1	1	-	1	2	-	1	
Labor (hired)	-	-	2	-	5	3	2	1	1	
Net revenue	87	89	92	95	91	93	93	95	95	

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Note: Gross revenue includes the value of non-marketed output. Cost of production refers to monetary costs and excludes some costs such as irrigation (which could not be allocated among crops). Net revenue refers to the returns to family labor and land.

Table 2-27. Gross and net revenue from production for fruit

	Type of fruit										
	Citrus	Pineapple	Bananas	Mango	Apple	Plum	Papaya	Litchi, longan & rambuttan	Custard apple	Jack fruit & durian	Other fruits
Price (VND per kg)	3,725	1,362	1,293	5,078	2,006	2,381	1,587	6,497	4,309	1,404	2,207
Yield (kg per hectare)	6,844	46,444	16,576	2,138	4,613	2,641	27,763	5,083	2,975	5,230	4,079
Gross revenue (1000 VND/ha)	24,674	57,377	20,573	9,352	8,066	5,055	38,290	30,580	9,737	6,223	7,877
Sales	6,883	5,274	6,993	4,935	4,787	2,218	9,147	21,801	3,146	1,678	3,644
Other	17,790	52,103	13,580	4,418	3,278	2,837	29,143	8,779	6,591	4,545	4,233
Cost of production (1000 VND/ha)											
Seed	1,252	858	1,233	850	303	1,060	685	1,817	8,668	1,243	872
Chemical fertilizer	317	154	-	9	15	6	2	30	5	4	21
Organic fertilizer	527	448	62	45	106	10	32	656	139	68	83
Pesticides	6	-	1	-	-	-	-	1	-	1	7
Labor (hired)	153	-	-	151	28	32	2	257	16	2	33
Net revenue (1000VND/ha)	23,422	56,519	19,340	8,502	7,763	3,995	37,605	28,763	1,069	4,980	7,005
	(percentage of gross revenue)										
Gross revenue	100	100	100	100	100	100	100	100	100	100	100
Sales	28	9	34	53	59	44	24	71	32	27	46
Other	72	91	66	47	41	56	76	29	68	73	54
Cost of production	5	1	6	9	4	21	2	6	89	20	11
Seed	1	0	0	0	0	0	0	0	0	0	0
Chemical fertilizer	2	1	0	0	1	0	0	2	1	1	1
Organic fertilizer	0	-	0	-	-	-	-	0	-	0	0
Pesticides	1	-	0	2	0	1	0	1	0	0	0
Labor (hired)	1	0	6	7	2	20	2	3	87	19	9
Net revenue	95	99	94	91	96	79	98	94	11	80	89

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Note: Gross revenue includes the value of non-marketed output. Cost of production refers to monetary costs and excludes some costs such as irrigation (which could not be allocated among crops). Net revenue refers to the returns to family labor and land.

**Table 2-28. Comparison of fruit and vegetable production in 1993 and 1998
by expenditure category**

	Expenditure category					Total
	Poorest	2	3	4	Richest	
1993						
Pct growing F&V	79	78	82	80	63	78
Avg nbr crops grown	3.3	3.5	3.6	3.6	2.7	3.4
Pct of growers selling	60	72	61	66	66	65
Pct of output sold	43	55	56	59	75	59
1998						
Pct growing F&V	88	85	85	83	83	85
Avg nbr crops grown	3.3	3.6	3.4	3.4	3.3	3.4
Pct of growers selling	65	71	73	69	71	70
Pct of output sold	56	63	65	69	76	68

Sources: Analysis of the 1993 and 1998 Vietnam Living Standards Surveys.

Table 2-29. Comparison of fruit and vegetable production in 1993 and 1998 by region

	NU	RRD	NCC	SCC	CH	SE	MRD
1993							
Pct growing F&V	96	87	82	63	76	50	68
Avg nbr crops grown	6.0	4.0	2.9	1.9	3.0	1.5	2.4
Pct of growers selling	58	63	77	66	69	53	67
Pct of output sold	35	48	43	53	47	84	80
1998							
Pct growing F&V	94	88	93	83	82	72	69
Avg nbr crops grown	5.0	3.9	4.5	1.9	2.1	1.9	1.7
Pct of growers selling	69	72	73	70	55	57	72
Pct of output sold	46	54	45	68	75	86	91

Sources: Analysis of the 1993 and 1998 Vietnam Living Standards Surveys.

Table 2-30. Comparison of fruit and vegetable production in 1993 and 1998 by product

Crop	Percent of rural households		Percent of growers selling		Share of output sold	
	growing crop		some of crop			
	1993	1998	1993	1998	1993	1998
Potatoes	9	8	14	19	8	16
Cabbage, cauliflower	23	20	27	29	63	58
Other greens	23	26	20	26	44	66
Tomato	7	6	42	42	73	82
Water morning glory	35	39	12	15	18	27
Fresh legumes	9	10	23	19	58	58
Dried legumes	20	19	49	53	69	83
Herbs & spices	7	15	63	45	60	79
Other vegetables	28	41	25	28	76	77
Citrus	19	18	48	49	80	63
Pineapple	6	5	18	37	79	85
Banana	43	50	51	22	69	55
Mangoes	11	7	38	50	65	63
Apple	5	6	43	43	79	73
Plum	6	4	38	35	64	74
Papaya	14	17	19	34	36	59
Longan/Lit/Ramb	13	12	75	26	94	42
Custard apple	10	10	30	75	44	97
Jack fruit/durian	27	21	37	40	37	62
Other fruit tree	24	7	49	34	67	38
Vegetables	62	66	46	39	54	80
Fruit	58	71	63	62	66	74
Fruits and vegetables	78	85	65	70	59	68

Sources: Analysis of the 1993 and 1998 Vietnam Living Standards Surveys.

Chapter 3

Commercial growers of fruits and vegetables

1 Introduction

The previous chapter described the characteristics of a fruit and vegetable growers from the 1998 Vietnam Living Standards Survey using a nationally representative sample. Although the VLSS is useful for understanding the national picture of fruit and vegetable production patterns, it does not provide much information on specialized commercial growers of fruits and vegetables because of the small number of farms of this type in the sample. Furthermore, the questionnaire, though comprehensive, does not address some topics of particular importance to commercial agriculture.

This chapter focuses on the characteristics, the profitability, and the constraints on commercial fruit and vegetable producers. It is based on an analysis of data from the IFPRI-MARD Survey of Commercial Fruit and Vegetable Producers, carried out in October-November 2000¹. The sample of 1505 producers was designed to include producers of the main types of commercialized fruits (longan, litchi, banana, pineapple, dragon fruit, oranges mandarins, pumelo and mango) as well as the main types of commercialized vegetables (tomato, cabbage, cucumber and carrots)². As Table 3-1 shows, the sample was drawn from 21 provinces comprising the main fruit and vegetable growing areas in Vietnam (see Figure 3.1).

Surveyed producers were classified according to the dominant fruit or vegetable that they produce³. The survey interviewed 150 producers of each commodity, including 50 growers in each of three provinces known for growing this product. The exceptions were dragon fruit, for which 50 growers in one province were interviewed, and carrots, for which 50 growers in each of two provinces were surveyed. The interviews were conducted at producers' homes and lasted around four hours.

The survey team consisted of a North team and a South team of interviewers. These interviewers were drawn from the Ministry of Agriculture and Rural Development (MARD), the Research Institute for Fruit and Vegetables (RIFAV), the Post-Harvest Technology Research Institute, and the Southern Fruit Research Institute (SOFRI).

2 Characteristics of growers

2.1 Household characteristics

The average age of the heads of households was 46 years. The female-headed households make up 14 percent of those surveyed, lower than the reported Vietnamese average for rural areas of 28 percent. The

¹ This chapter is a revised version of a longer report prepared for IFPRI by Agrifood Consulting International. This report is available on the CD-ROM that accompanies this document.

² Banana, pineapple and dragon fruit are designated as "Fruits" and tomato is designated as a "Vegetable" for the purposes of analysis following commonly accepted classification.

³ This information was based on key informant interviews at the Province and District level – and therefore may not be an accurate reflection of actual specialization.

highest concentration of female-headed farmers is higher in the North (11 percent) than in the South (4.5 percent).

The most common level of education for household heads was middle school, with 47 percent of male heads of household and 58 percent of female heads of household having only completed middle school. Less than 2 percent of the heads of household have not completed primary school. About one quarter of the heads of households have at least a secondary school education. There is no significant difference between the education levels of male- and female-heads.

2.2 Labor use

Labor resources available to producers include labor by family members, permanent employed labor, temporarily employed labor and in-kind labor⁴. This labor is used for fruit and vegetable production and other agricultural activities. Section 6.1 analyses the labor use in fruit and vegetable production on an activity basis for each fruit or vegetable. This section analyzes labor use in terms of labor type on a regional basis.

The most common type of labor used for agricultural purposes is family labor. Table 3-3 shows that 98 percent of the farms utilized family labor (both male and female) for agricultural production. More than two-thirds of the grower households used *only* family labor, while the remaining 31 percent used some hired labor. Temporary male and female labor were used by 27 and 25 percent of producers, respectively. However, those farms that do use temporary labor for agricultural production hire, on average, 5.5 temporary male and 6.7 temporary female laborers for about 40 days each. As a result, temporary workers account for about half of the workforce and family members the other half. Permanent workers are quite rare, found in less than 2 percent of the farms. On average, the number of days per worker per year for agricultural labor is approximately 153 days.

Agricultural wages average VND 20 thousand per day. Female workers appear to earn about 5-10 percent less than similar male workers. There are also large regional gaps in wage rates. Temporary workers in the North are paid VND 14.5 thousand per day, while those in the south receive VND 25.9 thousand per day. These differences in cash wages may reflect differences in off-farm opportunities, land/labor ratios, and/or differences in patterns of non-monetary compensation (such as provision of meals).

2.3 Experience with fruits and vegetables

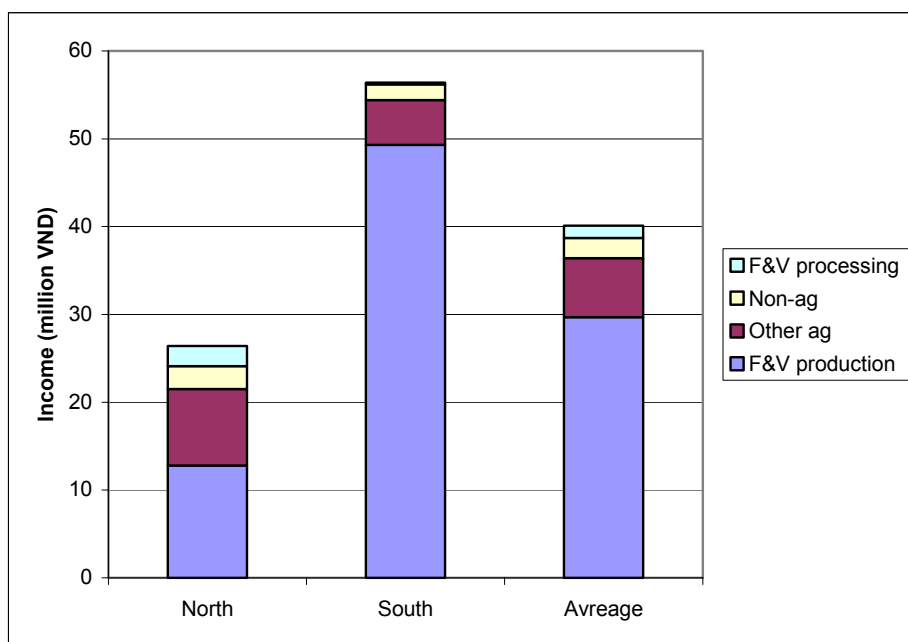
Most fruit and vegetable producers began operations relatively recently. About one-half of the respondents started growing fruits and vegetables since 1990 and two-thirds since 1986. These figures do not simply reflect the year the household starting farming. In 1990, 96 percent of the household heads were at least 18 years old, so in most cases they grew other crops before starting to produce fruits and vegetables. This suggests that the economic reforms have facilitated the transition from subsistence crop production to the production of higher-value commercial crops such as fruits and vegetables.

⁴ No respondents used in-kind labor while only 11 respondents out of 1505 indicated that they hired permanent workers on their farms (total workforce of 19 males and 22 females with an average of 2.3 workers per farm), and 9

2.4 Sources of revenue

Survey respondents were asked to detail the revenue obtained from various sources. Overall, the annual average total revenue was VND 40 million. Almost three-quarters of this income (74 percent) was obtained from fruit and vegetable production. Other agricultural income contributed 17 percent of total, non-agricultural income 6 percent, and fruit and vegetable processing 3.5 percent. Producers in the South had significantly higher total income compared to their counterparts in the North. Producers in the North had significantly greater incomes from non-fruit and vegetable agricultural activities and processing, but those in the South had significantly greater incomes from fruit and vegetable and non-agricultural activities (see Figure 3-1).

Figure 3-1. Size and composition of household income



Longan and litchi producers had the greatest income from processing activities (VND 3.8 and 9.1 million, respectively). This corresponds with post-harvest processing (mostly drying) of longan and litchi described later in this report. Citrus and mango producers had the highest income from fruit and vegetable production (VND 54 and 55 million, respectively). This compares with a low of VND 14 million dong for tomato producers.

Female-headed households had significantly lower total revenue (VND 27 million) compared with male-headed households (VND 42 million). This difference is due to the fact that female-headed households have less revenue from fruit and vegetable production and less from non-farm activities.

respondents (with an overlap of 3 respondents) indicated that they also hired permanent workers in indirect positions (an average of 1.2 workers).

2.5 Degree of specialization

The results indicate that the majority of fruit producers specialize fully in the production of one commodity, but a significant minority of growers, particularly vegetable growers, are not fully specialized. For all commodities except tomatoes, cucumbers and carrots, over 80 percent of producers specialize in their particular commodity. In the case of cucumber producers for instance, 50 percent of producers earn less than 54 percent of their total net income from cucumber production. The conclusions of these results indicate that while fruit producers are generally specialist producers of their commodity, vegetable producers are more likely to have mixed vegetable production systems and less likely to be specialist.

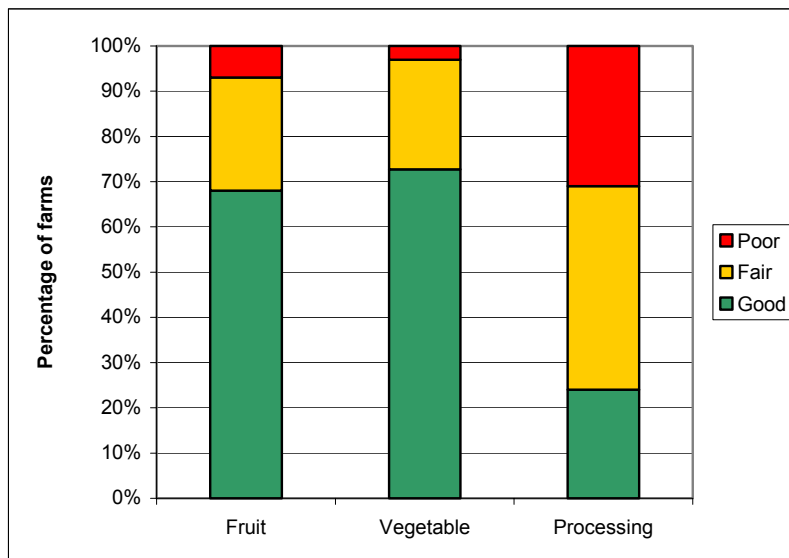
2.6 Assets

The assets that are most widely owned by fruit and vegetable growers are pesticide sprayers (owned by 61 percent), pump (53 percent), bicycle (26 percent), and boat (21 percent). The average value of assets per household was VND 5.4 million. The average value of assets did not change much across regions, ranging from VND 4 million to VND 7 million (except in the North West, where the average was VND 11 million).

2.7 Trends in farm profitability

According to Table 3-10, two-third of the growers thought that the profitability of fruit and vegetable production was “good” in 2001, with just 7 percent rating it “poor”. Banana and pineapple production had the lowest proportion of “good” ratings (under 60 percent), while dragon fruit, mango, and carrots had the highest proportion of “good” ratings (over 85 percent).

Figure 3-2. Perceived profitability of fruit and vegetable production and processing



Although farmers were generally pleased with the profitability of fruit and vegetable production, they rated its profitability in last year even higher. Three-quarters of the farmers rated the profitability as “good”

that year, with similar patterns by commodity. The majority of producers cited adverse weather conditions as being responsible for the change in profitability, followed by the market price and then the volume of trade.

3 Land Resources

3.1 Characteristics of land

The average land holding of survey respondents was 0.88 hectares. The average varies between 1.0 ha in the South and 0.8 ha in the North. The majority of the land is allocated to crop production (81 percent) and forestry (14 percent). The province of Hanoi had the smallest farms (0.27 ha), while provinces in the South had the largest.

The majority of the land is held either with title (57 percent) or without title (34 percent). Less than 10 percent of the land is being rented or squatted on. The difficulties in obtaining a land title are, in the majority of cases, associated with the backlog of applications rather than regulatory difficulties. On a commodity basis (Table 3-11), mandarin and pineapple producers have the largest land holdings (5.3 and 3.1 hectares, respectively), but a large part of this land is held without title. Growers of most other crops had around 1 hectare or less.

The topography of the land on which crops are grown varies with the general topography of the region. The majority of the crops grown in the Red River Delta, North Central Coast and the Mekong Delta regions are grown on flat land. This changes for the North East, North West, and Southeast regions where there is a mixture of flat, sloping, and terraced land. The majority of crops grown on terraced land are grown in the Southeast region while in the North West region crops are mainly grown on sloping land.

Two-thirds of the producers have access to either mechanical irrigation (pumps) or canal irrigation (34 percent and 32 percent of producers respectively). Another 22 percent of producers irrigate by hand, while only 11 percent rely solely on rainfall. The type of irrigation used on specific crops varies between regions. For instance, cabbage producers in the Red River Delta rely on canal irrigation (51 percent) or hand irrigation (37 percent) while in the North West region they depend on rainfall and in the Southeast they rely on mechanical irrigation.. The issue of irrigation specifically for horticultural production will be taken up again in Section 5.3.

3.2 Cropping calendar

The planting calendar is summarized in Table 3-12, while the timing of harvest is given in Table 3-13. The results indicate that there are significant differences between regions for the planting month of crops, except for those indicated with an asterisk.

Box 3-1. Citrus production in Nghe An

Nghia Dan district in Nghe An province is the largest citrus-growing zone in the north of the country. One of the larger production units in the province is the May 19 Farm, a state farm under the Coffee and Rubber Im-Export Production and Investment Company, a provincial state enterprise. The May 19 Farm harvested 1800 tons of oranges from 150 hectares in 2000. The average price was VND 2500 per kg and the average yield was 12 tons per hectare, implying revenues of VND 30 million per hectare. In contrast, one hectare of coffee or rubber would only generate VND 10 million in revenue.

In recent years, the farm-gate price has fallen. The farm management attributed this problem to “unscrupulous businessmen” who fix prices and purchase oranges from farmers before the harvest. In order to address these problems, the farm is being reorganized as the May 19 Orchard Company, giving it more legal rights and autonomy to operate and trade. The director of the farm said, however, that the farm still belongs to the provincial state enterprise, “so it still does not have legal status to implement free trade and production.”

Source: Vietnam News Service, 21 June 2001.

4 Cropping Patterns

4.1 Varietal Types

In the case of litchi and dragon fruit, one variety is dominant, being grown by almost all growers in the survey sample. For litchi, it is the Thieu variety and for dragon fruit it is the Binh Thuan variety. For other fruits and vegetables, Vietnamese farmers grow several varieties, often depending on the region and local climate.

The most common types of longan grown in Vietnam are the Lãng variety (64 percent of producers grow this variety), followed by the Tieu Da B variety (23 percent). Producers in the South overwhelmingly prefer the Tieu Da B variety, while those in the North prefer the Lãng variety.

The main types of banana varieties grown in Vietnam are the Tay/Xien and Tieu/Gia varieties (48 percent and 44 percent, respectively). Growers in the North using Tieu/Gia exclusively and three-quarters of those in the South growing Tay/Xien.

The main type of pineapple variety grown in Vietnam is the Queen variety with 96 percent of producers growing this variety. The other variety grown is the Cayen variety, which is grown by 5.6 percent and 2.8 percent of producers in the Red River Delta and Mekong River Delta respectively.

The main type of orange grown in Vietnam is the Sanh variety, with 56 percent of producers growing this variety. The next most common is the Xa Doai variety, grown by 34 percent of producers. Producers in the South almost exclusively grow Sanh (96 percent of producers) while in the North producers grow a combination of Sanh and Xa Doai.

The main type of mandarin grown in the North is the Chun/Sen variety, grown by 71 percent of the producers, followed by the Duong Be Tre variety. The sample had just two mandarin growers in the South.

The most widespread mango varieties are the Cat Hoa Loc variety and the Buoï variety (30.5 percent and 27.4 percent of producers respectively). All the mango growers in the sample were in the Mekong River Delta.

The most popular tomato varieties are the French and American varieties (33 percent and 31 percent of producers respectively), followed by the Taiwanese and Polish varieties. Producers in Lam Dong province in the South exclusively grow the Taiwanese variety, with the Taiwanese variety specific to Lam Dong province. Producers in the North grow various different varieties.

The two main types of cabbage grown in Vietnam are the KK-Cross and the NS-Cross variety (45 percent and 37 percent of producers respectively). Producers in the South use the KK-Cross, Shogun, and NS-Cross varieties. In the North, 76 percent of producers in the North East Region grow the NS-Cross variety while producers in the Red River Delta grow the KK-Cross (50 percent), NS-Cross (36 percent) or the S-Cross (12 percent) varieties.

The two main types of cucumber grown in Vietnam are the Japanese and the Thai variety (52 percent and 30 percent of producers, respectively). Almost all of the producers in the South (96 percent) grow the Thai variety, while 71 percent in the North grow the Japanese variety.

The main type of Carrot grown in Vietnam is the Japanese variety with 94 percent of producers growing this variety.

4.2 Life cycle of fruit trees

The yield of fruit trees varies over the life of the tree. Survey respondents were asked to identify the age and yield of fruit trees at each stage of the production profile (see Table 3-14).

Longan: The average age of first bearing fruit for longan is 3.9 years, with a yield at first bearing of 8.5 kgs/tree. The stable period of production begins at an average age of 9.4 years for longan. The yield during the stable period averages 52.8kg/tree. The maximum yield is reached at 20 years of age, at which point the yield averages 104 kg/tree. Yields start declining after an average of 39 years. The average lifespan was 64 years, but this was based on just 9 observations.

Litchi: The average age of first bearing fruit for litchi is 3.7 years, with a yield at first bearing of 7.6 kgs/tree. The stable period of production begins at an average age of 8.6 years and the yield is 58 kg/tree. For litchi, the maximum yield is 171 kg/tree, reached at 17.6 years of age. Yields start declining after 23 years with the yields falling to an average of 74 kg/tree (down from 171kg). No respondents reported cutting or natural death of litchi trees.

Dragon fruit: The average age of first bearing fruit for dragon fruit is 1.34 years, with a yield at first bearing of 6.5 kgs/tree. The stable period of production begins at an average age of 3 years for dragon fruit, when the yield is 33 kg/tree. The maximum yield (63 kg/tree) is reached at 5 years of age. No respondents indicated the age and yield at the unstable period or the cutting/natural death stage.

Oranges: The average age of first bearing fruit for orange is 3 years, with a yield at first bearing of 4 kgs/tree. The stable period of production begins at an average age of 5.2 years for orange, and the yield during this period is 20 kg/tree. The maximum yield (38 kg/tree) is reached at 6.8 years of age. Yields start declining after 10 years, reaching 12 kg/tree. Based on 8 responses, the average lifespan is 14 years.

Mandarin: The average age of first bearing fruit for mandarin is 3.2 years, with a yield at first bearing of 4.6 kgs/tree. The stable period of production begins at an average age of 6 years for mandarin, at

which point the yields are 18 kg/tree on average. The maximum yield of 58 kg/tree is reached at 8.4 years of age. Yields start declining after 11 years, falling to 12 kg/tree. The average lifespan (based on 3 responses) is 11.3 years.

Mango: The average age of first bearing fruit for mango is 4.2 years, with a yield at first bearing of 12 kgs/tree. The stable period of production begins at an average age of 12 years, during which time the yield is 120 kg/tree on average. The maximum yield, 22 kg/tree, is reached at 18 years of age. Yields start declining after an average of 31 years, but no respondents reported cutting or natural death.

4.3 Current production profile for fruit trees

While the above discussion highlighted the changes in yield over time, it is of interest to know the current situation for the age, yield and production of fruit trees. Table 3-15 shows the current production profile for fruit trees based on the responses of the 1068 fruit producers in the sample⁵.

The average age of fruit trees is quite uniform, varying between 2.3 years and 3.3 years for all six fruits being examined. This is reflection of the fact that many fruit growers are new to fruit production and possibly to the high “turnover” of fruit trees, in which growers cut trees of one species to plant another more profitable species.

The average number of trees varies widely. Longan, litchi, and mango growers often have less than 100 trees, while mandarin growers have 406 trees on average and dragon fruit producers have an average of 606 trees. Sanh orange growers have the largest average number of trees with 1186.

The farm gate price for fruit ranges from 2000 dong/kg to almost 13,000 dong/kg. The lowest-price fruit are dragon fruit, chanh oranges, buoi mangoes, and mandarins, which sell for less than 4000 dong/kg. The highest-price fruit are the Xa Doai oranges, Cat Hoa Loc mangoes, and Lãng longans, which sell for more than 8000 dong/kg.

5 Crop production methods

5.1 Propagation of fruit trees

There are three main methods of propagation used by fruit producers in the survey; grafting, marcotting and seedling. The main method used is marcotting, used by 45 percent of fruit producers, followed by seedling propagation (15 percent), and grafting (12 percent). As Table 3-18 shows, the type of propagation used by producers varies between fruit types. For instance, the majority of litchi producers use marcotting (83 percent) while longan producers are split between marcotting (46 percent) and seedlings (35 percent). Orange producers are the only ones who carry out grafting to any great extent (43 percent of orange producers), but marcotting is somewhat more common (47 percent of orange producers). The majority of mandarin producers (73 percent) use marcotting for propagation. Less than half the mango growers cited any type of propagation method, but almost all those that did, said they used seedlings. Dragon fruit producers use other forms of asexual reproduction.

⁵ A single survey respondent may cultivate more than one variety and more than one fruit and vegetable.

5.2 Culling of fruit Trees

The majority of producers considered that low yields were not a sufficient reason for culling underperforming trees. Only 23 percent of producers indicated that this was a valid reason, varying between 50 percent of mandarin producers to 18 percent of litchi producers. Generally, producers culled trees at quite low yields, at 4-5 kg/tree for litchi, orange and mandarin trees and 29 kg/tree for longan trees. Most producers would cull trees in the event of disease or death of the tree (82 percent and 87 percent, respectively). The exception to this was longan producers, where nearly 95 percent of producers indicated that disease was not a valid reason for culling. Varietal replacement was also not considered to be a valid reason for culling, with 89 percent of producers indicating that they would not cull. This varied between 63 percent of longan producers and 100 percent of mandarin producers.

5.3 Irrigation

As Table 3-16 shows, the majority of producers (51 percent) use mechanical irrigation systems for fruit and vegetable production. This varies between 67 percent of producers in the South and 42 percent of producers in the North. As Table 3-17 show, the irrigation patterns for fruit producers varies between different fruit types and regions.

Banana production is mainly rainfed, though one-third of the growers (largely in the North) use irrigation. Virtually all dragon fruit producers (98 percent) use mechanical irrigation. Similarly, two-thirds of the longan producers and 81 percent of litchi growers rely on mechanical irrigation. For mandarin producers 38 percent of mandarin producers use manual irrigation means, 35 percent use mechanical means and 27 percent rely on rainfall. Eighty-eight percent of mango growers and 66 percent of orange producers use mechanical irrigation. For pineapple producers, 58 percent of them rely on rainfall for their irrigation needs, though this is higher in the North (98 percent) than in the South 25 percent).

For cabbage producers, the use of irrigation systems is almost evenly split between canal, manual and mechanical irrigation systems (38 percent, 33 percent and 28 percent respectively). In the South (Lam Dong province), all producers indicated that they used mechanical means of irrigation for their cabbages. In the North, the majority of producers (49 percent) indicated that they used canal systems. For carrot producers, 65 percent use mechanical methods for irrigation. This varies between 100 percent of producers in the South (Lam Dong province) to 38 percent of producers in the North. For cucumber producers, 79 percent relied on manual means of irrigation. For tomato producers almost equal numbers relied on canal (33 percent), manual (37 percent) or mechanical (30 percent) irrigation systems. This varied between producers in the South, where 94 percent of producers relied on mechanical irrigation, and producers in the North, where growers were split between manual and canal irrigation methods respectively.

5.4 Wind breaks, shade, and netting

As Table 3-16 shows, very few producers (3 percent) are using windbreaks for fruit and vegetable production. Less than 4 percent of those surveyed indicated that they used any form of windbreak. This varied on a regional basis with producers in the South somewhat more likely to use windbreaks than producers in the North (6 percent versus 3 percent of producers respectively). In the North, 17 percent of

producers in Phu Tho province indicated that they were using artificial windbreaks, mostly in banana production. And 5 percent of producers in Bac Ninh province indicated the same. In the Red River Delta, 4 percent of producers in Hai Duong province indicated that they were using artificial windbreaks. In the South, the use of windbreaks was largely limited to orange growers in Ben Tre province.

The use of shade for fruit and vegetable production in Vietnam is rare, with just 2 percent of the growers using shade (see Table 3-16). The only growers using shade systems were orange growers in Ben Tre (where almost all growers used trees for shade) and a very small number of mandarin and pineapple growers. None of the vegetable producers used shade systems.

Netting for fruit and vegetable production is even more rare, with less than 1 percent of the producers using nets (see Table 3-16). Only a handful of vegetable growers in the North used nets.

Box 3-2. Serving the demand for organic vegetables

In 1997, Hoc Mon district became the first district to produce organic vegetables for consumers in nearby Ho Chi Minh City. Since that time, the techniques of farmers have been refined. The vegetables are grown in net-houses to protect them from insects. The doors have a double layer of nets to prevent insects from entering. Pesticides and herbicides are not used at all, and only fermented organic fertilizers are applied. Often, underground water sources are used to avoid water-borne insects and larvae.

These measures involve several additional costs. A 500 m² net-house costs VND 5 million (US\$ 344), but half of this cost is met by the Agricultural Chamber of Commerce. One farmer estimates that three times as much time must be spent weeding in the absence of chemicals. Furthermore, the yield is lower and the appearance of the vegetables is not as good. But farmers gain from the 15-20 percent higher price than organic vegetables get, as well as the savings on chemical inputs.

The Fresco Company buys about 60 percent of the district's organic output. The remainder must be sold on the free market at a considerable loss. As a result, only 10 households are participating in the organic vegetable scheme to date. The district plans to open an organic vegetable retail shop in hopes of providing a more stable outlet for the output.

Source: Vietnam News Service, 5 July 2001.

5.5 Pest control

As Table 3-16 shows, the majority of producers use pesticides to control for insect attack (90 percent of producers). This ranges from 98 percent of producers in the North to 75 percent of producers in the South. Producers in the North exclusively use pesticides except for a few pineapple producers in Ninh Binh province in the Red River Delta. Producers in the South also rely heavily on pesticides to combat insect attack, but there are a few producers who use biological control mechanisms. In particular, 70 percent of the pineapple growers in the South use biological pest control. There are no producers of fruits use IPM systems to combat insect attack.

The majority of vegetable producers use pesticides to control insect attack. There are no real differences between the different vegetable types in the use of pest control systems, with the major difference being on a provincial basis. All producers except those in Ha Noi province rely exclusively on pesticides.

Producers in Ha Noi, however, have had some exposure to IPM technologies with several producers of tomatoes, cabbages and cucumbers using IPM.

5.6 Incidence of pests and disease

The survey asked farmers about the incidence of different diseases for each type of fruit and vegetable⁶. For longan growers, the majority of the disease incidences were due to “bug” attacks (27 percent) followed by vein weevil and fruit weevil. For litchi producers, most of the disease incidences were due to Sooty Mould (22 percent), bug attacks (20 percent), and Mites (16 percent).

Over half the disease reports by mango growers (55 percent) were for anthracnose, though mango hoppers accounted for another 11 percent of the reports. Citrus growers reported a wide variety of diseases, the most common being greening (20 percent) and citrus red mite (14 percent). Citrus red mite and greening were also the most commonly reported problems by mandarin growers. Bananas are also affected by a wide variety of pests and diseases, none of which represents more than 20 percent of the reports. In contrast, two problems (*Fusarium Sp.* and *Psuedomonas Ananas*) account for over half the pest and disease problems reported by pineapple growers. In the case of dragon fruit production, ants account for a large majority (63 percent) of the pest and disease reports.

The results indicate that the susceptibility of the four vegetable products to pest and disease. For cabbage growers, Diamondback Moths were the most widely reported problem (33 percent), followed by soft rot (18 percent) and Imported cabbage Worm (17 percent). Among cucumber growers, 29 percent of the pest and disease reports were for downy mildew and 17 percent for aphids. Carrot growers reported cut worm (30 percent of reports) and late blight (13 percent) most often, though “Other” was cited by over one-third of the growers reporting problems. Among tomato growers, the most common problems reported were late blight (26 percent) and tomato fruit worm (20 percent).

5.7 Effects of pests and disease

The survey also asked about the timing and effect of pest and disease attack. Pest and disease problems tend to occur before harvest in the cases of bananas, longan, and litchi, though a number of them attack both before and after harvest. The most common problems in dragon fruit production (ant attack) and in citrus production (greening and red citrus mite) occur both before and after harvest. Similarly, the most common problems in mango production (anthracnose) and pineapple production (*Fusarium sp.*) generally affect the crop both before and after harvest. In the case of vegetables, the majority of the pests and disease attack before harvest.

When a pest or disease attacks, generally 20-40 percent of the crop is affected, but this percentage varies widely depending on the crop and type of pest or disease. For example, insects such as aphids, “bugs”, and citrus red mite often affect over half of the crop, which is not surprising since they are more mobile than the micro-organisms that cause diseases. Although a relatively large portion of the crop is

⁶ More information on this topic can be found in the background report on the IFPRI-MARD Survey of Fruit and Vegetable Producers, prepared by Agrifood Consulting International and available on the CD-ROM accompanying this report.

affected in some way, only 1-2 percent of the crop is normally destroyed. This percentage is highest for pineapples, where growers reporting infestation said that an average of 9 percent of the crop was destroyed.

Large majorities of growers obtained treatment to fight pests or disease. The proportion getting treatment is above 80 percent for every product except for bananas and pineapples. Less than a quarter of the banana growers reported getting treatment against pest and disease problems. For pineapple growers, the percentage was less than 5 percent. The lack of treatment probably contributed to the large losses reported by pineapple growers who had pest or disease problems.

Among those obtaining treatment, the vast majority reported that it was successful in dealing with the pests or disease. The percentage reporting success was above 90 percent for all crops except mandarin, orange, pineapple, and tomato.

Among those not obtaining treatment, the respondents were asked for the reason. In all but a few cases producers who did not obtain treatment did not even bother to seek treatment. The main reasons cited for this was that they either were not aware of a treatment for the disease or insect attack or that it was not cost effective to apply the treatment. For example, two-thirds of the banana producers who did not obtain treatment said that it was not cost effective to treat the problem. In the case of pineapple producers, 90 percent of those who had problems but did not obtain treatment said that they were not aware of an effective treatment. This was a similar case for mandarin and orange producers, almost all of whom reported that they were not aware of an effective treatment.

6 Inputs used in production

6.1 Labor

The amount of labor and its cost varies across fruit and vegetables and between activities. As Table 3-4 shows, the wage for labor varies across commodities, with wages paid to dragon fruit and mango laborers significantly higher than other commodities (29,300 dong/day and 28,700 dong/day respectively). Some of the lowest wages are paid to laborers working in mandarin and litchi production (15,400 dong/day and 16,700 dong/day respectively). These differences reflect regional production patterns, since mango and dragon fruit are produced in the South, while litchi and mandarins are grown in the North. Ignoring unspecified “Other” activities, the most labor-intensive activities carried out for fruit and vegetable producers are irrigation, weeding and harvesting.

6.2 Purchased inputs

Apart from the cost of labor inputs into the production process, the cost of fertilizer, pesticides and seeds forms a large component of the overall costs of production. In addition, fees for irrigation and taxes can impose a considerable burden on producer margins.

The results indicate that seed costs are an important component of non-labor inputs for vegetables, with tomato, cabbage and cucumber seeds being the most expensive. Fertilizer cost averages around 2000 dong/kg for all commodities.

The amount of manure used by dragon fruit and pineapple producers (11.9 and 10.5 tons respectively) is quite high relative to other commodities, with mango producers having the lowest manure usage of all the commodities (0.8 tons). However, the amount of inorganic fertilizer used by different commodities is relatively consistent, averaging 515 kg across all fertilizer types. Pineapple producers are the largest users of fertilizer.

6.3 Production Fees

The survey collected information on the fees paid by producers for irrigation, land and cooperative taxes. There are significant differences between commodities in the fees paid for each tax type ($p < 0.0001$). Within each commodity there are significant differences between regions for each type of tax paid. The Irrigation and Cooperative Taxes average 59,000 and 109,000 dong respectively while the Land Tax, Land Rent and Other Taxes average 281,000, 1936,000 and 84,000 dong respectively.

6.4 Fruit and vegetable input procurement

Fruit and vegetable producers obtain production inputs from different sources depending on the type of input and the location of the producer. Table 3-19 and Figure 3-3 show the importance of different suppliers for different purchased inputs. In general producers appear to be obtaining vegetable planting material (seeds) from other farmers (46 percent) and traders (17 percent) rather than state-owned enterprises (4 percent) and Cooperatives (9 percent). In contrast, fruit tree planting material is obtained mainly from traders (33 percent) and other farmers (28 percent) in the North and mainly from state-owned enterprises (60 percent) and traders (27 percent) in the South.

The majority of seedlings and cultivars are obtained from private nursery gardens, or by self-production. Institutes and research centers only play a role in the provision of orange varieties, in particular the Xa Doai variety of orange (29 percent of producers of that variety, or 13 respondents). State-owned enterprises play a role in the dissemination of pineapple and cucumber varieties (6 percent and 16 percent, respectively). Cooperatives play a role in the dissemination of cucumber varieties (34 percent) but do not play a role in the dissemination of other crops. Extension Organizations, the Agriculture Department, the District Agricultural Department, Garden Associations, Farmer Associations, Women's Associations and Informal Extension Clubs do not play any role in the dissemination of seedlings or cultivars, at least among the farms in the survey sample.

Figure 3-3. Sources of different purchased inputs

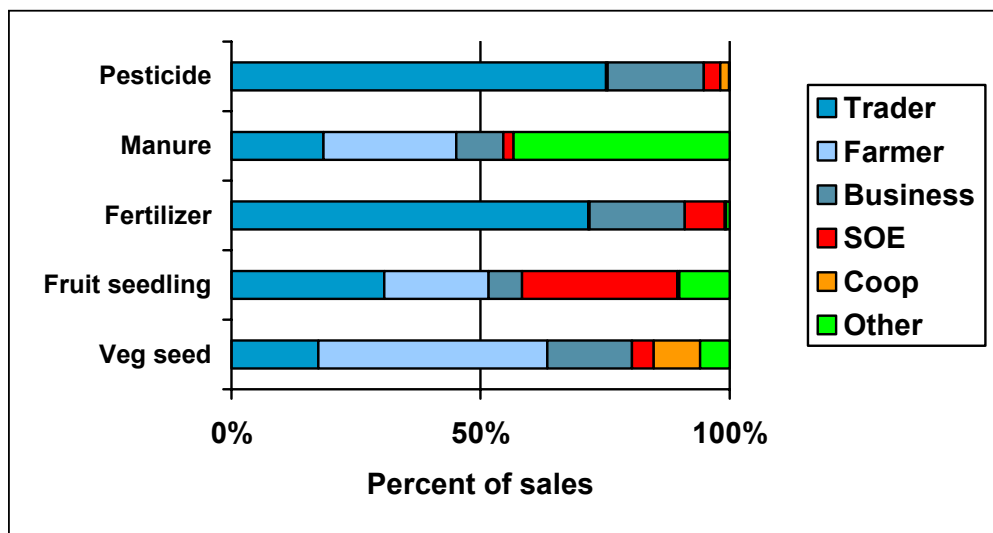


Table 3-19 shows that chemical fertilizer is obtained primarily from traders (72 percent) and other private businesses (19 percent), rather than from state-owned enterprises (8 percent) or cooperatives (0.21 percent). In contrast, organic fertilizer (manure) is obtained primarily from other farmers (41 percent) and traders (30 percent) in the South, but from “Other” sources (73 percent) in the North⁷.

Pesticides are obtained mainly from traders (75 percent) whereas general agricultural supplies (e.g. equipment) are obtained mainly from traders and other private businesses. Packaging for transport and sale are usually obtained from traders (86 percent) and other private businesses (14 percent). Traders are relied on to provide “Other” inputs into production (67 percent).

An examination of the regional and provincial differences indicates that producers in Ha Noi obtain their fruit planting material exclusively from state-owned enterprise, but in provinces further away from the government research institutes private traders, other farmers and other private businesses fill this role.

7 Post-Harvest and Storage

7.1 Storage

Only 7 percent of producers use storage facilities for fruit and vegetables. As Table 3-31 shows, all producers who are using storage are in the North of Vietnam. The most common type of storage facility is the producer’s own house, with only two producers using an outside shed for storage. The single producer in Son La province who is using an outside shed is using it to store longan, while the single producer in Ha Noi province is using their shed to store tomatoes. All but one producer owns their storage facility, with a single producer in Phu Tho province renting part of another farmer’s house to store bananas. The greatest numbers of producers with storage facilities are litchi and tomato producers (50 and 33 producers respectively). Those producers comprise 31 percent and 15 percent respectively of all litchi and tomato producers.

⁷ The “Other” sources were not specified by respondents.

Producers generally do not rent storage space and rely on their own capacity to store produce. On average, producers have 2.3 tons of storage capacity in their homes, ranging from 1 tons of capacity for dragon fruit and pineapple producers to 3 tons of capacity for litchi producers.

The average storage period was 86 days, ranging from a high of 141 days for litchi producers to just 3 days for a large banana producer from Phu Tho province. The amount stored averaged 0.86 tons, ranging from 0.29 tons of longan to 5 tons of bananas. This represented an average of 78 percent of available capacity. No producer indicated that any produce suffered from spoilage during storage.

7.2 Post harvest activities

The most common type of post-harvesting activity carried out by producers is grading (76 percent of producers) and drying (14 percent of producers). As Table 3-33 indicates, the majority of grading is done for fruit produce, while washing and ripening are carried out for vegetable produce. While substantial amounts of produce are “processed” further, this processing mainly involves grading of fruits or vegetables before being sold as fresh produce. For producers of banana, dragon fruit, mandarin, mango and pineapple, the only post-harvest processing carried out is grading. There are also large numbers of orange and cabbage producers who are also carrying out grading activities (96.3 percent and 82 percent of producers respectively).

Longan, litchi and tomato producers are the only ones carrying out drying and preserving, which are seen as “traditional” post-harvest activities. Over 98 percent of litchi producers and 42 percent of longan producers are involved in drying fruit before sale. Tomato producers are mainly involved in ripening produce before sale (76 percent of producers) while a small number are involved in preserving produce (23 of producers). Bagging operations, seen as a value-added process for retail sale, are carried out mainly by cabbage and tomato producers (15 percent and 8 percent of producers, respectively).

Almost all growers (96 percent) carry out their post-harvest activities on the farm rather than at cooperatives or centralized processing facilities. The only district-level post-harvest activities were washing carrots and ripening cucumbers.

The amount of product that is processed after harvest is a large proportion of the total crop. This ranges from 62 percent for litchi to 100 percent for banana, carrots and mandarins. Table 3-33 indicates that losses from post-harvesting are generally quite small, averaging 1.4 percent of total processed product. The exception to this is the post-harvest losses incurred by tomato producers, who average 7.3 percent losses on their preserving and ripening activities.

Table 3-33 shows that, overall, the post-harvest cost is 266,000 dong/tonne. This ranges from a low of 12,500 dong/tonne for cucumber producers to a high of 1.713 million dong/tonne for longan producers. The cost of post-harvest processing reflects the different activities carried out by producers. Those producers who carry out grading and washing activities generally have costs averaging 20,000 – 40,000 dong/tonne while longan and litchi producers, who carry out drying activities, average costs of 1.7 million and 395,000 dong/tonne respectively.

7.3 Grading and quality standards

Over 91 percent of producers claimed to be aware of quality and grading standards for fruit and vegetable production, and 95 percent of those based their growing and post-harvest decisions on those standards. Producers of mandarin were the least aware of grading standards (77 percent of mandarin producers), but, of those that were aware of grading standards, all incorporated those grading standards into their growing and processing of mandarin. Banana producers were least likely to incorporate grading and quality standards into their production process, with only 62.4 percent of producers who were aware of standards actually modifying their production process (84 percent of them were aware of grading standards).

The survey asked growers their views on the most important qualities emphasized in the quality standards⁸. Overall, size, shape and color (41 percent, 62 percent, and 37 percent of producers) were the first, second and third most important characteristics emphasized in the quality standards. This was consistent for all fruits and vegetables, except for litchi where shape was not considered to be as an important characteristic as size and color. The smell, texture and flavor of fruits and vegetables were considered less important characteristics, though 27 percent of orange producers cited flavor as the most important characteristic.

These results should be treated with caution, however, since they are based on the farmers' responses, not by testing their knowledge. Vietnamese researchers believe that farmers may be referring to commonly accepted quality standards rather than the officially adopted standards.

7.4 Post-harvest problems

As mentioned above, Table 3-33 indicates that losses from post-harvesting are generally quite small, averaging 1.4 percent of total processed product. Table 3-32 shows that the percentage of the crop that was affected by post harvest problems (as distinct from processing) was generally small as well, averaging 4 percent of the total crop. This varies between 32 percent of the Carrot harvest and 2 percent of the longan harvest. The percentage of the crop that was destroyed by post-harvest problems was approximately half that actually affected by problems (1.6 percent) while the overall value lost was quite small, at 2 percent of total crop value.

While the total proportion of the crop that was affected by post-harvest problems was quite small, the effect of those problems on the sales of that proportion was quite major. Table 3-34 shows that over 57 percent of producers reported post-harvest problems (even though the actual proportion of the crop affected was quite small). The percentage of producers reporting post-harvest problems ranged from just 3 percent of the carrot producers to 100 percent of the dragon fruit producers. In nearly 76 percent of the problem cases, the buyer rejected the produce due to post-harvest problems and in 66 percent of the cases the price subsequently offered producers was lower than the market price due to the problems.

As Table 3-34 shows, the major post-harvest problems included transportation problems (26.7 percent of producers with a problem reporting this problem), handling problems (16.9 percent of producers), Simply being unable to sell their produce after harvest (16.8 percent of producers), harvesting technique (11 percent of producers) and insect damage (10 percent of producers).

⁸ This is not necessarily what the quality standards actually emphasized.

For longan and litchi producers the main post-harvest problems were being unable to sell their produce after harvest and the harvest technique. For banana producers, the main post-harvest problems were transportation and handling. For pineapple and orange producers, the major problem was handling, whereas for mandarin producers harvest technique and handling were the major problems. The major post-harvest problem for dragon fruit producers is heat, while for mango producers, transportation and harvest technique are the major problems.

For tomato and cucumber producers the major post-harvest problem was transportation, whereas for cabbage producers the major problem was insect damage. Finally, for carrot producers the only problem reported was that producers were unable to sell their produce after harvest.

8 Fruit and vegetable sales

The average value of sales of fruit and vegetables by the commercial growers in the sample is almost VND 30 million. Very few of the sample farmers (less than 3 percent) had fruit and vegetable sales of less than VND 1 million and 60 percent had sales above VND 10 million. This contrasts sharply from the results from the VLSS in which just 13 percent had sales above VND 10 million (see Table 3-20). This difference illustrates the fact that the IFPRI-MARD survey focused on fruit and vegetable growers that were larger and more commercial than the average grower of fruits and vegetables (see Table 2-13).

The survey data also reveal that the growers in the sample are relatively specialized. One-quarter of them earn over 90 percent of their total revenue from fruits and vegetable sales and 60 percent earn more than half of their total revenue from these sales (see Table 3-21). Although the figures are not directly comparable, these growers are significantly more specialized than the fruit and vegetable growers in the nationally representative sample used by the Vietnam Living Standards Survey (see Table 2-14).

Fruit and vegetables are sold and processed in a variety of ways by producers. Producers both grow and purchase fruit and vegetables to be consumed on-farm, sold as fresh product, or processed at home for the fresh and processing markets. Overall, almost all the product (99 percent) is sold on the fresh market, with a very small proportion is kept for home consumption or reserved for further processing⁹. Few producers (just 23 of 1505) purchased some product, suggesting that fruit and vegetable growers rarely adopt the role of traders.

There is generally an upper limit to home consumption as production increases. Table 3-22 indicates that households generally consume 60-80 kg per year of each commodity (the average is 69 kg). The results indicate that there is no significant home processing of mandarin, cucumbers and carrots ($p < 0.001$). As mentioned in Footnote 9 there is a discrepancy between the amount of product sold on the fresh market and the amount of product used as inputs into home processed products. This discrepancy arises because product that is “processed” further by washing, grading, sorting and packaging etc. is then sold on the “Fresh” as

⁹ This is not actually borne out by the results shown in the “Inputs for Home Processed Products” column in Table 3-22. This discrepancy will be explained later in this section.

opposed to “Processed” market. This issue of post-harvest processing will be revisited in detail in Section 7.2.

8.1 Contracts

Producers were asked information about contracts with downstream firms for fruit and vegetable production. Table 3-24 shows the number of producers, by commodity types, with contracts for fruit and vegetable production. Only 244 producers (16 percent of those surveyed) indicated that they ever had contracts for their production. The majority of the contracts (80 percent) were for pineapple and cucumber production. The majority of producers with contracts started those contracts relatively recently, with the average start date being 1995 and running for just under 4 years in duration. The average individual contract length was a little less than 2 years. Among those with contracts, almost all (90 percent) sold all of their output under contract.

The majority of the contracts (80 percent) were held by producers in the North, and most of those in the North (84 percent) were in the Red River Delta, where pineapples and cucumbers are produced. The other main provinces where contracts have been arranged with producers include Hai Duong (29 percent, mainly cucumbers) and Tien Giang (25 percent, mainly pineapples). There were no significant differences between the numbers of producers with contracts across the rest of the provinces.

Most producers (97 percent) indicated that the lack of buyers willing to provide contracts was the main constraint to adoption of a contract system. Of the 244 producers who had ever entered into contract arrangements with downstream firms, only 23 producers (9.4 percent) had not had a continuous contract arrangement. The reasons for this were varied, but the lack of contractors in their area (presumably due to downstream firms relocating or abandoning a contract system) and a lack of scale in production were the major reasons suggested by those respondents.

At the time of the survey, 214 out of the 244 producers who ever had a contract were currently in a contract for fruit and vegetable production. Following Table 3-24, the majority of contracts were for pineapple (48 percent) and cucumbers (45 percent). The majority of contracts were with provincial state-owned processors (50 percent), central state-owned Processors (21 percent), and producer cooperatives (21 percent). This is a function of the commodity groupings, with most of the produce going to state-owned processors being pineapples and cucumbers.

The contracting of fruit and vegetable production appears to be relatively stable. Of the 244 producers who ever had contracts only 6 percent said that they had changed contractors, with most of these changing due to better contract terms with other firms. Only one producer out of the 244 admitted to renegeing on the terms of their contract, and that was because his crops failed and he could not supply the produce to the contractor.

While almost all producers had maintained links with their contractor, the relationship between producer and contractor was not always an ideal marriage. Of the 214 producers who currently held contracts for fruit and vegetable production¹⁰, 81 percent said that they could not choose freely amongst different

¹⁰ 214 of the 244 producers who ever held contracts were currently in contracts at the time of the survey.

contractors while 97 percent said that they were unable to work with more than one contractor at a time. Of the 244 producers who ever had contracts, 18 percent had attempted to renegotiate the terms of their contract, with 71 percent of those attempting to renegotiate the price, and 22 percent attempting to renegotiate the quantity delivered. In contrast, 14 percent (35 producers) said that their contractors at some stage had reneged on the contract with them. The main reasons for this renegeing by contractors was unclear to most respondents (22 percent saying that contractors simply did not buy their produce). However, for those respondents who did know, contractors either appeared to have cash-flow problems (17 percent), the market price was lower (14 percent), or a change in variety of product negated the contract (14 percent). Reneging on contracts had a negative effect on farm business in over 77 percent (27 respondents) of the cases. No respondent indicated that they had gained financially when the contractor reneged, with the balance (23 percent) indicating no significant effect on their farm business.

Despite this apparent friction between producers and contractors, 81 percent (173 of 214 respondents) indicated that they were generally satisfied with their contractor and 94 percent indicated that they intended to stay with their current contractor. It may be, however, that the willingness to stay contractually bound to a contractor is simply the result of a lack of choice among contractors, rather than an indication of satisfaction. Of those that intended on switching contractors, the majority, 67 percent, indicated that they had better opportunities with other contractors while the main reasons for dissatisfaction with their current contractor included price (39 percent), a lack of value-adding by contractors¹¹ (32 percent) and cheating by contractors (22 percent).

As Table 3-25 shows, most contracts specify the variety to be grown (87 percent of the contracts) and the time of harvest (71 percent). About 40 percent specified that the market price would be paid, while roughly one third provided for low-cost seeds and low-cost fertilizer. Extension services are provided in 37 percent of the contractual arrangements. Most contracts had a short contractual period of a few months, that is one growing season. Pineapple and litchi producers had the longest contract periods, at between 12-15 months in duration.

Most respondents with contracts (86 percent) reported that credit was provided by the buyer. The majority of the credit provided was for fertilizer and seed purchases. Table 3-26 shows that 84 percent of producers with contracts received technical support from their contractors, the majority of which was monitoring of production (52 percent) and technical training (44 percent). On average, producers received 3.7 visits in the year before the survey. Sixty-six percent of producers with contracts were satisfied with the technical support offered by contractors, with the 34 percent of producers dissatisfied wanting a better quality of service (56 percent) and more services (44 percent).

8.2 Fruit and vegetable marketing channels

The questionnaire asked fruit and vegetable growers about the type of buyer and the place where the transaction took place. As Table 3-27 and Figure 3-4 show, the majority of produce is sold to assemblers and wholesalers (50 percent and 30 percent, respectively) with very little sold at other levels of the marketing

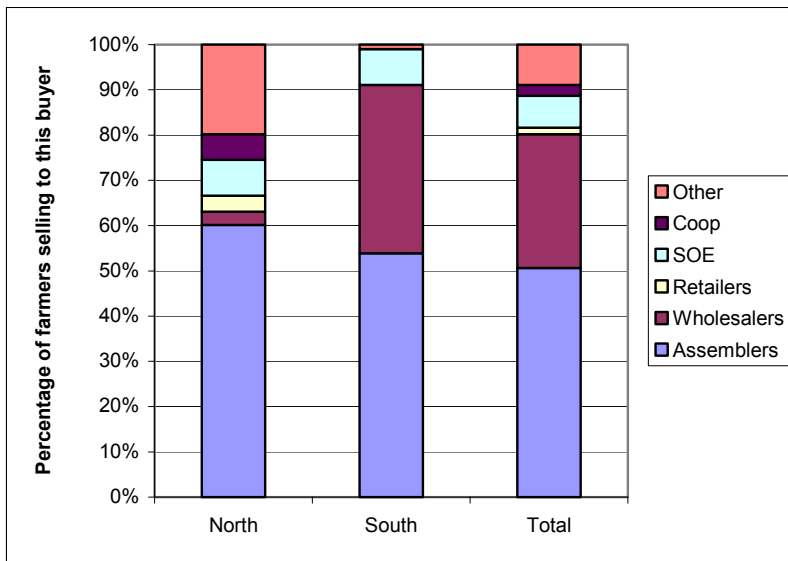
¹¹ The response in this case was that it was “More profitable to work for oneself”

chain. Pineapple growers in Ninh Binh and Tien Giang Provinces were the only ones to sell most of their output to state-owned processors. Private processors do not have a large market share of the sales by fruit and vegetable growers in the sample. The notable exceptions are produce sold in Son La and Bac Giang provinces, where litchis and longans are sold mainly to private processors. Little is sold to retailers except in Hanoi, and sales direct to consumers only form a large proportion of sales in Nghe An and Ha Noi provinces. Except for some cucumber producers in Hung Yen and some litchi growers in Hai Duong provinces, no produce is sold directly to exporters. Presumably exports of fruit and vegetable produce are done by firms further downstream.

Seventy percent of the farmer sales of fruits and vegetables take place at the farm-gate, while another 19 percent take place at a wholesale market. Virtually nothing is sold at the factory level, indicating that for those producers who sell produce to processors, the transaction is most likely carried out at the farm-gate. There are significant regional and provincial differences between transaction locations. For instance, while sales at the retail level only constitute 2.8 percent of total sales, 44.3 percent of sales in Ha Noi are carried out at the retail market level.

The majority of sales (94 percent) occurred at harvest time. The exceptions include some longan sales from Son La and some litchi sales from Bac Giang provinces that were made before harvest. The sales after harvest only accounted for 5.5 percent of total sales, most of which were sales of litchi and longan in the North East, North West, and Red River Delta regions.

Figure 3-4. Importance of different buyers of fruits and vegetables



Box 3-3. Lam Dong farmers face risky vegetable markets

Lam Dong province produces over 300 thousand tons of vegetables each year, making it the largest vegetable producer in Vietnam by a significant margin. Furthermore, Lam Dong growers have a reputation for high-quality produce and supply much of the vegetables consumed in Ho Chi Minh City. In spite of this reputation and the high volume of production, vegetable growers in Lam Dong face a volatile and unstable market. Tran Dung, a Da Lat city farmer, says "Although Da Lat vegetables are famous everywhere, farming here is still a gamble because growers do not know whether they will be able to sell their product or not." There are few markets in the province and growers must sell to "fickle" markets in Ho Chi Minh City. Dependence on distance markets means prices fluctuate wildly. For example, tomato prices in Don Duong district fell to VND 100-200 per kg (US\$ 0.007-0.013/kg) in August and September of 2001. Lam Dong growers face increasing competition from southern provinces closer to Ho Chi Minh City which have lower transportation costs.

The solution is seen in agro-processing, which will extend the shelf-life of local produce. Currently, the province has two major processing facilities, one belonging to a wholly-invested Japanese company and the other a provincial state enterprise. The Japanese company buys most of its raw materials from Ba Ria – Vung Tau and other provinces because Lam Dong farmers do not grow the variety preferred by the plant. Strict quality standards make local farmers reluctant to grow a product with just one outlet. The Japanese plant has a capacity of 5000 tons, but only processed 600 tons last year.

Experts suggest that "the next processing facility to be built in Lam Dong needs to closely match local production abilities in terms of both scale and product variety." Cabbage, cauliflower, and tomato account for about 85 percent of the vegetable production in Lam Dong province.

Source: Vietnam News Service, 21 January 2002.

8.3 Sales on Consignment or Advance Payment Basis

Overall, 33 percent of producers sold their produce on a consignment basis, but less than 3 percent of producers sold their produce on an advance payment basis. The percentage of producers selling on a consignment basis ranged from 26 percent of producers in the North to 41 percent of producers in the South. Conversely, 4.35 percent of producers in the North sold their produce on an advance payment basis compared with 0.71 percent of producers in the South. The largest number of producers in Son La province in the North West Region sold their produce on an advance payment basis (15.4 percent of producers). Of those producers that sold their produce on a consignment basis, 75 percent of their sales were made on consignment. This varied between 84 percent of sales in the North and 68 percent of sales in the South.

The average period of consignment was 22 days, compared with the average period of advance payment of 17 days. The period of consignment differed between an average of 33 days in the North to 13 days in the South. Consignment periods were longer in the Red River Delta region than in other regions in the North (40.6 days on average).

On a commodity basis the number of producers selling on consignment and advance payment terms differed significantly between products sold. The majority of dragon fruit producers (98 percent), pineapple producers (76.5 percent) and mango producers (65 percent) sold their produce on consignment. In contrast, the greatest numbers of producers selling on an advance payment basis were longan producers (5.7 percent), tomato producers (5 percent) and cabbage producers (4.8 percent). While there were significant differences

between individual commodities, there was no significant difference between producers of fruit and producers of vegetables on either a consignment or an advance payment basis.

8.4 Transportation

Although nearly 70 percent of sales are carried out at the farm gate level, the 22 percent of product sold at the wholesale and retail level had to be transported to market. Of the 1505 respondents in the survey, 890, or 59 percent, said that they used some form of transport to buy and sell fruits and vegetables. Only 11 percent said that they rented transport. Producers in the South of Vietnam (particularly in Ben Tre) were more likely to rent transport than their counterparts in the North.

Producers generally rent trucks, trains¹², boats/ships and tractors for fruit and vegetable marketing, but own the other types of transport¹³. When the volume of sales are taken into consideration, by far the most important transportation type is boats and shipping (44 percent of transport). This is exclusively carried out in the Mekong River Delta region. The second and third most important types of transportation are carts¹⁴ (22 percent) and bicycles (17 percent).

Of the 890 producers who used transportation in marketing fruits and vegetables, 118 provided information on shipping costs, distances and durations. Table 3-28 show that, on average, the mean weight of produce shipped is 2.8 tons per shipment. The average shipping distance was 53 km (39 km for the South and 90 km for the North). This reflects the fact that the survey provinces in the South were close to Ho Chi Minh, while the sample provinces in the North were more dispersed. Sixty-four percent of shipments were to destinations outside the district of origin, most of which (70 out of 74) were shipments of citrus. The length of time a shipment took was directly related to distance traveled. Overall, shipments took an average of nearly 7 hours.

Transportation costs varied significantly across the different modes of transport but, except for truck transport, did not differ across provinces. Even taking into consideration distance traveled, the transportation rates were relatively consistent across different provinces. From Table 3-28 the average transportation cost was 1,060 dong/ton/km.

8.5 Communication

Access to communications is important in the marketing of agricultural products. Producers were asked whether they had access to telephones and what their main sources of information were. Very few producers (2 percent) had a telephone, but 47 percent of producers had access to one. In the North, 65

¹² Only one producer rented trains, a pineapple producer in Kien Giang province.

¹³ No producer indicated that cyclos were used to transport fruit and vegetables.

¹⁴ Carts include hand-carts, ox-carts and towed carts. However, some respondents made the distinction between carts and “*Cong Nong*”, or agricultural tractors (grouped with “Tractors”). Usually *Cong Nong* and other Tractors pull carts when they are used in their transportation mode and so it is uncertain whether there should be a distinction between “Carts” and “Tractors”.

percent had access to a telephone, compared with 26 percent in the South. Just 5 respondents had access to a fax machine, and none used email.¹⁵

Producers receive marketing information from a variety of sources, including extension officers, banks, traders, processors and official government sources. Table 3-30 shows the percentage of producers obtaining different types of information from the different sources. Overall, most producers obtain their information from Personal Contacts, or word of mouth, (30 percent). This is followed by the radio or television (10.5 percent), cooperatives (9 percent), traders (8.4 percent) and the people's committee (8.14 percent). There is some variation between North and South Vietnam, where, for instance, Extension Agents in the South provide 13 percent of producers with information compared with 1.9 percent of producers in the North.

As Table 3-30 shows, most producers obtain price and market information from personal contacts (44 percent) and traders (30 percent). Information about regulations comes from the people's committee (25 percent), cooperatives (19 percent) and radio/TV (17 percent). Credit information comes overwhelmingly from banks (42 percent). Information about new varieties usually comes from personal contacts (36.5 percent) with extension agents coming a distant second at (14.3 percent). This follows for technical advice as well, whereas management advice comes from the people's committee (33.3 percent) and personal contacts (21 percent).

Overall, Extension Agents provide 14.3 percent of producers with information about new varieties, 20 percent of producers are given information about technical matters, and 5 percent of producers are given information about managerial matters. Producers in the South are much more likely to obtain information from extension agents than producers in the North.

9 Extension services

9.1 Availability and type of extension service

As Table 3-36 shows, 57 percent of respondents indicated that they had received some kind of extension service over the previous year, but this varied significantly between regions. Growers in the South were much more likely to receive extension services (84 percent) than those in the North (34 percent). Three-quarters of producers of dragon fruit, mango, cucumbers and pineapple had received extension services, compared to less than a third of the growers of litchi and bananas.

Extension services are provided by a variety of organizations. The majority (63 percent) of respondents indicated that the Extension Services Department provided some service, compared with the Farmer's Union (7.2 percent of respondents) and Cooperatives (5.8 percent of respondents). Extension services relating to fertilizer use and pest management were the most common form of extension provided (25 percent of producers each). This was followed by varietal selection (16.55 of producers) and pre-harvest disease control (11.2 percent of producers).

¹⁵ The existence of <http://www.vietfarm.com/> clearly shows that at least some fruit and vegetable producers are getting involved with Internet marketing, although this was not evident from the sample of farmer chosen for the survey.

In order to obtain a picture of the relative importance of each organization and the types of services that they provide, Table 3-37 shows the percentage of respondents getting information from different extension services. Most respondents received information from the Extension Services Department (63 percent) and that overall the majority of the advice was in the form of information on fertilizer use, pest management and varietal selection (16.5 percent, 15.9 percent and 9.4 percent respectively), all from the Extension Services Department. The other organizations and other types of services on offer played a largely insignificant role in the provision of Extension Services.

Looking at the commodity-level results, growers of cabbages (19 percent), oranges (13.5 percent), mangos (13.4 percent) and pineapples (13.4 percent) had the highest proportion of respondents receiving extension services. The Extension Services Department provided most of its extension services to mango, orange and cabbage producers. Cooperatives gave most advice to cucumber producers while the Farmer's Union was most active in providing extension advice to cabbage producers.

In terms of the type of service provided to commodity groups, cabbage producers (21.4 percent) and pineapple producers (16.8 percent) obtained most of the advice about varietal selection. Cabbage producers also obtained most of the advice about irrigation techniques (40 percent of respondents) while pineapple and orange producers obtained most of the advice about propagation techniques (33 percent and 30.5 percent respectively). mango producers were interested in the majority of the information about fertilizer use and pest management (21 percent of respondents). Finally, pineapple producers were most interested in information about marketing (42 percent of respondents).

9.2 Extension Organizations and Contact with Producers

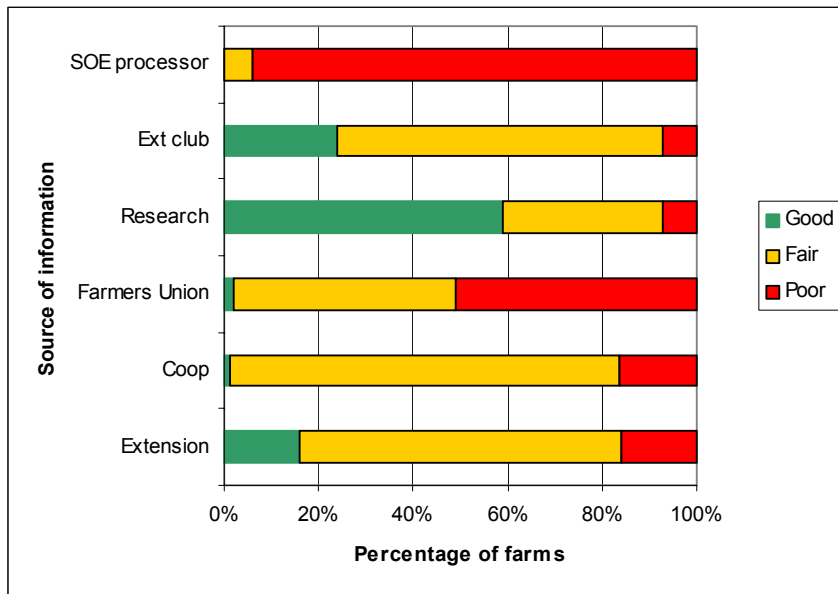
While the majority of producers had received extension services from the Extension Services Department, the number of visits to producers from each organization is also an important determinant of extension impact. It is interesting to note that despite the numbers of producers receiving visits from the Extension Services Department, the number of times each producer was visited (an average of 1.29 visits) was low compared with other organizations. NGO's, despite only visiting 6 respondents, had the highest number of repeat visits, at an average of 3.3 visits per farmer. On average, each of the 146 respondents visited by Cooperatives was visited 2.6 times, and the 79 producers visited by the Gardening Association were visited 2.7 times on average. Visits by producers to outside events arranged by the extension organizations were not as numerous as visits by organizations to producers. The highest number of visits by producers to outside events was an average of 1.4 visits to event organized by Cooperatives. This compares with an average of 0.22 visits by producers to events organized by the Extension Service Department.

Visits to producers by extension organizations were for a variety of purposes. The majority of visits to producers were for irrigation extension services (an average of 2.59 visits). This was closely followed by visits for propagation services (an average of 2.45 visits) and post-harvest disease control (an average of 2.2 visits). Off-farm visits were particularly low; the highest average number of visits being for propagation techniques and on-farm demonstrations (0.55 and 0.52 visits respectively).

9.3 Quality of Extension Organizations

Survey respondents were asked to rate the quality of service provided by the organizations providing extension services¹⁶. As Table 3-38 shows, the majority of producers (63 percent) rated the extension organizations as “Fair” quality, with a further 21 percent and 16 percent rating them “Poor” and “Good” quality respectively. Research centers were well regarded, with 59 percent of producers rating them as “Good” quality, while state-owned processors fared the worst, with a resounding 94.4 percent of producers rating them as “Poor” quality. Of the organizations that had the most contact with producers¹⁷, the majority of producers rated both the cooperatives and the Extension Services Department as “Fair” quality. In contrast, the Farmer’s Union was almost evenly split between producers as being either “Fair” or “Poor” quality.

Figure 3-5. Perceived quality of technical information by source of information



In terms of the type of service received, the majority of producers rated the quality of service as “Fair” quality (61.8 percent of respondents). This was consistent across service types, ranging from a low of 55.5 percent of respondents rating Varietal Selection extension services as “Fair” quality to a high of 76 percent of respondents rating Marketing extension services as “Fair” quality.

Overall, the percentage of producers rating extension services for each commodity type followed that for the rating of the extension services. 63 percent of producers rated the extension services for each commodity as being “Fair” quality. There were some differences between the qualities of services provided for different commodities. For instance, 45 percent of tomato producers rated the quality of service provided

¹⁶ It should be noted that the interview team comprised personnel from MARD, the Extension Services Department and Horticultural Research Centers.

¹⁷ Cooperatives, 146 respondents; Extension Services Department, 1580 respondents; Farmer’s Union, 181 respondents

to them as being “Good”. This compares with 52 percent of carrot producers rating the quality of service to them as “Poor”¹⁸.

Survey respondents were also asked to name the best and worst providers of extension services. Just half the respondents were able to identify a “best” provider and only 1 percent a “worst” provider. The Extension Services Department was identified by 41 percent of respondents as being the best extension service provider overall, with some variation between the types of service provided – for instance, Local Processors were identified by 36 percent of respondents as providing the best marketing extension services, compared with 30 percent of respondents who nominated the Extension Services Department for the same service.

10 Credit

10.1 Credit availability

As Table 3-39 shows, just over 25 percent of producers in the survey used credit to fund their agricultural activities. This differed significantly between producers, with producers in the North more likely to have loans (40.5 percent) compared with producers in the South (8.14 percent). Producers in Ninh Binh province in the Red River Delta had the highest rate of loans taken out (73 percent of producers). Of those producers who had taken out credit, 63 percent indicated that this was sufficient for their needs. This level of “credit satisfaction” varied between 98 percent for producers in the South to 56.8 percent of producers in the North. This high rate of satisfaction in the South coincides with a low uptake of credit, indicating that liquidity (of cash reserves) is not as much of a problem with producers in the South as it is in the North. The main reason given for not being able to access funds (55 percent of producers) was that credit applicants had difficulties dealing with the bank (or credit institution). The major reason for this difficulty appears to be credit limit regulations imposed on the banks by the government.

The total credit requirement (requirement, not actual credit) for producers is around 19million dong (Table 3-39). This is consistent between producers in the North and the South, with some variation on the provincial level for producers in the North. From Table 3-6 the average total revenue for producers is around 40 million dong. This indicates that those producers who access credit need nearly 50 percent of total revenue in credit requirements. Actual credit taken out is somewhat lower, with Table 3-40 showing that the average amount borrowed being 6.5million dong (16 percent of total revenue). According to respondents, the maximum interest rate that they are willing to pay is 0.855 percent per month (10.26 percent per annum). This conflicts with the interest rates of 0.974 percent per month (11.69 percent per annum) they are currently paying for credit. Nine-teen percent of respondents said that the high interest rates prevented them accessing additional funds.

¹⁸ The single mandarin producer who responded to this section of the survey rated the quality of service provided to them as “Poor”.

10.2 Credit sources

As Table 3-40 shows, the majority of producers with loans obtained them from the Agricultural Bank (64.5 percent of producers). The amount of credit obtained from the Agricultural Bank (7million dong) is consistent with credit obtained from Other Credit Institutions (6.5million dong) and Other Enterprises (5.3million dong). Apart from the three respondents who obtained credit from a Commercial Bank (30million dong), credit obtained from friends and relatives (9.1million dong) and traders (9.18million dong) were the highest levels of credit obtained.

On a commodity basis, the source of loans does not greatly differ between commodity groups ($p=0.146$). Over 80 percent of loans for all commodities are obtained from the Agricultural Bank, Other Credit Institutions, or Other Sources. The only sources of interest other than the above are the 11 percent of loans obtained from Moneylenders by carrot producers and the 15 percent of loans obtained from Other Enterprises by pineapple producers. In the latter case, pineapple producers are most likely to obtain credit from processors. Fruit producers were more likely to have significantly greater ($p<0.0001$) levels of borrowing (8.3million dong average) than vegetable and mixed fruit-vegetable producers (3.5million dong average). Dragon fruit, longan, litchi and mandarin producers had significantly higher levels of debt than other producer types.

10.3 Characteristics of loans

As Table 3-40 shows, interest rates varied across the types of credit institutions used. Moneylenders charged the highest interest rates (2.34 percent per month or 28 percent per annum), followed by other farmers (2.00 percent per month) and traders (1.37 percent per month). The Agricultural Bank had an interest rate of 0.975 percent per month. On a commodity basis the interest rates at which loans were taken out did not differ significantly between producers of different types. Interestingly, there was a counter-intuitive positive correlation between interest rates and the amount borrowed. Robust regression estimates of amount borrowed against interest rates indicate that each additional monthly interest rate point increases borrowing by 2.6 million dong.

The average loan period across institution types was 19 months, which varied between 30 months for loans from Family and Friends and 6 months from Other Farmers (Table 3-40). Banana producers had the longest loan period of 31 months, compared with the shortest loan period of 8 months for mango producers. Overall, fruit producers had a significantly longer ($p<0.002$) loan period (21 months average) compared with vegetable producers (16 months average).

The timing of the loans followed a bi-modal pattern, with most loans taken out in January (18.6 percent), February (11.7 percent), August (11.5 percent) and October (12.9 percent). All Dragon fruit producers took out their loans in January, and 90 percent of banana producers took out their loans in the first four months of the year, with 50 percent of them taking their loans out in February.

The type of collateral used against the loan varied between lending institutions (Table 3-40). The main type of collateral used was the family home (32 percent of respondents) with land (29 percent) and Social Capital, or group lending (18 percent), being the other main types of collateral. None of the loans

from traders, other enterprises and other farmers required any collateral, and 62 percent of those from moneylenders did not require any collateral. Excluding producers of Dragon fruit, mango and pineapple, there is no significant difference between the types of collateral used by each of the producer types. For dragon fruit and mango producers the only type of collateral used was land. For pineapple producers, 85 percent of producers used either social capital or was not required to have collateral in order to secure a loan.

For the majority of producers, loans were obtained mainly for the purchase of inputs other than fertilizer, pesticide, seeds, or labor. Overall, 50 percent of producers obtained loans for “other inputs”, compared with 26 percent of producers for buying fertilizer. Hardly any producer obtained pesticides or hired labor using loans (0.98 percent of producers) and only 5.5 percent of producers used loans to purchase seeds. On an individual commodity basis, the greater proportion of producers of pineapple and dragon fruit used the loan to purchase fertilizer (53 percent and 82 percent of producers respectively) whereas 22 percent of carrot producers used their loans to purchase seeds.

While 25.5 percent of respondents indicated that they received credit, only 3.9 percent of producers in the North indicated that they extended credit to other people. No producer in the South lent money. Most of these loans were for non-business purposes.

11 Summary

Most of the growers in the sample started growing fruits and vegetables since 1990. This reflects the rapid growth in fruit and vegetable production and the expansion in the number of growers since the economic reforms were launched.

Three-quarters of household income for farmers in the sample came from fruit and vegetable production. This reflects the characteristics of the sample, which was intended to focus on specialized, commercial growers of fruits and vegetables. Commercial fruit growers tend to specialize in one crop, while commercial vegetable growers may grow several vegetables.

Income from post-harvest processing was quite small (3.5 percent of total income). Longan and litchi producers had the greatest income from processing activities, corresponding to the drying activities of these growers. For fruit and vegetable production (not including processing) citrus and mango producers had the highest income while tomato producers had the lowest income.

The growers in the sample felt that the profitability of fruit and vegetable production was good. On the other hand, the profitability was judged somewhat lower than in the previous year. The majority of producers cited adverse weather conditions as being responsible for the change in profitability, followed by the market price and then the volume of trade.

The most common type of labor used for agricultural purposes is family labor. Virtually all farms used family labor (both male and female) for agricultural production and over two-thirds of the farms used *only* family labor. Male and female family members appear to contribute equally to fruit and vegetable production. Temporary male and female labor were each hired by about one-quarter of the producers, but

these laborers account for about half the total number of person-days of labor. Women account for more than half the temporary laborers.

The management systems for fruit and vegetable production are not particularly advanced. The majority of producers rely on mechanical irrigation systems and canal irrigation where possible, but the usage of tube and drip irrigation is virtually nonexistent. Very few producers are using windbreaks or netting for crop protection. The vast majority of producers use pesticides to control for insect attack, with biological control and integrated pest management being rare.

In general, producers rely on other farmers to provide seeds and organic manure, and on private traders to provide virtually everything else. Some specialty items, such as cuttings and seedlings for fruit production are purchased from state enterprises and government institutions, particularly in the South. In the North, the use of government organizations is largely limited to areas close to Hanoi.

Almost all fruit and vegetable output in the survey was sold in fresh form. Less than 2 percent of the output was kept for home consumption or reserved for further processing. Produce sold on the fresh market does, however, undergo post-harvest activities such as grading and washing. The majority of produce is sold to assemblers and wholesalers, with very little sold to processors, exporters, or retailers.

About 80 percent of the fruit and vegetable output was sold to wholesalers and assemblers. Processors, exporters, and state-enterprises play only small roles in farm-level marketing, although the some of the output ends up there at a later stage in the marketing process.

Overwhelmingly, post-harvest activities are carried out on the individual farm level rather than at cooperatives or centralized processing facilities. The most common post-harvesting activities carried out by producers are grading (76 percent of producers) and drying (14 percent of producers). The majority of grading is done for fruit produce, while washing and ripening are carried out for vegetable produce. Longan, litchi and tomato producers are the only ones carrying out drying and preserving. Over 98 percent of litchi producers and 42 percent of the longan growers are involved in drying fruit before sale. About three-quarters of the tomato producers are involved in ripening produce before sale.

Almost all producers (over 91 percent) were aware of quality and grading standards for fruit and vegetable production. Ninety-five percent of those based their growing and post-harvest decisions on those standards. Overall, producers believed that size, shape and color were the most important characteristics in the quality standards. Other characteristics, such as smell, texture and flavor, are considered less important.

Over 57 percent of producers reported some post-harvest problem, but losses from post-harvesting are generally quite small, averaging 1.4 percent of total processed product. The major post-harvest problems included transportation (27 percent), handling (17 percent), and being unable to sell their produce after harvest (17 percent).

Sixteen percent of those surveyed indicated that they had had contracts for their production. The majority of the contracts were for pineapple and cucumber production (80 percent of contracts). Almost all the producers without contracts indicated that the lack of buyers willing to provide contracts was the main constraint to adoption of a contract system. The majority of contracts were with state enterprises (72

percent) and producer cooperatives (21 percent). The most common type of contract arrangement was a stipulation of the variety of produce grown and the time of harvest with a guarantee to purchase product (10 percent).

While 84 percent of producers in the South indicated that they had received extension services over the previous year, only 34 percent of producers in the North had received extension services. Most respondents received information from the Extension Services Department, and that overall the majority of the advice was in the form of information on fertilizer use, pest management and varietal selection. The majority of producers (63 percent) rated the extension organizations as “Fair” quality, with a further 21 percent and 16 percent rating them “Poor” and “Good” quality respectively. Research centers were well regarded, with 59 percent of producers rating them as “Good” quality. State-owned processors and farmer cooperatives were generally rated “Poor”.

About one-quarter of producers in the survey used credit to fund their agricultural activities. Producers in the North more likely to have loans (41 percent) compared with producers in the South (8 percent). Of those producers who had taken out credit, most indicated that this was sufficient for their needs. This level of “credit satisfaction” varied between 98 percent for producers in the South to 57 percent of producers in the North, perhaps implying that liquidity is not as much of a problem in the South. For those producers who did not have enough credit to fund their operations, the main reason given was that credit applicants had difficulties dealing with the bank. Two-thirds of those with loans received them from the Agricultural Bank. Fruit producers were more likely to have significantly greater levels of borrowing than vegetable and mixed fruit-vegetable producers.

Table 3-1 Sample Locations and Producer Numbers

Product	Provinces	Number of Producers
Longan	Hung Yen, Son La, Tien Giang	152
Litchi	Bac Giang, Hai Duong, Quang Ninh	150
Banana	Phu Tho, Tien Giang, Kien Giang	150
Pineapple	Ninh Binh, Tien Giang, Kien Giang	152
Dragon fruit	Binh Thuan	50
Citrus (Oranges Mandarin)	Ha Giang, Nghe An, Ben Tre	150
Mango	Tien Giang, Dong Thap, Can Tho	150
Tomato	Hai Duong, Bac Ninh, Lam Dong	150
Cabbage	Hai Duong, Ha Noi, Lam Dong	150
Cucumber	Hai Duong, Hung Yen, Soc Trang	151
Carrots	Hung Yen, Lam Dong	100
TOTAL		1505

Table 3-2 Level of education of heads of household

Level of education	Percentage of respondents		Cumulative percentage of respondents	
	Male-headed households	Female-headed households	Male-headed households	Female-headed households
None	1.7	1.0	1.7	1.0
Primary school	26.0	26.8	27.7	27.8
Middle school	46.7	57.9	74.4	85.7
Secondary school	23.9	12.9	98.3	98.6
Technical School	0.7	1.0	99.0	99.5
College	0.2	-	99.2	99.5
University	0.8	0.5	99.9	100.0
Post-graduate	0.1	-	100.0	100.0
Total	100.0	100.0		

Table 3-3 Household Labor Utilization

Labor	Type	Share of Labor Force (%)	Utilization (% of Farms)	Agriculture			Fruit and Vegetables		
				N ^o Laborers	Days p.a.	Daily Wage ('000 dong)	N ^o Laborers	Days/year	Daily Wage ('000Dong)
Family	Male	24.8	97.9	1.55	194		1.54	104	
	Female	24.0	98.3	1.49	171		1.49	81	
Permanent	Male	0.2	0.7	1.73	254	19.55	1.73	208	19.55
	Female	0.2	0.7	2.00	191	17.77	1.45	154	18.56
Temporary	Male	23.7	26.8	5.48	41	20.91	4.19	41	20.98
	Female	27.1	24.9	6.74	38	19.62	4.85	38	19.68
Total		100.0		2.47	153	20.24	2.14	83	20.32

Table 3-4 Wages paid to laborers by main commodity produced

Commodity	Mean
Longan	20.14
Litchi	16.66
Banana	19.78
Pineapple	21.59
Dragon Fruit	29.34
Orange	19.43
Mandarin	15.43
Mango	28.73
Tomato	17.25
Cabbage	18.41
Cucumber	17.12
Carrots	23.31
Total	20

Wage =(‘000 Dong/Person/day) including own labor

Table 3-5 Sources of Revenue by Sex of Head of Household

Household Activity	Female	Male
	N=209	N=1296
Fruit and Vegetable	17565	31753
Other agriculture	6340	6793
Non-Agriculture	2632	2356
Processed Fruit and Vegetable	422	1560
Total	26960	42462

(‘000 Dong)

Table 3-6 Sources of revenue by region

Region	No. Obs	Fruit and Vegetable		Other agriculture VND	Non-Agricultural VND	Processed Fruit and Vegetable VND	Total VND
		VND	Pct.				
NCC	50	21,521	60%	9,561	4,628	120	35,830
NE	301	12,794	49%	7,469	2,666	3,129	26,057
NW	52	8,757	40%	6,745	4,333	2,223	22,058
RRD	402	12,238	47%	8,661	2,638	2,332	25,869
North	805	12,798	49%	8,147	2,881	2,486	26,312
MRD	450	49,144	87%	5,837	1,647	0	56,628
SE	250	49,623	89%	3,775	2,170	437	56,006
South	700	49,316	87%	5,101	1,834	156	56,406
Total	1505	29,783	74%	6,730	2,394	1,402	40,309

Table 3-7 Total Revenue by Commodity

Commodity	No. Obs	Total revenue (VND 1000/year)
Banana	150	22,063
Cabbages	150	35,775
Carrots	100	41,807
Citrus	150	65,669
Cucumbers	151	26,637
Dragon Fruit	50	86,558
Longan	152	41,172
Litchi	150	37,914
Mango	150	58,372
Pineapple	152	36,413
Tomatoes	150	22,478
Total	1505	40,309

Table 3-8 Asset ownership and value by function and type of asset

	Percent of farms owning	Average value among owners (‘000 VND)	Percent of total value of assets
Function of asset			
Equipment	86.1	2,083	30.1
Transportation	65.9	3,087	34.2
Building and storages	18.6	11,226	35.1
Other	5.7	2,409	0.6
Total	91.4	2,503	100.0
Type of asset			
Pump	52.9	1,288	12.3
Pesticide sprayer	61.3	600	6.7
Generator	6.0	2,008	2.2
Cart	13.4	470	1.2
Ox	4.6	1,837	1.6
Bicycle	26.1	392	1.8
Motorcycle	7.0	14,565	18.7
Ship	21.9	2,353	9.2
Barn	3.3	6,820	4.1
Pit	3.3	3,224	1.9
House	5.5	24,803	25.1
Warehouse	3.1	4,914	2.8
Other	5.3	10,409	12.4
Total	91.4	2,503	100.0

Source: IFPRI – MARD Survey of Fruit and Vegetables Producers

Table 3-9. Total value of assets by region

Region	Number of observations	Average value (‘000 VND)
North	807	5,763
Red River Delta	403	4,019
North East	301	7,160
North West	52	11,023
North Central Coast	51	5,941
South	698	5,076
South East	248	6,857
Mekong River Delta	450	4,095
Total	1,505	5,445

Source: IFPRI – MARD Survey of Fruit and Vegetables Producers

Table 3-10 Profitability of Household Activities by Commodity

Commodity	Fruit Production				Vegetable Production				Fruit Processing			
	Good	Fair	Poor	N	Good	Fair	Poor	N	Good	Fair	Poor	N
Profitability of Activity in Previous Year (Percentage of Producers)												
Longan	77	21	2	180	33	57	10	21	78	22		27
Litchi	87	12	1	149		50	50	2	63	30	7	43
Banana	46	49	5	149	20	80		5				
Pineapple	56	24	20	148	50		50	2				
Dragon Fruit	92	8		50								
Orange	83	15	2	144		88	13	8				
Mandarin	79	21		14								
Mango	91	9		147								
Tomatoes	33	67		3	82	17	1	152	100			1
Cabbages	50	50		6	79	20	1	194	50	50		2
Cucumbers	50	38	13	16	78	22		114	100			1
Carrots	100			3	86	14		83				
Total	74	21	5	1,009	77	22	1	581	69	27	4	74
Profitability of Activity in Current Year (Percentage of Producers)												
Longan	63	28	9	180	19	71	10	21	15	52	33	27
Litchi	70	23	7	149		50	50	2	28	40	33	43
Banana	42	53	5	149	20	80		5				
Pineapple	59	23	18	148	50		50	2				
Dragon Fruit	94	6		50								
Orange	78	20	2	144		88	13	8				
Mandarin	86	14		14								
Mango	89	9	2	147								
Tomatoes	33	67		3	76	22	3	152		100		1
Cabbages	33	50	17	6	73	24	3	194	50	50		2
Cucumbers	56	38	6	16	75	22	3	114	100			1
Carrots	100			3	87	13		83				
Total	68	25	7	1,009	72	24	3	581	24	45	31	74

Table 3-11 Area of Land Used and Owned by Commodity

	Rented In	Rented Out	Land used	Total Land Owned
Banana	0.02	0.00	0.74	0.74
Cabbages	0.04		0.33	0.33
Carrots	0.05		0.39	0.39
Cucumbers	0.03		0.64	0.64
Dragon Fruit			0.79	0.79
Longan	0.06	0.01	0.91	0.91
Litchi	0.11		1.23	1.25
Mandarin			5.27	5.27
Mango			0.85	0.85
Orange	0.08		1.87	1.87
Pineapple	0.51		3.08	3.08
Tomatoes	0.08		0.41	0.41
Total	0.08	0.00	0.88	0.88

(hectares)

Table 3-12 Planting Profile for Crops by Region

Commodity	North								South			
	Red River Delta		North East		North West		North Central Coast		Southeast		Mekong River Delta	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Apple			February	0.7								
Apricot					April	2.0						
Banana	April	2.8	May	3.2					June	1.1	June	1.7
Beet*	September	3.0	October	2.9							August	0.4
Cabbage	September	1.8	September	2.7	September				May	3.2		
Carrots	September		September	2.9					April	3.3		
Cauliflower*	September	0.7	October	0.7								
Chick Peas	August	3.5	February	1.4					October	1.1		
Chinese Cabbage*	August	2.1							August	0.4		
Cucumber*	July	3.6	August	3.2					July	2.8	June	0.4
Custard Apple*	July		March	1.4	April	1.9						
Dragon Fruit									May	2.8	August	3.5
Durian											May	0.7
Guava											May	0.5
Kohlrabi*	September	1.9	September	3.4								
Lemon	May	3.1					February	0.6				
Longan	March	2.3	March	1.9	April	2.2					May	1.5
Litchi	March	1.8	April	2.7	April							
Mandarin*	February		May	2.2			March	2.3			June	0.5
Maize	July	3.4	August	3.3	April	0.7			May			
Mango											May	1.1
Orange	February		April	1.5			May	3.4			June	0.5
Paddy	April	2.3	April	2.3	May	2.4	April	2.2	July	3.2	August	3.1
Peanut*	February	0.5	February	0.8								
Pineapple	July	2.2	November								June	0.6
Potato*	October	0.6	October	3.0					September	1.2		
Pyriiform Melon*	June	3.9	March	1.2								
Radish	September	2.4	April	1.5								
Rose Apple	February										May	0.6
Soya-Bean*	June	3.7	July	3.6								
Squash*	August	3.4	July	4.0								
Sugar Cane	February	1.5	February		May		March	3.2			November	2.3
Sweet Potato*	September	1.6	October	0.6								
Tea*			April	2.6	April							
Tomato	September	1.9	September	2.8	September				June	3.5		
Water Melon	May	2.7									September	0.4

Means and Standard Deviations (Months); *=No significant difference between regions (p<0.05)

Note: Table 3-includes only crops grown by at least 10 farm households in the sample.

Table 3-13 Harvesting Profile for Crops by Region

Commodity	North								South			
	Red River Delta		North East		North West		North Central Coast		Southeast		Mekong River Delta	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Apple			November	0.7								
Apricot					June	2.8						
Banana	August	3.5	July	3.7					January		April	2.5
Beet	September	3.6	March	4.0							October	0.5
Cabbage	September	3.5	July	4.9	December				August	3.2		
Carrots*	November		July	4.7					July	3.3		
Cauliflower*	October	3.8	December									
Chick Peas	October	3.8	May	2.1					March	3.3		
Chinese Cabbage*	September	2.8							October	2.0		
Cucumber*	August	3.6	September	3.7					October	2.8	August	0.4
Custard Apple*	June		August	1.2	August	0.7						
Dragon Fruit*									July		July	
Durian											May	0.9
Guava											January	1.1
Kohlrabi	October	3.0	July	4.8								
Lemon	September	2.1					June	2.1				
Longan	July	0.5	July	1.0	July	0.5					June	2.0
Litchi*	June	0.4	June	0.5	May							
Mandarin	November		November	0.2			October	0.6			August	
Maize*	July	4.3	September	4.1	September	1.8			September			
Mango											March	1.6
Orange	November		November	0.6			October	2.6			July	3.3
Paddy	July	2.1	August	2.2	September	2.3	July	2.0	July	2.4	July	3.6
Peanut*	May	1.0	May	1.0								
Pineapple	August	3.3	December								May	2.5
Potato	November	2.7	April	4.6					December			
Pyriiform Melon*	May		June									
Radish*	September	3.6	June	1.5								
Rose Apple*	July										June	2.1
Soya-Bean*	August	2.8	August	4.1								
Squash*	July	3.9	October	3.7								
Sugar Cane	July	4.8	June		January		November	0.7			September	2.3
Sweet Potato*	October	4.0	May	6.4								
Tea*			February	1.7	January							
Tomato	October	2.5	August	4.4	December				April	2.5		
Water Melon	July	2.5									December	

Means and Standard Deviations (Months); *=No significant difference between regions (p<0.05)

Note: Table 3-includes only crops grown by at least 10 farm households in the sample.

Table 3-14 Production Profile for Selected Fruit Tree Varieties

Commodity	Variety	First Bearing			Stable Period			Maximum Yield			Unstable Period			Cutting/Natural Death							
		N	Mean	Age	N	Mean	Age	N	Mean	Age	N	Mean	Age	N	Mean	Age	N	Mean	Age		
Dragon Fruit	Binh Thuan	50	1.4	50	6.5	50	3.0	50	33	3	5	3	63								
Longan	Làng (Laong)	132	4.7	132	8.2	100	11.0	100	60	48	27	48	128	13	47	13	37	6	79	6	9
	Tieu Da B	70	2.1	69	9.0	55	6.6	55	41	31	9	31	65	5	19	5	43	3	35	3	11
Litchi	Thieu	165	3.7	163	7.6	144	8.6	144	58	72	18	72	171	11	23	11	74				
Mandarin	Vang Vo Ron	17	3.0	16	4.3	14	5.9	14	18	10	9	10	72	8	12	8	13				
Mango	Buoi	44	3.0	44	10.7	43	9.2	43	79	14	14	14	142	2	25	2	24				
	Cat Chu	31	5.3	31	15.6	30	16.1	30	311	8	24	8	448								
	Cat Hoa Loc	48	4.6	48	10.6	48	11.4	48	75	11	19	11	148	3	35	3	44				
	Hon	20	4.2	20	11.8	20	11.2	20	81	1	22	1	200								
Orange	Sanh	95	2.9	95	3.2	89	5.1	89	18	66	6	66	32	54	10	54	9	5	11	5	7
	Xa Doai	45	3.2	45	5.5	36	5.5	36	26	14	9	14	60	8	14	8	24	2	16	2	6

Yields (kg/tree) and Ages (Years)

Table 3-15 Current Production Profile for Selected Fruit Tree Varieties

Commodity	Variety	N	Tree Age (Years)	Number of trees	Farm Gate Price ('000Dong/kg)	Annual Production (kg)
Dragon Fruit	Binh Thuan	49	3.0	606	2.08	37,123
Longan	Lãng (Laong)	221	2.3	48	8.54	1,893
	Tieu Da B	75	3.1	164	6.70	5,464
Litchi	Thieu	300	2.3	76	7.38	2,590
Mandarin	Vang Vo Ron	18	2.9	406	3.98	3,484
Mango	Buoi	44	3.1	118	3.38	10,094
	Cat Chu	32	2.8	65	5.28	15,971
	Cat Hoa Loc	48	3.3	90	10.51	4,515
	Hon	20	2.7	106	5.53	16,545
Orange	Chanh	11	2.6	147	2.15	1,814
	Sanh	106	3.1	1186	4.24	10,553
	Xa Doai	63	2.4	291	12.73	6,958

Table 3-16 Fruit and Vegetable Management Systems by Region

Region	Irrigation System				Pest Control System			Wind Break System			Shade System			Netting System								
	Canal Irrigation	Manual Irrigation	Mechanical Irrigation	Rainfed	Tube/Drip Irrigation	Total	Biological Control	Integrated Pest Management	Pesticide	Total	Artificial	Trees	None	Total	Artificial	Tree	None	Total	Net House	None	Total	
North Central Coast	11	89				71		100		72		100		71		100		71		100		71
North East	17	57	8	0		538		100		508	4	0	96	538		100		538	1	99		538
North West	5	22	72	1		96		100		92		100		96		100		96		100		96
Red River Delta	22	35	31	11	1	867	1	2	97	803	2		98	867		100		867	1	99		866
North average	18	26	42	13	1	1,572	1	1	99	1,475	3	0	97	1,572		100		1,572	1	99		1,571
Mekong Delta	2	20	62	16		510	27	73		509	10	90		509	0	10	90	509		100		508
Southeast	1	13	67	18		297	23	77		297		100		297		100		297		100		297
South average	1	13	67	18		807	25	75		806	6	94		806	0	6	94	806		100		805
National average	12	22	51	15	1	2,379	9	1	90	2,281	2	2	96	2,378	0	2	98	2,378	1	99		2,376

Percentage of Producers

Table 3-17 Irrigation Methods for Fruit and Vegetable Production

		Type of irrigation					Total	N
		Canal	Hand	Mech	Rain	Tube		
Banana	North		11	84	5		100	63
	South			1	99		100	118
	Total		4	30	66		100	181
Dragon fruit	North							
	South			98	2		100	52
	Total			98	2		100	52
Longan	North		6	67	27	0	100	262
	South		24	76			100	83
	Total		10	69	21	0	100	345
Litchi	North	4	6	81	7	2	100	299
	South							
	Total	4	6	81	7	2	100	299
Mandarin	North		42	29	29		100	24
	South			100			100	2
	Total		38	35	27		100	26
Mango	North							
	South	4	5	88	2		100	164
	Total	4	5	88	2		100	164
Orange	North		22	68	9		100	130
	South	2	38	60			100	53
	Total	1	27	66	7		100	183
Pineapple	North			1	98	1	100	89
	South		10	65	25		100	106
	Total		6	36	58	1	100	195
Cabbage	North	49	42	9		1	100	269
	South			100			100	74
	Total	38	33	28		1	100	343
Carrots	North	37	23	38	3		100	71
	South			100			100	53
	Total	21	13	65	2		100	124
Cucumber	North	19	75	5		1	100	146
	South		88	12			100	51
	Total	14	79	7		1	100	197
Tomato	North	40	44	16		0	100	219
	South		6	94			100	50
	Total	33	37	30		0	100	269

(Percentage of Producers)

Table 3-18 Propagation Methods for Fruit Trees

Fruit	Marcotting	Grafting	Seedlings	Other
Dragonfruit	0	0	0	100
Longan	46	6	35	0
Lychee	83	1	2	1
Mandarin	73	0	13	0
Mango	1	2	33	1
Orange	47	43	1	0
Total	45	12	15	9

(percent of growers)

Table 3-19 Source of Inputs by Region

Location	Inputs	Traders	Farmer	Other Private Business	Government Enterprises	Cooperatives	Other
North	Vegetable Seeds	25.53	32.61	12.01	6.65	14.26	8.94
	Fruit Tree Planting Material	33.17	27.92	9.90	12.18		16.83
	Chemical Fertilizer	75.28		14.98	8.04	0.38	1.32
	Manure	8.95	15.15	1.45	1.23		73.22
	Pesticide	76.10	0.07	15.22	5.61	2.93	0.07
	Equipment	61.41	1.63	26.09	9.24	1.63	
	Packaging	69.23		30.77			
	Other	34.75	35.82	7.80	2.84	18.79	
South	Vegetable Seeds	2.12	71.22	26.46			0.21
	Fruit Tree Planting Material	26.87	10.45	1.94	59.70	1.04	
	Chemical Fertilizer	66.78	0.55	24.54	8.13		
	Manure	30.00	40.79	19.10	3.00		7.12
	Pesticide	73.91	0.59	25.30			0.20
	Equipment	34.91		65.09			
	Packaging	93.10		6.90			
	Other	97.39	0.65	1.31	0.65		
Total	Vegetable Seeds	17.44	45.95	17.00	4.35	9.33	5.92
	Fruit Tree Planting Material	30.65	20.95	6.73	31.13	0.42	10.12
	Chemical Fertilizer	71.62	0.24	19.11	8.08	0.21	0.75
	Manure	18.45	26.71	9.41	2.03		43.40
	Pesticide	75.21	0.28	19.32	3.33	1.74	0.12
	Equipment	41.35	0.40	55.62	2.24	0.40	
	Packaging	85.71		14.29			
	Other	67.35	17.52	4.42	1.70	9.01	

Percentage of Cost by Location

Table 3-20. Distribution of farms by value of fruit and vegetable sales

Fruit and vegetable sales category (1000 VND)	Number of households	Percentage of households	Average value of sales (1000 VND)
Less than 500	20	1.3	103
500 - 1,000	16	1.1	783
1,000 - 5,000	303	20.1	3,025
5,000 - 10,000	264	17.5	7,502
10,000 - 50,000	659	43.8	26,095
50,000 - 100,000	161	10.7	69,566
Greater than 100,000	82	5.5	164,814
Total	1,505	100	29,783

Source: IFPRI – MARD Survey of Fruit and Vegetables Producers

Table 3-21. Distribution of farms by share of total revenue from fruit and vegetable sales

Share of revenue from fruit and vegetable sales (percent)	Number of households	Percentage of households	Average value of sales (1000 VND)
Less than 10	58	3.9	1,225
10 - 20	115	7.6	3,088
20 - 30	146	9.7	5,037
30 - 40	130	8.6	7,765
40 - 50	135	9.0	10,781
50 - 60	120	8.0	14,650
60 - 70	126	8.4	23,675
70 - 80	137	9.1	30,711
80 - 90	165	10.9	41,527
Greater than 90	373	24.8	68,086
Total	1,505	100	29,783

Source: IFPRI – MARD Survey of Fruit and Vegetables Producers

Table 3-22 Production, Sales, Consumption and Stocks of Fruit and Vegetables

Commodity	Quantity Produced (kg)	Fresh Quantity Sold (kg)	Sale Price ('000 Dong/kg)	Fresh Home Consumption (kg)	Inputs for Home Processed Products (kg)	N
Banana	9,302	9,603	0.85	73	798	148
Cabbage	15,688	15,612	0.96	76	17,316	211
Carrots	9,294	9,291	1.26	3	741	81
Cucumber	2,322	2,292	0.78	29		112
Dragon Fruit	29,170	29,031	2.23	139	35,926	51
Longan	3,195	2,873	7.08	57	1,326	197
Litchi	3,895	2,788	7.45	84	1,446	157
Mandarin	5,404	5,347	4.50	57	964	21
Mango	8,972	8,865	6.33	106	7,551	151
Orange	7,498	7,721	6.94	60	4,660	141
Pineapple	33,992	33,897	0.92	65	16,320	150
Tomato	5,913	5,833	1.27	71	430	203
Total	10,630	10,485	3.42	69	6,473	1623

Table 3-23 Income and Revenue from Fruit and Vegetable Production

Commodity	Total Production Income		Total Income		Total Net Revenue		Total Sales Revenue	
	('000 Dong)	% Specialization	('000 Dong)	% Specialization	('000 Dong)	% Specialization	('000 Dong)	% Specialization
Banana	7,241	98%	7,565	98%	7,240	98%	7,484	98%
Cabbage	13,970	78%	13,970	78%	13,896	78%	13,896	78%
Carrots	12,481	79%	12,481	79%	12,477	80%	12,477	80%
Cucumber	1,849	61%	1,849	61%	1,825	62%	1,825	62%
Dragon Fruit	65,583	99%	65,583	99%	65,270	99%	65,270	99%
Longan	22,552	86%	24,877	86%	17,805	84%	19,522	83%
Litchi	28,572	96%	31,221	96%	17,968	92%	20,308	90%
Mandarin	24,602	55%	24,602	55%	24,370	55%	24,370	55%
Mango	50,277	97%	50,277	97%	49,660	97%	49,660	97%
Orange	34,579	93%	35,714	93%	34,458	93%	35,451	93%
Pineapple	31,445	99%	31,445	99%	31,374	98%	31,374	98%
Tomato	8,413	73%	8,413	73%	8,305	73%	8,305	73%
Total	22,748	86%	23,414	86%	21,033	86%	21,577	85%

Note: Total production income is the value of production.

Total income is the value of sales, including sales of own production and sales of purchased goods.

Total net revenue is the value of sales minus the value of purchased goods.

Total sales revenue is the value of fresh quantities sold.

Table 3-24 Respondents who Have Had Contracts for Fruit and Vegetable Production by Commodity

Commodity	N ^o Respondents	%	N
Longan	7	5%	152
Litchi	3	2%	150
Banana	3	2%	150
Pineapple	102	67%	152
Dragon Fruit	0	0%	50
Citrus	7	5%	150
Mango	0	0%	150
Tomatoes	6	4%	150
Cabbages	12	8%	150
Cucumbers	94	62%	151
Carrots	10	10%	100
Total	244	16%	1505

Table 3-25 Contractual Arrangements

Contract Arrangement	Number of contracts with this feature	Percent of contracts with this feature
Free seeds	5	2%
Low cost seeds	84	39%
Low cost fertilizer	64	30%
Low cost pesticide	15	7%
Low cost other inputs	67	31%
Below market price purchase contract	40	19%
At market price purchase contract	86	40%
Below market price specific quantity purchased	52	24%
Extension provided by contractor	80	37%
Variety stipulated by contractor	181	85%
Harvest time stipulated by contractor	153	71%
Fertilizer/inputs on credit	16	7%
Other contract stipulation	2	1%
Total	845¹	

¹ (Producers can have more than one arrangement with Contractors)

Table 3-26 Provision of Technical Support by Contractors

Technical Support	Percentage	Total number of respondents
Percentage of contracts involving provision of technical support	84%	214
Of those getting technical support, type:		
Technical Training	44%	179
Field Visits	4%	179
Monitoring	52%	179
Percent of farmers with technical support contracts that are satisfied with support	66%	179
Of those dissatisfied, reason:		
Want better quality of existing support	56%	119
Want additional services	44%	119

Table 3-27 Sales of Fruit And Vegetables to Different Types Of Buyers

Region	Assemblers	Wholesalers	Retailers	State- Owned Processors	Province- Owned Processor	Coope- ratives	Private Processors	Consumers	Exporter	Own Use	Other
NCC	27.9	33.9	6.6					29.2		2.1	0.2
NE	67.5	24.7	0.8		0.2		2.3	1.2		1.8	1.5
NW	38.2	25.1	1.4				23.4	4.2		5.7	2
RRD	35.3	19.9	4.2	11.3	1.8	9.4	3.1	5.7	5.5	2.4	1.5
North	47.7	23	2.8	5.4	0.9	4.5	4	5.2	2.6	2.4	1.5
MRD	44.2	41.6			12.8		0.2			1.2	
NE	69.6	29.9								0.5	
South	53.9	37.2			7.9		0.1			0.9	
Total	50.5	29.5	1.5	2.9	4.1	2.4	2.2	2.8	1.4	1.7	0.8

Table 3-28 Shipping Distances, Costs and Duration

Region	Transport	N ^e Obs	Cost per shipment (*000 Dong)	Shipments per Year (number)	Shipping Distance (km)	Shipping Time (days)	Weight Transported (mt)	Cost/mt/kg (*000 Dong)
North	Truck	12	981.67	2.42	196.88	1.20	6.17	0.81
	Cart	2	3.50	33.50	0.50	0.02	0.20	35.00
	Motorcycle	6	24.33	5.17	8.67	0.03	0.28	10.21
	Tractor	5	34.00	11.80	6.60	0.03	0.70	7.36
	Other	8	248.75	7.86	66.00	0.26	2.06	1.83
	Total	33	427.06	7.53	90.20	0.52	2.91	1.63
South	Truck	13	109.23	6.85	3.81	0.06	3.15	9.10
	Motorcycle	4	3.75	26.75	1.50	0.02	30.04	0.08
	Bicycle	2	150.00	4.50	1.50	0.05	3.20	31.25
	Train	1	30.00	1.00	2.00	0.04	1.00	15.00
	Boat/Ship	65	43.94	81.58	49.69	0.24	1.05	0.84
	Total	85	54.36	64.81	38.71	0.19	2.79	0.50
Total	Bicycle	2	150	4.5	1.5	0.052	3.2	31.25
	Boat/Ship	65	43.94	81.58	49.69	0.239	1.05	0.84
	Cart	2	3.5	33.5	0.5	0.0167	0.2	35.00
	Motorcycle	10	16.1	13.8	5.8	0.027	12.18	0.23
	Tractor	5	34	11.8	6.6	0.0333	0.7	7.36
	Train	1	30	1	2	0.042	1	15.00
Total	Truck	25	528	4.72	96.48	0.604	4.6	1.19
	Other	8	248.75	7.86	66	0.262	2.06	1.83
	Total	118	158.59	49.15	53.11	0.283	2.82	1.06

Table 3-29 Access to communication and transportation

Region	Has Telephone		Access To Telephone		Access To Fax Machine		Uses Transportation	
	Percent	Total number of respondents	Percent	Total number of respondents	Percent	Total number of respondents	Percent	Total number of respondents
North Central Coast	4	50	94	48	2	50	32	50
North East	4	301	59	289	0	301	49	301
North West		52	48	52		52	21	52
Red River Delta	3	402	67	391	0	402	79	402
North average	3	805	65	780	0	805	61	805
Mekong River Delta	0	450	26	448		450	73	450
Southeast	0	250	27	249	0	250	28	250
South average	0	700	27	697	0	700	57	700
National average	2	1505	47	1477	0	1505	59	1505

Table 3-30 Sources of Information for Fruit and Vegetable Producers

Source of Information (Percentage Contribution)	Price and Market Information	Regulations	Credit	New Varieties	Technical Advice	Management Advice	Total
Extension Agents	0.63	3.1	0.86	14.25	19.9	5.02	7.66
Press/Magazines	0.63	1.09	0.45	0.3	0.78	0.19	0.6
Radio/TV	5	16.49	14.74	11.49	9.63	6.24	10.45
Intermediaries	11.67	1.4	1.26	4.74	3.67	0.64	4.56
Banks	0.13	0.04	41.84	0.07	0.04	0.06	6.36
Personal Contacts	44.03	14.92	16.64	36.49	35.24	20.98	29.9
Processors	2.74	1.92	1.98	1.72	1.6	1.8	2
Traders	29.53	0.39	0.68	7.16	2.03	1.48	8.39
Informal Extension Clubs	0.28	0.44	0.27	3.02	4.92	0.77	1.74
Cooperatives	3.27	19.42	6.04	9.74	9.63	7.98	9.08
Department of Technology, Science and Environment			0.05	0.11	0.11	0.13	0.06
Department of Agriculture		0.26		0.86	0.68		0.33
Circular/Decree	0.06	3.93	0.18				0.65
Women's Union		0.44	1.26	0.04	0.18		0.3
Horticulture Association	0.41	3.45	0.9	2.72	3.46	2.96	2.23
Farmer's Union	0.28	5.19	6.13	3.13	3.14	10.04	4.02
People's Committee	0.09	24.61	4.33	0.26	0.43	33.27	8.14
Other	1.23	2.27	2.25	3.21	4.17	7.85	3.16
Other Farms	0.03	0.65	0.14	0.67	0.39	0.58	0.39

Table 3-31 Growers using storage by Region and by Commodity

Region	Percent	N
North Central Coast	0.0	50
North East	13	301
North West	15	52
Red River Delta	16	402
North average	14	805
Mekong Delta	0	450
Southeast	0	250
South average	0	700
National average	7	1505
Commodity		
Banana	1	152
Dragon fruit	0	50
Longan	14	207
Litchi	31	160
Mandarin	0	23
Mango	0	153
Orange	1	151
Pineapple	1	153
Cabbage	7	248
Carrots	3	106
Cucumber	8	165
Tomato	15	222

Table 3-32 Proportion of Crop Affected by Post Harvest Problems

Commodity	N	Affected	Destroyed	Value Lost
Banana	75	2.74	0.70	0.77
Cabbage	79	2.88	1.41	1.44
Carrot	5	32.00	11.00	16.00
Cucumber	65	4.21	2.24	1.74
Dragon Fruit	50	2.80	0.36	1.49
Longan	74	1.83	0.74	1.18
Litchi	82	4.04	1.72	3.67
Mandarin	13	3.96	1.04	0.81
Mango	162	3.98	0.95	1.83
Orange	113	2.49	1.11	1.21
Pineapple	103	2.93	1.95	1.74
Tomato	99	7.19	3.87	4.12
Total	920	3.76	1.58	2.02

Percentage of Crop

Table 3-33 Post-Harvest Activity Costs and Returns for Fruit and Vegetable Production

Commodity	Post Harvest Activity							N	Raw Material Input (Tonnes)	Loss of Raw Material (Percent)	Post Harvest Cost ('000 dong/ tonne)	Post Harvest Revenue ('000 dong)	Average Price ('000 Dong/kg)
	Fungicide	Drying	Preserving	Washing	Ripening	Grading	Bagging						
Banana						100	7	16.22	0.50	33.57	14675.71	0.90	
Cabbage			3			82	15	61	170.57	0.79	49.59	51343.85	0.93
Carrot			100				3	20.00	0.00	30.00	24200.00	1.20	
Cucumber			50	50			2	4.05	0.50	12.50	7850.00	1.75	
Dragon Fruit						100	50	36.65	0.36	37.72	81885.50	2.25	
Longan	3	42				56	72	3.52	1.43	1713.32	19985.90	32.28	
Litchi		98				2	54	4.05	2.70	394.56	28066.73	24.80	
Mandarin						100	4	5.06	0.13	27.50	39725.00	7.25	
Mango						100	158	8.48	0.89	40.57	49688.76	6.43	
Orange	2					96	2	54	12.57	0.36	26.33	101124.60	6.55
Pineapple						100	100	27.64	0.92	21.48	35727.94	0.66	
Tomato			23	3	68		8	40	3.11	7.30	25.03	3487.50	1.22
Total	1	14	1	1	5	76	2	605	29.45	1.43	266.14	45690.47	8.73

Percentage of Producers

Table 3-34 Post Harvest Problems and Buyer Rejection

Commodity	Respondent has experienced post harvest problems		Buyer Rejection		Buyer Offered Lower Price	
	Percent	N	Percent	N	Percent	N
Longan	54	136	91	74	23	74
Litchi	53	154	78	82	41	82
Banana	48	157	48	75	68	75
Pineapple	96	107	50	103	91	103
Dragon Fruit	100	50	100	50	100	50
Orange	78	145	73	113	67	113
Mandarin	62	21	92	13	54	13
Mango	95	170	72	162	100	162
Tomato	44	223	75	99	37	99
Cabbage	49	160	95	79	70	79
Cucumber	42	154	100	65	25	65
Carrot	3	132	80	5	80	5
Total	57	1,609	76	920	66	920

Table 3-35 Type of Post Harvest Problem

Commodity	Micro-organisms	Insects	Heat	Handling	Weather	Post Harvest Problems					Total	Total number of observations
						Transport	Harvest Time	Harvest Technique	Unable To Sell	Other		
Longan	4	4	-	18	7	7	1	26	34	-	100	74
Litchi	15	1	12	1	9	13	1	26	18	4	100	82
Banana	-	16	-	23	-	43	-	-	19	-	100	75
Pineapple	4	13	1	42	2	20	7	-	12	-	100	103
Dragon Fruit	-	2	56	6	-	36	-	-	-	-	100	50
Orange	3	3	-	46	4	11	1	19	13	2	100	113
Mandarin	-	-	-	31	8	-	-	46	15	-	100	13
Mango	17	12	1	12	1	29	1	19	7	1	100	162
Tomato	5	3	4	2	6	53	-	1	25	1	100	99
Cabbage	9	39	4	1	3	28	-	-	16	-	100	79
Cucumber	-	8	-	-	2	39	17	5	26	5	100	65
Carrot	-	-	-	-	-	-	-	-	100	-	100	4
Total	7	10	5	17	3	27	3	11	17	1	100	919

(Percent of respondents)

Table 3-36 Extension services provision by region and by type of commodity

Commodity	Percentage of farmers receiving extension services in past year
Banana	23.3
Cabbages	66.7
Carrots	52.0
Citrus	47.3
Cucumbers	89.4
Dragon Fruit	98.0
Longan	40.1
Litchi	30.0
Mango	92.0
Pineapple	75.8
Tomatoes	40.0
Region	
North East	16.9
North West	34.6
Red River Delta	47.3
N C Coast	28.0
Southeast	88.2
Mekong Delta	87.2
North average	33.9
South average	84.0
Total	57.2

Table 3-37 Provision of Extension Services by Organization, Importance of Type of Service Provided

Extension Organization	Fertilizer Use	Irrigation Technique	Marketing	On-Farm Demonstration	Pest Management	Post-Harvest Disease Control	Pre Harvest Disease Control	Propagation	Varietal Selection	Total
Extension Services Department	16	3	1	1	16	5	8	3	9	63
Cooperative	1	1			2	0	1	0	1	6
Government Owned Processor	1		0	0	0			0	0	1
Local Processor			1						0	1
Informal Extension Clubs	0	0	0		1	0	0	0	0	2
Research Centers	0	0	0	0	1		0	0	1	3
Farmer's Union	1	1	0	0	2	1	1	0	1	7
Gardening Association	0	0	0	0	0		0	0	1	3
Private Input Supply Company	0		0		0	0	0	0	0	1
Other	4	0	0	0	3	0	0	2	3	12
Total	26	6	2	1	25	6	11	7	17	100

Total Percentage of Producers receiving extension.

Table 3-38 Quality of Service by Provider and by Commodity

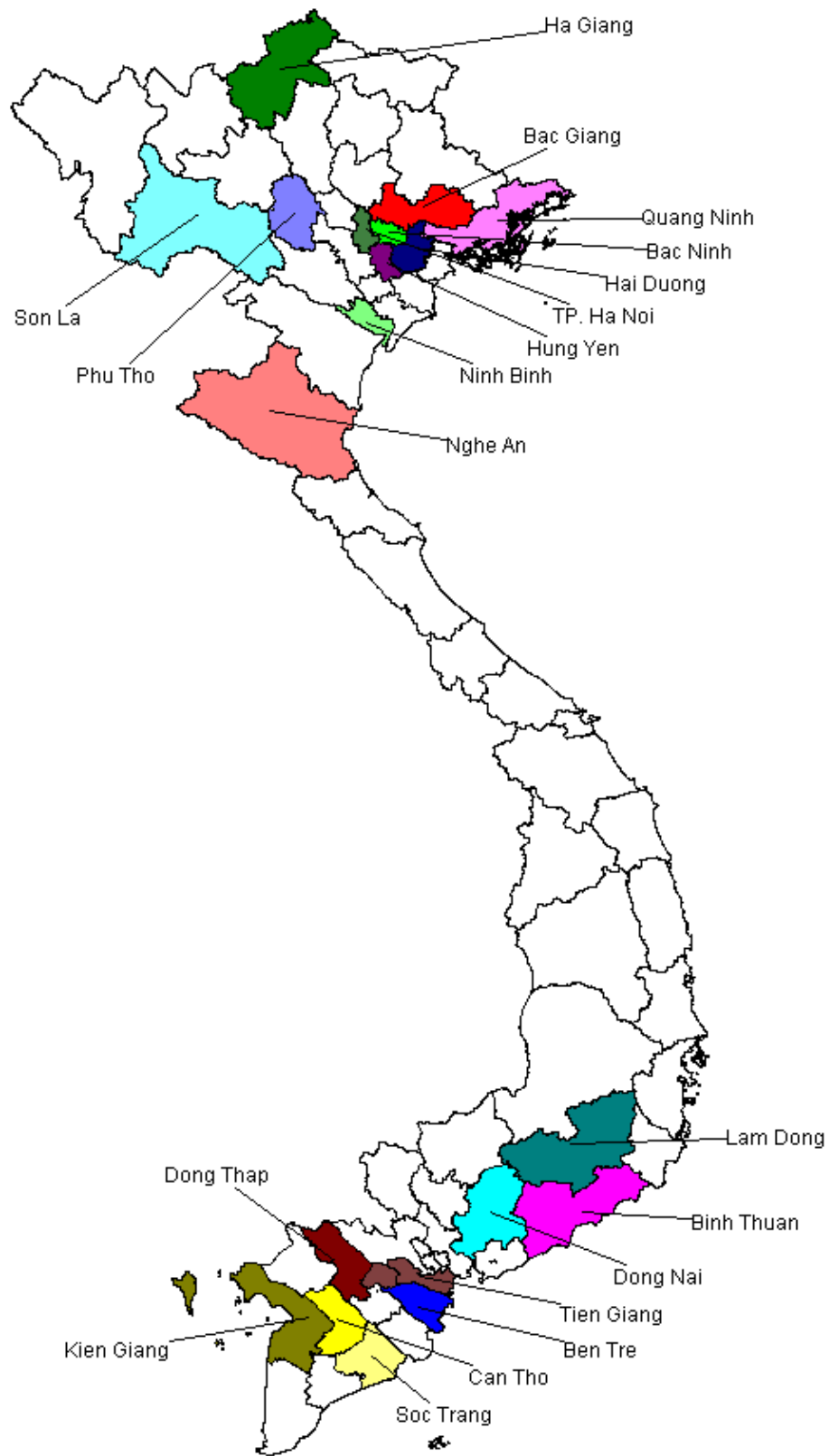
Quality of Service	Very Good	Good	Fair	Poor	Very Poor	Total
	Percent of Producers					N° Obs
Extension organization						
Cooperative		0.68	82.19	15.75	1.37	146
Extension Services Department	0.32	15.51	68.67	15.51		1580
Farmer's Union		1.66	46.96	49.72	1.66	181
Gardening Association		7.59	81.01	11.39		79
Government Owned Processor			5.56	94.44		36
Informal Extension Clubs		23.64	69.09	7.27		55
Joint Venture			100.00			5
Local Processor			94.74	5.26		19
NGOs			100.00			6
Other	1.00	27.67	36.67	34.67		300
Private Input Supply Company		16.67	45.83	33.33	4.17	24
Private Processor		33.33	66.67			3
Provincial Processor			100.00			4
Research Centers		58.82	33.82	7.35		68
Veteran's Association			100.00			4
Women's Union		22.22	77.78			9
Total	0.32	15.80	62.88	20.76	0.24	2519
Commodity						
Banana		36.07	40.98	22.95		61
Cabbage	0.42	1.89	70.11	27.37	0.21	475
Carrots	1.98	3.96	41.58	52.48		101
Cucumbers	0.93	14.20	59.57	25.31		324
Dragon Fruit	0.93		91.59	7.48		107
Longan		11.31	59.52	27.38	1.79	168
Litchi		6.86	53.92	39.22		102
Mandarin				100.00		1
Mango		21.30	64.79	13.91		338
Orange		9.41	84.71	5.88		340
Pineapple		33.43	48.52	17.75	0.30	338
Tomato		45.12	40.85	13.41	0.61	164
Total	0.32	15.80	62.88	20.76	0.24	2519

Table 3-39 Credit Usage by Region

Region	Use Credit		Report having enough credit		Total Credit Requirement ('000 Dong)		Maximum Interest Rate Acceptable (% per month)
	Percent	N	Percent	N	N	Mean	
	North Central Coast	48	50	42	24	14	14,486
North East	41	301	57	122	52	21,289	0.85
North West	31	52	44	16	9	23,333	1.20
Red River Delta	41	402	60	164	66	17,637	0.79
North average	41	805	57	326	141	19,034	0.83
Mekong Delta	9	450	98	40	1	20,000	5.00
Southeast	7	250	100	17			
South average	8	700	98	57	1	20,000	5.00
National average	25	1,505	63	383	142	19,041	0.86

Table 3-40 Loan Amounts, Interest Rates and Type of Collateral by Source of Loan

Source	Loan Amounts and Interest Rates				Type of Collateral Used for Loan				
	No Obs	Amount Borrowed) ('000Dong	Interest Rate (per Month)	Length of Loan (Months)	House	Land	Other physical capital	Social Capital	Not Required
					Percentage of Respondents				
Agricultural Bank	330	7,031	0.97	19	32	40	5	18	5
Commercial Bank	3	30,000	0.85	20	67	33			
Friends and Relatives	14	9,143	0.55	30	7			71	21
Farmers	1	2,000	2.00	6					100
Foreign Bank	1	10,000	1.50	24	100				
Money Lender	8	4,813	2.34	24	13			25	63
Other Credit Institutions	62	6,484	1.13	13	53	11	2	15	19
Other Enterprises	12	5,342	1.03	12					100
Other	77	3,044	0.72	23	26	8	1	19	45
Traders	4	9,175	1.38	26					100
Total	512	6,543	0.97	19	32	29	2	18	17



Map 3-1. Provinces where IFPRI-MARD Fruit and Vegetable Producer Survey carried out

Chapter 4

Fruit and Vegetable Traders

1 Introduction

Previous chapters have shown that fruit and vegetable production can generate higher returns per hectare than rice, but that various constraints prevent farmers from taking advantage of this opportunity. Many (though not all) of these constraints relate to the availability and reliability of markets for the farmers output. Thus, the operations and behavior of traders is a critical part of any strategy to promote the production and post-harvest processing of fruits and vegetables. In addition, it is important to note that post-harvest activities are carried out by a range of participants in the fruit and vegetable subsector. Although processors are the most obvious example, we showed in Chapter 3 that fruit and vegetable growers are also involved in various post-harvest activities. Although farm-level processing is mostly limited to the drying of litchi and longans, farmers carry out a number of other post-harvest activities such as washing, grading, ripening, storage, and packaging.

By definition, traders buy and sell the “same” product without processing or transforming it. However, this does not mean that the contribution of the trader is limited to moving the product from one place to another. In fact, as will be shown in this chapter, traders (particularly exporters) are involved in a number of post-harvest activities that add value to the product. These may include sorting, grading, fumigation, cleaning, labeling, packaging, and storage, as well as less tangible services such as certification of quality and transmission of information about demand to suppliers.

This chapter examines the characteristics of large traders of fresh fruits and vegetables that undertake some type of post-harvest activity, as well as large exporters of fresh produce¹. The analysis the results of the IFPRI-MARD Survey of Fruit and Vegetable Traders, carried out between May and August 2001². The sample of 104 exporters and domestic traders was designed to capture the situation and activities of large exporters of fresh fruits and vegetables, and domestic traders who undertake post-harvest processing of fresh fruits and vegetables, such as washing, fumigating, storing, sorting, grading, bagging, packaging, labeling, or irradiating produce.

The domestic traders and exporters in the sample were stratified based on their geographic location: approximately half of the sample is in the North, and half in the South. The survey interviewed 19 exporters and 85 domestic traders.

¹ This chapter is a revised version of a longer report prepared for IFPRI by Agrifood Consulting International. The background report is available on the CD-ROM that accompanies this report.

² We use the term “trader” to refer to people who buy and sell goods with little transformation of the product. We distinguish between two types of traders, domestic traders and exporters, depending on where they make most of their sales.

The survey team consisted of a North team and a South team of enumerators. The enumerators were drawn from such organizations as the Information Center on Agriculture and Rural Development (ICARD), the Research Institute for Fruit and Vegetables (RIFAV), the Post-Harvest Technology Research Institute (PTRI), the Southern Fruit Research Institute (SOFRI), and the extension services of the departments of agriculture for the provinces of Tien Giang and Vinh Long.

2 General characteristics

The typical manager is male (70 percent), 43 years old, and has about 4.2 years of experience as a trader. Traders in the North are more often male (78 percent) and have more marketing experience than those located in the South. Similarly, exporters are more often male (84 percent), older (47 years old), and have more experience (4.9 years), than traders that trade fruits and vegetables for domestic consumption.

Generally, traders in the North and exporters have a higher level of education than those located in the South and domestic traders (see Table 4-2). In particular, 80 percent of the exporters located in the North have completed at least some University or College.

The businesses in the sample have been in business for an average of 6.3 years. Exporters and businesses in the North have on average been in operation longer than domestic traders and those businesses located in the South.

Nearly all of the traders are from the private sector. Overall, 59 percent of the traders are registered private businesses, and 33 percent are non-registered private businesses, and most reside locally.

Whereas all of the traders in the sample from the South are registered private businesses, sixty percent of the exporters in the sample from the North are SOEs, while the other forty percent are registered private businesses. Unlike in the South, trading businesses from the North are primarily unregistered private businesses (77 percent). Less than 16 percent of the domestic traders in the North are registered private businesses.

Overall, the market value of the trader businesses in the sample is about 2.5 billion VND. In comparison to domestic traders located in the South who have an average market value of about 235 million VND, domestic traders in the North are over 2.5 times larger, and exporters in the South are over 3 times larger.

The domestic traders and exporters in the sample are quite specialized in their marketing activities. Overall, about 85 percent of the income from these businesses comes from the marketing of fruits and vegetables. Only about 6 percent of their income comes from other trading activities like food and food products, and 9 percent from other activities such as crop and livestock production related activities. In the North, traders on average earn a larger share of their income from the trading of other foods or other non-trade related activities. The exporters in the North in particular derive about 35 percent of their income from other food trading activities and 17 percent from non-trade

related activities. The large difference in the sources of income for exporters in the North is primarily due to the fact that the exporters in the Northern sample include large, diversified SOEs. Nevertheless, the general trend is also true among the private domestic traders sampled in the North as well.

3 Land

The average trader has nearly 1.2 hectares of land used for trading, agro-processing, crop production, and other activities. About two-thirds of the land or 0.8 hectares is used in crop production, and about 18 percent is used for agro-processing related activities. Of the remaining land, about 3 percent is used for other activities such as short term storage, and about 11 percent is available for future use.

Land area and land usage differs somewhat between domestic traders and exporters. On average, exporters have over 4.1 hectares available for their exporting business, while the average domestic trader has only about 0.5 hectares of land. Generally, domestic traders use a larger proportion of their land for crop production and agro-processing than exporters. Overall, domestic traders utilize all of their land for their businesses current operations, and have no land available for future expansion. Although average land area is broadly similar, nearly 89 percent of the land area of South Vietnamese businesses, particularly among exporters, is used for crop production, and 8 percent is used in agro-processing. None of the traders in the South have land sitting idle for future use. By contrast, traders in North have about 44, 28, and 24 percent of their land used in crop production, agro-processing, and idle, respectively. Exporters in the South with 5.4 hectares of land, have nearly four-fifths more land than their Northern counterparts

Only about 7 percent of traders rent land for producing crops, and about 10 percent rent land used for their agro-processing or trading activities. Overall, about 26 percent of exporters and 12 percent of businesses in the North rent land. Domestic traders and businesses in the South are less likely to rent land.

4 Storage

Overall, about 84 percent of traders have facilities to store the fruits, vegetables, and other commodities that they buy and sell. As shown in Table 4-3, all traders in Southern Viet Nam used storage during the past year, while only about 69 percent of traders in the North used storage facilities. Homes, shops, and enclosed warehouses or sheds are the most common locations for the storage of fruits and vegetables for traders. Overall, these structures are primarily owned and under exclusive control of the fresh fruit and vegetable traders. Homes are the most common storage location of domestic traders located in the North, while the domestic trader's shop is the most common location in the South. Exporters in the North primarily use warehouses and sheds most frequently to store their products. Few traders have chilled or frozen storage facilities. Overall, less than 3 percent of traders have refrigerated storage. These are mainly exporters in Southern Viet Nam.

Storage capacity for exporters is much larger than those of domestic traders. Comparing exporters, average storage capacity is nearly 4 times greater in the North (434 tons) than in the South (112 tons). By contrast, domestic traders in both North and South Viet Nam have storage capacities of about 49 tons on average.

Generally, fruit and vegetable traders plan to acquire no new land for their businesses needs over the next couple years. Overall, with the exception of exporters located in the North, most traders (95 percent) have enough land available for their businesses operations.

Expected land use by fruit and vegetable traders in Viet Nam will remain relatively unchanged at about 1.1 hectares of land, on average (see Table 4-4). In general, crop production area is projected to increase to 72.7 percent of land area from 67.4 percent at present, unused land area is expected to decline from 11.2 percent to 9.2 percent, and presumably due to misallocation, agro-processing related land is expected to decline as a proportion of total land area from 17.7 percent to 14.3 percent of land area.

5 Labor

5.1 Workforce characteristics

Fresh fruit and vegetable exporters and large domestic traders employ about 47 people on average. Exporters typically employ more workers and pay higher wages than domestic traders. Traders in the South, also generally pay higher wages than their competitors located in the North.

While most traders employ family members, only 43 percent of the businesses in the sample employ skilled labor. Exporters and domestic traders located in the South have the highest proportion of skilled workers in their work force, and pay higher wages than their counterparts in the North.

Overall, 38 percent of the fresh fruit and vegetable traders in the sample employ unskilled permanent workers. Exporters and Southern traders typically have a higher proportion of unskilled workers in their work force than domestic traders and traders in the North. Conversely, domestic traders in the North and exporters in the South, pay higher wages to temporary laborers than to their unskilled workers. The difference in wage may reflect differences in labor markets or hiring practices. Often firms hire unskilled workers on a permanent basis at a higher than temporary labor wage in order to retain good employees.

Finally, nearly 86 percent of traders of fresh fruits and vegetables also hire temporary laborers. Temporary laborers, hired on a part-time or seasonal basis, are often vital to firms because of seasonal or otherwise regular or irregular temporary increases in trading or processing volumes. On average, fresh fruit and vegetable traders hire 32.6 temporary laborers. Although the work is seasonal or part-time, laborers are usually employed for a total period of about 6 months per year (3.6 days per week). Exporters also typically hire a larger number of temporary laborers (105.9) than do domestic

traders (16.2). Wages paid by exporters and traders in the South, are generally higher than those offered by domestic traders and Northern fruit and vegetable traders.

5.2 Gender and the workforce

Women comprise about 52.8 percent of permanent workers in the South, but make up only 39.5 percent of the permanent employees of businesses in the North. Over the past five years, the male-female composition of the workforce has remained relatively constant.

Female workers are employed less frequently by trader businesses. Male laborers on average receive wages that are higher than their female counterparts. Regardless of employment category, the differential between male and female wages is highest among traders in the South, particularly among the exporters.

5.3 Worker training

Overall, about 84 and 14 percent of the permanent employees of domestic traders developed their skills through self study, and through on the job training, respectively. By contrast, only 26 percent of the employees of exporting firms developed their skills through self study. Rather exporter employees primarily developed their skills through on the job training (32 percent) and university studies (32 percent).

About 14 percent of marketing firms consider the skills and training of their workforce to be seriously deficient. The problem is most serious for traders located in the South (22 percent) and for exporters (21 percent). Even though their firms could benefit from additional training in business management and the marketing of products, less than 4 percent of firms are planning to send employees on training programs to improve the skills of their workforce. The primary reason is due to the lack of availability of suitable training programs. The problem is most severe in the North, where two-thirds of traders do not have access to relevant training. Firms also cite the cost of the courses in terms of employee time. Overall, time was a more important factor than money for affected businesses.

6 Capital

6.1 Start-up capital

As noted previously, traders of fresh fruits and vegetables are primarily private businesses. Family and friends were the principal source of startup capital for these privately-owned fruit and vegetable traders (see Table 4-5). Overall, 92 percent of private traders began their businesses with capital from their immediate family. In addition, 39 and 36 percent of the private businesses also obtained startup capital from friends and other family, and from commercial banks, respectively. Domestic traders are more likely to obtain startup funds and obtain a larger share of their total startup from commercial banks than exporters.

Startup capital from immediate family is primarily in the form of equity investment. Only about 2 percent of the startup capital from the owners' immediate families was provided as short term loans. Non-immediate family and friends are also primarily risk-taking investors in the business. Only about 17 percent of the capital obtained from other family and friends, all of which were located in the North, was in the form of short-term loans. About 91 percent of the startup capital from banks was in the form of short-term loans, with the remainder in the form of loans of more than one year.

6.2 Post start-up capital

Post-startup, the main source of working capital for traders was reinvested profits, followed by short-term credit. A number of enterprises, particularly private exporters, also obtain new working capital by bringing new equity investment into the business (see Table 4-6). By contrast, the main source of post-startup capital for SOE exporters was subsidies from the state budget. Additional funds came from reinvested profits and short-term loans.

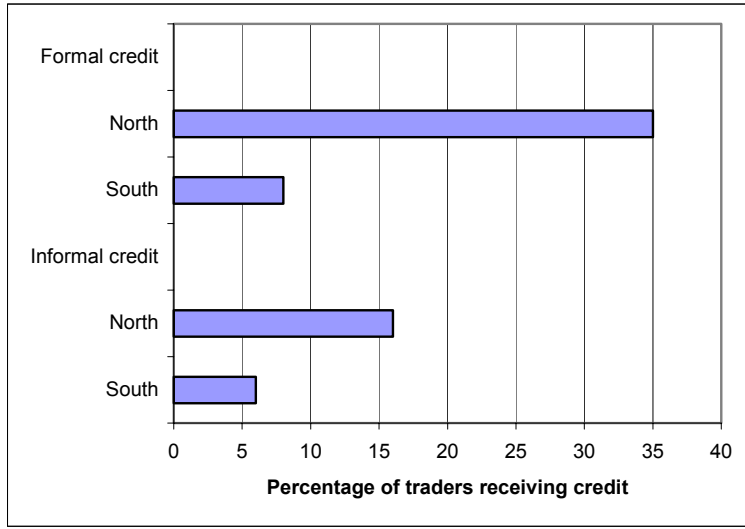
About 83 percent of traders in the North obtain their short-term working capital loans from formal credit lending institutions. In comparison, southern traders rely primarily on informal credit lenders for their post-startup working capital needs.

6.3 Credit

Overall, 35 percent of the businesses in the sample borrowed funds or had outstanding loans during the year 2000. Use of credit was higher by businesses in the North (54 percent) than in the South (14 percent). Figure 4-1 shows that formal sector credit is more common than informal credit for farmers in the North and South. Of the firms that borrowed money, all exporters, whether they were located in the North or in the South, and all domestic traders in the South, indicated that they were able to borrow sufficient funds to conduct the operations of their business. About 36 percent of domestic traders in the North reported that they did not have enough funds to conduct the operations of their business during 2000. The main reasons for not being able to obtain more funds were lack of collateral (44.4 percent), complicated banking procedures (44.4 percent), and poor credit history (22.2 percent).

Overall, about 71 percent of the loans were from formal lending institutions such as the agricultural bank (59 percent), commercial banks (24 percent), and other formal sources of credit (12 percent). Of the loans from informal lenders, the majority of the loans were from friends and family (83 percent), with the remainder from money lenders (16.7 percent). About two-thirds of the loans to domestic traders were secured with collateral in the form of buildings or land, while the other third of the loans did not require any collateral. By contrast, all of the loans to the exporters in the sample were not secured with physical capital.

Figure 4-1. Percentage of traders receiving credit by region



The characteristics of loans from both formal and informal institutions are broadly similar when loans to state and province owned companies are excluded from the sample. As shown in Table 4-7, the interest rate for loans from both formal and informal institutions was about 1.5 percent per month in 2000, while loans from formal institutions tended to be for a longer period (8.6 months versus 5.9 months, on average). Loans from informal institutions, however, tended to be larger than loans from formal institutions, both in the North and in the South. With the inclusion of the large loans to state and province owned companies by formal institutions in the sample, the average formal loan increases to 2.6 billion VND, for a somewhat shorter period of 8.3 months, at a lower average interest rate of 1.3 percent per month.

6.4 Assets

Overall, the average fresh fruit and vegetable marketing business has about 2.4 billion VND in assets (see Table 4-8). While relatively large, when assets that are largely peripheral to the fruit and vegetable marketing business are excluded, the average firm in the sample has only about 471 million VND in assets for their businesses fruit and vegetable trading and processing components. When peripheral assets are excluded, about 78 percent of the current value of the firms assets are in the form of land and buildings. In addition, the average business in the sample has about 57 million VND or about 12.1 percent of non-peripheral fresh fruit and vegetable marketing assets in transport related items such as trucks, boats, motorbikes, etc., about 7.6 percent in durable goods such as office furniture and equipment. and about 2.3 percent of non-peripheral assets are processing or trading equipment related assets.

7 Technology

The main types of equipment used by the domestic traders and exporters in the sample are for the weighing, processing, and packaging of fresh fruits and vegetables. Fresh fruit and vegetable traders obtain information on the type of equipment to purchase from a number of sources. The main source of information on weighing equipment is the equipment supplier, personal observation of the type of weighing equipment used by competitors (45.2 percent) and the firms' customers.

Overall, the equipment of businesses in the South and the equipment of domestic traders are newer than those owned by firms in the North and by exporters. All of the traders own all of their equipment.

The majority of the weighing, processing, and packaging equipment used by the traders in the sample was newer and manufactured in Viet Nam (83.3 percent). Only about 14.3 percent was manufactured in other Asian countries such as China, Thailand, or India, and about 2.3 percent of the equipment was manufactured in Japan, the European Union, and North America

8 Commercial networks

Commercial networks are often critical to the success of a domestic trader's business operations. Domestic traders may be members of numerous groups that facilitate the buying and selling of goods. These groups may be along commercial lines (domestic trader, buyer, and seller associations), along product lines (longan, fruit, or vegetable associations), and along ethnicity, religious, or extended family lines. Regardless of the type, and whether formal or informal, associations are often useful to bring together buyers, sellers, and agents to develop contacts and commercial relationships.

In the fresh fruit and vegetable marketing sub-sector, formal associations are underdeveloped. Overall, only about 6 percent of the traders in the sample were a member of a processor or domestic trader association. Of these traders, all were exporters. Overall, 32 percent of exporters (n=6) were a member of at least one commercial association. None of the domestic traders in the sample were a member of an association.

The low level of association membership was due to no relevant association exists (76.0 percent), and 2) existing associations were ineffective or not needed (18.3 percent). Fresh fruit and vegetable traders identified areas where an association could provide beneficial services. These services could include helping businesses better coordinate their buying and selling activities (41.3 percent), organizing an insurance program for members to better deal with shocks in the production, processing, or trading of commodities (37.5 percent), and helping to develop better commercial contacts between buyers and sellers, (36.5 percent).

The average exporter was a member of 2.5 associations. For all of these exporters, the sole advantage of membership was to obtain access to market information. The average association to which these exporters belonged had over 150 members, of which about 25 were domestic traders. On average, the exporters had been a member of an association for 6.5 years, and paid about 6.2 million VND in membership fees during the year 2000, and gave an additional 3.4 million VND as a voluntary contribution to the association.

9 Procurement of raw material inputs

Overall, 41 percent of the traders in the sample dealt primarily in vegetables, while 59 percent primarily handled fruit. Vegetable traders were primarily located in the North (76.7 percent), while fruit traders were mainly located in the South (65.6 percent). Exporters mainly handled fruit (84.2 percent), and domestic traders mainly vegetables.

9.1 Purchasing

The average trader purchased 5.6 billion VND of raw materials during the year 2000, mostly from domestic suppliers. Only about 2.0 percent of the raw materials procured by the average trader were obtained from their own production, while about 1.8 percent was imported. Exporters purchased substantially more fruits and vegetables than the domestic traders in the sample. Whereas domestic traders purchased about 2.9 billion VND in fruits and vegetables, exporters spent more than 6 times as much, or 17.8 billion VND for their produce. Like exporters, domestic traders in the South purchased more produce than their brethren in the North.

Overall, about 57 percent of the fruit and vegetables purchased by traders in Viet Nam is obtained from private farmers and 37 percent from domestic traders. In the North, over 65 percent of the produce was purchased directly from private farmers and about 24 percent from traders. By contrast in the South, traders rely more heavily on domestic traders to procure their raw materials.

Overall, domestic traders purchase a larger share of their raw materials inputs directly from private farmers, while exporters purchase the largest share of their produce from domestic traders. In addition, about 7 percent of traders, 20 percent of exporters, and 38 percent of exporters in the North, obtained fruit and vegetable inputs from government farms. These purchases were all made from farms attached to the state and province owned enterprises in the sample. Nearly all of the produce of the non-private enterprises was sourced from the government farms. None of the private domestic traders and exporters in the sample purchased raw material inputs from government farms. Although about 30.8 percent of traders grow fruits and/or vegetables, this comprised only about 2.0 percent of the average firm's procurement of raw material inputs. Of these businesses that produce their own raw materials, only 15.6 percent indicated that the quality of the fruits and vegetables was better than that available from other producers or domestic traders, and only 9.4 percent have plans to expand their

own production. The main reasons cited for not expanding production of raw materials was the availability of an ample supply of raw materials in the market (58.6 percent), the difficulty in obtaining land to increase crop production (24.1 percent), the lack of funds to invest in the expansion of crop production (10.3 percent), and the availability of cheap raw materials of similar quality (6.9 percent).

Overall, about 56.7 percent of the traders in the sample placed orders for the fresh fruits and vegetables inputs they purchased. Of these firms, about 63.5 percent placed orders for their raw material inputs. About 70 percent of traders had disagreements over the quality of produce and 46 percent had problems with late or the partial delivery of produce. Problems with suppliers were more severe in the South than in the North.

9.2 Contracts with farmers

Overall, 12.5 percent (n=13) of the fresh fruit and vegetable traders contracted with farmers to supply raw material inputs (mainly vegetables) at one time or another. Contracting with raw material suppliers has generally been more prevalent in the North (22 percent) than in the South (2 percent), and among exporters (15.8 percent) than among domestic traders (12 percent).

Over 61 percent of the contracting businesses have had problems with a contractor renegeing on the terms of the contract. In any given year, about 14 percent of contractors renege on their contracts with fresh fruit and vegetable traders. The most common reasons include uncontrolled factors like crop failure (25 percent), spoilage of produce (25 percent), and price differentiation between the higher market price and than the lower contracted price (25 percent).

Contractees have also renegeed on their contracts (8 percent). More commonly, about 38 percent of the contractees have tried to renegotiate the price to be paid for the raw materials (40 percent) and the quantity of produce to be delivered to the trader (40 percent).

In 2000, overall, 61 percent of the contracts to obtain raw material supplies of tomatoes, vegetables, and fruits were with private farmers and 31 percent were with domestic traders.

Most of the contracts between traders and their fruit and vegetable suppliers give the contractee the right of first refusal, where the contractor must first offer the produce for sale to the contracting trader. If an agreement on price and quantity can not be reached, then the contractees may sell to another customer.

Even though most contracts do not specify special input, price, or quantity conditions, the contracts usually have stipulations specifying the type or variety of produce that the trader will purchase, what the producer should plant, when the produce should be harvested and delivered for sale. In addition, the contracts have a clause stipulating the quality of the produce to be delivered to the trader. Through these stipulations, the fresh fruit and vegetable exporters and domestic traders are able to gain some control over the type and quality of the produce, and to guarantee supply of produce to facilitate their trading efforts and meet their delivery commitments.

About 85 percent of fruit and vegetable domestic traders and exporters, have never entered into contracts with farmers or other domestic traders to provide produce due to high price variability. In years when the market price is higher than the contracted price, traders still lose as farmers and domestic traders renege on their contracts forcing the contracting traders to purchase produce at the higher market price.

Box 4-1. Official support for contract farming

The slow transformation of economic structure and methods of promoting agro-product exports were a source of much debate when government members and provincial chairmen met recently. ... Deputy Prime Minister Nguyen Cong Tan said one measure to speed up transformation of economic structure was to promote relations between farmers and businessmen. Tan said: "If enterprises are not active, economic structure transformation will not be successful. Signing contracts to buy products with farmers should be considered as an obligation of enterprises in all economic sectors." He said relations between producers and businessmen had not been close enough and there were cases in which businessmen left producers aside and vice versa. "This is a sad reality that should end soon," Tan said.

Extracted from *Vietnam Investment Review*, No. 540, Feb. 18-24, 2002.

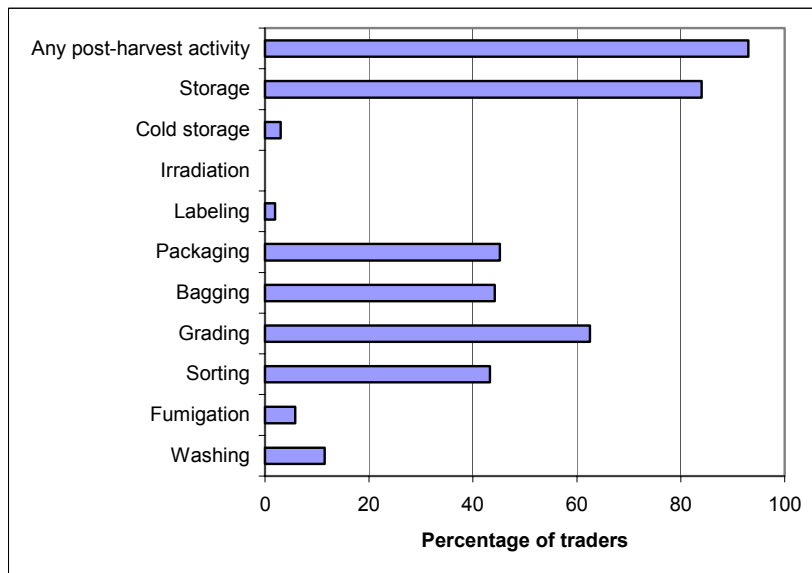
10 Post-harvest activities

Post-harvest processing can take many forms including freezing, drying, salting, pickling, and canning, among other activities. Processing that transforms the produce is described in more detail in the processor report. This study by contrast examines post-harvest processing of fresh fruits and vegetables that do not transform the product. The processing examined below looks at such post-harvest activities related to the cleaning, sorting, and grading of produce, and activities which increase the shelf life of the produce through such activities as packaging, cold storing, and irradiation.

Domestic traders and exporters of fresh fruit and vegetable produce perform a variety of post-harvest processing to their raw materials. The level and type of post-harvest processing however differs considerably depending on the type of produce, and the location and type of trader. Overall, about 93 percent of fresh fruit and vegetable traders undertake some type of post-harvest processing of the produce that they buy and sell. Only 79 percent of the exporters in the sample undertake post-harvest processing, however. This likely reflects that the fresh fruits and vegetables sold by the exporter already received some type of post-harvest processing prior to being purchased by the exporter (see Table 4-10 and Figure 4-2). The most common post-harvest activities include bagging or packaging (86.5 percent), grading (62.5 percent), and sorting (43.3 percent). Only about 6 percent of traders fumigated their fresh fruits and vegetables against rodents or fungi. Unlike in North America and the European Union, cold storage and irradiation are not widely used in Viet Nam. None of the

domestic traders or the exporters in the sample used cold storage to extend shelf life or irradiated their produce to kill bacteria to increase the shelf life of the fresh fruit and vegetables they sold.

Figure 4-2. Percentage of farms involved in different post-harvest activities



Overall, traders in the South tend to undertake more post-harvest processing. For example, although low, about 10 percent of traders in the South and only about 2 percent of traders in the North fumigated their produce or facilities against pests and fungi. About 48 percent and 90 percent of fresh fruit and vegetable domestic traders and exporters in the South sorted and graded their produce, respectively. By comparison, only about 39 and 38 percent of traders in the North sorted and graded their produce, respectively.

In addition, the level of processing differs somewhat between domestic traders and exporters in North and South Viet Nam. In the North, produce is primarily bagged before being sold to customers (64.8 percent). In the South, only about 22 percent of traders bag their produce. Rather, the majority of traders in the South package their produce. Though more expensive and time consuming, packaging has the advantage of helping to protect the fresh produce from vibration and poor handling, which helps retard the deterioration of the product and thereby extend its shelf life. The type of packaging used by traders in North and South may in part reflect differences in the packaging needs of the produce handled. For example, vegetables more commonly grown in the North like tay onions and potatoes, are heartier and require less protective packaging than fragile fruits like custard apples, mangosteens, and mangos which are predominantly grown in Southern Viet Nam.

The type of post-harvest processing differs somewhat between fruits and vegetables as well. As shown in Table 4-11, vegetables in Viet Nam receive relatively little post-harvest processing. The most common activity is the bagging or re-bagging of vegetables for sale to customers (64.9 percent).

Only 17.0 and 28.7 percent of traders sort and grade their vegetables before being sold to customers. Cabbage, tomato, and cucumbers are the most commonly sorted and graded vegetables in Viet Nam, respectively. The cost of each post-harvest activity differs considerably based on the type of vegetable and the type of activity (see Table 4-12). As one would expect, fumigation is the most expensive of the post-harvest activities, and the sorting of cabbage and the grading of garlic and tomatoes, are the most expensive sorting and grading activities.

In comparison, fresh fruit in Viet Nam receives considerably more post-harvest processing. As shown in Table 4-13, nearly 50 percent of fruit is sorted and about 87 percent graded by the trader before being sold to their customers. In addition, nearly all fruit is packaged, bagged, or rebagged before sale. Primarily in the South and unlike vegetables, fruit is more likely to be fumigated, labeled, and placed in cold storage. In terms of both time and money, post-harvest processing of fruit tends to be more expensive than that of vegetables (see Table 4-14). The wider use of post-harvest technologies to improve shelf life and the larger incidence of sorting and grading, reflects in part the large proportion of fruit exporters in the sample and the more developed and internationalized nature of fruit marketing and export in Viet Nam.

In addition to post-harvest activities, fresh fruit and vegetable traders take a number of measures to help ensure that the produce that they sell is of acceptable quality. Overall, over 70 percent of traders took measure to ensure the quality of their produce. The number of traders taking measures differed considerably between domestic traders and exporters, and by location. While about 82 percent of traders in the South took measures to ensure produce quality, less than 60 percent of those in the North took measures. Similarly, all exporters and less than two-thirds of domestic traders used measures to ensure the quality of their fresh fruits and vegetables. In over 60 percent of the cases, fresh produce traders sought to help ensure the quality of their produce by specifying the variety of fruit or vegetable to be produced by the farmer, particularly exporters ($p < .1$). Relatively few of the traders required or encouraged farmers to use fertilizers or agro-chemicals to help ensure better quality produce (see Table 4-15). Although exporters appear to require more farmers to use IPM and organic fertilizers than domestic traders, the results are not statistically significant ($p < .5$).

As part of the post-harvest processing, traders also took measure to help ensure the cleanliness of their facilities. As shown in Table 44, these measures included removing foreign matter from the produce (48.1 percent), homogenizing produce (43.3 percent), and sanitizing equipment (29.8 percent) or cleaning equipment (14.4 percent).

Beside the measures taken to help ensure that the quality of the produce remains high, firms also need to dispose of their waste effectively. Most waste from post-harvest processing activities is simply deposited in the firms' onsite dumps (48.1 percent). In addition, as most of the waste is organic, about 8.7 percent of the firms compost the waste onsite for subsequent use as a nutrient supplement for cropping land. A further 24 percent of the businesses in the sample dispose of their

waste in a local garbage dump. Nearly 20 percent however, dump their waste illegally in the street or on public lands (see Table 4-16).

In order to help ensure that traders maintain a sanitary environment during the storage and processing of fruits and vegetables, trading and exporting businesses are supposed to be inspected periodically by government health and sanitation inspectors. Overall, only about 22 percent of the traders in the sample were inspected (See Table 46). Generally, exporters and businesses in the North were more likely to be inspected during a given year. Inspectors visited the business about 1.6 times during the year 2000. Although inspections were relatively few, most of the businesses complied with health and sanitary regulations. Only 9.5 percent of traders, all of them domestic traders, were required to take remedial action to comply with regulations. None of the violations resulted in the imposition of a fine.

The inspections were primarily carried out by the Department of Science, Technology, and Environment (48.0 percent), the Department of Health (28.0 percent), and the Department of Agriculture (20.0 percent) (see Table 4-18). An inspector from the Department of Health visited nearly 37 percent of the inspected businesses in the North, but none in the South.

11 Sales and Marketing

11.1 Sales

In 2000, traders earned about VND 7.3 billion in revenue on average from their domestic trading and exporting activities. As noted in Section 7.1, the average cost of raw materials was VND 5.6 billion. This implies that, on average, raw materials accounted for 77 percent of the value of gross revenue. Nonetheless, there was a wide variation in the scale of operations. Some of the traders (6 percent) had gross revenues of less than VND 1 billion, while 11 percent of them had revenues of greater than VND 10 billion. Two-thirds of the traders in the sample fell into the range of VND 1-5 billion in gross revenue (see Table 4-20). Overall, about 1.9 percent of the product value handled is lost due to spoilage, breakage, or other mishandling of produce and other traded products.

The traders in the sample sold to various types of customers. The main customer for the domestic traders in the sample was food processors, which accounted for about 52 percent of the sales of traders. Other important customers included other domestic traders (27 percent) and licensed exporters (18 percent). In contrast, exporters earned most of their revenue through direct sales to foreign customers (88 percent). Sales to processors and licensed exporters accounted for the remainder (6 and 4 percent, respectively).

Domestic traders in the South earned about 27 percent of their revenue from sales to licensed exporters, while only 10 percent of the revenue of Northern domestic traders came from licensed exporters. While most of the sales revenue of domestic traders in the North continued to come from sales to processors (45.5 percent), approximately 40 percent of sales revenue came from sales to other

domestic traders. In the South, only about 13 percent of revenue was obtained from other domestic traders.

As shown in Table 4-21, vegetable trade and export earnings by businesses in the North are about 34 times larger than those of their competitors in the South. By contrast, fruit related earnings by domestic traders and exporters in the North are only about 93 percent of the revenue of those located in the South. As in the aggregate case, both fruit and vegetable exporters sold direct to foreign customers (about 90 percent). After processors, domestic traders sold the bulk of their vegetables to other domestic traders (42.2 percent). In the case of fruit however, only 14.5 percent of revenue came from sales to other domestic traders. Rather, about 28.0 percent of revenue was obtained from sales to licensed exporters, particularly in the South where 34.0 percent of sales revenue comes from sales to licensed exporters.

By disaggregating the data, the average exporter earned about 1.2 billion VND in revenue from the sale of both fresh produce and processed products in 2000. Domestic traders and exporters in the South sold fresh produce only. In the North, by contrast, traders sold both fresh produce as well as various types of processed products. In comparison to exporters, domestic traders by contrast, earn over 12 times more revenue from the sale of fresh produce than from other processed products.

11.2 Orders and payments

Overall, nearly 83 percent of traders took orders for the delivery of their produce at a future date. Of these traders, about 81 percent of the total sales revenue was obtained through buyers placing orders (see Table 4-22).

About three-quarters of the domestic traders and exporters in the South had problems with buyers who wished to renegotiate the sale price at the time of delivery. Other problems experienced by traders were related to disagreements over the quality of the produce delivered to the buyer (34.9 percent), and late and partial payment for the delivered produce (22.1 and 18.6 percent, respectively). While all domestic trader transactions were completed on a cash basis, over 88 percent of purchases by exporters were completed on a cash basis. For about 11 percent of purchases, and 12 percent of sales, exporters also paid for produce, goods, or services using bank wire transfers. However, in addition to payment in local currency (43.2 percent), exporters also received payment in other currencies, mainly US dollars.

Consignment sales are a common method for conducting sales transactions and extending credit to customers and generally used more often by domestic traders, and by firms located in the North. Overall, over three-quarters of traders sold goods on consignment in 2000. Of these firms, about 61 percent of sales were made using consignment sales.

Box 4-2. Problems with longan markets

Longans are an important crop in Hung Yen province. About 60 percent of the harvest is normally dried to produce *long nhan*, used in traditional medicine. A large share of the harvest is typically exported to China.

Longan growers in Hung Yen province face a difficult year. After bumper crops in 1999 and 2000, the harvest for 2001 was significantly smaller. Part of the problem is the weather. Longans need cool weather to flower, but unusually high temperatures in the spring of 2001 disrupted the tree's natural cycle.

In addition, Hung Yen producers are facing increasing competition with producers in the south of Vietnam and in Thailand. Although the Thai longans are more expensive than those from Vietnam, Chinese consumers consider them to be of a higher quality. In contrast, longans from the south of Vietnam are sold very cheaply and northern producers cannot compete with them on price alone.

A third problem is that last year, China stopped buying longans from Hung Yen. The fruit was transported to the border at Lang Son, but had to be returned. One trading household lost VND 100 million as a result of the loss of the Chinese market.

Source: Vietnam News Service, 1 September 2001.

11.3 Exports

In 1998, Viet Nam exported about US\$52.6 million worth of fruits and vegetables. The main two markets for Vietnamese fruits and vegetables were China and Taiwan, which were responsible for about 30 and 25 percent of export revenue, respectively. About 28 percent of the produce was sold to other countries within Asia and the EU and the US constituted only about 10 and 4 percent, respectively (GSO 2000). By 2001, fruit and vegetable exports had risen to US\$ 330 million. China remains the most important buyer of Vietnamese fruits and vegetables (see Chapter 6).

The IFPRI-MARD Survey of Fruit and Vegetable Traders included in its sample 19 exporters. Based on this small sample, it appears that exporters have a relatively small number of contacts abroad. Furthermore, these contacts are established primarily through a relative or friend (47 percent of exporters), or through a relationship established from a previous job or employer (37 percent) through which they sell.

11.4 Transportation

Overall, 91 percent of the traders in the sample use some form of transport. About 73 percent use dry trucks, 23.2 percent use vans and minivans, and 11.6 percent use boats and ships to move their produce.

Domestically traded fruits and vegetables were shipped over 500 kilometers on average within Viet Nam in 2000. In particular, produce items in the North were shipped considerably longer distances than those originating in the South.

As described in IFPRI (2000), cold chains are quite underdeveloped in Viet Nam. Only about 15 percent of meat processors and none of the domestic traders of meat in Viet Nam had cold transport or storage facilities in 1998/99. In 2000, less than 17 percent of the fresh fruit and vegetable

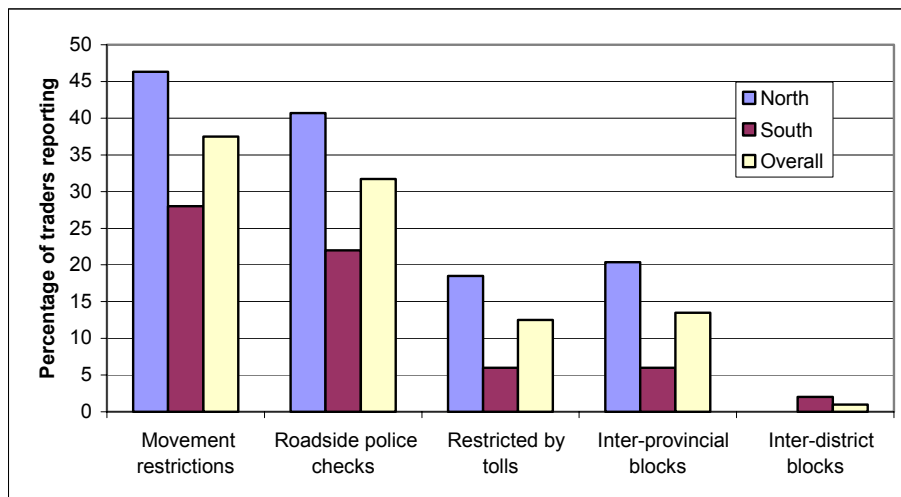
traders used refrigerated trucks to transport their fresh produce to and from their firm’s facilities. Refrigerated transport was used most frequently by exporters (50 percent) and by businesses in the sample from the North (20 percent).

Overall, 83 percent of the firms in the sample rent transport services. These transport companies primarily used trucks and vans to move the goods. Since shipping costs are lower for trucks, whether dry (0.82 VND/ton/day) or refrigerated (0.84 VND/ton/day) than for vans and minivans (1.59 VND/ton/day), trucks were used most efficiently and effectively to transport larger quantities over longer distances. Although the shipping costs of boats and ships may be even lower than that of trucks, the accumulation of product using water-based transport may not be feasible and was employed less frequently than truck transport.

For the most part, the businesses in the sample were satisfied with the quality of the services they received from the transport companies. Overall, only about 10 percent of firms experienced problems with their transport service providers, the main problems were related to poor road infrastructure, seasonal transport related bottlenecks, and the imposition of informal rents. These problems were most acute for exporters and businesses located in the South.

Restrictions on the movement of goods continue to be a problem in Viet Nam (See IFPRI 2001). Nearly 38 percent of the businesses in the sample indicated that they have difficulty in transporting goods on occasion (see Table 4-23). The main impediment to the movement of goods continued to be police conduct. In addition to the conduct of police, about 14 and 13 percent of the firms indicated that inter-provincial movement restrictions and tolls affected their ability to move goods effectively and efficiently. These problems were most acute for domestic traders in Northern Viet Nam. Police conduct was an important factor among businesses, especially exporters, located in the South.

Figure 4-3. Percentage of traders reporting restrictions on movement



11.5 Information

All exporters and nearly all domestic traders (99.0 percent) had access to a telephone (see **Table 4-24**). Most businesses had a landline telephone (90.4 percent). Nearly 29 percent of the businesses in the sample also had a cellular telephone. Ownership of cell phones was highest among firms located in the North (46.3 percent) and among exporters (57.9 percent), particularly Northern exporters (80.0 percent). Although most businesses had access to a telephone, only about 14 percent of the firms in the sample had a fax machine. Like cell phones, facsimile machine ownership was highest among businesses in the North (20.4 percent), and exporters (47.4 percent), particularly Northern exporters (80.0 percent).

Use of computers by fresh fruit and vegetable traders is limited. Just over 10 percent of the businesses in the sample used a computer for their business operations. Even fewer businesses (8 percent) used the Internet and email to obtain marketing information. Internet access was highest among businesses in the North (18.5 percent), and exporters (52.6 percent), especially exporters located in the North (90.0 percent).

Overall, export domestic traders had better access to most types of information than their domestic counterparts. Both exporters and domestic traders, however, could benefit from better access to information on domestic and international prices, consumer demand, new processing, storage technologies, and obtaining credit.

Raw material availability, marketing opportunity, tender notification, price, and consumer demand information were most important to traders in the sample. Although important, information on accessing credit, freight rates, regulatory changes, and new technologies were less critical to the average firms marketing efforts. A number of firms did not have access to certain types of information. For these businesses, the information that would be most beneficial to them would be information on domestic marketing opportunities and tender notices, new processing and storage technologies, and national and international market prices (see **Table 4-24**).

11.6 Sources of information

Information comes to traders through a variety of sources. In general, personal discussions with buyers, sellers, intermediaries, and processors are the most important source of marketing related information for most of the businesses in the sample. Communication technologies, whether through media outlets or Internet and email technologies, are not widely accessed for marketing related information.

Local price information was collected from communications with processors, buyers and sellers, intermediaries, and through personal observation of prices in local markets. Information on national and international prices relied primarily on personal communications with processors, buyers and sellers, and intermediaries as well. Because of physical constraints, personal observation of prices in national and international markets is impractical. Consequently, an increasingly important source of

price information in domestic and international markets was communication technology, like the Internet and to a lesser extent the media. About 27 and 37 percent of traders obtained domestic and international price information, respectively, through the Internet and the media, particularly exporters.

12 Operating costs

Total variable operating costs were about 1.0 billion VND on average. The main operating costs for the average firm in the sample were transport (45.4 percent), labor (25.5 percent), and non-raw material inputs such as containers, boxes, and other packaging material. Taxes and fees (e.g. registration fees, voluntary contributions, and market and income taxes) and financial costs (e.g. credit costs and depreciation) were relatively small. Post-harvest activities like sorting and grading represented only about 0.2 percent of total operating costs.

Operating costs for exporters were over 6 times higher than those of domestic traders. As a share of total operating costs, other material costs of exporters were lower than that of domestic traders (6.7 vs. 10.8 percent), while fees and taxes and financial costs for exporters (7.3 and 4.4 percent) were nearly double those of domestic traders (3.7 and 2.6 percent). In both absolute and relative terms, exporters had higher post-harvest activity related costs (0.5 percent) than domestic traders (0.1 percent).

Although total absolute costs of exporters and domestic traders are similar for businesses located in Northern and Southern Viet Nam, variable cost structures are quite different. Whereas labor costs were a larger proportion of variable operating costs of exporters in the North (30.3 percent) than in the South (16.4 percent), labor costs as a share of variable operating costs of domestic traders were much lower in the North (10.1 percent) than in the South (42.7 percent). The differences in the share of labor in variable operating costs reflects differences in employment levels and to a lesser extent employee wage rates of domestic traders and exporters in Northern and Southern Viet Nam. Similarly, transport costs of exporters were a larger share of variable operating costs in the South (59.3 percent) than in the North (29.6 percent), while the proportion of transport costs in variable operating costs of domestic traders were much lower in the South (29.5 percent) than in the North (60.9 percent). The relatively large share for transport primarily reflects differences in the quantity and total cost of rented transport services, and to a lesser extent differences in the price of the services.

Transport costs for domestic traders in the North are generally higher than those in the South because of the relatively large share of fresh fruits and vegetable trade from North to South rather than from South to North. In the case of exporters, the converse is true. Exporters in the South tend to ship goods a longer distance and at higher total cost than those located in the North.

13 Profitability

The average business in the sample had gross revenues of about VND 3 billion, and raw material and operating costs of about VND 5.6 and 1.0 billion, respectively, corresponding to raw material and operating cost shares of 80.2 and 15.4 percent, respectively. The resulting profit of about VND 662 million corresponded to an average profit share in total revenue of a respectable 4.4 percent.

Overall, exporters were more profitable than domestic traders, and traders in the North were more profitable than those in the South. Domestic traders in the South had the lowest profit share. Despite the low operating cost share, the relatively high cost of raw materials (nearly 88 percent of total revenue, on average) substantially squeezed the profits for these firms on average.

The capital-labor ratio was substantially higher among exporters than among domestic traders, and higher among traders in the North compared to those in the South. The very high capital-labor ratio of Northern exporters in part reflects the substantial assets of the state and province owned companies in the sample, for which only the proportion of profits from the sale of fresh and processed fruit and vegetable products are reflected in the returns on assets.

Domestic traders and exporters were asked about their perceptions about their level of profits during 2000, and the previous year. As shown in Table 4-25, nearly all traders were profitable in 2000, with about 58 percent of the traders in the sample reporting a small profit and about 37 percent reporting good or very good profits. A larger proportion of exporters reported good or very good profits (47.4 percent) than domestic traders (34.2 percent). Only 4 percent of traders in the sample expected losses in 2000, all were located in the North.

Traders were also asked about whether the profitability of their business had improved between 1999 and 2000. Overall, 9 percent said it had improved, 19 said it had deteriorated, and the remainder reported no change. As shown in Table 4-26, an increase in the volume of goods traded and a decrease in price instability were the main reasons cited for the improvement in profitability between 1999 and 2000 (82 percent). Traders reporting lower profits cited various factors including reductions in trade volumes (50.0 percent) sale prices (46.2 percent), increased volatility of raw material prices and greater competition. Traders report that the number of competitors increased more than 40 percent between 1998 and 2000. This suggests that the level of competition in fruit and vegetable trade has increased significantly in recent years.

14 Conclusions

Fruit and vegetable traders are diverse in terms of size and legal status. Small traders tend to be unregistered private enterprises, while medium and large ones are often registered private enterprises. Also among the large traders are provincial and central state-owned enterprises.

The average trader in employed 47 workers, though most of these are temporary (seasonal) workers. This figure includes a small number of family members and a large number of temporary (seasonal) hired workers.

Only a minority of traders obtain formal-sector credit. Almost all the surveyed traders used family funds for start-up capital, and 36 percent obtained formal-sector loans as well. Barely one third had outstanding loans at the time of the survey, implying that most traders are self-financed.

The use of cold storage is quite rare. Although a large majority of traders (84 percent) have storage facilities, just 3 percent use cold storage facilities. This percentage is somewhat higher among larger traders and exporters.

Traders purchase most of their produce from farmers in spot-market transactions. About 57 percent is purchased directly from farmers and 37 percent from other traders, such as assemblers. Just 12 percent have contracts with growers. Traders are reluctant to contract with growers because of uncertainty regarding the market price.

The traders in the sample are involved in various post-harvest activities. Eighty-six percent provide packaging or bagging, 62 percent grading, and 43 percent sorting.

The average gross revenue among the traders is VND 7.5 billion, compared to VND 5.6 billion in raw material purchases. Exporters tend to have much higher revenues (VND 25 billion, compared to VND 3.6 billion). Domestic traders in the North and South have similar gross revenues.

The main customers for domestic traders in the sample were processors, while exporters mainly sold directly to foreign customers. Processors accounted for 52 percent of the sales of domestic traders, while foreign customers represented 88 percent of the sales of exporters.

Almost all traders have telephones, but few have faxes, computers, or are members of associations. Just 6 percent are members of associations, though this percentage is higher for exporters and large traders.

Transport costs represent the majority (about 60 percent) of the operating costs of traders. Over 39 percent of traders experienced serious problems for their businesses due to poor access to roads, rail, and docks. Delays, circumspect routes, under loading and inefficient use of transport vehicles among others, due to poor access to transport infrastructure, contribute to both higher transport costs, as well as costs associated with damage to and the spoilage of perishable produce.

Over 30 percent of the fruit and vegetable traders report that the actions of police impede the movement of goods in Vietnam. These results echo those of an earlier IFPRI study that found that over 25 percent of domestic livestock traders had problems with random road side checks and fines by police (IFPRI 2000). In addition, restrictions on the movement of produce between provinces were experienced by about 14 percent of traders.

Table 4-1. Distribution of sample by province and type of trader

Province	Trader	Exporter	Overall
North			
Ha Noi	3	4	7
Hai Phong	0	1	1
Hai Duong	13	1	14
Hung Yen	2	0	2
Lang Son	0	3	3
Bac Giang	10	1	11
Bac Ninh	16	0	16
South			
Lam Dong	4	1	5
Binh Thuan	1	3	4
Long An	9	0	9
Tien Giang	18	5	23
Ben Tre	7	0	7
Can Tho	2	0	2
Overall	85	19	104

Source: IFPRI/MARD Fruit & Vegetable Trader Survey 2001

Table 4-2. Education level of business managers (%)

	North	South	Overall
Domestic trader			
% primary school	2.3	2.4	2.4
% middle school	27.3	51.2	38.8
% high school	56.8	46.3	51.8
% university/college	13.6	0.0	7.1
# of observations	44	10	54
Exporter			
% primary school	0.0	0.0	0.0
% middle school	0.0	33.3	15.8
% high school	20.0	55.6	36.8
% university/college	80.0	11.1	47.4
# of observations	41	9	50
Overall			
% primary school	1.9	2.0	1.9
% middle school	22.2	48.0	34.6
% high school	50.0	48.0	49.0
% university/college	25.9	2.0	14.4
# of observations	85	19	104

Source: IFPRI/MARD Fruit & Vegetable Trader Survey 2001

Table 4-3. Percentage of traders using storage

	North	South	Overall
Domestic trader			
% use storage	65.9	100.0	82.4
% have sufficient storage	90.0	100.0	95.8
Exporter			
% use storage	80.0	100.0	89.5
% have sufficient storage	100.0	100.0	100.0
Overall			
% use storage	68.5	100.0	83.7
% have sufficient storage	92.1	100.0	96.6

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-4. Planned land usage in 2002 by land use activity (square meters)

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Crop production	4760	8000	5360	2917	50900	11554	3871	28321	8338
Agro-processing	220	10668	2155	585	3353	1083	396	7203	1640
Trading	23	210	58	0	22	4	12	121	32
Other used	331	793	417	432	102	373	380	466	396
Not used	0	11000	2037	0	0	0	0	5789	1058
Total	5334	30671	10026	3934	54378	13014	4659	41901	11463

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-5. Sources of startup capital

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Immediate family									
Avg. investment (m VND)	85	775	146	90	1039	260	87	958	206
%	83.9	98.1	85.2	98.7	97.2	98.4	91.3	97.5	92.1
Extended family & friends									
Avg. investment (m VND)	24	0	22	1	6	2	13	4	11
%	43.4	43.4	25.0	25.0	25.0	41.1	25.0	39.3	
Commercial banks									
Avg. investment (m VND)	4	12	5	2	0	2	3	4	3
%	39.6	7.7	36.4	28.6	28.6	38.5	7.7	35.7	
Total	113	788	173	93	1044	264	103	965	221

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-6. Sources of post-startup capital

	North	South	Overall
Domestic trader			
% reinvested profits	97.7	100.0	98.8
% equity	6.8	0.0	3.5
% short-term credit	75.0	39.0	57.6
% long-term credit	2.3	2.4	2.4
% state budget	0.0	0.0	0.0
Exporter			
% reinvested profits	90.0	100.0	94.7
% equity	10.0	11.1	10.5
% short-term credit	80.0	44.4	63.2
% long-term credit	0.0	0.0	0.0
% state budget	50.0	0.0	26.3
Overall			
% reinvested profits	96.3	100.0	98.1
% equity	7.4	2.0	4.8
% short-term credit	75.9	40.0	58.7
% long-term credit	1.9	2.0	1.9
% state budget	9.3	0.0	4.8

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-7. Characteristics of loans (excluding SOEs)

	North	South	Overall
Informal			
Amount borrowed (m VND)	104.11	100.00	103.08
Loan period (months)	5.7	6.7	5.9
Interest rate (%/month)	1.3	2.1	1.5
# of observations	9	3	12
Formal			
Amount borrowed (m VND)	55.00	92.50	61.52
Loan period (months)	8.6	8.5	8.6
Interest rate (%/month)	1.6	0.9	1.5
# of observations	19	4	23
Overall			
Amount borrowed (m VND)	70.79	95.71	75.77
Loan period (months)	7.7	7.7	7.7
Interest rate (%/month)	1.5	1.4	1.5
# of observations	28	7	35

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-8. Average current value of assets (million VND)

Asset type	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Transport	33	325	87	11	84	24	22	211	57
Buildings	168	2707	638	41	220	74	107	1529	367
Durables	4	355	69	1	2	1	2	188	36
Equipment	5	3	5	8	61	17	6	31	11
Other	405	17825	3631	156	353	192	285	9549	1977
Total	615	21215	4430	217	720	308	422	11508	2448

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-9. Main reason not a member of an association

	North	South	Overall
Domestic trader			
% no association in area	75.0	82.9	78.8
% not effective	9.1	2.4	5.9
% high membership costs	0.0	0.0	0.0
% not needed	15.9	14.6	15.3
Exporter			
% no association in area	50.0	77.8	63.2
% not effective	0.0	11.1	5.3
% high membership costs	0.0	0.0	0.0
% not needed	0.0	0.0	0.0
Overall			
% no association in area	70.4	82.0	76.0
% not effective	7.4	4.0	5.8
% high membership costs	0.0	0.0	0.0
% not needed	13.0	12.0	12.5

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-10. Types of post-harvest activities undertaken by traders

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
% any PHAs	93.2	60.0	87.0	100.0	100.0	100.0	96.5	78.9	93.3
% Washing	13.6	10.0	13.0	9.8	11.1	10.0	11.8	10.5	11.5
% Fumigation	0.0	10.0	1.9	4.9	33.3	10.0	2.4	21.1	5.8
% Sorting	40.9	30.0	38.9	43.9	66.7	48.0	42.4	47.4	43.3
% Grading	36.4	40.0	37.0	90.2	88.9	90.0	62.4	63.2	62.5
% Bagging	77.3	10.0	64.8	19.5	33.3	22.0	49.4	21.1	44.2
% Packaging	15.9	60.0	24.1	68.3	66.7	68.0	41.2	63.2	45.2
% Labeling	2.3	10.0	3.7	0.0	0.0	0.0	1.2	5.3	1.9
% Irradiation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-11. Types of post-harvest activities undertaken by main types of vegetables

Activity	Potato	Tomato	Cucumber	Garlic	Kohlrabi	Tay onion	Cabbage	Overall
% Washing	6.7	3.4	7.1	0.0	10.0	6.7	18.8	7.3
% Fumigation	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.9
% Cold storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Sorting	13.3	10.3	0.0	10.0	20.0	0.0	50.0	14.7
% Grading	6.7	44.8	57.1	20.0	10.0	0.0	12.5	24.8
% Labeling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Bagging	86.7	51.7	50.0	100.0	90.0	93.3	43.8	68.8
% Packaging	6.7	6.9	21.4	0.0	0.0	6.7	0.0	6.4
% Other	6.7	0.0	0.0	0.0	0.0	6.7	0.0	1.8
# of observations	15	29	14	10	10	15	16	109

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-12. Characteristics of post-harvest processing activities by main type of vegetable

Activity	Potato	Tomato	Cucumber	Garlic	Kohlrabi	Tay onion	Cabbage	Overall
Washing								
Time (days/ton)	7.0	2.0	1.0		1.0	7.0	1.3	2.8
Cost (000VND/ton)	14.0	4.0	2.0		2.0	14.0	5.3	6.5
# of observations	1	1	1	0	1	1	3	8
Fumigation								
Time (days/ton)							1.0	1.0
Cost (000VND/ton)							200.0	200.0
# of observations	0	0	0	0	0	0	1	1
Cold storage								
Time (days/ton)								
Cost (000VND/ton)								
# of observations	0	0	0	0	0	0	0	0
Sorting								
Time (days/ton)	3.0	2.7		1.0	3.5		12.9	7.8
Cost (000VND/ton)	6.0	4.1		12.0	0.0		13.0	8.8
# of observations	2	3	0	1	2	0	8	16
Grading								
Time (days/ton)	1.0	13.0	1.1	12.8	2.0		1.5	7.8
Cost (000VND/ton)	2.0	18.9	12.0	22.5	12.0		11.0	15.7
# of observations	1	13	8	2	1	0	2	27
Labeling								
Time (days/ton)								
Cost (000VND/ton)								
# of observations	0	0	0	0	0	0	0	0
Bagging								
Time (days/ton)	14.2	4.8	2.9	17.8	3.1	5.9	1.6	7.7
Cost (000VND/ton)	13.0	13.3	7.1	14.3	7.3	8.6	5.6	10.5
# of observations	13	15	7	10	9	14	7	75
Packaging								
Time (days/ton)	24.0	1.2	1.2			24.0		7.7
Cost (000VND/ton)	48.0	13.0	13.3			48.0		23.1
# of observations	1	2	3	0	0	1	0	7
Other								
Time (days/ton)	8.0					8.0		8.0
Cost (000VND/ton)	16.0					16.0		16.0
# of observations	1	0	0	0	0	1	0	2

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-13. Types of post-harvest activities undertaken by main types of fruit

Activity	Mango	Dragon	Longan	Lychee	Overall
% Washing	0.0	5.0	0.0	0.0	1.6
% Fumigation	0.0	10.0	15.8	0.0	8.2
% Cold storage	0.0	5.0	0.0	0.0	1.6
% Sorting	55.6	30.0	68.4	46.2	49.2
% Grading	100.0	95.0	78.9	76.9	86.9
% Labeling	0.0	0.0	5.3	7.7	3.3
% Bagging	11.1	15.0	15.8	38.5	19.7
% Packaging	77.8	85.0	84.2	69.2	80.3
% Other	0.0	0.0	0.0	0.0	0.0
# of observations	9	20	19	13	61

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-14. Characteristics of post-harvest processing activities by main type of fruit

Activity	Mango	Dragon	Longan	Lychee	Overall
Washing					
Time (days/ton)		2.0			2.0
Cost (000VND/ton)		75.0			75.0
# of observations	0	1	0	0	1
Fumigation					
Time (days/ton)		2.6	0.6		1.4
Cost (000VND/ton)		111.2	250.0		194.5
# of observations	0	2	3	0	5
Cold storage					
Time (days/ton)		0.2			0.2
Cost (000VND/ton)		18.0			18.0
# of observations	0	1	0	0	1
Sorting					
Time (days/ton)	1.0	0.8	16.1	16.1	10.5
Cost (000VND/ton)	13.6	16.8	98.8	45.0	57.5
# of observations	5	6	13	6	30
Grading					
Time (days/ton)	1.8	1.3	6.1	13.6	5.0
Cost (000VND/ton)	16.1	19.5	69.1	37.0	36.3
# of observations	9	19	15	10	53
Labeling					
Time (days/ton)			1.6	8.0	4.8
Cost (000VND/ton)			5.0	20.0	12.5
# of observations	0	0	1	1	2
Bagging					
Time (days/ton)	0.5	0.5	14.0	4.4	5.5
Cost (000VND/ton)	15.0	20.0	100.0	11.3	36.0
# of observations	1	3	3	5	12
Packaging					
Time (days/ton)	1.8	1.9	4.8	10.7	4.4
Cost (000VND/ton)	18.7	38.4	51.9	31.1	38.7
# of observations	7	17	16	9	49
Other					
Time (days/ton)					
Cost (000VND/ton)					
# of observations	0	0	0	0	0

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-15. Characteristics of measures taken to ensure quality of raw material inputs from suppliers

	North	South	Overall
Domestic trader			
% specify variety	59.1	50.0	53.7
% use inorganic fertilizers	13.6	3.1	7.4
% use organic fertilizers	4.5	21.9	14.8
% use IPM	9.1	6.2	7.4
% use pesticides	4.5	40.6	25.9
Exporter			
% specify variety	80.0	77.8	78.9
% use inorganic fertilizers	10.0	22.2	15.8
% use organic fertilizers	10.0	44.4	26.3
% use IPM	30.0	11.1	21.1
% use pesticides	10.0	11.1	10.5
Overall			
% specify variety	65.6	56.1	60.3
% use inorganic fertilizers	12.5	7.3	9.6
% use organic fertilizers	6.2	26.8	17.8
% use IPM	15.6	7.3	11.0
% use pesticides	6.2	34.1	21.9

Source: IFPRI/MARD Fruit & Vegetable Trader survey 2001

Table 4-16. Characteristics of measures taken to ensure quality during post-harvest processing

	North	South	Overall
Domestic trader			
% remove foreign matter	45.5	46.3	45.9
% wash produce	25.0	0.0	12.9
% sanitize equipment	15.9	34.1	24.7
% clean equipment	2.3	24.4	12.9
% homogenization	22.7	70.7	45.9
Exporter			
% remove foreign matter	60.0	55.6	57.9
% wash produce	0.0	22.2	10.5
% sanitize equipment	70.0	33.3	52.6
% clean equipment	20.0	22.2	21.1
% homogenization	20.0	44.4	31.6
Overall			
% remove foreign matter	48.1	48.0	48.1
% wash produce	20.4	4.0	12.5
% sanitize equipment	25.9	34.0	29.8
% clean equipment	5.6	24.0	14.4
% homogenization	22.2	66.0	43.3

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-17. Main waste disposal methods of traders

	North	South	Overall
Domestic trader			
% garbage dump	9.1	39.0	23.5
% composting	0.0	19.5	9.4
% own dump	77.3	22.0	50.6
% illegally dumped	13.6	19.5	16.5
Exporter			
% garbage dump	20.0	33.3	26.3
% composting	0.0	11.1	5.3
% own dump	30.0	44.4	36.8
% illegally dumped	50.0	11.1	31.6
Overall			
% garbage dump	11.1	38.0	24.0
% composting	0.0	18.0	8.7
% own dump	68.5	26.0	48.1
% illegally dumped	20.4	18.0	19.2

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-18. Characteristics of visits by health and sanitary inspectors

	North	South	Overall
Domestic trader			
% periodically inspected	20.5	12.2	16.5
Avg. # of visits in 2000	1.4	1.8	1.6
Exporter			
% periodically inspected	80.0	11.1	47.4
Avg. # of visits in 2000	1.6	1.0	1.6
Overall			
% periodically inspected	31.5	12.0	22.1
Avg. # of visits in 2000	1.5	1.7	1.6

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-19. Organizations that inspected traders in 2000

	North	South	Overall
Domestic trader			
% Dept. of Health	25.0	0.0	15.4
% Dept. of Sci., Tech., & Env.	12.5	80.0	38.5
% Dept. of Agriculture	50.0	20.0	38.5
% Dept. of Extension	12.5	0.0	7.7
Exporter			
% Dept. of Health	45.5	0.0	41.7
% Dept. of Sci., Tech., & Env.	54.5	100.0	58.3
% Dept. of Agriculture	0.0	0.0	0.0
% Dept. of Extension	0.0	0.0	0.0
Overall			
% Dept. of Health	36.8	0.0	28.0
% Dept. of Sci., Tech., & Env.	36.8	83.3	48.0
% Dept. of Agriculture	21.1	16.7	20.0
% Dept. of Extension	5.3	0.0	4.0

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-20. Distribution of traders by gross revenue ('000 VND)

Gross Revenue Category (1000 VND)	Number of traders	Percent of total	Average gross revenue (1000 VND)
Less than 1,000,000	6	5.8	781,854
1,000,000 - 2,500,000	40	38.5	1,775,381
2,500,000 - 5,000,000	30	28.8	3,448,333
5,000,000 - 7,500,000	12	11.5	5,842,450
7,500,000 - 10,000,000	4	3.9	8,477,425
Greater than 10,000,000	12	11.5	39,986,741
Total	104	100.0	7,336,696

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-21. Average total value and composition of production and sales by type of produce

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Vegetables									
Value (m VND)	1865	4399	2334	733	482	688	1319	2544	1543
% sales	95.5	99.7	96.1	99.6	50.0	94.7	96.4	92.6	95.8
% waste	3.8	0.3	3.3	0.3	50.0	5.3	3.1	7.4	3.7
% stock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% other	0.7	0.0	0.6	0.1	0.0	0.1	0.5	0.0	0.5
Fruit									
Value (m VND)	996	27209	5850	3708	16699	6046	2304	22231	5945
% sales	94.4	99.0	96.2	99.7	99.3	99.6	98.0	99.2	98.3
% waste	5.2	0.8	3.5	0.2	0.0	0.2	1.9	0.4	1.5
% stock	0.4	0.2	0.3	0.0	0.0	0.0	0.1	0.1	0.1
% other	0.0	0.0	0.0	0.1	0.6	0.2	0.1	0.3	0.1
Overall									
Value (m VND)	2861	31608	8184	4441	17181	6734	3623	24774	7487
% sales	96.3	99.1	96.8	99.7	93.9	98.6	97.9	96.6	97.7
% waste	3.1	0.7	2.6	0.2	5.6	1.2	1.7	3.0	1.9
% stock	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.1
% other	0.5	0.0	0.4	0.1	0.6	0.2	0.3	0.3	0.3

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-22. Characteristics of buyers placing orders for future delivery

	North	South	Overall
Domestic trader			
% accept orders for future delivery	79.5	90.2	84.7
% sales revenue through orders	91.0	70.1	80.3
# unmet buyers placing orders	6.0	6.8	6.4
Exporter			
% accept buyer orders	80.0	66.7	73.7
% sales by orders	84.6	83.3	84.0
# unmet buyers	3.9	4.0	3.9
Overall			
% accept buyer orders	79.6	86.0	82.7
% sales by orders	89.8	72.0	80.9
# unmet buyers	5.6	6.4	6.0

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-23. Prevalence and characteristics of restrictions on the movement of goods

	North	South	Overall
Domestic trader			
% affected by movement restrictions	54.5	22.0	38.8
% affected by random roadside police checks	47.7	19.5	34.1
% restricted by tolls	22.7	7.3	15.3
% affected by inter-provincial blocks	22.7	4.9	14.1
% affected by inter-district blocks	0.0	0.0	0.0
Exporter			
% affected by movement restrictions	10.0	55.6	31.6
% affected by random roadside police checks	10.0	33.3	21.1
% restricted by tolls	0.0	0.0	0.0
% affected by inter-provincial blocks	10.0	11.1	10.5
% affected by inter-district blocks	0.0	11.1	5.3
Overall			
% affected by movement restrictions	46.3	28.0	37.5
% affected by random roadside police checks	40.7	22.0	31.7
% restricted by tolls	18.5	6.0	12.5
% affected by inter-provincial blocks	20.4	6.0	13.5
% affected by inter-district blocks	0.0	2.0	1.0

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-24. Expected usefulness of information that traders do not currently have access to

Type of information	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Domestic marketing									
% very useful				100.0	0.0	75.0	100.0	0.0	75.0
% useful				0.0	0.0	0.0	0.0	0.0	0.0
% not useful				0.0	100.0	25.0	0.0	100.0	25.0
Export marketing									
% very useful	3.0		3.0	35.9	50.0	36.6	20.8	50.0	21.6
% useful	27.3		27.3	38.5	50.0	39.0	33.3	50.0	33.8
% not useful	69.7		69.7	25.6	0.0	24.4	45.8	0.0	44.6
Input availability									
% very useful	0.0		0.0	50.0		50.0	33.3		33.3
% useful	100.0		100.0	0.0		0.0	33.3		33.3
% not useful	0.0		0.0	50.0		50.0	33.3		33.3
Tender notification									
% very useful				50.0	50.0	50.0	50.0	50.0	50.0
% useful				50.0	50.0	50.0	50.0	50.0	50.0
% not useful				0.0	0.0	0.0	0.0	0.0	0.0
Freight rates									
% very useful		0.0	0.0	33.3		33.3	33.3	0.0	25.0
% useful		100.0	100.0	33.3		33.3	33.3	100.0	50.0
% not useful		0.0	0.0	33.3		33.3	33.3	0.0	25.0
National prices									
% very useful	0.0		0.0	56.5	0.0	54.2	44.8	0.0	43.3
% useful	83.3		83.3	21.7	0.0	20.8	34.5	0.0	33.3
% not useful	16.7		16.7	21.7	100.0	25.0	20.7	100.0	23.3
Foreign prices									
% very useful	2.5		2.5	41.0	83.3	46.7	21.5	83.3	25.9
% useful	32.5		32.5	28.2	0.0	24.4	30.4	0.0	28.2
% not useful	65.0		65.0	30.8	16.7	28.9	48.1	16.7	45.9
Process technology									
% very useful	58.1		58.1	84.6	75.0	83.3	70.2	75.0	70.5
% useful	22.6		22.6	15.4	0.0	13.3	19.3	0.0	18.0
% not useful	19.4		19.4	0.0	25.0	3.3	10.5	25.0	11.5
Storage technology									
% very useful	41.4	0.0	37.5	60.0	75.0	61.5	51.6	42.9	50.7
% useful	44.8	100.0	50.0	17.1	0.0	15.4	29.7	42.9	31.0
% not useful	13.8	0.0	12.5	22.9	25.0	23.1	18.8	14.3	18.3
Consumer demand									
% very useful	20.0		20.0	47.4	50.0	47.8	30.6	50.0	32.1
% useful	70.0		70.0	21.1	0.0	17.4	51.0	0.0	47.2
% not useful	10.0		10.0	31.6	50.0	34.8	18.4	50.0	20.8
Regulation changes									
% very useful	8.3		8.3	0.0	0.0	0.0	5.3	0.0	5.0
% useful	70.8		70.8	21.4	0.0	18.8	52.6	0.0	50.0
% not useful	20.8		20.8	78.6	100.0	81.2	42.1	100.0	45.0
Credit information									
% very useful	25.0	0.0	20.0	8.3	50.0	18.8	15.0	33.3	19.2
% useful	75.0	50.0	70.0	8.3	0.0	6.2	35.0	16.7	30.8
% not useful	0.0	50.0	10.0	83.3	50.0	75.0	50.0	50.0	50.0

Table 4-25. Characteristics of profitability in 2000

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Very good profit	4.5	10.0	5.6	0.0	0.0	0.0	2.4	5.3	2.9
Good profit	27.3	40.0	29.6	36.6	44.4	38.0	31.8	42.1	33.7
Slight profit	59.1	30.0	53.7	63.4	55.6	62.0	61.2	42.1	57.7
Breakeven	2.3	10.0	3.7	0.0	0.0	0.0	1.2	5.3	1.9
Slight loss	4.5	0.0	3.7	0.0	0.0	0.0	2.4	0.0	1.9
Big loss	2.3	10.0	3.7	0.0	0.0	0.0	1.2	5.3	1.9

Source: IFPRI – MARD Survey of Fruit and Vegetables Traders.

Table 4-26. Reason for improvement in profitability of traders in 2000

	North			South			Overall		
	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall	Domestic trader	Exporter	Overall
Sale price	0.0	0.0	0.0	25.0		25.0	10.0	0.0	9.1
Volume of trade	66.7	100.0	71.4	100.0		100.0	80.0	100.0	81.8
Competition	0.0	0.0	0.0	25.0		25.0	10.0	0.0	9.1
Price volatility	16.7	0.0	14.3	0.0		0.0	10.0	0.0	9.1
Other	50.0	0.0	42.9	25.0		25.0	40.0	0.0	36.4
# of observations	6	1	7	4		4	10	1	11

Source: IFPRI/MARD Survey of Fruit & Vegetables Traders.

Chapter 5

Characteristics of fruit and vegetable processors

1 Introduction

Fruit and vegetable processors are defined as enterprises that transform fruits and vegetables into a different state, generally in order to preserve them. This transformation may involve drying, pickling, freezing, canning, or converting into jams and preserves. The largest processors are those involved in canning and freezing. The Vietnam Fruit and Vegetable Export Company (Vegetexco) is a centrally-managed state-owned enterprise with most of the canning and freezing capacity in the country. It manages 12 canning plants with a combined capacity of 70,000 tons per year and 5 freezing plants with a capacity of 20,000 tons per year. Actual output is considerably lower than capacity due to seasonality of production and difficulties in obtaining raw materials. In addition to centrally-managed state enterprises, there are about 22 provincially-managed state enterprises involved in fruit and vegetable processing, about half of which are located in Ho Chi Minh City and Dong Nai. These companies include canners as well as salting and drying facilities. Finally, there are about 18 processing plants built by private companies, including wholly foreign-owned facilities. The total capacity of these processing plants is variously estimated at 150,000 to 200,000 tons per year. In addition to these medium- and large-scale processing plants, there are numerous smaller-scale processing operations, particularly in the fruit and vegetable drying sector where large-scale equipment is not necessary (see Truong Dinh Luc, 2001).

It is important to note that processors are only one element of the post-harvest activities carried out in the fruit and vegetable sector. As noted in Chapter 3, some fruit and vegetable growers are involved in processing their output, the most common case being the drying of litchi and longans. In addition, producers often carry out other post-harvest activities such as storage, washing, grading, and packaging. Furthermore, as noted in Chapter 4, traders may be involved in post-harvest activities, particularly cleaning, grading, and packaging.

This chapter describes the results of the IFPRI-MARD Survey of Fruit and Vegetable Processors, carried out in 2001¹. The chapter is divided into 12 sections. Section 2 describes the methods used to implement the survey. Sections 3-5 present the use of labor, land, and equipment by the surveyed fruit and vegetable processors in Vietnam. Section 6 describes the methods used by the processors to obtain raw materials for processing. Sections 7 and 8 explain the patterns of production and marketing. Section 9 reviews the use of credit, while Section 10 examines the means by which processors gather information on markets and technology. Section 11 summarizes the revenue,

¹ This chapter is a revised version of a longer background report prepared for IFPRI by Agrifood Consulting International. The report is available on the CD-ROM that accompanies this report.

operating expenses, and profits of fruit and vegetable processors. And Section 12 summarizes the results of this chapter.

2 Survey methods

The processor survey aimed to provide a balanced sample representing different regions, commodities, firm sizes, and processor types. Because there is no master list of food processors in Vietnam, it was not possible to select a stratified random sample. Instead, the survey sample was purposive. The sample was designed to focus primarily on processors of six fruits (longan, lychee, banana, pineapple, dragonfruit, and citrus) and four vegetables (tomatoes, cabbage, cucumber, and carrots), though a few processors of other commodities were included. Furthermore, the sample was selected to provide a balance between processors in the north and south, between fruit and vegetable processors, and across different sizes of processors.

The survey used a 51-page pre-coded questionnaire that was developed through extensive discussions with Vietnamese researchers and agriculturalists.

In the implementation of the survey, 241 processors from 21 provinces were interviewed. Of those, around 50 percent (122 processors) were from the two northern regions (the Red River Delta and the North East) and the remaining 119 processors were from the southern regions (Central Highlands, Southeast, and Mekong River Delta). Table 5-1 shows that the majority of processors were located in Red River Delta and Mekong River Delta regions. Only 2 surveyed processors were located in the Central Highlands region.

More than 67 percent of processors surveyed processed only vegetables, 22 percent processed only fruit, while the remainder of processors were involved in processing both fruit and vegetables. Although vegetable processors dominate in both the North and the South, the proportion of fruit processors was somewhat higher in the South (26 percent) than in the North (18 percent).

As specified in the sample design, processors were to be divided into size categories based on the level of gross revenue. These divisions were to be made on a tercile basis, with the lowest third being classified as small, the middle third being classified as medium and the top third being classified as large. Mixed processors tended to be larger average, and processors in the north tended to be smaller than in the south.

Given the relative scarcity of data on the characteristics and operations of private enterprises in Vietnam, the survey was designed to focus on private processors. In fact, 86 percent of the surveyed processors were either registered private Vietnamese companies (53 percent) or non registered private Vietnamese companies (33 percent). About 8 percent were state-owned enterprises (including those managed by the provinces). The sample also included five registered foreign companies and three joint-venture companies. The small firms tended to be non-registered private companies, while the large ones included both registered private firms and state-owned enterprises.

The majority of the processors in the North were non-registered private firms, while more than 83 percent of the processors surveyed in the South were registered private firms. Of the 218 privately owned processors surveyed, an average of 92 percent of the ownership of the firm was with individual people living close to the location of the firm. Partial ownership by national or foreign companies is somewhat more common among large processors, but local individuals still account for 81 percent of the ownership (see Table 5-2)

3 Labor

3.1 Characteristics of managers

The average age of the processor managers was around 47 years, and 80 percent were male. The age and gender showed little variation across regions and types of processors (see Table 5-3). The average level of experience of processor managers was around 5 years and 96 percent had some secondary school education. The average education level was higher among larger processors and among mixed processors. For example, although 10 percent of managers of small firms had some form of tertiary training, 45 percent of those running large firms did. Education levels did not vary significantly between the North and South. Somewhat surprisingly, the level of experience tended to be somewhat higher among small processors compared to large ones (see Table 5-4). Only 5 percent of managers had previously worked for Vegetexco (Vietnam Fruit and Vegetable Export Company) in any capacity. However, this proportion was higher among large firms (11 percent) and among mixed processors (35 percent).

3.2 Workforce and wages

The average number of workers (including family members) is 34. This figure, however, is somewhat misleading because of the large number of temporary workers at fruit and vegetable processors. The survey collected information on the total number of person-days, which can be converted into the number of full-time equivalent (FTE) workers². The average number of FTE workers is 29. Of course, this figure varies considerably among types of processors. Cannery and freezers have over 100 FTE workers on average, but driers have just 17 FTE workers on average.

Almost all (85 percent) of the processors surveyed used male family labor and a similar percentage (78 percent) used female family labor. Two-thirds of the processors used temporary male labor, while three-quarters used female temporary labor. Between 43 and 55 percent of the processors used each of the other types of laborers: male and female, skilled and unskilled permanent workers. The use of family labor was almost universal among small processors and somewhat less common among large ones. In contrast, the use of permanent labor was quite common among large processors, but relatively rare among the small ones (see Table 5-5).

² For example, two half-time workers and a full-time worker would be considered two full-time equivalent workers. In converting from person-days of work to the number of full-time equivalent workers, we assume 300 work days per year.

The daily wage varies from VND 34 thousand per day for permanent skilled male workers to VND 20 thousand per day for temporary female workers. For each category of labor (skilled, unskilled and temporary), the average daily rate for males was about 20 percent higher than the corresponding wage for females (see Table 5-6).

The daily rates for skilled and unskilled permanent labor increased as the size of processor increased. In one case, male skilled labor, the average daily rate for large firms was 28 percent greater than that of small firms. Wages in the South are about 20 percent higher than those in the North.

3.3 Education and skills

About half (51 percent) of the workers of fruit and vegetable processors did not complete secondary school. About 37 percent had just a secondary school degree and just 12 percent had educational levels greater than secondary school. The proportion of the workers with post-high school qualifications was just 5 percent among small processors, rising to 20 percent among large ones.

Processors workforces obtained their skills from a number of sources. The most common source (48 percent) of skills for the workforce was that they were self taught. The next most common source of workplace skills was learning on the job at the processor, accounting for an average of almost 29 percent of the workforce. A higher proportion of the workforce of large processors obtained their skills at universities. Around 15 percent of processors indicated that they felt that their staff had serious skill deficiencies. The main areas of serious skill deficiency highlighted by processors were pricing of products and underlying technical skills. These areas were highlighted as important by all sizes of processor.

Only 6 percent of processors indicated that members of their workforce had undertaken training courses, though this percentage was higher among large processors. Among the few processors who planned to provide training to workers, the most common training location was at universities, accounting for almost 54 percent of the cases.

Around 8 percent (20) of the processors indicated that their workforce would be undertaking training courses in the future. The major reasons cited for having no intention of providing training to workers was that there were no training programs available or that the cost of training in terms of staff time would be too great. The majority of the training courses undertaken by staff of processors were provided by universities. These accounted for almost 63 percent of the total training courses provided.

4 Access to land

4.1 Current Land Use

The average land area available to processors is around 688 hectares. This includes land used for production, as well as land used for processing of fruits and vegetables. This figure is heavily influenced by the a few processors with large land-holdings. Most processors have less than two hectares, but the average land-holding for large processors is 2000 hectares. The land area available to producers in the North is substantially smaller than that available to processors in the South. In spite of the small land-holdings of most fruit and vegetable processors, almost 90 percent of them report that they have access to “sufficient” land area to allow them to conduct their current level of business.

Around 55 percent, or 131 of the processors had land that they utilized for crop production. The proportion of processors utilizing crop production land decreases as the size of the processing company increases. While 73 percent of small processors had some crop production land, only 37 percent of large processors had crop production land. Although the use of land for crop production is more common among small and medium firms, these enterprises have little land so the average area allocated to crop production is around 1 hectare (see Table 5-7).

The average current value of crop production land for processors was VND1.8 billion. The value of crop production land is similar for small and medium processors, but significantly larger for large processors. It was also larger for mixed fruit and vegetable processors and for processors in the South.

Almost all (97 percent) of the processors indicated that they had land which they utilized for agro-processing. Five of the small processors and one of the medium and one of the large processors indicated that they did not have land which they utilized for agro processing. At least a portion of agroprocessing land was rented by 33 processors. Of these, 26 processors rented 100 percent of their agroprocessing land. The average rental cost for rented agroprocessing land is around VND13000 per m² per month.

Around 32 percent, or 78 of the processors had land that they utilized for trading. The proportion of processors utilizing land for trading increases as the size of the processing company increases. While 29 percent of small processors had some trading land, 34.1 percent of large processors had some trading land.

4.2 Planned Land Uses

While around 10 percent of processors indicated that they do not have sufficient land to carry on their current operations, around 17 percent of processors indicated that they would be interested in gaining access to additional land in order to expand their business operations. The proportion of

processors wanting to access more land in order to expand their business operations was highest amongst medium firms (24 percent). Of the businesses that are interested in gaining more land for expansion, over 80 percent (33 processors) were implementing this strategy by actively looking for land at the time of the survey. The average land area desired by those processors actively looking for more land is around 3.7 hectares.

Only 5 of the surveyed processors (around 2 percent) had considered moving their processing business to an industrial park. These processors were all either medium or large processors. The most common reason for not considering moving to an industrial park was that the processor had no plans to expand production, and hence saw no need to change locations. Of the businesses that indicated that they had plans for expansion but had not considered moving to an industrial park, the most common reason for not wanting to move to an industrial park was that none existed in their location.

5 Processing equipment and other assets

5.1 Value of assets

The total current value of assets ranged from VND 14.5 million to VND 137 billion with an average level of VND 2.44 billion. The total current asset value reported by processors increased as the size of processor increased, with the average current asset level of large processors being over 10 times greater than that of small processors.

The average total current value of processing equipment owned by processors is around VND1.82 billion, or three-quarters of the total value of assets. The average varies from VND 383 million among small processor to VND 7.9 billion among large processors. Similarly, the value of processing equipment of processors in the South is substantially greater than that of processors in the North (VND 2.3 billion compared to VND 1.4 billion) (see Table 5-8).

5.2 Characteristics of processing equipment

Processors have a number of different types of processing equipment that are used in the processing plants. The most common type of major equipment item was drying machines (30 percent of all equipment cited), followed by weighing machines (28 percent). These two types of equipment were the most common for all sizes of processor, in North and South, and in both fruit and vegetable processors (see Table 5-9).

The average age of equipment used by processors was 5.5 years. Furthermore, the average age of equipment did not show much variation between small and large processors. On average the oldest types of equipment were juicing, concentrating and mixing machines and the newest types were grading and power generating machines. These figures are somewhat surprising, given that the food processing industry in Vietnam is often criticized for using old and obsolete equipment. Among the

processors interviewed for this survey, the designs may not be new, but the equipment itself is relatively new (see Table 5-10).

Over 82 percent of the equipment was manufactured in Vietnam. Large processors were more likely to use imported equipment, with Russia, Taiwan, and China being the most often cited sources. Even for large processors, however, almost two-thirds of the equipment (65 percent) is Vietnamese (see Table 5-11).

Viet Nam is the dominant country of source for all types of equipment, with the exception of sterilizing machines, quick freeze machines, juicing machines and concentrating machines.

Almost all equipment specified by the processors (98 percent) was owned by the processors rather than rented. The only type of specified equipment that any of the processors rented was drying machines, with rented machinery accounting for almost 6 percent of drying machines.

The major source of information used by processors is observation of equipment used by other processors. This information source is more important for small and medium processors, whilst large processors have a heavier reliance on equipment suppliers and customers for processing equipment information.

The majority of processors (more than 87 percent) reported that they had experienced no major problems with equipment. The most common reported problems were that equipment was worn out, or that it was technically unable to produce good products. Similar proportions of small, medium and large processors reported problems with equipment (see Table 5-12).

Around 51 percent of processors owned equipment other than transportation or processing equipment and 49 percent owned transportation equipment assets. These proportion increased as the size of processor increased. Almost all of the processors (98.8 percent) owned building assets of some type. The most common reported type of assets owned by processors were livestock, motorcycles and housing/cottages.

6 Input Procurement

6.1 Raw material purchases

The quantity of raw materials used annually by processors varied between 182 kg annually and 57 thousand tons annually, with an average of around 1365 tons. Small processors used an average of about 100 tons per year, compared to 3688 tons for the large processors. The average amount of raw material utilized by Southern processors was substantially larger than that utilized by Northern processors (see Table 5-13).

The value of purchased raw material inputs averaged around VND2.33 billion, whilst the average value of purchased and own produced inputs was around VND2.39 billion. Processors can obtain raw material inputs from a number of sources, including their own production, various domestic sources and imports. The most common sources of raw material inputs were from domestic

private farms and traders, together accounting for an average of over 93 percent of raw material inputs on a volume basis. Own production accounted for an average of around 4 percent of input procurement. Domestic private farms and traders were the dominant input source for all sizes of processor. Small processors sourced a substantially higher proportion of inputs from their own production than did either medium or large processors. Beets and pineapples were the only products with significant proportions being sourced from own production, while passionfruit was the only product sourced through imports.

Around 57 percent (138) of processors sourced inputs through placing orders with input suppliers. This figure was around 35 percent for small processors and around 79 percent for large processors. Processors who placed orders with suppliers sourced an average of almost 68 percent of inputs from these orders.

Processors purchasing products through orders with suppliers can have disagreements with suppliers over a number of matters. The most common areas for disagreements were the processor attempting to renegotiate the price of products and disagreements over price, which were experienced by around 62 percent and 57 percent of processors placing orders respectively. The problem occurring with the highest average frequency was processors attempted renegotiation of price, an average of almost 70 times per year for processors who experienced this problem.

The majority of processors who grew their own fruit and vegetables believed that they were of the same quality standard as the fruit and vegetables that they purchased. This was the case for all processor sizes. Of the processors growing their own fruit and vegetables, around 11 percent intended to expand production of fruit and vegetables from their own sources. The majority of these would do so to improve supply levels. The major reasons cited by processors who did not want to expand production were that supply was adequate and that there was no land available for them to expand (see Table 5-14 and Table 5-15).

6.2 Contracts with suppliers

Almost 15 percent of the processors indicated that they had been involved in supply contracts with producers for the production of fruit and vegetables. Contracting was more common among large processors (23 percent) than among small processors (7.6 percent). In spite of the fact that processors in the South tend to be larger, only 4 percent of processors in the South were involved in supply contract arrangements, compared to over 25 percent of processors in the North (see Table 5-16).

The most common reasons why processors were not involved in contractual arrangements were high market price variability and the perception that the processor was too small to be involved in contracting.

Processors have generally only recently entered into contracting arrangements, with over 60 percent of processors with contracts having entered into their first contract in 1998 or later. Supply

contracting arrangements are a relatively recent phenomenon in the South compared with the North, perhaps as a result of the legacy of the relationship between cooperatives and state enterprises. The average number of farmers that processors had contracts with increased from 1998 to 2000, reaching an average of 593 in 2000. Processors that use supply contracts rely on contract producers for about three-quarters of their total supply (see Table 5-18).

Over three-quarters of the contractual arrangements were written, the remainder being more informal oral agreements. The majority of contractual arrangements with suppliers were exclusive arrangements. The most common types of contractual arrangements were that processors stipulated varieties to be used, processors stipulated the quality of the product, and processors provided seeds at low cost to suppliers. Two-thirds of the contracting processors provide technical assistance, and almost half provided some form of credit to their suppliers.

Two of the processors indicated that they had reneged on the terms of a contract with a supplier. The reasons given were a lack of consumer demand and flooding. Almost 39 percent of processors had attempted to renegotiate the terms of a contract with a supplier. The main aspect of contracts that processors attempted to renegotiate was the price paid. Over 61 percent of processors with contracts reported that some suppliers had reneged on a contract. The most common reason for suppliers reneging on contracts was that they had experienced a failure of their crop. Other reasons included the fact that the market price was higher than the contracted price (see Table 5-17). Of the 35 processors who had contracts with suppliers in 2000, cucumbers and litchee represent almost half the cases.

The major types of supplier that processors contracted were private farmers and cooperatives. Small and medium processors often entered contractual arrangements with private farmers, whilst large processors more frequently contracted cooperatives.

Over half the processors with contracts enlisted the help of local authorities to assist them in securing supply contracts with farmers. The most common role played by local authorities was to identify suitable farmers and assist with the terms of the contract.

6.3 Ensuring Quality of Inputs

Processors look at a number of different quality aspects of fruit and vegetables that they procure. The attributes examined by the highest proportion of processors were damage by insects, pest or disease and the variety of fruit or vegetable. Very few processors examined moisture content and freshness of produce. The most common methods of analyzing quality attributes of products was through visual inspection and via previous experience with the seller.

Almost 83 percent of processors indicated that they undertook measures to ensure the quality of the inputs and outputs of their processing operations. The most common measures utilized were to ensure the use of specified varieties and to ensure the use of organic fertilizers. The proportions of

processors taking no action to ensure product quality on farm decreased as the size of processor increased. For all other measures, except the use of organic fertilizer, a higher proportion of large and medium processors than small processors specified their use to ensure quality.

Processors also indicated that they undertook quality control measures to ensure the quality of inputs once they arrived at the processor. The most common methods were the removal of foreign matter and washing of products.

7 Production

7.1 Processing volume

As mentioned above, the average quantity of raw material processed was close to 1400 tons/year. This volume tended to be concentrated during certain periods of the year. The seasonal operations of processing plants can be classified into three phases: peak production, non-peak production, and closed. On average, processing plants are in operation for around 28 weeks per year, of which around 18 weeks is peak production period and 10 weeks is non-peak production period. Large processors are in operation for a longer period (39 weeks, including 22 weeks at peak production), while small processors operate for shorter periods (17 weeks, including 13 at peak production) (see Table 5-19). Vegetable processors tend to have shorter periods of operation than fruit processors or mixed processors, perhaps due to the shorter harvest period (see Table 5-20).

The average quantity of raw material processed per day in peak periods is around 7.7 tons, compared with an average of around 4.6 tons of raw material per day during non-peak periods. Small and medium processors average 1.1 tons/day and 2.0 tons/day during peak production, respectively, while large ones process an average of 19 tons/day. There is a large regional difference as well, with processors in the North handling an average of 3.8 tons/day during peak production, compared to 11.6 tons/day in the South .

Of the 227 processors that close for part of the year, the major reason for closure (cited by over 63 percent of processors) was that there was no product to process. This was the dominant reason for all types and sizes of processors. In addition, processors closed because the owners had other seasonal occupations which prevent them from processing throughout the year.

The most that processors reported they could operate was 19 hours per day, regardless of the type of processor. Combined with their maximum hourly capacity, we estimate that the maximum daily capacity was 1.3 tons/day for small processors, 2.5 tons/day for medium-size processors, and 22 tons/day for large processors. In other words, during the peak production period, fruit and vegetable processors are working at 81-96 percent capacity, depending on the location, type, and size of processor. During non-peak periods, the processors run at 29-39 percent capacity. Thus, over-

capacity does not seem to be a problem among fruit and vegetable processors, except to the extent that raw material supply does not allow them to operate all year (see Table 5-21).

Processors were asked about the trends in volume over the past five years. Based on these responses, it appears that the average quantity of raw materials processed increased substantially between 1996 and 2000. The average quantity increased from 575 tons in 1996 to around 1396 tons in 2000, representing a growth rate of over 20 percent. High rates of growth occurred for all sizes of processor, for fruit and vegetable processors, and for processors in the North and the South. These trends may over-estimate growth in the sector as a whole because the sample excludes processing firms that closed down over this period and over-represents large and growing processors. Nonetheless, it is very likely that the fruit and vegetable processing sector is enjoying a period of rapid growth.

Box 5-1. Fruit processing and export

“Viet Nam mainly exports fruit to China, Taiwan, Japan and the Republic of Korea. It has only recently introduced its fruit to Europe and America.

Neighboring nations who have exported fruit for long time grow better quality fruit than Viet Nam and are also better at marketing their products.

More importantly, they get more assistance from their governments that help farmers keep their prices down and produce on a large scale.

Moreover, their superior post-harvest technology allows them to preserve fruit longer and retain their markets. In Viet Nam, the issue of improving post harvest technology has been on the table for some time, but not much headway has been made thus far.

Only 5-7 per cent of home-grown fruit is processed. There are around 60 processing factories and workshops in Viet Nam with total capacity of 150,000 tonnes per year. But most of these use backward technology.”

Extracted from Vietnam News Service, 3 August 2002.

7.2 Sales transactions

Of the product processed by processors, an average of almost 94 percent was sold, with a further 5.6 percent on average being stored. The proportion of processed product that was above 90 percent for all processor sizes.

By far the most common raw materials used by processors were longans and lychees, accounting for around 21 percent and 16 percent of the cases. These were followed by banana, cucumber, pineapple, chilies, beets, and cabbage, each representing 3-4 percent of the cases (see Table 5-22).

The most common types of processed product were dried (39 percent), salted (16 percent), and canned products (15 percent). More than three quarters of processors using longans and litchis were driers, so that litchi and longan driers were the most common types of processors in the sample (see Table 5-23).

Around 59 percent of the processors sold products to buyers who placed orders with them, though the figure was higher among large processors (82 percent) than among small processors (34 percent). The practice of selling to buyers who placed orders was also more common in the South (84 percent) than in the North (34 percent). However, processors who sold to buyers who placed orders made an average of 79 percent of sales to buyers who placed orders.

It was relatively uncommon for processors to have disagreements with buyers placing orders over quality, quantity, and late payment. On the other hand, over half the processors (57 percent) reported disagreement with buyers involving the renegotiation of price. The average number of disagreements of this type was 19 per year. Almost 70 percent of processors employed at least one debt collector, but few processors employed more than one.

7.3 Product quality control

Processors take a number of measures to ensure the quality of outputs, both during processing and after processing. The most common measures taken during processing were ensuring that machinery was clean and ensuring that the processing environment was clean.

The most common measures taken to ensure product quality after processing were fumigation and packaging of products. Fumigation of storage space was undertaken by a higher proportion of large processors and mixed processors than other types of processor. Garlic and cucumbers were the only products to be irradiated after processing.

Only around 15 percent of processors were quality certified for fruit and vegetable processing. Not surprisingly, a higher proportion of large and medium processors were certified than small processors. Although processors in the North tend to be smaller, a higher proportion of them were quality certified (23 percent, compared to 7 percent in the South).

Only around 18 percent (44) of the processors followed a defined quality control program. This figure increased as the size of processor increased and was higher among Northern processors and mixed processors.

The major type of defined quality control program utilized was Total Quality Management (TQM) followed by over 93 percent of processors with a defined quality program. HACCP was only utilized for quality control in cucumber and jackfruit processing.

The majority of processors (54 percent) regarded the health and sanitary conditions of their businesses to be “good” but not “very good”. About 41 percent rated themselves as “fair”. The highest self-appraisals were those given by mixed processors and fruit processors, while the lowest were those given by vegetable processors.

The most common means of waste disposal undertaken by processors was free disposal of waste on their own land. Large and mixed processors were more likely than other processors to undertake disposal of waste products in containers.

Health and sanitary inspectors periodically visited around 34 percent (82) of the processors. Inspectors were more likely to visit large or medium processors than small processors. Mixed processors and fruit processors were more likely than vegetable processors to receive periodic visits from inspectors. In spite of their smaller size, processors in the North were significantly more likely to receive visits from inspectors than processors in the South. Among those inspected, the average number of inspections received per year was 2. Of the businesses that received periodic inspections, around 16 percent (13) of processors were asked to take remedial action by the inspector. None of the inspected processors was required to pay a fine in relation to health and sanitary conditions.

The majority of processors (56 percent) obtained water from wells located on their property. This was the main source of water for small and medium processors, but the main source for large processors was the government water main. The major source of water for processors in the North was wells on their own property, whilst for processors in the South, the major source of water was from government mains.

About 40 percent of the processors took measures to ensure the water was safe. The percentage was highest among mixed processors and fruit processors. The most common action taken to ensure safe water was to treat water before use (see Table 5-24).

About one third of the processors reported periodic visits from government inspectors, though the percentage was higher in among large processors and those in the north (see Table 5-25). The inspectors that visited processors periodically came from a number of organizations, but the most commonly cited inspections were those by the Ministry of Health and the Ministry of Science Technology and Environment. Small and medium processors were most often visited by inspectors from the Ministry/Department of Health, while large processors were inspected by the Ministry/Department of Science Technology and Environment. The most common level of government supplying inspectors was the provincial government., accounting for two thirds of the inspectors.

8 Storage and marketing

8.1 Storage

Nearly all processors (97 percent of respondents) use some form of storage facility for their produce. The most common type of storage used is the processor's house or cottage (40 percent of respondents) followed by a closed shed or a shed without walls (20 and 13 percent of respondents respectively). The use of a house for storage is less common among large processors (24 percent),

while 18 percent use a closed shed, 15 percent use either frozen storage facilities or a sealed warehouse, and 10 percent use chilled storage facilities.

Chilled or frozen storage facilities are used by about 11 percent of the processors, though more often by large processors (25 percent) and mixed fruit and vegetable processors (25 percent). Chilled and frozen storage are also more common in the South (17 percent) than in the North (3 percent).

The average storage capacity of processors was 222 tons, ranging from 42 tons among small processors to 427 tons among large processors.

The vast majority of the storage facilities used by processors (97 percent) are owned by the processor, and a similar share (98 percent) are for exclusive use by that processor rather than being shared. Only 5 respondents indicated that they shared storage facilities. The majority of processors (97 percent) were satisfied with the amount of storage space they had.

The average storage quantity for processed produce was 36.3 tons, with a maximum of 57 tons. The average quantity stored ranged between 75 tons for large processors down to 6.3 tons for small processors.

Storage losses appear to be quite modest. Processors reported only a 0.51 percent loss in quantity and a 1.5 percent loss in quality. The loss in quantity and quality did not vary substantially across processor size and type. The most common cause of loss in quantity in stored produce was humidity and rodents (36 and 33 percent of respondents respectively). The most common cause of loss in quality in stored produce was humidity and transport related problems (63 and 22 percent of respondents). As a result of the very low losses in storage, the majority of processors (77 percent of respondents) take no action to reduce storage losses (see Table 5-26).

8.2 Marketing channels

Processors can make sales of products through a number of different channels, both domestically and on the export market. Small processors sell primarily to supermarkets (79 percent), while medium-sized processors sell to supermarkets (38 percent) and exporters (37 percent). Large processors sell to exporters (32 percent) and export directly (44 percent). Overall, somewhat more than half of the sales of the fruit and vegetable processors surveyed were for export, either directly or through exporters. Southern processors and vegetable processors were more export oriented than others. Vegetable processors were more likely to export through an exporter, while fruit processors were more likely to export directly. This may reflect the larger size of the average fruit processors compared to vegetable processors. Products with the longest average transportation distance are juice (594 km) and dried products (684 km).

Around 58 percent (139) of the processors exported products, either directly or through selling to exporters or dealing with licensed exporters or agents. Of the processors exporting products, less than a quarter (36) of the processors were involved in directly selling the products for

export themselves. Small and medium-sized processors sold to exporters, while larger processors exported directly. The export channels for processors in the North and South were similar (see Table 5-27).

Processors exporting directly had an average of 4 foreign customers. The main methods of meeting foreign customers were through a relative or friend or during previous work experience with a state-owned enterprise. In addition, large processors made contacts at trade exhibitions.

All of the processors who exported directly were aware of the country of destination of their exports. However, none of the processors who exported through other channels (either selling to exporters or through dealing with export agencies) had any knowledge of what the country of destination of their products was.

Among those processors that could name the destination of their exports, the most commonly cited countries were Taiwan, Japan and China, accounting for around 50 percent of total. China is more important destination for exports from medium processors, and Japan and Taiwan being relatively more important for large processors.

8.3 Transportation

Of the 241 processors in the survey, 214 respondents, or 89 percent, said that they use some form of transport to buy and sell fruits and vegetables. Although the majority of processors use some form of transportation in buying and selling fruits and vegetables, large processors of fruit are more likely to use transportation than small processors of vegetables.

The most common forms of transport were truck, van or minivan, boat and motorbikes (36, 18, 10 and 10 percent of respondents respectively). Small processors mainly used vans or minivans (30 percent of respondents) and motorbikes (19 percent). In contrast, medium-size and large processors mainly used trucks (42 percent and 48 percent, respectively).

Nearly all processors rent some form of transport (93 percent of respondents) and this is consistent across all types of processor and across all business sizes. Trucks were the most common form of rented transport (50 percent of respondents) followed by vans and minivans (22 percent) and cars (11 percent).

Over one-third of the processors (36 percent) indicated that they had experienced transport restrictions of some form. These restrictions were mainly targeted towards larger processors, perhaps due to their size making them more readily identifiable. Forty-four percent of medium and large processors experienced some form of restrictions compared with 20 percent of small processors. Processors were asked to identify the two most important restrictions that negatively affected their business. The half the respondents (50 percent) indicated that police conduct was the most important restriction while inter-province blocks were cited by 24 percent and tolls by 15 percent (see Table 5-28).

Only 12 percent of the processors surveyed reported problems with transportation. The main problems involved poor road infrastructure and demurrage (lateness) (27.5 and 22.5 percent of respondents respectively). Unreliable drivers, informal rents, and overloaded vehicles were seen as the next most common forms of problems.

8.4 Marketing Problems and Constraints

Almost 40 percent of processors surveyed indicated that they suffered from infrastructure related problems., with higher proportion of medium and large processors reporting problems. The proportion of processors citing infrastructure problems was similar in the North and South.

The main infrastructure problem cited by processors was physical access infrastructure (roads, rail, docks) for purchasing inputs and selling products. This was considered to be a major problem for by all sizes, types and locations of processor.

The main regulatory problems identified are problems with tax administration and tax laws, which together account for over 44 percent of the cited problems (see Table 5-29).

When asked to name the main constraints facing the fruit and vegetable processing industry as a whole, the most common complaints concerned the low levels of demand for processed products and unstable prices of processed products.

9 Credit and investment

The average initial investment to start the processing business was around VND1.8 billion. The most common source of start up capital for processors was immediate family., accounting for 72 percent of the total sources cited. This was true for all three size categories and all three processor types. Although immediate family is the most common source of start-up capital, the average contribution of family is small relative to the average contribution from other sources.

The capital obtained from family and friends, non-government organizations, state companies and foreign investment, is typically in the form of equity in the company. In contrast, start-up capital from commercial banks and suppliers tends to take the form of credit.

In addition to start up capital, processors also require working capital in order to carry out their operations. The most common source of working capital is reinvested profits of the processor, followed by formal short term credit. These patterns hold for small, medium, and large companies. Informal credit was relatively important for small firms, while formal credit was more important for large ones.

Of the 241 processors surveyed, 56 percent indicated that they used credit during the year 2000 or had older, still outstanding loans. Small processors were somewhat less likely to have outstanding loans (49 percent) compared to large processors (61 percent), but this indicates a relatively high level of access to credit even among small processors. Most processors obtained loans

from the Agricultural Bank (36 percent of respondents), family and friends (24 percent), and commercial banks (21 percent) (see Table 5-30).

On average, processors obtained loans from only one source, but a few processors obtained loans from multiple sources. Few processors (6 percent) had loans outstanding from previous years, indicating that most of the credit available to processors is short-term. Virtually all the loans were denominated in Vietnamese dong (99 percent of respondents).

The type of collateral required for loans varied according to the lending institution. Family and friends, other enterprises, moneylenders, and other credit institutions usually did not require collateral (95, 100, 82 and 54 percent of respondents respectively). In contrast, banks usually required a house, building, or land as collateral. The majority of small processors required to put up their house as collateral (64 percent of respondents) while many medium and large processors were not required to put up any collateral (43 and 48 percent of respondents respectively). This may reflect the greater risks, as perceived by banks, in lending to small enterprises.

Box 5-2. Expanding fruit and vegetable processing capacity

In the year 2001, Vietnam completed five new fruit and vegetable processing plants with a total annual capacity of 28,600 tons of processed product. This represents an increase of almost 20 percent in the capacity of fruit and vegetable processing plants. One of the main constraints on the government's plan to expand fruit and vegetable processing is that the provinces have failed to develop fruit and vegetable growing areas in order to provide sufficient raw materials for the planned processing plants. A number of newly opened processing plants have operated far below capacity and have incurred losses because of the shortage of raw materials and falling export prices.

According to officials at the Ministry of Agriculture and Rural Development, VND 960 billion (US\$ 6.3 million) has been earmarked to promote production, build processing plants, and improve preservation methods this year. Priority is being given to processing plants located near fruit and vegetable growing areas, and projects will not be approved unless they have access to at least 60 percent of their raw materials requirements.

Source: Vietnam News Service, 21 January 2002.

The majority of processors used loans to purchase raw materials (89 percent of respondents), with only 17 out of the 160 loans taken out by producers used for other purposes. The other purposes included the purchase of equipment, construction, and business start-up.

The amount borrowed and the terms of the loan varied across lending institutions. On average, processors borrowed VND 2.2 billion, for an average of 13 months and at an interest rate of 1.14% per month. Commercial banks loaned relatively large amounts, VND 4.3 billion, for an average of 11 months at an interest rate of 0.8% per month. Loans from family and friends were for VND 129 million, for an average of 5 months at an interest rate of 1.4% per month. Loans from moneylenders appeared to be for emergencies, with the amount borrowed being the lowest amongst

all of the lending institutions (VND 59 million), for one of the shortest periods of time (6 months) and at the highest interest rate (2.67% per month) (see Table 5-31).

The terms also varied depending on the borrower. Large processors borrowed VND 5.0 billion, compared to less than VND 1.0 billion for small and medium processors. Fruit processors and mixed processors borrowed more than vegetable processors.

More than two-thirds of the processors (71 percent) said that they had sufficient funds for their operations after borrowing. This finding is somewhat surprising since credit is widely thought to be a key constraint facing Vietnamese food processors. Small processors were the least satisfied, with “only” 64 percent saying they had sufficient funds. In contrast, 96 percent of fruit processors and 71 percent of dual-produce processors were satisfied. Over half the respondents (54 percent) said that they were willing to pay more in order to obtain credit, ranging from 70 percent of large processors to 43 percent of small processors.

On average, processors claimed to need VND 2.8 billion in credit in order to conduct their operations at the peak business period, for which they would be willing to pay 1.36% per month in interest. This varied across the size of processor business, with small processors needing VND 153 million, medium size processors needing VND 272 million, and large processors needing VND 7.9 billion.

The majority of processors said that difficulties in dealing with banks and lack of collateral were the two main reasons why their business could not obtain sufficient funds (43 and 35 percent of respondents respectively). This was consistent across the size of business and across processor type. However, when asked whether they could borrow additional funds if needed, 93 percent of processors indicated that funds were available.

Another form of credit received by processors is advance payment from buyers for products sold by the processor. Advance payment was relatively rare: only 13 percent of the processors reported this type of transaction. Even among those who received advance payment, the average share of sales involving advance payment was just 15 percent.

Processors not only receive credit, but they offer credit to their buyers in the form of consignment sales. Nearly 54 percent of processors sold goods on consignment, a proportion that did not vary much across types of processors. For those processors that sold goods on consignment, an average of 61 percent of sales were on consignment and the average consignment period was 27 days. Few processors (7 percent) provided loans to other companies and individuals.

10 Information and communication

10.1 Gathering market information

The majority of processors have at least one person collecting price information for their commercial operations and larger businesses have three workers collecting price information. The

majority of processors have price information on a daily basis (61 percent of processors), while 23 percent of processors collect price information on a weekly basis. About 82 percent of processors can obtain price information without having to personally visit other markets outside their main location, but 18 percent (and 29 percent of small processors) must visit other markets to obtain price information. Processors contact traders, other processors and exporters in their market on almost a daily basis (an average of 337 times a year). Small processors check less often than large processors.

Over 90 percent of processors have a telephone. Even among small processors, 80 percent have telephones (see Table 5-32). Mobile telephones are less common, being owned by just 23 percent of the processors. For those processors who have neither a telephone nor a mobile phone, 93 percent of them have access to a telephone nearby. Only 16 percent of respondents (39 out of 241 processors surveyed) have a computer for business operations, and 11 percent (27 processors) use the Internet or email to obtain price or market information. In the main, these processors are larger, dual-produce processors. The proportions are similar for processors in the North and in the South.

Processors appear to have access to local and domestic market information but are lacking in information about international markets and technology. At least three-quarters of processors report having information about each of the following: domestic marketing opportunities, local price information, and national price information. However, no more than a quarter report having information on international prices and export marketing opportunities. More large processors had information about changes in the international scene than small processors (40 and 15 percent, respectively). This is consistent with the finding, reported earlier, that large processors are much more likely to export directly than small processors. Ninety-seven percent of processors have information about raw material availability, 88 percent of processors have information about freight rates, and 72 percent of processors have information about credit availability. No more than 40 percent reported having information about processing, storage technologies, and consumer demand (see Table 5-33).

Most processors obtained information from several sources, the main ones being speaking with buyers or suppliers (22 percent of respondents), speaking with intermediaries (22 percent), speaking with other processors (17 percent), and personal observation (13 percent). Processors found all information sources either very useful or somewhat useful, but processors saw speaking with extension agents and circulars/decrees as being only “somewhat useful.”

10.2 Association membership

Around 8 percent (20) of the surveyed processors were members of a processing or trading association. Membership in an association was highly dependant on the size of business: less than 5 percent of small and medium sized processors were members of processing or trading associations, but almost 20 percent of large businesses were members. Almost 11 percent of processors in the North were members of an association, compared with 6 percent in the South (see Table 5-34).

The main reason cited by processors for not belonging to an association was that there was no processor association existing that they would be able to be members of. A further 24 percent of processors indicated that they felt that they had no need to belong to an association. These proportions were relatively consistent amongst sizes of processors, types of processor, and location of processor.

Of the 20 processors that were members of an association, 14 were members of one association only, 5 were members of two associations and one was a member of three associations. Of the associations the one most frequently cited as giving the most benefits of membership was the Viet Nam Chamber of Commerce and Industry, which was referred to by 10 of the 20 processors who are members of associations.

The majority of the associations were rated as providing very good or good levels of service effectiveness by their members. The only exceptions to this were cooperative groups, which were rated as fair or poor by 66 percent of members.

Average annual membership fees for processor associations varied between zero and VND85 million with an average level of VND7.8 million. In addition to compulsory membership fees for associations, 15 of the processors also made voluntary contributions to the association, averaging VND3.8 million.

The main advantage that processors feel they gain from being in an association are access to market information and the ability of an association to assist them in coordinating sales and purchases. Small processors feel that the main advantages of belonging to an association are access to information, insurance and the ability to negotiate floor and ceiling prices while large processors are interested in gaining market information and coordinating sales and purchases, but also view associations as good vehicles for making business contacts (see Table 5-35).

Processors in associations and outside associations nominated services that they felt associations should provide to their members. The most common services nominated were coordination of sales and purchases and the development of business contacts among members.

11 Profitability

11.1 Revenue and operating costs

The average revenue from processing activities was around VND4.5 billion. Large processors have an average annual revenue 80 times greater than that of small processors (VND 12 billion compared to VND 150 million). Mixed processors are the largest, with revenues of VND 15 billion, followed by fruit processors (VND 5.7 billion) and vegetable processors (VND 2.4 billion). Processors in the South had revenues that were, on average, twice as large as those in the North (VND 6.0 billion compared to VND 3.0 billion) (see Table 5-36).

The average total annual operating cost of processors was VND1.4 billion, though there was large degree of variation across firms. Small processors had operating costs of just VND 53 million, while the corresponding figures for medium and large processors were VND 296 million and VND 3.9 billion. In other words, the average operating cost of large processors is 70 times greater than that of small processors. Of the processor types, vegetable processors had the smallest annual average operating costs, while mixed processors had the highest average annual levels. The average total operating cost for processors in the South was around double that of processors in the North (see Table 5-37).

Table 5-38 shows the revenue and costs of operation of twelve types of fruit and vegetable processors. The volume of production is over 1000 tons/year for just two types: canners and freezers. Picklers and driers average over 200 tons/year, but the smallest average volumes are recorded by the 7 producers of candied fruits in the sample. In the case of the value of output, canners and freezers are again the largest of the processors, with a value over VND 10 billion per year. In contrast, makers of candied fruit produce less than VND 1 billion per year in output. It should be noted that an output of 1000 tons per year is still relatively small compared to many of the state-owned canners and other processors.

In Table 5-39, the same data are presented in percentage terms. The operating costs represent at least three-quarters of the value of output for all types of processors except makers of fried and salted products. There is a fair amount of variation in the composition of costs, but some patterns emerge. First, the cost of raw materials is, in every case, the largest cost item for the processors. This implies that small changes in the price or availability of raw materials can have a large impact on the profitability of the processing company. Second, hired labor and packaging are the second and third most important cost categories, though the ranking varies between them.

Table 5-40 shows the value added (value of output minus operating costs) and several ratios to indicate the intensity of the use of capital and labor in production. Only canners and freezers have more than 100 full-time equivalent workers. Most of these are permanent employees. Makers of candied fruit have just 6 FTE workers. Companies that dry fruits and vegetables are the most numerous in the sample and employ an average of 17 FTE workers. Although they hire more than 17 workers, most of these workers are temporary or seasonal, reducing the number of FTE workers. The most capital intensive types of processors are juice manufacturers, freezers, and producers of jams and preserves. For these processors, the fixed asset base is more than VND 200 million per FTE worker. In contrast, other types of processors require less than half this much capital for each job created. In general, the smaller types of processors are more labor intensive and, thus, create more employment per unit of investment.

11.2 Perceived level of Competition

Processors perceived that competing processing companies operated at many levels, ranging from market and village level, through to national and international levels. Small processors perceived their major competition to be operating at the commune level, while medium-sized processors perceived major competition at the commune and province level. Not surprisingly, large processors cited major competition at the district and province level. The levels of perceived competition are similar for processors in the North and in the South.

The average number of competitors perceived by processors increased between the founding date of the business and between 1998 and 2000. The number of competitors perceived by processors increased from eight, when the business started, to 12 in 1998, to 17 in 2000. These figures may represent a trend toward increasing competition in the fruit and vegetable processing sector.

11.3 Trends in profits

Over three-quarters of the processors interviewed expected to make profits in 2001 and an additional 20 percent reported breaking even. Just 2 percent reported losses. This makes 2001 the most profitable year over the period 1996-2001. The proportion of processors that were profitable did not increase steadily from year to year, however. There appears to be a fair amount of volatility in profits from year to year, probably as a function of weather and competition (see Table 5-41).

Overall, almost 88 percent of processors expected to have the same or improved profitability in 2001 as their profitability in 2000. Smaller firms were even more likely to report improved profitability (95 percent) than large firms (83 percent). The proportions of processors expecting to have the same or improved profitability in 2001 compared to 2000 was similar in the North and South.

Profit levels of processors can change for many reasons. The main reasons for profit change cited by processors were changes in the sale price of products, price volatility of inputs and changes in the volumes of trade. These three factors were the major reasons for profit change cited by all sizes of processor, but price volatility of inputs was more often cited as a problem by small processors.

12 Conclusions

The majority of processors surveyed were privately-owned firms, relying on family labor and a relatively smaller amount of hired temporary labor. Processors operated on a seasonal basis, with peak and non-peak periods depending on the types of fruit and vegetable that they process. Only a small minority of processors were sufficiently diversified in the range of products that they processed to operate processing all year round.

The processors generally were involved in fairly basic processing of fruit and vegetables, with the most types of processing being drying, salting, and canning. Most processors only produced

either one or two types of processed product and utilized only one major type of fruit or vegetable input.

Only around 15 percent of processors had been involved in contracts with suppliers to provide them with fruit and vegetable inputs. The main reason for the low level of involvement in contracts was that the processors believed that they were too small to undertake such arrangements or that output prices were too variable. Most of those involved in contracting started the practice since 1998.

The major avenues of sale of processed products were to supermarkets, exporters, and buyers in other countries. While most processors had at least some of their product exported, only a small minority of these processors directly exported. The remainder sold their products to exporters or agents. While the processors who exported directly knew the country of destination of their products, none of the processors who exported through agents, or who sold to exporters knew the country of destination of their products.

Somewhat more than half the processors reported having outstanding loans. Most processors obtained loans from the Agricultural Bank, family and friends, and commercial banks. Family and friends, other enterprises, moneylenders, and other credit institutions usually did not require collateral. In contrast, banks usually required houses, buildings, or land as collateral. Smaller processors were more likely to be asked to put up their house as collateral, while the majority of medium and large processors were not required to put up any collateral.

Most of the processors indicated that they took measures to ensure the quality of inputs to their businesses. This included quality measures at suppliers' farms and quality measures at the processor. These measures were usually rudimentary, such as washing and removal of foreign matter. A small proportion of processors (usually large processors) also sterilized inputs before processing.

Processors take a number of measures to ensure the quality of outputs, both during processing and after processing. The most common measures taken during processing were ensuring that machinery was clean and ensuring that the processing environment was clean. Cleaning machinery and ensuring a clean processing environment were the major measures taken by all sizes of processor.

The most common measures taken to ensure product quality after processing were fumigation and packaging of products. Fumigation of storage space was undertaken by a higher proportion of large processors than other types of processor. Garlic and cucumbers were the only products to be irradiated after processing. While the majority of processors indicated that they undertook measures to ensure quality control of products, only around 15 percent of processors were quality certified for fruit and vegetable processing. Not surprisingly, a higher proportion of large and medium processors were certified than small processors.

Almost all processors utilized storage facilities, but few used cold storage. For small and medium sized processors, this was primarily a house or cottage. Larger processors also utilized houses and cottages for storage, but additionally utilized sheds and warehouses, some of which were chilled.

Despite the fact that processors utilized rudimentary storage facilities, losses in quantity and quality of processed products appear to be relatively low. Processors reported on average only a 0.51 percent loss in quantity and a 1.5 percent loss in quality of stored processed products. The loss in quantity was consistent across processor size and type but smaller processors experienced a greater reduction in quality than medium and large processors.

The most common cause of loss in quality in stored produce was humidity and transport related problems. Humidity was the main cause of quality reductions in stored produce. Humidity was also the main cause of quality reductions in stored produce for fruit and vegetable processors. Transport related problems were the major causes of quality loss in the North, whilst humidity was the dominant cause of product quality deterioration in the South.

Since the amount of loss in quantity and quality of stored produce is relatively low, three-quarters of the processors take no action to reduce their losses in storages. 14 percent of processors do take action to reduce their losses by weatherizing their storage structures and 11 percent of processors repair holes in their storage structures.

The canners and freezers in the sample were large compared to other types of processors, but small compared to many state-owned fruit and vegetable processors. The average production for freezers and canners was over 1000 tons/year, but many state-owned canners have capacities of several thousand tons per year.

Raw material costs are the most important cost item for fruit and vegetable processors. This implies that the procurement strategy and their ability to secure raw material at a reasonable price is one of the most important determinants of the profitability of a processing enterprise.

Juice manufacturers and freezers are the most capital-intensive types of fruit and vegetable processors. These processors have over VND 200 million in fixed assets per FTE worker, compared to less than VND 100 million for other processors. Generally speaking, larger processors are more capital-intensive and generate less employment per unit of investment.

Table 5-1. Location of Processors

Region	Freq.	Percent
RRD	85	35.27
NE	37	15.35
CH	2	0.83
NES	26	10.79
MRD	91	37.76
Type of Processor		
Fruit	53	21.99
Vegetables	162	67.22
Mixed	26	10.79
Size		
Small	84	34.85
Medium	74	30.71
Large	83	34.44
Total	241	100.00

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-2. Ownership structure of business by type of business

Size	Small	Medium	Large	Total
SOC	1.27	2.5	4.88	2.9
POC	0	1.25	14.63	5.39
Equity	0	0	2.44	0.83
Reg Prv For	0	0	6.1	2.07
Reg Prv Nat	37.97	61.25	59.76	53.11
Non Reg Prv	60.76	30	9.76	33.2
Coop	0	3.75	0	1.24
JV	0	1.25	2.44	1.24
Total	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-3. Distribution of manager by gender and Size of processor

Size	Male	Female
Small	79.75	20.25
Medium	75.00	25.00
Large	82.93	17.07
Fruit	81.13	18.87
Vegetables	79.01	20.99
Mixed	76.92	23.08
Total	79.25	20.75

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-4. Level of education of business manager by business size

Education of manager	Small	Medium	Large	Total
Completed primary school	0	1.25	1.22	0.83
Completed middle school	2.53	3.75	2.44	2.90
Completed high school	43.04	25.00	20.73	29.46
Completed technical school	44.30	51.25	30.49	41.91
Some university/college	3.80	5.00	2.44	3.73
Completed university/college	6.33	11.25	37.80	18.67
Post-graduate	0	2.50	4.88	2.49
Total	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-5. Use of labor by labor type (%)

Labor Type	Proportion of processors using labor type
Family Male	85.06
Family Female	78.01
Permanent Skilled Male	54.77
Permanent Skilled Female	41.08
Permanent Unskilled Male	42.74
Permanent Unskilled Female	44.81
Temporary Male	65.56
Temporary Female	75.93

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-6. Daily labor price (‘000 VND) by labor type and size of business

Labor Type	Daily Labor Price (‘000VND)			
	Total	Small	Medium	Large
Family Male				
Family Female				
Permanent Skilled Male	34	29	32	37
Permanent Skilled Female	27	25	26	29
Permanent Unskilled Male	27	26	27	27
Permanent Unskilled Female	21	17	21	23
Temporary Male	25	26	25	24
Temporary Female	20	20	20	20

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-7. Proportion of processors with crop production land by size & type of business

Size and type of business	Proportion (%)	Land Area (m ²)
Small	73.4	12,762
Medium	55.0	9,141
Large	36.6	3,939,635
Fruit	60.4	4,426
Vegetables	56.8	415,198
Mixed	30.8	11,600,000
North		378,260
South		1,468,420

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors

Table 5-8. Average total value of processing equipment and asset value by size & type of business and region (VND 000)

Size, Type of business and Region	Equipment Value (‘000 VND)	Asset Value (‘000 VND)
Small	383,713	404,232
Medium	349,412	612,949
Large	4,638,506	6,179,525
Fruit	2,246,133	2,317,172
Vegetables	699,225	1,014,038
Mixed	7,934,780	11,600,000
North	1,353,848	1,625,410
South	2,297,935	3,272,196

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-9. Distribution of functions of processing equipment (% of total equipment)

Function code	Number of processors that own	Percent of processors that own	Percent of all equipment
Weighing	178	74%	29
Grading	16	7%	3
Washing	27	11%	4
Sterilizing	19	8%	3
Cutting	9	4%	1
Steaming	7	3%	1
Cooking	32	13%	5
Drying	188	78%	30
Crushing	12	5%	2
Mixing	30	12%	5
Quick freezing	10	4%	2
Juicing	9	4%	1
Concentrating	5	2%	1
Canning	28	12%	5
Homogenizing	5	2%	1
Packaging	7	3%	1
Power generating	5	2%	1
Other	32	13%	5
Total	619		100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-10. Average age of processing equipment (years) by size and type of business

Size and Type of business	Age
Small	5.18
Medium	5.48
Large	5.92
Fruit	7.25
Vegetables	4.03
Mixed	8.30

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-11. Country of origin of processing equipment by size of processor

Country	Small	Medium	Large	Total
Bulgaria	0	0	0.45	0.16
China	1.07	8.96	5.45	5.33
Danish	0	0	0.45	0.16
German	0	0.47	4.09	1.62
India	0	0.47	0	0.16
Italy	0.53	0	1.82	0.81
Japan	0	0.47	4.09	1.62
Poland	0	0	1.36	0.48
Russia	0	3.30	7.73	3.88
Sweden	0	0	0.45	0.16
England	0	0	0.45	0.16
United state	0	0	2.73	0.97
Vietnam	98.40	85.85	64.55	82.07
Taiwan	0	0.47	5.91	2.26
West Europe	0	0	0.45	0.16
Total	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-12. Problems with processing equipment (as a percentage of total problems) by size

2nd problem	Small	Medium	Large	Total
Worn-out equipment	5.35	5.56	9.82	7.02
Unable good products	5.35	3.70	2.68	3.83
Inadequate supply se	0.53	0.00	0.00	0.16
Inadequate advice/ser	0.00	0.46	0.45	0.32
Poor labor skills	1.07	1.85	0.89	1.28
No serious problems	87.70	88.43	86.16	87.40
Total	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-13. Average quantity of raw material processed (tons), processed and purchased value (000 VND) by size & type of business and region

Size, Type of business and Region	Material processed (Tons)	Processed Value ('000 VND)	Purchased Value ('000 VND)
Small	98.97	150,569	160,748
Medium	255.16	650,460	632,495
Large	3,668.43	6,273,788	6,077,856
Fruit	1,189.59	1,952,842	1,852,900
Vegetables	1,079.16	1,970,117	1,926,690
Mixed	3,506.53	5,989,339	5,821,364
North	592.07	1,276,785	1,208,720
South	2,158.00	3,551,383	3,480,832

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-14. Percentage of processors that grow their own fruit and vegetables by size of business

Size, Type of business and Region	Percent
Small	49.37
Medium	32.50
Large	17.07
Fruit	32.08
Vegetables	35.80
Mixed	15.38
North	38.52
South	26.89
Total	32.78

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-15. Average proportion of inputs from various sources by size and type of processor and region

Size, Type of business and Region	Own Production	Private Farmers	Government Farms	Traders	Direct Imports	Other
Small	10.11	63.75	0.59	25.56	0	0
Medium	1.23	63.88	0.27	34.63	0	0
Large	1.07	51.45	4.43	41.85	0.20	0.99
Fruit	2.44	62.97	1.89	31.21	0	1.48
Vegetables	4.76	58.94	1.92	34.38	0	0
Mixed	3.23	56.87	0.82	38.34	0.64	0.10
North	7.02	76.28	0.56	15.41	0.14	0.60
South	1.07	42.51	3.05	53.29	0	0.07

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-16. Business involved in contract for production of fruits or vegetables by size, type of business and region

Size, Type of business and Region	Percent
Small	7.59
Medium	13.75
Large	23.17
Fruit	26.42
Vegetables	5.56
Mixed	50.00
North	25.41
South	4.20
Total	14.94

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-17. Percentage of businesses that have disagreements with suppliers over various matters by size of business

Size	Product Quality	Measuring System	Processor renegotiate price	Late delivery of purchases	Partial Delivery of Purchases	No Delivery of Purchases
Small	39.29	17.86	50.00	7.14	42.11	0.00
Medium	55.56	4.44	66.67	28.89	40.79	2.22
Large	64.62	4.62	63.08	35.38	41.67	4.62
Fruit	57.89	21.05	47.37	23.68	28.57	2.63
Vegetables	63.16	1.32	73.68	32.89	42.22	2.63
Mixed	33.33	4.17	45.83	16.67	46.15	4.17
Total	56.52	7.25	61.59	27.54	41.30	2.90

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-18. Percentage of purchases on a contract basis in 2000 by size & type of business and region

Size, Type of business and Region	Percent
Small	87
Medium	73
Large	64
Fruit	86
Vegetables	51
Mixed	66
North	75
South	42

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-19. Average weeks per year plant is in operation

Size	Peak	Non Peak	Total
Small	13.0	4.4	17.4
Medium	17.8	10.0	27.8
Large	22.3	16.5	38.9
Fruit	24.4	8.3	32.6
Vegetables	14.8	10.7	25.5
Mixed	22.8	12.9	35.8
North	14.6	4.6	19.2
South	21.0	16.4	37.3
Total	17.8	10.4	28.2

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-20. Processing capacity (kg/day) by size & type of business of business and region

Size, Type of business and Region	Hourly Capacity	Maximum Hours Per Day	Maximum Daily Capacity
Small	80.2	19	1,343.9
Medium	157.3	19	2,482.8
Large	1,817.0	19	22,051.1
Fruit	684.9	13	8,297.9
Vegetables	536.0	21	6,779.9
Mixed	1,722.1	14	22,108.9
North	329.4	19	4,662.9
South	1,073.3	18	12,975.6
Total	696.7	19	8,767.5

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-21. Capacity utilization (%) by size & type of business and region

Size, Type of business and Region	Peak	Non Peak
Small	81.63	29.43
Medium	82.56	29.88
Large	86.14	38.76
Fruit	82.72	27.63
Vegetables	83.81	35.06
Mixed	82.96	34.29
North	82.12	23.74
South	84.86	39.75

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-22. Raw material usage as a proportion of all raw materials

Raw Material	Percent
Longan	20.58
Lychee	15.96
Banana	4.62
Cucumber	4.42
Pineapple	4.23
Chilies	4.04
Filed cabbage	3.46
Beets	3.08

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-23. Processed form as a proportion of all processed forms

Form of process	Percent
Canned	15.00
Pickled	7.31
Juice	2.50
Chips	1.54
Frozen	5.77
Dried	39.42
Powdered	1.73
Paste, jams, preserves	2.88
Candied	3.08
Salted	15.58
Fried	0.96
Fresh	4.23
Total	100.00

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors

Table 5-24. Take measures to ensure safe water by size & type of business and region (%)

Size, Type of business and Region	Percent
Small	35.44
Medium	40.00
Large	42.68
Fruit	69.81
Vegetables	21.60
Mixed	88.46
North	37.70
South	41.18
Total	39.42

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-25. Inspectors periodically visit business by size and type of business

Size & Type of Business	Yes	No	Total
Small	15.19	84.81	100
Medium	35.00	65.00	100
Large	51.22	48.78	100
Fruit	49.06	50.94	100
Vegetables	22.22	77.78	100
Mixed	76.92	23.08	100
North	49.18	50.82	100
South	18.49	81.51	100
Total	34.02	65.98	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-26. Type of storage used

Type of storage used	Total		Processor Size			Processor Type		
	Frequency	Percent	Small	Medium	Large	Fruit	Vegetables	Both
Shed without walls	34	12.64	15.38	14.12	9.43	28.57	7.43	13.16
Closed shed	54	20.07	24.36	18.82	17.92	26.79	17.71	21.05
Concrete structure	7	2.60	2.56	2.35	2.83	3.57	1.71	5.26
Sealed warehouse	26	9.67	5.13	7.06	15.09	12.5	4.57	28.95
Non-sealed warehouse	1	0.37	0	1.18	0	0	0.57	0
Silo	2	0.74	0	2.35	0	1.79	0.57	0
Chilled storage	12	4.46	0	1.18	10.38	0	5.71	5.26
Frozen storage	17	6.32	0	1.18	15.09	10.71	1.71	21.05
House/cottage	107	39.78	52.56	48.24	23.58	12.5	56	5.26
Store/shop/stand	3	1.12	0	1.18	1.89	0	1.71	0
Factory/mill	5	1.86	0	2.35	2.83	1.79	2.29	0
Other storage	1	0.37	0	0	0.94	1.79	0	0
Total	269	100.00	100	100	100	100	100	100
Percentage of respondents								

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-27. Proportion of sales to different buyers by size & type of processor and region (%)

Size, Type of business and Region	Consumer	Traders	Supermarket	Other processors	Exporters	Direct export	Other
Small	2.1	0.4	79.1	1.1	14.3	0.0	1.3
Medium	0.3	10.5	37.9	0.7	37.0	12.5	0.1
Large	0.8	3.8	14.2	3.2	32.3	43.7	1.9
Fruit	1.0	6.7	40.6	4.4	7.1	38.9	1.4
Vegetables	1.2	2.8	37.3	0.6	48.1	8.0	0.6
Mixed	0.0	9.9	24.4	2.1	17.1	44.1	2.3
North	0.8	7.2	40.4	2.3	26.1	22.3	0.1
South	1.0	3.1	28.1	1.4	36.1	27.1	2.7

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-28. Experience of transport restrictions

	Total	Processor Size			Processor Type		
		Small	Medium	Large	Fruit	Vegetables	Mixed
Percent reporting some restriction	36.10	20.25	43.75	43.90	16.98	43.83	26.92
Type of restriction							
Police conduct	50.37	58.33	48.28	49.06	50.00	51.38	41.67
Inter-district blocks	5.93	4.17	3.45	9.43	7.14	5.50	8.33
Inter-province blocks	24.44	25.00	25.86	22.64	21.43	26.61	8.33
Food company regulations	0.74	0.00	0.00	1.89	0.00	0.00	8.33
Tolls	14.81	4.17	17.24	16.98	21.43	11.93	33.33
Other	3.70	8.33	5.17	0.00	0.00	4.59	0.00
Total	100	100	100	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-29. Main regulation problem (%)

Regulation problem	Percent
Business licenses	1.93
Tax laws	14.15
Tax administration	29.90
Law of contract / sale	9.97
Land access law / regulations	0.96
Land use rights pricing	1.61
Zoning regulations	7.40
Building development regulations	3.86
Import /export regulations	4.82
Import /export tariffs / taxes	6.43
Health / sanitary regulations	13.83
Environmental regulations	1.61
Laws about acceptable loan-collateral	2.89
Other	0.64
Total	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-30. Sources of business loans

Source of Loan	Frequency	Percent
Family and Friends	39	24.38
Other Enterprises	1	0.63
Money Lenders	11	6.88
Foreign Bank	5	3.13
Commercial Bank	33	20.63
Agricultural Bank	58	36.25
Other Credit Institution	13	8.13
Total	160	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-31. Characteristics of loan

		Amount borrowed (‘000 VND)	Loan Period (Months)	Interest rate (% per month)	Amount outstanding (‘000 VND)
Lending Institution	Family and Friends	129,372	5	1.39	55,000
	Other Enterprises	1,493,500	12	0.65	800,000
	Money Lenders	59,091	6	2.67	40,000
	Foreign Bank	2,294,600	10	1.13	3,706,667
	Commercial Bank	4,310,864	11	0.80	7,771,875
	Agricultural Bank	636,103	11	0.96	1,733,500
	Other Credit Institution	12,212,692	62	0.88	14,461,111
Size	Small	952,023	10	1.09	2,045,600
	Medium	470,845	7	1.21	1,656,072
	Large	4,954,853	21	1.12	11,459,524
Type of producer	Fruit	5,939,391	12	0.90	13,740,700
	Vegetables	796,348	9	1.27	2,526,875
	Mixed	5,836,068	35	0.75	6,652,308
	Mean	2,228,622	13.24687	1.145456	5,540,855
Total	Std. Dev.	8,920,582	29.61424	.6347824	14,500,000
	Frequency	160	160	159	55

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-32. Telecommunications

	Total		Processor Size			Processor Type		
	Frequency	Percent	Small	Medium	Large	Fruit	Vegetables	Mixed
Has telephone	218	90.46	79.75	96.25	95.12	90.57	89.51	96.15
Has mobile telephone	55	22.82	5.06	18.75	43.90	30.19	12.96	69.23
Access to telephone	27	93.10	88.24	100	100	60	100	100
Has computer	39	16.18	3.80	8.75	35.37	24.53	4.94	69.23
Has email	27	11.20	1.27	3.75	28.05	22.64	1.85	46.15

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-33. Percent of processors reporting to have information on different topics

	Processor Size				Processor Type		
	Total	Small	Medium	Large	Fruit	Vegetables	Mixed
Domestic Marketing Opportunities	89.63	94.94	91.25	82.93	94.34	88.27	88.46
Export Marketing Opportunities	25.31	15.19	20.00	40.24	35.85	14.81	69.23
Raw Material Availability	96.68	94.94	97.50	97.56	100	95.06	100
Tender Notification	76.35	84.81	73.75	70.73	83.02	72.22	88.46
Freight Rates	87.97	77.22	91.25	95.12	84.91	88.27	92.31
Local Price Information	93.78	86.08	97.50	97.56	86.79	95.68	96.15
National Price Information	76.76	67.09	83.75	79.27	56.60	84.57	69.23
International Price Information	16.18	2.53	11.25	34.15	28.30	4.94	61.54
Better Processing Technology	39.83	30.38	37.50	51.22	50.94	32.72	61.54
Better Storage Technology	33.20	29.11	26.25	43.90	43.40	26.54	53.85
Demand of Final Consumers	38.17	45.57	41.25	28.05	60.38	29.01	50.00
Changes in regulation	57.26	34.18	66.25	70.73	43.40	60.49	65.38
Credit Availability and Requirements	71.78	62.03	72.50	80.49	43.40	79.63	80.77
Total	61.76	55.70	62.31	67.07	62.41	59.40	75.15

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-34. Membership in trader association by size, type of business and region

Size	Percent
Small	1.27
Medium	3.75
Large	19.51
Fruit	13.21
Vegetables	3.09
Mixed	30.77
North	10.66
South	5.88
Total	8.30

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-35. Main advantages of belonging to an association

Association advantage	Freq.	Percent
Access to credit	3	6
Access to market information	14	28
Development of contacts	8	16
Negotiate with authorities	1	2
Gives me more credibility	6	12
Protect fair competition	4	8
Agree on floor/ceiling prices	1	2
Satisfy large orders	1	2
Mutual insurance bad shocks	2	4
Coordinate sales and purchase	9	18
Knowledge about consumers	1	2
Total	50	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-36. Average total revenue (000 VND) by size & type of business and region

Size, Type of Business and Region	Total Revenue ('000 VND)
Small	151,312
Medium	882,146
Large	12,300,000
Fruit	5,652,038
Vegetables	2,437,404
Mixed	15,300,000
North	3,067,721
South	6,041,865

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-37. Average total cost level (000 VND/year) by size & type of business and region

Size, Type of business and Region	Total Cost ('000 VND)
Small	53,092
Medium	296,033
Large	3,917,407
Fruit	1,315,440
Vegetables	654,702
Mixed	6,666,314
North	981,681
South	1,927,221

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Table 5-38. Revenue and costs for different types of processors

	Canned (N=26)	Pickled (N=22)	Juice (N=4)	Chips (N=6)	Frozen (N)	Dried (N=145)	Powdered (N=5)	Jams, paste & preserves (N=13)	Candied (N=7)	Salted (N=37)	Fried (N=4)	Fresh (N=13)
Price (thousand VND per ton)	11,050	6,003	7,234	21,426	,805	26,006	13,808	9,023	15,121	5,710	37,500	6,497
Production (tons)	1,075	194	646	215	1,353	150	303	412	13	437	348	295
Value of output (million VND)	10,676	1,300	5,417	7,252	11,971	2,501	1,118	3,781	169	4,180	9,514	1,409
Sales	9,399	1,292	5,413	5,980	11,971	2,379	1,118	3,708	169	3,947	9,214	1,409
Other	1,277	9	4	1,272	-	122	-	73	-	234	300	0
Operational Cost (million VND)	8,275	947	5,080	6,054	11,010	2,247	797	2,845	124	2,376	3,388	1,161
Raw materials	3,945	338	2,053	4,312	6,380	1,708	572	1,956	57	1,347	1,797	899
Hired Labor	793	150	630	112	950	113	62	197	37	168	403	79
Packaging	1,970	300	1,135	549	870	123	24	338	7	460	251	60
Facilities	71	12	54	12	183	8	10	12	2	26	108	8
Rental/leasing	49	4	31	14	211	6	-	38	0	4	18	1
Utilities	287	33	292	461	652	05	86	138	12	40	47	35
Transportation	163	25	84	47	171	64	13	66	2	115	162	13
Quality control	13	3	9	-	9	1	1	6	-	5	21	1
Taxes/fees	360	32	195	396	608	78	8	42	2	89	14	35
Finance	565	45	568	134	926	35	20	44	4	111	255	27
Other	60	6	29	17	52	6	1	9	1	10	311	4
Net revenue (million VND)	2,401	353	336	1,198	960	254	322	936	45	1,804	6,126	248

Source: IFPRI-MARD Survey of Fruit and Vegetable Processors

Table 5-39. Composition of revenue and costs by type of processors

	Canned (N=26)	Pickled (N=22)	Juice (N=4)	Chips (N=6)	Frozen (N)	Dried (N=145) (percent of value of output)	Powdered (N=5)	Jams, paste & preserves (N=13)	Candied (N=7)	Salted (N=37)	Fried (N=4)	Fresh (N=13)
Value of output	100	100	100	100	100	100	100	100	100	100	100	100
Sales	88	99	100	82	100	95	100	98	100	94	97	100
Other	12	1	0	18	-	5	-	2	-	6	3	0
Operational Cost	78	73	94	83	92	90	71	75	73	57	36	82
Raw materials	37	26	38	59	53	68	51	52	34	32	19	64
Hired Labor	7	12	12	2	8	5	6	5	22	4	4	6
Packaging	18	23	21	8	7	5	2	9	4	11	3	4
Facilities	1	1	1	0	2	0	1	0	1	1	1	1
Rental	0	0	1	0	2	0	-	1	0	0	0	0
Utilities	3	3	5	6	5	4	8	4	7	1	0	2
Transport	2	2	2	1	1	3	1	2	1	3	2	1
Qual. control	0	0	0	-	0	0	0	0	-	0	0	0
Taxes/fees	3	2	4	5	5	3	1	1	1	2	0	2
Finance	5	3	10	2	8	1	2	1	2	3	3	2
Other	1	0	1	0	0	0	0	0	0	0	0	0
Net revenue	22	27	6	17	8	10	29	25	27	43	64	18

Source: IFPRI-MARD Survey of Fruit and Vegetable Processors

Table 5-40. Value added and asset ratios by type of processor

	Canned (N=26)	Pickled (N=22)	Juice (N=4)	Chips (N=6)	Frozen (N)	Dried (N=145)	Powdered (N=5)	Jams, paste & preserves (N=13)	Candied (N=7)	Salted (N=37)	Fried (N=4)	Fresh (N=13)
Fixed assets (1000 VND)	13,571,007	1,678,835	17,670,907	922,189	19,776,671	655,883	719,174	4,464,145	263,475	3,446,668	6,416,665	853,211
Value added	6,731,490	962,389	3,363,447	2,940,130	5,590,966	793,237	546,471	1,824,867	112,180	2,833,470	7,716,137	509,949
Workers:												
Total workers	162	32	77	22	131	34	15	38	12	54	53	19
FTE workers	120	22	61	14	103	17	11	28	6	30	42	11
Family	2	1	-	1	-	3	-	2	2	2	-	1
Family FTE	1	1	-	1	-	2	-	2	1	2	-	-
Permanent	92	16	62	14	114	8	10	16	2	24	35	7
Perm. FTE	91	16	59	12	96	5	9	15	1	16	36	6
Temporary	68	15	15	7	17	23	5	20	8	27	17	11
Temp. FTE	28	5	2	2	7	10	2	12	4	13	6	5
Value added/ fixed assets	1.0	0.8	0.4	1.8	0.5	2.2	3.8	3.0	0.4	1.4	0.9	2.0
Value added/ FTE	53,192	48,931	55,089	100,495	68,124	24,713	63,841	79,395	14,061	53,015	138,020	48,932
Fixed assets/ labor ratio	159,465	89,717	363,773	60,909	247,386	138,792	84,620	232,352	74,963	85,736	159,811	140,765

Source: IFPRI-MARD Survey of Fruit and Vegetable Processors

Table 5-41. Proportion of processors by profitability levels

Profitability	2001	2000	1999	1998	1997	1996
Very good profit	2.51	3.32	4.37	3.35	2.72	3.09
Good profit	17.15	15.35	34.06	46.89	34.78	35.19
Slight profit	57.74	38.59	55.90	45.93	46.74	50.62
Breakeven	20.50	4.15	3.49	2.87	9.24	10.49
Slight loss	1.67	14.52	1.31	0.96	4.89	0.62
Big loss	0.42	14.94	0.87	0	1.63	0
Very Big Loss	0	9.13	0	0	0	0
Total	100	100	100	100	100	100

Source: IFPRI – MARD Survey of Fruit and Vegetables Processors.

Chapter 6

Fruit and vegetable exports

1 Introduction

One of the factors behind the growth of agro-industrial development and post-harvest activities is the potentially profitable opportunity to export high-value agricultural goods to high-income countries. Agricultural exports tend to stimulate agro-industry for several reasons:

- Many exported commodities must be preserved during the period until they reach consumers, a period which may be as long as several weeks if sea-freight is used. Preservation may involve anything from canning to atmosphere-controlled containers to specially designed packaging, all of which require the processing or post-harvest activities.
- Import regulations in high-income countries often impose strict requirements in terms of food safety and phyto-sanitary control. Meeting these requirements generally requires special processing, packaging, testing, and/or certification.
- Retailers and consumers in high-income countries demand that imported food meet high standards for quality, uniformity, and presentation. Again, meeting these requirements often involves additional processing, selection, or packaging.
- And high-income consumers are willing to pay extra for convenience, such as cutting, wrapping, and pre-cooking which reduce the time required for meal preparation. When this additional preparation is labor-intensive, it is often economical to carry out these post-harvest activities in the exporting country.

Although these factors are relevant for most agricultural commodities, they are particularly relevant in the case of fruits and vegetables. First, fruits and vegetables are highly perishable, so that often some form of processing or special packaging must be used to ensure that exported items do not spoil during transport. Second, sanitary and phyto-sanitary regulations are a major obstacle to fruit and vegetable exports to industrialized countries. These countries impose strict limits on pesticide residues and on the introduction of pests (such as fruit flies). These import regulations create strong incentives for post-harvest systems to test and certify the safety of fruit and vegetable exports. Third, retailers in high-income countries are particularly demanding in terms of the quality of fruits and vegetables because this is an important factor in the strong competition among retail shops for customers. Finally, the demand for convenience foods motivates fruit and vegetable processing in exporting countries. Some horticultural exporters, such as Kenya, export pre-cut vegetables in consumer-sized, pre-labeled packages.

At the same time that fruit and vegetable exports tend to stimulate agro-processing and post-harvest activities, the level of development of agro-industry in a country strongly influences the types of horticultural export markets it can penetrate. With an under-developed agro-industrial sector, fruit and vegetable exports are likely to be limited to nearby countries with minimal quality standards. In contrast, a highly developed agro-industrial sector makes it possible to penetrate distant, high-income

markets. This is important because high-income markets tend to be more profitable (paying higher unit prices) and because these markets constitute a large share of the overall market for internationally trade fruits and vegetables.

The level of agro-industrial development does not refer simply to the size and technical sophistication of the agricultural processing factories, but also to the level of development of the public and private institutions that support agricultural exports. For example, some of the fastest growing components of horticultural trade are fresh fruits and vegetables. Although large factories are not necessary, a credible system (public or private) of regulating and monitoring pesticide residues is an important ingredient in promoting fresh fruit and vegetable exports. Similarly, a system for identifying, monitoring, and controlling pests is necessary for exporting fresh horticultural products (particularly fruit) to high-income markets with strict phyto-sanitary regulations.

One might ask whether it is necessary to target high-income countries in fruits and vegetables exports, given the difficulties in penetrating these markets. To ignore these markets is to ignore a large portion of the international demand for fruits and vegetables. The industrialized countries account for about 82 percent of the international import demand for fruits and vegetables. According to FAO statistics, the industrialized countries imported US\$ 53 billion in fruits and vegetables in 1999, compared to less than US\$ 12 billion by developing countries¹.

Given the linkages between agro-industrial development and horticultural exports, understanding the patterns of fruit and vegetable exports is critical to examining the agro-industrial sector. This chapter is devoted to describing Vietnamese fruit and vegetable exports, with particular emphasis on their impact on agro-industrial development and rural incomes.

2 Historical background

Although fruits and vegetables have been grown by Vietnamese farmers for thousands of years, international trade in horticultural products dates back just a few decades. During the 1960s, 1970s, and 1980s, most of Vietnam's international trade was with the Soviet Union and other members of the east bloc. These relationships were formalized in 1978 when Vietnam joined the Council for Mutual Economic Assistance (COMECON), the body that coordinated trade among the Soviet Union and other socialist countries. Vietnam and Cuba were the only tropical countries in COMECON, so Vietnam was a supplier of tropical fruits to the Soviet Union and eastern Europe.

¹ In these calculations, we define "industrialized countries" narrowly to include the United States, Canada, Western Europe, Japan, Australia, and New Zealand, while "developing countries" include all of Latin America, the Caribbean, Eastern Europe, and Africa, and the rest of Asia.

Like other exports, fruit and vegetable exports were arranged through bilateral government-to-government contracts. Because of the lack of market-determined prices, trade among COMECON members was organized as barter trade. All exporting units were state-owned enterprises, assigned by the state to carry out the trade plans. Since much of the trade was in the form of government-to-government barter contracts, it is difficult to evaluate the monetary value of these exports. According to estimates from the Food and Agriculture Organization, fruit and vegetable exports during the late 1970s was in the range of US\$ 8-15 million per year. The unit value of these exports was just US\$ 200-300 per ton, indicating that exports were dominated by relatively bulky low-value commodities (see Table 6-1).

An early step in reforming Vietnamese agriculture was undertaken in January 1981, when the Central Committee of the Vietnamese Communist Party issued Instruction 100/CT. Under this regulation, farmers were required to produce a certain quota of rice and other basic commodities for the state, but any production beyond this amount could be sold elsewhere at market-determined prices. This policy stimulated the production of fruits and vegetables for the local market. Fruit and vegetable exports are estimated to have risen from US\$ 8 million in 1980 to US\$ 35 million in 1985 (see Table 6-1). In the latter year, Viet Nam exported almost 12 thousand tons of fresh bananas and 3.5 thousand tons of fresh pineapple to COMECON countries (GSO. 1996). Nonetheless, food shortages in the 1980s kept the emphasis of agricultural policy and investment on food production, with the goal of achieving self-sufficiency in rice and other staples.

In December 1986, the Sixth Congress of the Viet Nam Communist Party announced a new set of policy goals under the name *doi moi* (renovation). The government affirmed its intention to encourage the development of the private sector; to give greater priority to agriculture, exports, and consumer goods; to reduce inflation by correcting the budget deficits; and to promote international trade. Specific policy changes to achieve these goals in agriculture, however, were not enacted until 1988-1989.

On April 5, 1988, the Politburo issued Resolution 10 which accepted the farm household as the basic unit of agricultural production. Farmers were allowed to buy, own, and sell agricultural inputs such as machines, buffaloes, and tools. Cooperative land was assigned to farming households for 10-15 years under different forms of contracts or bidding. Furthermore, farmers were allowed to market 40 percent of contracted output. Later, compulsory government purchase of farm products was eliminated.

In the late 1980s, the government established the Vegetable and Fruit Export Corporation (Vegetexco) to consolidate state-owned enterprises involved in fruit and vegetable production for export. Vegetexco had 28 state farms with 30 thousand hectares of land. In addition, it had 15 processing plants, primarily involved in processing fruits and vegetables for export. In addition, it was given responsibility for carrying out research on the production and processing of fruits and

vegetables (Nguyen Tri Khiem et al, 2000). In addition to producing fruits and vegetables for export, Vegetexco organized other state farms and cooperatives to meet the requirements of government-to-government contracts.

The increased policy support for fruit and vegetable exports, as well as the initiation of market liberalization following the announcement of *doi moi* in 1986, contributed to an expansion in exports. Fruit and vegetable exports grew from US\$ 35 million in 1980 to US\$ 50 million in 1990 (see Table 6-1).

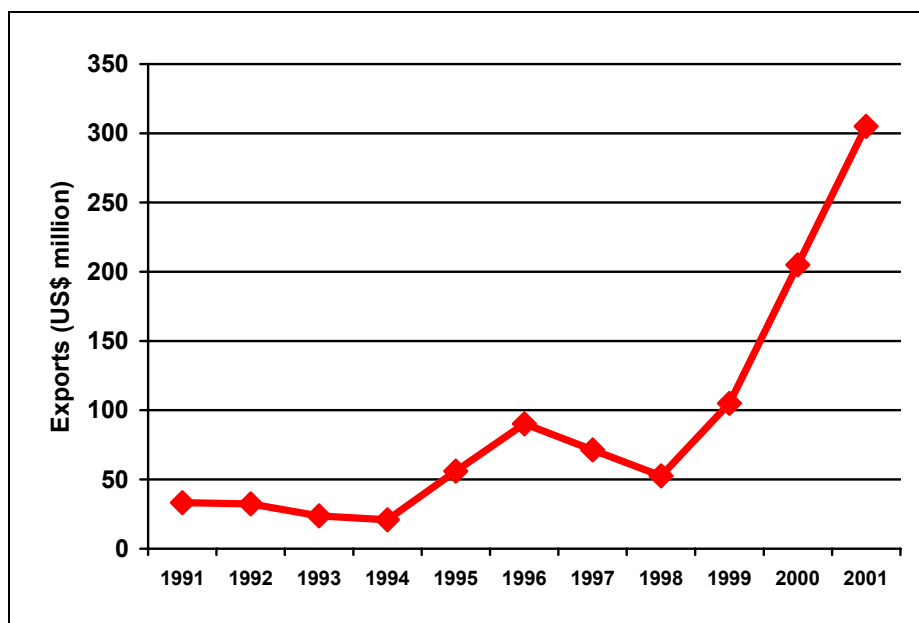
Reforms in international trade were accelerated by the crisis in the socialist countries over the period 1989-91. Political changes in these countries led to the collapse of COMECON and the disruption of trade among members. In addition, economic recessions in those countries reduced their demand for imports from Vietnam. The collapse of COMECON and the liberalization of markets required drastic adjustment on the part of state-owned enterprises exporting fruits and vegetable. First, they could no longer count on the Ministry of Agriculture to organize their supplies, but instead had to negotiate with farmers who now had other options. Second, instead of merely implementing trade agreements reached in government-to-government negotiations, they now had to find and negotiate contracts with buyers. And third, they had to identify and open new markets, particularly in Asia. As a result, Vietnamese exports of fruits and vegetables decreased sharply as exporters attempted to find alternative markets (see Table 6-1 and Table 6-2). According to one source, vegetable exports fell from 9535 tons in 1989 to just 450 tons in 1991.

Within a few years, Vietnam's fruit and vegetable exports began to increase dramatically. This was driven by three factors. First, the exchange rate was devalued successively until it reached its market level. By 1994, the Vietnamese dong was allowed to "float"². This change made exports in general much more remunerative in local currency terms. Second, export markets were further liberalized, allowing private companies to export fruits and vegetables. These enterprises now account for a growing share of fruit and vegetable exports. Third, exporter (private and state-owned) improved their ability to identify new markets and meet the volume, quality, and food safety requirements of those markets. As a result of these factors, fruit and vegetable exports rose from US\$ 56 million in 1995 to over US\$ 300 million in 2001.

Trade liberalization in the 1990s has also meant rising fruit and vegetable imports. According to FAO data, these imports rose from zero in the 1980s to around US\$ 20 million in the mid-1990s (see Table 6-1 and Figure 6-1). Although these figures do not include informal imports of fruits and vegetables from China and Thailand, it is safe to say that fruit and vegetable exports greatly exceed imports.

² This type of policy is sometimes called a "dirty float" because the government continues to intervene in foreign exchange markets to stabilize the exchange rate, using regulations regarding dollar bank accounts, the surrender for foreign exchange by exporters, and other policies to meet these ends.

Figure 6-1. Trend in exports of fruits and vegetables



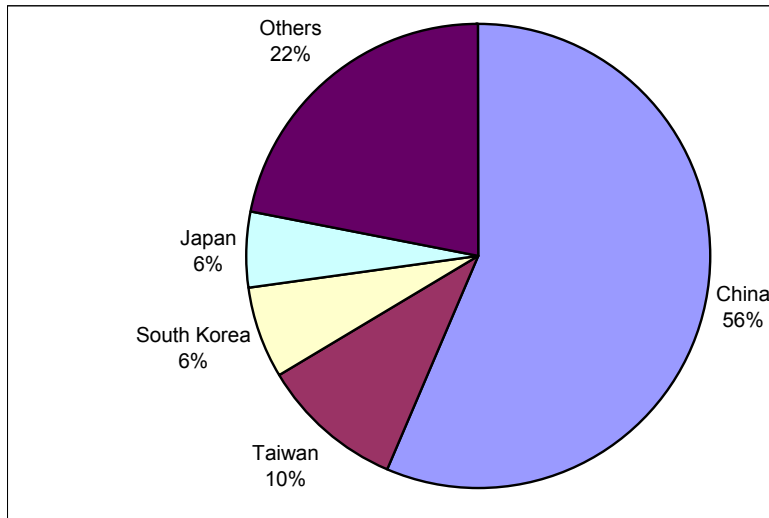
3 Fruit and vegetable export patterns

In this section, we describe some of the patterns in fruit and vegetable exports. The description is somewhat limited by the difficulty of obtaining fruit and vegetable export statistics. The General Department of Customs publishes monthly figures on total fruit and vegetable exports, and it publishes the composition by import-country. However, it does not report on the product-composition of fruit and vegetable exports, nor is it clear what products are included in “fruits and vegetables.” Data files obtained from the General Department of Customs with commodity breakdowns did not appear to be consistent with the reported total exports. More specifically, the published value of fruit and vegetable exports appears to be substantially higher than the sum of the value of exports under ISIC 07 (vegetables), 08 (fruit), and 20 (processed fruits and vegetables). The discrepancy may be related to the definition of fruits and vegetables (particularly related to cashew nuts and black pepper), to different treatment of informal exports to China, or some other factor. The generation and dissemination of fruit and vegetable export statistics by product and by country will be absolutely necessary in order to monitor progress toward the 2010 fruit and vegetable export targets. More generally, effective policy analysis is hampered by the often-difficult process of obtaining statistical data in Vietnam.

With these qualifications in mind, recent statistics indicate that China accounts for over half (56 percent) of the export sales of Vietnamese fruits and vegetables. Taiwan, South Korea, and Japan are next, accounting for 5-10 percent of export sales each. Other countries represent less than one

quarter of export sales (see Figure 6-2). Below, we examine the larger markets for Vietnamese fruits and vegetables. Each market has different patterns of seasonal demand, different commodity preferences, and different regulatory environment for fruit and vegetable trade.

Figure 6-2. Destination of Vietnamese fruit and vegetable exports



3.1 China

Though China now exports ten times as much fruits and vegetables as it imports³, fruit and vegetable exporting activity between Vietnam and China over some recent years has increased rapidly. Some of the advantages for Vietnam of the Chinese market are:

- Chinese is close, reducing the cost of transportation and making it feasible to export perishable goods.
- The Chinese market is large and growing. The large population and the rapid rate of economic growth create a growing demand for non-staple foods such as animal products and fruits and vegetables.
- Currently, the import requirements of mainland China in terms of food safety and food quality are much less strict than those of other major importers such as Japan, Taiwan, Hong Kong, and Singapore.
- Both countries have taken steps to promote trade relations, although protectionist pressure on both sides leads to occasional trade restrictions.

³ China exports over US\$ 3 billion of fruits and vegetables per year, compared to imports of US\$ 300- 400 million.

As a result, China is the largest export market for Vietnam's fruits and vegetables. In 1999, Vietnam exported US\$ 36 million of fruits and vegetables to China, accounting for about 36 percent of Vietnamese fruit and vegetable exports. In 2000, exports to China grew to US\$ 120 million, representing 56 percent of Vietnamese fruit and vegetable exports (see Table 6-3). In fact, Vietnamese fruit and vegetable exports to China may be even higher because it is difficult to estimate the value of informal border trade between the two countries.

Vietnam exports mango, litchi, longan, banana, blue dragon, coconut and pineapple to China, particularly to the border provinces of Quangdong, QuangTay and Vannam. The island province Hainam also imports coconut to produce coconut milk.

However, fruit and vegetable exports to China do face a number of problems. The stability of market's demand now is low. Thai fruits and vegetables are highly competitive, and China itself is a large fruit and vegetable exporter. Nevertheless, Vietnamese fruit and vegetable exporters feel there is the potential to expand exports to China to the range of hundreds of millions of dollars per year.

Box 6-1. Pomelo exports

Vietnam has exported pomelos to China and Singapore for many years. In recent years, however, pomelo exports have been extended to Europe. A Vietnamese exporter reports that “many of our European buyers have said our pomelos have the edge over those from other countries.”

The exports and increasing popularity of pomelos have caused its price to rise to a level twice as high as last year. This results in significant benefits to pomelo growers, particularly those who cater to the export market. Nguyen Van Trinh, a farmer in Vinh Long province in the Mekong Delta, earned VND 91 million (over US\$ 6000) from just one hectare of pomelos last year. He has already been offered VND 120 million for this year's harvest, but declined the offer expecting better prices later.

Source: Vietnam News Service, 4 July 2001.

3.2 Taiwan and South Korea

Taiwan and South Korea have become important markets for Vietnam's exporting fruits and vegetables in recent years. Taiwan is the second largest importer of Vietnamese fruits and vegetables, purchasing US\$ 20.8 million in 2000. This represents about 10 percent of Vietnamese fruit and vegetable exports. In the same year, South Korea imported US\$ 13.7 million or 6 percent of the total (see Table 6-3). These markets are favored by the relatively short distance, low transportation cost, and high standards of living which imply significant demand for fruits and vegetables. In some cases, these markets import for re-exporting. It is estimated that the fruit and vegetable export turnover to these markets can reach US\$ 100- 120 million by 2010.

3.3 Japan

In the long term, Japan is a market of great potential. Japan imports US\$ 5.8 billion in fruits and vegetables, making it the fourth largest importer in the world. The Japanese market is the most important destination for Thai fruits and vegetables, importing US\$ 50-60 million of fresh fruits and vegetables and US\$ 60-80 million of processed fruits and vegetables.

At present, Vietnam's fruit and vegetable export value to Japan is modest. In 1999 it was US\$ 11.7 million USD in 2000, much lower than the fruit and vegetable export value of Taiwan, Korea, southeast Asian countries, and China to this market (see Table 6-3). The biggest difficulty in exporting fruits and vegetables to Japan's market is that this market has very strict requirements on quality, food safety and hygiene, product forms, and styles. Moreover, there is strong competition among suppliers.

However, the potential for fruit and vegetable export to Japan is great. Experience indicates that the best way to penetrate the Japanese market is by cooperating with Japanese companies to obtain guidance in selecting crop varieties, production methods, processing, packing and delivering. Some Vietnamese companies have applied this approach, including firms in Nam Dinh, Ho Chi Minh City, and Da Lat. It is estimated that the fruit and vegetable export value to Japan can reach US\$ 150-200 million in 2010.

Box 6-2. Eggplants for export

Farmers in Tan Uyen district of Binh Duong province have been working with a Japanese company to produce eggplants (aubergines) for local consumption and for export. Under the scheme, Japan's Matsuo Company provides credit, successful strains, and standardized pesticides, while the Tan Ba cooperative provides technical assistance, and farmers implement the plan using their land and labor.

Each hectare yields about 15 tons of eggplants which sell for about VND 3000 per kg. This implies an average revenue of about VND 45 million per hectare. Production costs are high, though, and Matsuo advances farmers about VND 20 million per hectare to cover the cost of inputs.

The company handles all post-harvest operations, including salting, spicing, and cold storage. The eggplants are sold to restaurants (particularly those serving Japanese food) and supermarkets in Vietnam and some is exported directly to Japan.

Source: Vietnam News Service, October 23, 2001

3.4 ASEAN countries

The ASEAN countries are currently of modest importance to Vietnamese fruit and vegetable exporters⁴. Singapore, Malaysia, and Indonesia imported US\$ 1-2 million each of Vietnamese fruits and vegetables in 2000. The advantages in exporting fruits and vegetables to ASEAN countries are

⁴ Some sources include spices (particularly pepper) in the statistics for fruits and vegetables. Under this broader definition, Singapore is an important market, importing over US\$ 50 million in Vietnamese fruits, vegetables, and spices.

short distance, belonging to AFTA, and the liberal trading system. At the same time, the agro-ecological conditions in these countries is roughly similar to those of Vietnam, implying that these countries are often competitors rather than potential markets for Vietnamese horticulture. There is good potential for joint ventures between Vietnam and other ASEAN members to take advantage of the technology and skills from those countries and the lower-cost labor and growing conditions in Vietnam.

3.5 Other markets

Australia: Vietnam's fruit and vegetable exports to Australia are modest, amounting to US\$ 0.9 million in 1999 and US\$ 1.4 million in 2000. This market has strict requirement on quality of fruits and vegetables, and particularly strict requirements on phyto-sanitary conditions. As an island nation with many unique fauna and flora, Australia is particularly careful to control the potential spread of pests and diseases from other countries. According to experts, if cooperation way is well-exploited Australia can be considered a potential market in the future.

Europe: Because of the long distance and high transportation cost (and the availability of closer suppliers of fresh tropical products), European imports of Vietnamese horticultural products consist mainly of canned fruit and vegetables, fruit juices, and pepper. France, Netherlands, Italy, England, Switzerland and especially Germany import many canned pineapple products, fruit juices and other kinds of canned fruits and vegetables. Vietnam export fruits and vegetables and pepper to 15 countries in this region, with the value rising from US\$ 30 million in 1999 to US\$ 40 million in 2000.

Box 6-3. Export subsidies

The Ministry of Finance has announced the exporters of selected products will receive a bonus (or subsidy) for every dollar of exports they ship. In particular, exporters of rice, coffee, pork, and canned fruits and vegetables will receive a bonus worth VND 180-900 for each dollar of exports, based on the FOB value. The bonus is VND 400 for canned vegetables and VND 500 for canned fruit, representing 2.7 percent and 3.3 percent of the FOB value at current exchange rates. Fresh fruits and vegetables are not eligible for the export subsidy.

Vietnam News Service, 5 July 2001.

North America: The markets in this region are completely new for Vietnam's fruit and vegetable exporters. In some recent years, Vietnam has exported fruits and vegetables to some countries in this region. In 1999, Vietnam exported fruits and vegetables and pepper to the U.S, Canada, Mexico and Brazil with the value of US\$ 13.5 million, of which the U.S accounted for US\$ 12.2 million. This is a very small amount compared with this huge market. The United States is the largest importer of fruits and vegetables in the world, purchasing US\$ 10.0 billion in 1999.

The Vietnam-U.S. Bilateral Trade Agreement will eventually open the door for greater horticultural exports to the United States. Businessmen from the U.S. are now visiting Vietnam to explore this potential. In attempting to penetrate the U.S. market, however, Vietnam faces strict food safety and phyto-sanitary barriers, as well as competition from closer suppliers in Latin America, particularly Mexico, Central America, and Chile.

Russia and Eastern Europe: As discussed earlier, the East Bloc was the main market for Vietnamese fruits and vegetables in the 1980s. Vietnam exported cabbage, carrot, potato, onion, garlic, banana, orange and some kinds of canned fruits and vegetables. These exports have declined significantly since the collapse of COMECON. According to statistics from the Ministry of Trade, Russia accounted for about 21 percent of fruit and vegetable exports in 1996, but this figure fell to less than 7 percent in 2000. Other statistics suggest that Russia accounts for just 2 percent of Vietnamese fruit and vegetable exports (see Table 6-3) . In 1999, Vietnam exported canned fruits, dried banana and other kinds of fruits to Russia, Poland, the Ukraine, the Czech Republic, Hungary and Bulgaria. There are some signs that economic recovery in Russia and eastern Europe is stimulating imports from Vietnam. Fruit and vegetables exports from Vietnam to this region rose from US\$ 3.8 million in 1999 to US\$ 9 million in USD in 2000, with Russia accounting for about half.

Box 6-4. Baby corn exports from An Giang

Cho Moi district in southern An Giang province has become a center for growing baby corn for export. The An Giang Technical Services Company (ANTESCO) exported over 500 tons of baby corn this year and expects to expand further next year. The company provides the seed and technical assistance and buys the product for VND 1200-1500 per kg. Nguyen Van Phong, a local farmer, grew 0.1 hectares of baby corn last year and earned VND 10 million (US\$ 135). Satisfied with these returns, he has planted 0.5 hectares of baby corn this year.

Baby corn has several advantages: the production cycle is short, allowing farmers to rotate crops; it grows well in the sandy soil common in the area; and the market is relatively stable due to the presence of two buyers in the region, one in An Giang and one in Can Tho.

Source: Vietnam News Service, 23 August 2001.

4 Plans for expanding fruit and vegetable exports

Though, in some recent years, a quite high growth rate has been obtained in compared with the world Vietnam's fruit and vegetable export is now modest. According to FAO's documents Vietnam's fruit and vegetable export value accounts for only 10% of the total agricultural product export value. Meanwhile the value of some Asian countries is China and Thailand more than 20%, the Philippines nearly 40% and Portugal nearly 50%.

In September 1999, the government issued Decision No 182/1999/QD-TTg approving *"Development project for fruits, vegetables and ornamental plants to 2010"* suggested by MARD. This plan represents a clear shift in thinking on Vietnamese agricultural policy. During most of the 1990s, the focus of agricultural policy was on assuring adequate supplies of rice and the other staple foods. This policy was a response to the serious food shortages that occurred in the 1970s and 1980s. The setting of rice export quotas during much of the 1990s was a reflection of this concern. The relaxation of the rice export quota in the late 1990s indicated a growing confidence that the agricultural sector could, without central management, ensure national food security, even if poverty means that food security is not always assured at the household level. However, regulations to limit the conversion of rice to other crops continued to limit diversification away from rice.

The dramatic fall in international rice prices in the past two years has shifted the terms of debate over agricultural policy in Vietnam. There is now more widespread support for the idea that farmers should diversify away from rice into high-value agricultural commodities such as fruits, vegetables, and livestock. One manifestation of this new approach is that the regulations against conversion of riceland to other crops have been relaxed (though not eliminated). The 2010 plan to expand fruit and vegetable exports is another result of this shift in thinking.

Box 6-5. Promoting pineapple exports

Vietnam currently exports about 3000 tons of pineapple to Japan, the United States, Switzerland, and Russia. The plan, however, is to expand pineapple exports to 120,000 tons within ten years, generating export revenues of US\$ 150 million per year.

The plan involves expanding both pineapple cultivation and pineapple processing capacity. Authorities in Ha Tinh province intend to develop 10,000 hectares of pineapple (total fruit area in the province is currently less than 5,000), as well as building a new pineapple processing plant next year. In September 2001, a news report revealed that the amount of land devoted to pineapple plantations had increased 80 percent in the previous 12 months, but that even so only 70 percent of the processing capacity was being reached.

The foreign-invested Dong Giao Fruit Processing Plant in Ninh Binh is one of six major fruit and vegetable processing centers in the country. It has a juice processing facility with an output of 2000 tons per year and the company recently spent US\$ 1.7 million on a cannery plant. Furthermore, it plans to build a pineapple concentrate factor with that will increase its juice capacity to 5000 tons per year.

The country has 10 investment projects engaged in pineapple processing, worth a combined VND 346 billion (US\$ 23 million). Five of the ten produce condensed pineapple juice, with a total capacity of 20,000 tons. The industry is upgrading equipment and capacity in order to expand exports. A French-invested pineapple processing plant in Long An province has recently installed a modern production line to produce pineapple and orange juice for local and international markets.

Sources: Vietnam News Service, 18 September 2001 and 28 July 2002

Unlike other agricultural development projects such as the 1981 Food Program and the 1990 sugar plan which focused on productivity, this project is defined in terms of an export target: to

generate US\$ 1 billion in export revenue from fruits, vegetables, and ornamental plants by 2010. Other objectives include raising per capita consumption of vegetables to 85 kg and of fruits to 65 kg. The plan involves expanding fruit and vegetable planting area to about 1.31 million ha and output to 20 million tons. The output for export includes 1.4 million tons of vegetables, 1.7 millions of fruits and 1.0 billion flowers. The expectation is that the plan would generate roughly 5 million jobs (see Table 6-4).

Box 6-6. Mushroom exports

Vietnam's mushroom industry dates to the 1970s, but production and exports were minimal until the early 1990s. Production has increased from a few hundred tons in the early 1990s to 1000 tons in 1998 and 5000 tons in 1999.

Vietnam exports US\$ 8 million of mushrooms per year, making it the third largest meadow mushroom exporter in the world. More than 40 percent of the mushrooms are exported to Japan, with the remainder going to Hong Kong, Singapore, Australia, Europe, and North America.

The foreign-invested Mekofood Company, based in Can Tho province, recently changed from producing canned baby corn for export to mushroom export. Dak Lak province remains, however, the leading producer of mushrooms.

Source: Vietnam News Service, 21 January 2002.

Even in light of the rapid growth of the horticultural industry, this plan must be considered ambitious. Furthermore, the means available to the government for implementing such a program are more limited than in the past, since much of the production, processing, and export activity in the sector is carried out by the private sector. On the other hand, the project should be given credit in that, for the first time, fruit and vegetable production and export is considered one of the important priorities of the agricultural sector. This is a welcome shift away from the heavy focus on food crop production by the government. It is important to keep in mind that fruit and vegetable exports, in spite of their growth, remain a very small share of production. For example, in 1998 vegetable and bean production was about 5.1 million tons., while production of the main fruit crops was slightly less than 997 thousand tons⁵, for a total of about 6.1 million tons. By contrast, fruit and vegetable exports from Vietnam were just 247 thousand tons using the broad FAO definition which includes beans, tubers, and nuts. Thus, fruit and vegetable exports represent less than 4 percent of production (by weight). This suggests that even significant expansion of exports is possible with no change in production and only minor effect on domestic availability. In the medium term, there is no significant trade-off between exports and domestic consumption of fruits and vegetables.

⁵ The fruit production estimate includes citrus, bananas, mangoes, pineapple, lychee, longan, and rambutan.

Of course, expanding exports cannot be accomplished simply by exporting some portion of the fruits and vegetables now consumed domestically. The real challenges in implementing the 2010 plan are not getting farmers to produce sufficient quantities of the target commodities, but rather matching production with markets. This entails getting farmers to grow the right products at the right time (many markets are seasonal) at a competitive price for a well-defined destination market. In the past, too much attention has been paid to the production side with insufficient attention to the marketing and demand side.

Another issue that the 2010 plan appears not to address is the roles of the state and private sector in implementing the plan. In the past, processed fruit and vegetable exports have been dominated by state enterprises such as Vegetexco, while fresh fruit and vegetable exports have been largely organized by private traders and joint ventures. The bulk of the planned expansion in exports appears to be in fresh form, but it is not clear whether the plan involves 1) attempts to expand the capacity of state enterprises to export fresh fruits and vegetables or 2) creating an environment in which private firms can expand exports of these commodities. In the former case, the government would be mostly investing in the capacity of state enterprises to carry out this kind of trade, perhaps through subsidies for training, cold storage, inputs, and marketing facilities. The model would be the sugar self-sufficiency program or the expansion of pineapple processing capacity currently underway. In the latter case, the government would have to focus on institutional development, to create market information systems, promote the formation of business associations, improve infrastructure, facilitate the establishment and enforcement of quality standards, and efforts to improve the trace-ability of produce. The state-led version of the plan might have more immediate results, but it is less clear whether the success would be sustainable.

5 Fruit and vegetable imports

By all accounts, Vietnamese fruit and vegetable imports have risen in recent years, although statistics vary. According to the FAO, fruit and vegetable imports increased from close to zero in 1990 to US\$ 11 million in 1995 and around US\$ 20 million in recent years (FAO). According to a report by the United States Department of Agriculture (USDA), the imports of fresh and processed fruits and vegetables was at least US\$ 28 million in 1998⁶ (see Table 6-5). The main reasons for this growth are the liberalization of trade, including the lowering of tariffs and non-tariff barriers, and rising standards of living in Vietnam. Many consumers, particularly in the urban areas, now have the purchasing power to diversify their diets away from rice and to consumer more animal products and fruits and vegetables. China is the largest supplier of imported fruits and vegetables. It exports apples, pears, mandarins, and peaches to Vietnam. Durian, mango, mangosteen and star apple are imported from Thailand. The United States exports grapes and apples to Vietnam, worth US\$ 2.3

⁶ The report listed four types of fruit, while other fruits were combined into the category “Other

million according to the USDA. New Zealand supplies kiwi and apples. Most of these are sold in Hanoi, Ho Chi Minh City, and other major urban areas.

The import values may be higher than reported above because of the difficulty of monitoring informal imports of fruits and vegetables from China and from Thailand (via Cambodia). Even taking into account these informal imports, it is certain that Vietnamese fruit and vegetable exports are significantly smaller than exports of these products.

As further trade liberalization is implemented as part of the ASEAN Free Trade Agreement, fruit and vegetable growers in Vietnam will be exposed to greater competition from countries such as Thailand, Malaysia, and Indonesia. Previously, the import tariffs on fruits and vegetables were quite high (40 percent), as were the rates on other consumption goods that were not considered to be essential. When Vietnam joined ASEAN, it committed itself to join the ASEAN Free Trade Agreement, an important component of which is the Common Effective Preferential Tariff (CEPT).

Fruit and vegetable products, like other agricultural products, are considered more sensitive than other commodities so the reductions in import tariffs follow a much slower schedule. The import tax imposed on goods in general and on agricultural products (including fruits and vegetables) in particular is gradually decreasing. The tax rate for fresh fruits and vegetables has applied from 1999 to now in the framework of CEPT is 15% for ASEAN members and 30% for non-members. Processed fruits and vegetables are subject to a higher tariff rate (40 percent). According to regulation, by 2006 the import tax for fruits and vegetables imported from ASEAN countries will be no greater than 5% (see Table 6-6 through Table 6-8).

One implication of these figures import liberalization is that fresh fruit and vegetable producers in Vietnam will face a smaller shock related to import competition than will fruit and vegetable processors. The importation of fresh fruits and vegetables will increase somewhat with trade liberalization, affecting growers of import-competing fruit (e.g. apples), but the large reduction in protection for processors will probably have more serious adverse effect for the processing sector..

6. Conclusions

The fruit and vegetable export sector was hard hit by the collapse of COMECON and the shift toward a market economy. Exports of bananas and pineapples to east bloc countries declined sharply over the period 1989-1993.

However, the fruit and vegetable export sector has recovered well, opening up new markets in Southeast Asia and elsewhere. This transition has been facilitated by export liberalization, which has allowed private exporters to seek new markets for new products.

agricultural products”.

The past five years, there has been a significant shift in attention toward fruit and vegetable production, particularly for export. After many decades of food shortages, food security is now ensured, at least at the national level. The change from rice importer to rice exporter makes it easier to justify the diversification of agricultural production from basic staple foods such as rice to high-value commodities such as fruits and vegetables and livestock. Second, since 1998, international rice prices have fallen significantly, resulting in lower farm-gate prices in Vietnam. At the same time, the returns to growing many kinds of fruits and vegetables are quite high, providing opportunities to generate more income per hectare. Third, the support from international organizations in the restoration of deforested land and in promoting rural income generation have led to numerous programs to provide technical assistance and inputs for fruit and vegetable production. This is particularly true in the Northern Uplands (North West and North East) and in the Central Highland areas.

Agricultural statistics regarding fruit and vegetable export patterns need improvement. The data are incomplete and apparently inconsistent, perhaps due to the problem of estimating informal exports and perhaps due to differing definitions. In any case, this information is necessary to establish a baseline from which to measure progress toward the 2010 plan.

The plan to export US\$1 billion fruits and vegetables by 2010 is both promising and worrisome. It is promising that the government is devoting greater attention to strategies to expand rural income through diversification into high-value agricultural commodities. It is worrisome because it appears to resemble centralized management of the agricultural sector, in which provinces and districts will be given responsibility for reaching targets. It is also worrisome because it is not clear if this is a plan to expand the role of state enterprises in fresh fruit and vegetable exports, an areas in which international experience suggests that state enterprises are not well suited.

China has become the most important market for Vietnamese fruits and vegetables. This trade has been stimulated by import liberalization in China, the long porous national border between the two countries, and the low level of quality and sanitary requirements on the part of Chinese consumers and traders.

However, trade with China is subject to intense competition and instability related to Chinese import policy. Vietnamese traders compete with each other, and, to some degree, with Chinese traders. Changes in Chinese policy or market conditions can have a dramatic effect on marketing opportunities for Vietnamese produce.

Exports to higher-income markets such as the European Union, Australia, and the United States are small but growing. Quality requirements, packaging, and sanitary and phyto-sanitary requirements are the main impediment to these remunerative exports.

Vietnamese imports of fruits and vegetables are small compared to exports, but they are growing. Apples and grapes from New Zealand and the United States, as well as tropical fruit from Thailand, will increasingly compete with Vietnamese produce in domestic markets.

Trade liberalization under the ASEAN Free Trade Agreement will definitely benefit Vietnamese consumers. It will probably benefit farmers as well, though more research is needed.. Consumers will gain from greater variety and more competition in the sector. It is likely that farmers will gain on average because current trade patterns and low labor costs suggest that Vietnam has a comparative advantage in many fruit and vegetable commodities. The fact that the current tariffs are higher on processed fruits and vegetables than on fresh produce suggests that Vegetexco and other processors will be more adversely affected by import liberalization than farmers. However, the impact of trade liberalization in fruits and vegetables on Vietnamese farmers is an important question that merits additional research.

Table 6-1: Trends in fruit and vegetable imports and exports

Year	Imports			Exports		
	Quantity (mt)	Value (1000 \$)	Unit value (\$/mt)	Quantity (mt)	Value (1000 \$)	Unit value (\$/mt)
1975	0	0		22,138	6,205	280
1976	0	0		45,267	13,535	299
1977	0	0		50,014	10,891	218
1978	0	0		61,352	15,210	248
1979	183	45	246	40,397	12,066	299
1980	77	41	532	33,227	8,388	252
1981	0	0		44,747	17,640	394
1982	0	0		75,378	28,100	373
1983	0	0		51,250	19,000	371
1984	0	0		73,000	28,640	392
1985	0	0		104,600	35,500	339
1986	0	0		188,073	42,515	226
1987	0	0		167,408	44,513	266
1988	0	0		155,311	50,802	327
1989	19,535	2,825	145	139,809	40,562	290
1990	8,959	1,392	155	129,358	50,802	393
1991	0	0		81,373	41,192	506
1992	4,435	1,551	350	132,449	69,802	527
1993	12,172	5,136	422	108,718	52,616	484
1994	19,434	8,073	415	157,630	90,125	572
1995	17,745	11,527	650	159,379	50,562	317
1996	34,036	21,452	630	156,721	62,019	396
1997	50,203	22,861	455	145,126	166,964	1,150
1998	63,676	21,189	333	149,023	159,595	1,071
1999	68,702	19,079	278	246,987	173,771	704

Source: FAO (<http://apps.fao.org>)

Note: FAO definition of fruits & vegetables includes root crops, legumes, and tree nuts.

Table 6-2: Trends in fruit and vegetable exports

Year	Fruit and vegetable exports (1000 US\$)
1990	52.3
1991	33.2
1992	32.3
1993	23.6
1994	20.8
1995	56.1
1996	90.2
1997	71.2
1998	52.6
1999	104.9
2000	205.0
2001	305.0

Source: General Statistics Office and
Vietnam Economic News (2001).

Table 6-3: Destination of Vietnamese fruit and vegetable exports (2000)

Country	Value (1000 US\$)	Percent of total
China (mainland)	120,351	56.4
Taiwan	20,841	9.8
South Korea	13,691	6.4
Japan	11,729	5.5
Russia	4,654	2.2
Hong Kong	3,316	1.6
Holland	2,161	1.0
France	2,089	1.0
Laos	2,086	1.0
Italy	2,028	0.9
Germany	1,844	0.9
Malaysia	1,392	0.7
Indonesia	1,374	0.6
Others	25,998	12.2
Total	213,554	100.0

Source: General Department of Customs, compiled by Vietnam Economic News (2001)

Table 6-4. Plan for expanding horticultural exports to 2010

Crop	Yield (t/ha)	Export turnover (Mil.US\$)		Investment (million US\$)	Employment (1000 workers)
		2005	2010		
Vegetables & spices		200	690	408	850
Asparagus	10	50	200	90	400
Bamboo roots	13	50	150	45	60
Mushrooms	-	30	100	65	100
Beans	25	20	60	45	120
Taro	11	10	30	2	45
Tomato	40	10	30	6	30
Pepper	16.5	30	100	140	55
Other herbs		-	20	15	40
Fruits		120	350	42	155
Pineapple	40	50	150	20	60
Banana	25	30	100	8	60
Sectioned fruit	15	10	30	5	15
Litchi	10	5	10	2	5
Mango	12	5	10	2	5
Other fruits		20	50	5	10
Flowers & ornamental trees		10	60	5	110
Total		330	1100	455	1115

Source: Vietnam Economic News, No 41, 1999; p. 30.

Table 6-5. Composition of Vietnamese fruit and vegetable imports (1998)

Product	Import value (1000 US\$)	Leading supplier
Apples	10,413	China
Mandarins	5,395	China
Grapes	3,324	United States
Pears	8,837	China
Other fresh vegetables	548	China
Processed vegetables	180	China
Total	28,697	

Source: US Department of Agriculture (2001)

Note: Total does not include minor fruit imports.

Table 6-6. Vegetable tariff reduction schedule to implement ASEAN Free Trade Area

Code	Product Description	Recent tax rate	98	99	00	01	02	03	04	05	06
0701.00	Fresh or frozen potatoes	20	15	15	10	10	10	5	5	5	5
0702.00	Fresh or frozen tomatoes	20	15	15	10	10	10	5	5	5	5
0703.00	Fresh or frozen Onions and Garlics	20	15	15	10	10	10	5	5	5	5
0704.00	Fresh or frozen cabbage, cauliflower, and other kinds of eating vegetables	20	15	15	10	10	10	5	5	5	5
0705.00	Fresh and frozen lettuce and endive	20	15	15	10	10	10	5	5	5	5
0706.00	Fresh or frozen carrot, beet, sugar beet, celery, eatable bulb and root.	20	15	15	10	10	10	5	5	5	5
0707.00	Fresh or frozen cucumber	20	15	15	10	10	10	5	5	5	5
0708.00	Fresh or frozen peeled or unpeeled bean	20	15	15	10	10	10	5	5	5	5
0709.00	Other kinds of fresh or frozen vegetables	20	15	15	10	10	10	5	5	5	5
0710.00	Kinds of (cooked or uncooked) and frozen vegetables	20	15	15	10	10	10	5	5	5	5
0711.00	Kinds of temporarily stored vegetables (for example, by picking in salt or other preserving solutions) but not to eat immediately	20	15	15	10	10	10	5	5	5	5
0712.00	Dried vegetables uncut, cut, sliced, crushed or in flour without further processing	25	25	25	20	20	15	15	10	10	5
0713.00	Dried vegetables, dried peeled or unpeeled or broken bean	25	25	25	20	20	15	15	10	10	5
0714.00	Cassava, arrow- root, sweet potatoes, other similar kinds of bulb and root with high flour or Inulin content, fresh or frozen, sliced or unsliced, or formed in pills	10	7	7	7	7	7	5	5	5	5

Source: Ministry of Finance: Vietnam's tariff reduction schedule to implement AFTA, Financial Publishing House, Hanoi, February 1998.

Table 6-7. Fruit tariff reduction schedule to implement ASEAN Free Trade Area

Code	Product Description	Recent tax rate	98	99	00	01	02	03	04	05	06
0801.00	Coconut, cashew fresh or frozen, peeled or unpeeled	30	30	25	25	20	15	15	10	10	5
0802.00	Other kinds of grains, fresh or dried, peeled or unpeeled	30	30	25	25	20	15	15	10	10	5
0803.00	Bananas including plantain, fresh or dried	30	30	25	25	20	15	15	10	10	5
0804.00	Date- palm, fig, pineapple, pear, guava, mango, mangosteen, fresh or dried	30					30	30	20	15	5
0806.00	Grapes, fresh or dried	30					30	30	20	15	5
0807.00	Fresh melon (including water melon), papaw.	30					30	30	20	15	5
0808.00	Fresh apple, pear, quince	30					30	30	20	15	5
0809.00	Fresh apricot, cherry, peach, plum	30					30	30	20	15	5
0810.00	Other kinds of fresh fruits	30					30	30	20	15	5
0811.00	Kinds of fruits, grains, cooked or uncooked, frozen, added or unpadding in sugar or other sweetens.	30					30	30	20	15	5
0812.00	Kinds of temporarily stored fruits and grains (for example by salt or other preserving solutions)	20					20	20	15	15	5
0813.00	Dried fruits excluding fruits in groups from 0801 to 0806; mixture of fruits and dried fruits in this chapter	30	25	25	20	20	15	15	10	10	5
0814.00	Peel of segment fruits (lemon family), or peel of melon (including water melon), fresh, frozen, dried or temporarily stored in salt water or other preserving solutions	10	5	5	5	5	5	5	5	5	5

Source: Ministry of Finance: Vietnam's tariff reduction schedule to implement AFTA, Financial Publishing House, Hanoi, February 1998.

Table 6-8. Processed fruit and vegetable tariff reduction schedule to implement ASEAN Free Trade Area

Code	Product Description	Recent tax rate	98	99	00	01	02	03	04	05	06
2001.00	Fruits, vegetables and other eatable parts of the trees, processed or stored by vinegar and acetic acid.	40					40	30	20	15	5
2002.00	Tomatoes, processed or stored in other ways excluding vinegar and acetic acid.	40					40	30	20	15	5
2003.00	Mushrooms, processed or stored in other ways excluding by vinegar and acetic acid	40					40	30	20	15	5
2004.00	Other kinds of vegetables, processed, stored in other ways excluding by vinegar or acetic acid, or frozen	40					40	30	20	15	5
2005.00	Other kinds of vegetables processed or stored in other ways excluding by vinegar and acetic acid but not frozen	40					40	30	20	15	5
2006.00	Fruits, peel of fruits and other part of the trees stored by sugar	40					40	30	20	15	5
2007.00	Comfiture, puree, jam (mainly from lemon family), fruit juice...	40					40	30	20	15	5
2008.00	Fruits and other eatable parts of the trees stored by sugar or wine: undetailed or listed in other places	40					40	30	20	15	5
2009.00	Fruit juices (including grapes brever's grains), vegetable juices unfermented, not added with wine or sugar	40						40	25	15	5

Source: Ministry of Finance: Vietnam's tariff reduction schedule to implement AFTA, Financial Publishing House, Hanoi, February 1998.

Chapter 7

Fruit and vegetable consumption in Vietnam

1 Introduction

In this section, we examine the patterns of fruit and vegetable consumption in Vietnam. These patterns shed light on the likely shifts in demand over time as incomes rise and the share of the population living in urban areas increases. In this introduction, we describe the data used to describe fruit and vegetable consumption patterns. Section 2 examines the patterns of fruit and vegetable consumption across regions and across income categories. Section 3 describes the changes in consumption patterns between 1993 and 1998. And Section 4 presents the results of econometric analysis of the demand for fruits and vegetables.

Much of the results in this chapter are based on the 1998 Vietnam Living Standards Survey. This survey was carried out by the General Statistics Office (GSO) with technical assistance from the World Bank. It used a stratified random sample of 6000 households, designed to generate reliable results for three urban strata and seven rural strata. The three urban strata are Hanoi and Ho Chi Minh City, other cities, and towns. The seven rural strata correspond to the seven regions: Northern Uplands, Red River Delta, North Central Coast, South Central Coast, Central Highlands, Southeast, and Mekong River Delta.

Three questionnaires were used: a community questionnaire, a household questionnaire, and a price questionnaire. The 100-page household questionnaire includes a section on consumption expenditures that asks about consumption of 32 categories of food. Among the 32 food categories are six vegetable categories (beans¹, water morning glory, kohlrabi, cabbage, tomato, and “other vegetables”) and four fruit categories (oranges, bananas, mangoes, and “other fruit”). The results in this chapter focus on these ten fruit and vegetable categories, but it is important to recognize that some fruit and vegetable products may be classified elsewhere. For example, fruit and vegetable products are undoubtedly included in categories such as “cake, candy, and candied fruit,” “beverages”, and “food and drink away from home.”

We also make use of the 1993 VLSS, which used a very similar questionnaire and a similar (though somewhat smaller) sample. Comparing the two surveys allows us to examine the trends in food consumption over the 1990s. And we complement these data with an informal survey of urban retail shops to explore the range of processed fruit and vegetable products available to Vietnamese consumers.

Section 2 describes the patterns of fruit and vegetable consumption in Vietnam using the data from the 1998 Vietnam Living Standards Survey. Section 3 uses econometric demand analysis to

¹ We include beans here to allow some comparability with Vietnamese statistics, which often use the category “Vegetables and beans.”

examine the household factors that affect the demand for fruits and vegetables. Section 4 describes trends in fruit and vegetable consumption by comparing the results of the 1998 VLSS with those of the 1993 VLSS. Section 5 provides the results of an informal survey of retailer in Hanoi to better understand the range of processed fruit and vegetable products and the degree of import competition in each sector. And Section 6 summarizes the results of this chapter.

2 Consumption patterns

Fruits and vegetables are consumed by virtually all Vietnamese households. Every household in the 1998 VLSS sample consumed vegetables during the year prior to the survey, and 93 percent of them consumed fruit. The most widely consumed fruits and vegetables are morning glory (consumed by 95 percent of the households), tomato (88 percent), and bananas (87 percent). Vietnamese household consume an average of 71 kilograms of fruits and vegetables per person per year². Vegetables account for three-quarters of the total (54 kg), while fruits account for the remainder (17 kg). The most important individual products are morning glory, accounting for 31 percent of the total, and bananas, representing 17 percent. The annual value of fruit and vegetable consumption (including consumption from own production) is VND 126 thousand per person or VND 529 thousand per household. Although fruits represent just one quarter of the weight of fruit and vegetable consumption, they tend to be higher priced so they account for almost 40 percent of the value. Fruit and vegetable consumption represents about 4 percent of the total value of consumption expenditure (see Table 7-1).

We now look at some of the variation in fruit and vegetable consumption across households. As mentioned above, vegetables are consumed by virtually all Vietnamese households. Fruit consumption is almost universal in the large urban areas: 99 percent of the households in Hanoi and Ho Chi Minh City reported consuming fruit. Fruit consumption is least common in the Northern Uplands, where 79 percent report eating fruit. In the other six rural regions, the percentage of households consuming fruit was over 90 percent. Fruit consumption was also less widespread among poor households. Just 83 percent of the households in the poorest income group³ consumed fruit. This percentage rises steadily across expenditure categories, reaching 93 percent in the highest category (see Table 7-2).

The composition of fruit and vegetable consumption varies regionally as well. Beans, kohlrabi, and cabbage are more widely consumed in the North, while oranges, bananas, mangoes, and other fruit being more widely consumed in the South. The sharpest regional contrasts are found in

² It is worth noting that these figures probably exclude the consumption of fruits and vegetables consumed as part of processed goods (such as juice or jam) and that consumed outside of the home.

³ The income groups are defined in terms of per capita consumption expenditure, including the value of purchases and home production of consumption goods. We use five categories, each containing 20 percent of the households. Thus, the poorest category refers to the poorest 20 percent of Vietnamese households.

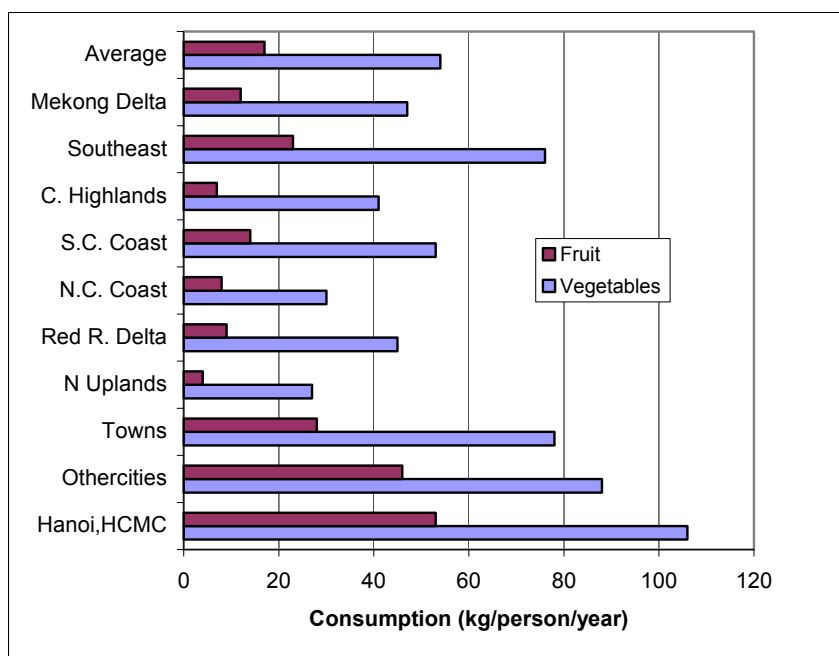
the case of kohlrabi, which is consumed by over 90 percent of the rural households in the Northern Uplands and Red River Delta, but less than 15 percent of those living in the Southeast and Mekong Delta. In urban areas, the percentage of households consuming is high for all products (see Table 7-2).

These figures allow us to calculate the average number of fruit and vegetable products consumed by different types of households, a measure of the diversity of their diets. In Hanoi and Ho Chi Minh City and in other cities, the average household consumes 8.6 of the 10 fruit and vegetable categories, indicating a diet with a relatively wide variety of fruits and vegetables. By contrast, rural households in the South Central Coast and other regions consume less than 7 of the 10, indicating a less diverse diet (see Table 7-2).

Most of the fruit and vegetable commodities are more widely consumed among richer households than poorer ones. This pattern is particularly strong for mangoes, which are consumed by 18 percent of the poorest households and more than 80 percent of the richest ones. One of the most consistent patterns in food consumption is that, as incomes rise, households diversify their diets. This is clearly demonstrated in the case of Vietnamese fruit and vegetable consumption. The poorest households consume an average of 5.6 fruit and vegetable products. This figure rises to 7.4 in the middle income category and 8.4 in the highest category (see Table 7-3).

We now examine patterns in per capita consumption of fruits and vegetables. Total consumption ranges from 31 kg/person in the Northern Uplands to 159 kg/person in the two largest cities (see Figure 7-1). Consumption tends to be higher in urban areas (106-159 kg) than in rural areas (31-99 kg), and higher in the rural south (48-99 kg) than in the rural north (31-54 kg). In addition, the relative importance of fruit is highest in urban areas (26-34 percent of the total), lower in the Southeast and Mekong Delta (20-23 percent), and lowest in the Northern Uplands and Red River Delta (13-17 percent).

Figure 7-1. Consumption of fruits and vegetables by region

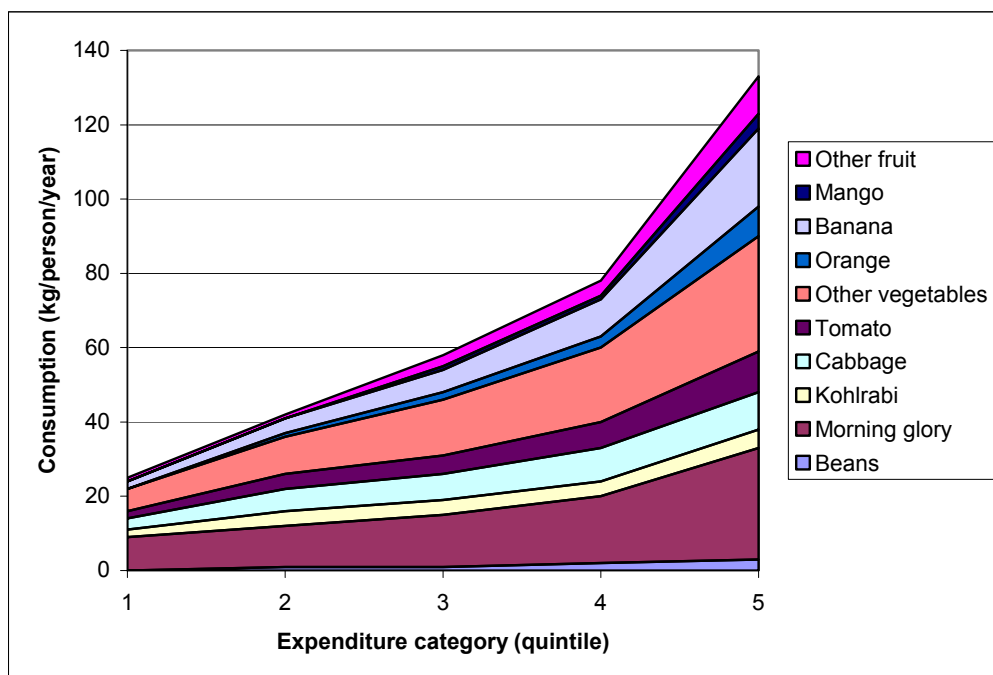


Looking at individual commodities, urban consumption is greater than rural consumption for all products except for beans, for which they are roughly similar. Southern rural consumption is higher for bananas, mangoes, and “other fruit”, while northern rural consumption is greater for cabbage and kohlrabi. These differences reflect regional differences in production (and hence prices), as well as income differences across regions (see Table 7-4).

As households become richer they consume more fruits and more vegetables. From the poorest category to the richest, per capita consumption of fruits and vegetables rises five-fold, from 26 kg to 134 kg. The increase is much stronger for fruit, which increases 14-fold, than for vegetables, which rises 4-fold. As a result, the share of fruits in the total rises from 12 percent to 32 percent. Demand for oranges, bananas, and mangoes rises strongly as income rises, but that of kohlrabi rises much more slowly (see Table 7-5 and Figure 7-2).

The value of fruit and vegetable consumption by region is shown in Table 7-6 and the same figures by expenditure category are presented in Table 7-7. Although fruits represent less than one-quarter of the volume of fruit and vegetable consumption, they account for 40 percent of the value of fruit and vegetable consumption. This is because the value per kilogram is, on average, higher for fruits than for vegetables. In other ways, these tables show similar patterns to those of per capita consumption. As income rises, households spend more on fruits and vegetables. Spending households in the highest income category is several time greater than spending by households in the lowest category. Urban households spend the most on fruits and vegetables, and rural households in the Northern Uplands and North Central Coast spend the least.

Figure 7-2. Consumption of fruits and vegetables by expenditure category



As noted above, fruit and vegetable “expenditure” includes both purchases and the value of home produced fruits and vegetables. The share of fruit and vegetable consumption that comes from home production is shown in Table 7-8. Overall, 43 percent of the fruits and vegetables consumed by Vietnamese households are from own production. The home production share is higher for fruits (54 percent) than for vegetables. It is interesting that even among “urban” households, 8 percent of fruits and vegetables are from own consumption⁴. Home consumption plays a much more important role in rural areas, particularly in the North. Not surprisingly, home production plays a minor role for urban households, accounting for just 8 percent of consumption. By contrast, home production represents 72 percent of fruit and vegetable consumption in the rural Northern Uplands and at least 60 percent elsewhere in the rural North. In the rural Southeast, households get just 27 percent of their fruits and vegetables from home production.

Home production of fruits and vegetables is a much more important source of fruits and vegetables for poor households than for higher-income households. The share of fruits and vegetables from home production falls from 67 percent in the poorest category to just 18 percent in the richest category (see Table 7-8). In the next section, we use regression analysis to estimate the income elasticities for each commodity.

⁴ Recall that “urban” households include those in Hanoi, Ho Chi Minh City, other cities, and towns. Urban fruit and vegetable production may take the form of gardens in town or plots outside the city that the household maintains rights to.

Box 7-1. Fruit juice demand

The domestic demand for packaged fruit juice is expected to grow as incomes rise, but this does not guarantee profits for fruit juice makers. British Delta Juice established the first large-scale modern fruit juice factory in the Mekong River Delta. The company produced guava, papaya, and pineapple juices under the brand name Ole. The processing plant was designed to produce 4 million liters of juice and 3000 tons of pineapple juice concentrate per year. The high price of raw materials and lack of demand, however, forced the company into bankruptcy. The factory is being modified by its new owners to produce canned formula milk instead.

It is estimated that Vietnamese consumers drink 4 billion liters of fruit juice per year. Nonetheless, fruit juice forms just 5 percent of the overall demand for beverages. Tea is said to account for 42 percent of the purchased beverage market, while beer represents another 18 percent and milk products 10 percent. The demand for fruit juice is predicted to grow rapidly in the coming years, but profitability of juice production is not assured

Source: Vietnam News Service, 23 June 2001.

3 Determinants of fruit and vegetable demand

In this section, we use regression analysis and the data from the Vietnam Living Standards Survey (VLSS) to examine the factors that influence the demand for fruits and vegetables. We use the Working-Lessor functional form, which takes the following form:

$$y = \alpha + \beta \ln(x) + \sum_i \gamma_i Z_i + e.$$

where y is the share of the budget spent on a commodity, x is the total per capita expenditure of the household, Z_i are a set of household characteristics that may affect demand, and e is the residual which represents the effect of variables not included in the equation. The parameters α , β , and γ_i are estimated based on the data. The income elasticity (η) is calculated using the coefficient on per capita expenditure (β) and the budget share (y) as follows:

$$\eta = 1 + \frac{\beta}{y}$$

Since the budget share (y) varies across households, the normal practice is to evaluate the income elasticity at the average budget share.

The estimated income elasticities of fruits and vegetables as a whole is 0.74 (see Table 7-9). This means that a 10 percent increase in per capita income is associated with a 7.4 percent increase in spending on fruits and vegetables⁵. The fact that it is less than 1.0 implies that the budget share of fruits and vegetables declines as income rises. This is consistent with Engle's Law which states that the share of household budgets allocated to food tends to decline as incomes rise. Nonetheless, the income elasticity of fruits and vegetables is higher than that of staple foods such as rice, maize, and cassava.

⁵ This pattern describes the differences between food consumption patterns of rich and poor households in 1998, but income elasticities are often used to make projections about changes in food consumption over time as household income rises.

The results of the demand analysis indicate that fruits and vegetables have different consumption patterns. The income elasticity of vegetables is 0.54, while that of fruits is 1.09 (see Table 7-9). This implies that as household income rises, the budget share allocated to vegetables declines, while the budget share of fruits rises slightly. In particular, a 10 percent increase in income is associated with a 5 percent increase in vegetable demand and a 1.1 percent increase in fruit demand. If we assume that consumption patterns of higher-income households today reflect the direction that consumption will go as incomes rise, then it is likely that the demand for fruits by Vietnamese consumers will grow twice as fast as the demand for vegetables.

We have also estimated the income elasticities for individual fruits and vegetables. Orange and mango have the highest income elasticities (1.45 and 1.38, respectively), suggesting that as Vietnamese household incomes rise, the budget share of these goods will rise. In other words, the demand for these commodities by Vietnamese consumers will grow more quickly than per capita income. For example, if per capita income rises 5 percent annually, then the demand for oranges is likely to grow at 7.2 percent per year, while mango demand increases at 6.9 percent per year (see Table 7-9).

At the other extreme, water morning glory and kohlrabi have the lowest income elasticities (0.40 and 0.46, respectively). These elasticities imply that, given a 5 percent growth rate in per capita income, the demand for these two vegetables will grow at less than 2.5 percent per year. In general, the income elasticities of vegetables are lower than those of fruits. Among the vegetables, tomatoes have the highest income elasticity (0.88), and, among the fruit, bananas have the lowest income elasticity (0.79).

Table 7-10 through Table 7-21 provide more detail on the factors that influence the demand for fruits and vegetables. In most of the tables, the coefficient on household size is negative and statistically significant. This indicates that, other things being equal, households with many members allocate a smaller share of their budgets to fruits and vegetables. If there are economies of scale in household size, then larger households with the same per capita expenditure may be “better off” in some sense. This helps explain the negative coefficient on household size in the case of vegetables, but not in the case of fruit.

The number of years of education of the head of the household and the spouse has a negative effect on the budget shares allocated to all vegetables, “other vegetables,” and bananas. It is difficult to interpret this finding. Perhaps higher levels of education are associated with changes in food preferences away from vegetables. Alternatively, an educated spouse may be more likely to be employed outside the household, thus putting a premium on foods that can be prepared quickly. As noted above, processed fruits and vegetable consumption is probably not captured by the commodity categories in the VLSS.

Another demographic pattern in Table 7-10 through Table 7-21 is that households with a large proportion of older residence allocate a larger share of their budgets on fruit, particularly oranges,

bananas, and mangoes. This may be a generational difference in food preferences, where older people prefer fruit while younger ones consume processed sweets.

Regional factors also affect fruit and vegetable demand, although they may simply be reflecting differences in prices across regions. The base region is Hanoi and Ho Chi Minh City, so the coefficients represent the differences in budget share in each region relative to the two main cities of Vietnam. In general, the share of the budget allocated to fruits and vegetables is less in towns and in rural areas than in the major cities, even after controlling for differences in per capita income and household composition. Several exceptions are worth noting. Demand for kohlrabi is actually higher in the rural Northern Uplands and rural Red River Delta than in the major cities, other things being equal. Similarly, cabbage demand in the Southeast is no less than in the major cities. Finally, demand for mangoes and “other fruit” is greater in the Southeast and Mekong Delta than in the major cities. All of these cases concern fruit and vegetable demand in the main production zone, where prices are probably lower.

4 Changes in fruit and vegetable consumption

We can examine changes in fruit and vegetable consumption over time by comparing the results of the 1993 Vietnam Living Standards Survey (VLSS) with the 1998 VLSS. Both surveys use stratified random samples. The 1993 VLSS had a sample of 4800 households, while the 1998 VLSS used the earlier sample plus 1200 new households, for a total sample size of 6000 households. The questionnaires used in the two surveys are almost identical, improving the comparability of the results.

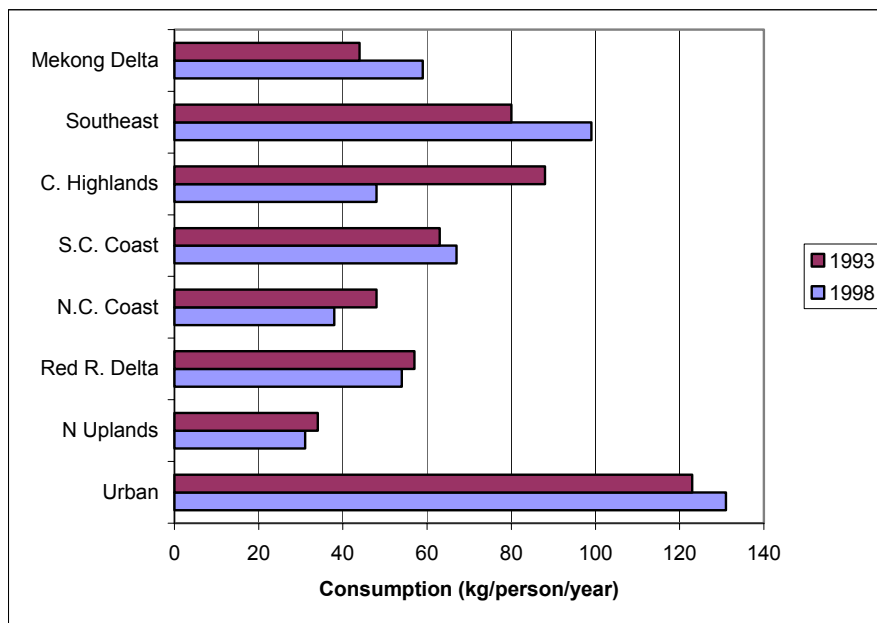
Table 7-22 compares the quantity of fruits and vegetables consumed in 1993 and 1998 by expenditure category. Overall, fruit and vegetable consumption has increased about 8 percent, rising from 66 kg/person/year to 71 kg/person/year. Vegetable consumption has remained almost unchanged, rising from 53 to 54 kg/person/year, while fruit consumption has increased from 13 to 17 kg/person/year or 31 percent. The growth in vegetable consumption is less than we would have expected based on income growth over 1993-98 and the income elasticities estimated in the previous section, but the growth in fruit consumption is roughly equal to what we would expect.

The results for different expenditure categories indicate that fruit and vegetable consumption rises with income. This is true individually for fruits and for vegetables, and it is true whether we are looking at the 1993 patterns or the 1998 pattern. For example, in 1993 fruit and vegetable consumption rose from 31 kg/person/year among the poorest category to 126 kg/person/year. A similar pattern arises in 1998, in which consumption rises from 26 kg among the poorest households to 134 kg among the richest. It is somewhat worrisome that vegetable consumption has declined in the lower-income categories. Fruit consumption, on the other hand, has increased in every income category (see Table 7-22).

Of the ten categories of fruits and vegetables in the VLSS, the average Vietnamese household consumed 7.3 of them in 1998, up from 5.8 in 1993. This indicates that Vietnamese consumers are consuming a more diverse set of fruits and vegetables than they used to. Factors behind this trend include the growth in household income and liberalization of import markets. The average number of fruits and vegetables consumed in 1998 rises from 5.6 among the poorest expenditure category to 8.4 among the richest. It is interesting to note that the increasing diversity of fruit and vegetable consumption occurs at all income levels. Poor households, as well as rich, have increased the diversity of fruits and vegetables consumed (see Table 7-22).

The regional patterns in changes in fruit and vegetable consumption are shown in Table 7-23 and Figure 7-3. In urban areas, vegetable consumption has increased just 3.4 percent, rising from 88 kg/person to 91 kg/person. In contrast, urban fruit consumption has increased 20 percent, rising from 34 kg/person to 41 kg/person. In rural areas, vegetable consumption has declined somewhat in the North and increased significantly in the Southeast and in the Mekong Delta. Fruit consumption among rural households in the North has increased sharply from a low base, while trends in the South are mixed with reductions in the Central Highlands and the Mekong Delta.

Figure 7-3. Change in consumption of fruits and vegetables by region

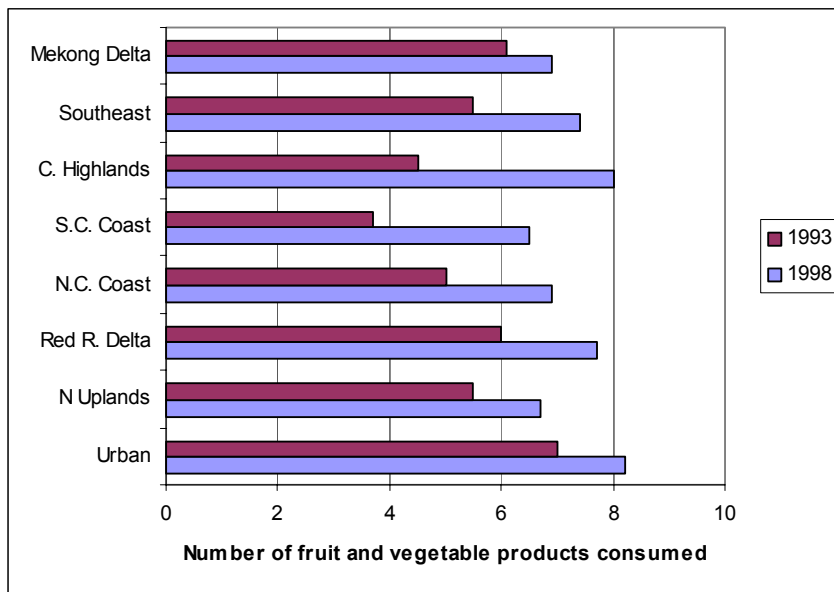


In summary, all three regions in the North rural consumers are substituting away from vegetables and toward fruits, though vegetables are still dominant. In the Mekong Delta, the reverse is occurring: rural households are substituting away from fruit and toward vegetables. This can be

seen as part of a transformation from an economy where food consumption patterns are strongly affected by local production to a more integrated national economy where food consumption patterns are more similar across regions.

Table 7-23 and Figure 7-4 also reveal that the rising diversity of fruit and vegetable consumption is widespread, occurring in both urban and rural areas and in all seven regions of the country. In proportionate terms, the diversification of fruit and vegetable consumption is occurring more strongly in rural areas than in urban areas.

Figure 7-4. Changes in diversity of fruit and vegetable consumption



Looking at changes in fruit and vegetable consumption by commodity, we see that all ten commodity are consumed by a larger percentage of Vietnamese consumers in 1998 than in 1993 (see Table 7-24). In particular, mangoes and oranges have gone from being products consumed by barely one-third of the Vietnamese households to being consumed by roughly one-half or more.

The per capita consumption of all four fruit categories increased significantly between 1993 and 1998, as would be expected from their relatively high income elasticities. The vegetables show a more mixed pattern, with increased consumption of water morning glory and “other vegetables” and decreased consumption of cabbage and kohlrabi (see Table 7-24). Based on income growth and the income elasticities presented in the previous section, we would expect slow growth in the demand for cabbage and kohlrabi, but we would not expect demand to fall. Clearly, income growth is not the only factor affecting fruit and vegetable demand. The most likely explanation is that the prices and availability of other fruits and vegetables have improved as a result of import liberalization and improved domestic marketing, causing consumers to substitute away from cabbage and kohlrabi.

5 Retail marketing of fruits and vegetables

The VLSS describes the consumption patterns for ten categories of fruits and vegetables, but this is a great simplification of the fruit and vegetable markets in Vietnam. First, the actual number of fruit and vegetable products available to Vietnamese consumers is probably in the hundred. In addition, as mentioned above, the VLSS categories tend to focus on fresh fruits and vegetables, while processed goods are part of general categories such as “beverages” and “other”. In order to get a better understanding of the range of processed fruit and vegetable products available to Vietnamese consumers, IFPRI carried out an informal survey of retail shops in Hanoi. The survey was carried out in late 2001 and covered five supermarkets, ten small shops, and ten open-air stalls. In addition to providing an idea of the range of products available, it is useful in understanding the competition between imported and domestically-produced fruit and vegetable products.

Box 7-2. Food safety in Vietnam

Nutrition experts say that improvements in the standard of living in Vietnam have raised the quality of diets and expanded their knowledge of nutrition issues. In particular, consumers are giving a higher priority to food safety and hygiene. Plans call for more random food safety inspections at food manufacturers and restaurants, as well as expanded education programs.

Statistics for the period 1997-2000 indicate that there have been 1400 outbreaks of food poisoning reported, affecting 25,500 people and killing 217 of them. In 2000 alone, there were 213 cases of food poisoning reported, including 60 deaths. According to food safety inspectors, food poisoning costs the country an estimated VND 500 billion per year.

Furthermore, it is likely that many incidents of food poisoning go unreported due to either incompetence or secret agreements between food producers and their victims.

Random testing indicates that about 4.2 percent of the vegetables sold in Ho Chi Minh City markets contain measurable pesticide residues.

Source: Vietnam News Service, 9 October 2001.

5.1 Fresh fruits and vegetables

Fresh fruits and vegetables are sold by ambulatory vendors, sidewalk vendors, in market stalls, and in specialized stores, though most supermarkets also sell a selected assortment of fresh fruits and vegetables. While available fresh vegetables are almost exclusively produced domestically, fresh fruits sold in Vietnam are produced both in Vietnam and abroad. Several kind of fresh fruits, such as mandarins, apples, grapes, oranges, and melons, are imported from China. Some small quantities of fresh fruits, mainly sold in supermarkets and indoor stores, are imported from other countries. Examples include apples and grapes from the United States, apples from New Zealand, mangoes and tamarind from Thailand, pumpkin from South Korea, and kiwi from Italy.

5.2 Processed fruits

The main forms of processed fruit are juice, candied fruit, jams, dried fruit, and some canned fruit. Fruit syrup is also being produced and sold in Vietnam. A large choice of fruit juices is available in supermarkets, as well as in many smaller shops. Examples include apple, orange, pineapple, litchi, rambutan, peach, and mango juice. The most common fruit juices are orange, apple and mixed fruit juices, which are available from a variety of brands. There are two dominant domestic brands and a number of imported brands. In addition, there is an increasing number of high-quality specialized fruit juices produced domestically. Clearly, the domestic market leader in that field is Vinamilk, followed by Delta. These companies market a range of juices including somewhat more exotic types such as mango juice, guava juice, and sour sop juice. Sweetened fruit juice drinks in cans are mainly imported from Malaysia, Thailand and Singapore, though a few domestic products are also available. Domestically produced fruit-flavored yoghurt drinks are available mainly in supermarkets.

A large choice of canned and jarred fruits is available in shops and supermarkets. Though the majority of these products are imported, there are a few domestically produced canned and jarred products. Domestic products included canned apricots, litchi, rambutan, cherry and pineapple.

Candied and dried fruits are very popular in Vietnam, and are sold in market stalls, shops and in supermarkets. Candied fruits include apricot, plum, star fruit, mandarin, apple, canari, pumpkin, coconut, jackfruit, and banana. Equally, a large variety of dried fruits, in varying qualities though, is available: persimmon, longan, litchi, apple, strawberry, jackfruit, banana and many others. Most of the candied and dried fruits are produced domestically. Only a small selection of dried fruits such as prune, apricot, and apple are imported. These are imported from China, France and Australia.

Fruit jam, mainly sold in supermarkets, is largely imported, though the number of domestically produced jams seems to be increasing. The largest domestic producer appears to be Les Vergers du Mekong, offering a variety of fruit jams such as strawberry, plum, pineapple, guava, raspberry, pomelo, mandarin, and papaya. A few small shops also sell home-made jams made from pineapple, plums, oranges, and other fruit.

Fruit syrups are produced domestically and include mainly products made from orange, grape, strawberry, pineapple, litchi, rambutan, apple and peach. Only one domestic brand was available in supermarkets and in a few shops.

5.3 Processed vegetables

Most of the processed vegetables are canned or pickled, though a few juiced and some dried vegetables are available, too. Popular canned vegetables include baby corn, sweet corn, mushroom, bamboo shoot, baby cucumber, mixed vegetables, and green peas. Those products are produced domestically, with Vegetexco being a main supplier, as well as imported from a number of countries. Local manufacturers mainly can mushrooms, bamboo shoots, baby corn, and sweet corn, imported

brands, but additional products can be found as well such as mixed vegetables, green peas, a large variety of beans, and asparagus. Most canned tomato products found in local shops and supermarkets are imported. While supermarkets normally carry a large selection of canned vegetables, a good selection is also available in many smaller and medium size shops.

Availability of pickled vegetables is increasing. Several smaller shops, as well as most supermarkets, offer a variety of mainly domestically produced and often newly introduced pickled vegetables. Products include baby corn, mushroom, bamboo shoot, baby cucumber, and eggplant. Most pickled vegetables are local brands, though a few imported brands, mainly from China and Japan, are also available, but only in a few supermarkets.

Tomato juice produced by Vinamilk is available in most supermarkets. Other vegetable juices (e.g. carrot juice) were not seen during the survey. Imported carrot juice was available in supermarkets only.

With the exception of products such as garlic, onion, and mushrooms, dried vegetables were rare. However, dried and candied ginger is rather popular in Vietnam, and it is available in market stalls, as well as in supermarkets.

Frozen vegetables are available only in limited quantities and in a limited range of products. Only a few products such as sweet corn, green peas, and some legumes, could be found. While most of these products are imported from different European countries and Australia, a few products are also being produced domestically. The most common domestic frozen vegetable products were frozen legumes from a producer in Dalat. However, these products are available only in a few supermarkets and some specialized up-marked shops.

6 Summary

Fruits and vegetables are consumed by virtually all households in Vietnam. All households in the 1998 Vietnam Living Standards Survey report vegetable consumption. Over 90 percent report fruit consumption in all household groups except the poorest household category (83 percent of which consume fruit) and among households in the Northern Uplands (79 percent).

Per capita consumption of fruits and vegetables is 71 kg, roughly three-quarters of which are vegetables. The annual value of fruit and vegetable consumption (including home consumption) is VND 126,000 per person or VND 529,000 per household. This represents about 4 percent of the household budget.

Fruit and vegetable consumption patterns are influenced by local production patterns. for example, beans, kohlrabi, and cabbage being more widely consumed in the North, while mangoes, bananas, oranges, and other fruit are more widely consumed in the South.

As incomes rise, the consumption of all fruits and vegetables rise, but some more than others. The consumption of oranges, mangoes, and “other fruit” tend to increase rapidly as income rises. In contrast, the demand for kohlrabi and water morning glory is less sensitive to income growth.

Econometric analysis indicates that the income elasticity of vegetables is 0.54, while that of fruits is 1.09. This implies that the per capita consumption of vegetables will grow at roughly half the rate of per capita income, while that of fruits will slightly outpace income growth. Higher fruit consumption seems to be related to the number of older members of a household, while higher vegetable consumption appears to be associated with lower level of education by the spouse of the head of household.

About 43 percent of the fruits and vegetables consumed by Vietnamese households are produced at home. This percentage is higher for fruits, for rural households, and for households living in the North.

Over the 1990s, fruit and vegetable consumption patterns have become more uniform and less subject to local production. According to a comparison of the 1993 and 1998 VLSS, fruit consumption has increased in the North at the expense of vegetable consumption. At the same time, vegetable consumption has increased at the expense of fruit consumption in the Mekong Delta.

Overall fruit and vegetable consumption has increased in urban areas and in the rural South, but it has declined slightly in the rural North and in the Central Highlands. The decline in vegetable consumption was greater than the increase in fruit consumption.

The average number of different fruit and vegetable products consumed increased markedly between 1993 and 1998. This is true for all regions and for all income groups. The greater diversity in fruit and vegetable consumption is probably the result of import liberalization and improved domestic marketing.

According to an informal survey of urban retail outlets, a wide range of fresh fruits and vegetables are available. Almost all the vegetables are domestic, but there is a small but increasing share of imported fruit, including apples, grapes, and citrus, imported from China and elsewhere. Domestic fruit juice producers offer a wide range of products, though there is some import competition. Candied and dried fruit are popular and the market for these products is dominated by domestic producers. Fruit jams are mostly imported, but domestic companies are breaking into the market. A range of canned vegetables are available in supermarkets but do not appear to be widely consumed. Most are domestic, except for canned tomato products, which are often from Thailand or elsewhere. Frozen vegetables are available in a few supermarkets, but are not widely consumed in Vietnam. .

Table 7-1. Summary of fruit and vegetable consumption patterns

Product	Pct of households consuming	Quantity (kg/year)		Value (VND 1000/year)	
		Per person	Per household	Per person	Per household
Beans	55	1	6	5	22
Morning glory	95	17	72	16	70
Kohlrabi	54	4	15	5	22
Cabbage	82	7	30	9	37
Tomato	88	6	26	11	45
Other vegetables	91	17	75	29	125
Orange	59	3	12	11	41
Banana	87	9	37	16	68
Mango	49	1	6	7	31
Other fruit	73	4	17	16	68
All vegetables	100	54	224	76	321
All fruit	93	17	72	50	208
Fruits & vegetables	100	71	296	126	529

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-2:. Percentage of households consuming each product by region

Product	Region									
	Hanoi, Other		Town	NU	RRD	NCC	SCC	CH	SE	MRD
	HCMC	cities								
Beans	64	64	52	54	62	57	50	65	62	38
Morning glory	97	99	96	91	98	98	90	79	94	94
Kohlrabi	42	69	45	91	96	68	19	59	12	3
Cabbage	94	92	90	90	94	70	47	78	79	78
Tomato	98	99	95	85	94	78	76	79	89	87
Other vegetables	94	93	91	81	84	91	98	97	98	97
Orange	92	92	68	33	65	57	46	70	60	48
Banana	97	96	87	72	89	88	92	95	93	85
Mango	89	76	68	17	27	22	49	83	65	72
Other fruit	90	83	82	53	57	59	83	91	90	88
All vegetables	100	100	100	100	100	100	00	100	100	100
All fruit	99	98	93	79	92	94	97	99	97	94
Fruits & vegetables	100	100	100	100	100	100	100	100	100	100
Avg nbr consumed	8.6	8.6	7.7	6.7	7.7	6.9	6.5	8.0	7.4	6.9

Source: Analysis of the 1998 Vietnam Living Standards Survey,

Table 7-3: . Percentage of households consuming each product by expenditure quintile

Product	Expenditure quintile					
	Poorest	2	3	4	Richest	Total
Beans	38	50	57	59	65	55
Morning glory	86	96	97	96	97	95
Kohlrabi	53	61	58	54	47	54
Cabbage	68	81	83	86	90	82
Tomato	67	87	90	94	98	88
Other vegetables	83	89	91	93	95	91
Orange	26	45	59	70	86	59
Banana	74	85	89	90	94	87
Mango	18	32	45	58	82	49
Other fruit	49	65	74	79	90	73
All vegetables	100	100	100	100	100	100
All fruit	83	90	94	95	98	93
Fruits & vegetables	100	100	100	100	100	100
Avg. nbr. consumed	5.6	6.9	7.4	7.8	8.4	7.3

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-4 . Per capita consumption by region

	Region									
	Hanoi, HCMC	Other cities	Towns	NU	RRD	NCC	SCC	CH	SE	MRD
	(kg/person/year)									
Beans	2	2	2	1	2	1	2	1	2	1
Morning glory	39	34	25	8	12	10	24	19	24	10
Kohlrabi	6	6	5	5	8	4	1	2	0	0
Cabbage	11	11	10	6	10	5	3	8	7	4
Tomato	11	11	9	4	7	3	3	5	8	6
Other vegetables	37	24	27	3	6	7	20	6	35	26
Orange	10	10	5	1	3	1	1	2	3	1
Banana	25	22	16	2	4	5	9	3	12	6
Mango	5	3	2	0	0	0	1	1	2	1
Other fruit	13	11	5	1	2	2	3	1	6	4
All vegetables	106	88	78	27	45	30	53	41	76	47
All fruit	53	46	28	4	9	8	14	7	23	12
Fruits & vegetables	159	134	106	31	54	38	67	48	99	59

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-5. Per capita consumption by expenditure quintile

Product	Expenditure quintile					Total
	Poorest	2	3	4	Richest	
	(kg/person/year)					
Beans	0	1	1	2	3	1
Morning glory	9	11	14	18	30	17
Kohlrabi	2	4	4	4	5	4
Cabbage	3	6	7	9	10	7
Tomato	2	4	5	7	11	6
Other vegetables	6	10	15	20	31	17
Orange	0	1	2	3	8	3
Banana	2	4	6	10	21	9
Mango	0	0	1	1	4	1
Other fruit	1	1	3	4	10	4
All vegetables	23	36	47	60	91	54
All fruit	3	6	11	17	43	17
Fruits & vegetables	26	42	58	77	134	71

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-6. Per capita value of consumption by region

Product	Region									
	H&H	Cities	Towns	NU	RRD	NCC	SCC	CH	SE	MRD
(VND 1000/person/year)										
Beans	7	7	6	4	6	4	5	5	6	3
Morning glory	33	26	18	11	16	12	15	14	20	12
Kohlrabi	8	7	5	8	10	5	1	3	1	0
Cabbage	15	14	10	9	9	6	4	9	10	7
Tomato	26	21	15	6	8	5	7	9	17	10
Other vegetables	52	35	32	12	14	17	50	22	45	38
Orange	39	31	14	3	9	6	4	4	10	4
Banana	38	26	19	10	14	13	12	7	19	13
Mango	27	15	11	1	2	2	3	6	10	9
Other fruit	33	30	18	10	10	9	12	11	20	19
All vegetables	141	110	86	50	63	49	82	62	99	70
All fruit	137	102	62	24	35	30	31	28	59	45
Fruits & vegetables	278	212	148	74	98	79	113	90	158	115

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-7. Per capita value of consumption by expenditure quintile

Product	Expenditure quintile					Total
	Poorest	2	3	4	Richest	
(VND 1000/person/year)						
Beans	2	3	5	6	8	5
Morning glory	9	13	15	17	25	16
Kohlrabi	3	5	6	6	6	5
Cabbage	4	7	8	9	14	9
Tomato	3	6	8	12	22	11
Other vegetables	15	19	27	33	45	29
Orange	1	3	5	9	31	11
Banana	7	10	13	17	31	16
Mango	1	2	4	7	20	7
Other fruit	4	8	13	18	32	16
All vegetables	36	53	69	83	120	75
All fruit	13	23	35	51	114	50
Fruits & vegetables	49	76	104	134	234	125

Source: Analysis of the 1998 Vietnam Living Standards Survey

Table 7-8. Share of consumption from home production

	Vegetables	Fruit	Fruits and vegetables
Region			
Urban	6	11	8
NU	67	86	72
RRD	54	78	60
NCC	63	76	67
SCC	47	58	49
CH	26	74	42
SE	16	50	27
MRD	31	65	43
Expenditure category			
Poorest	61	84	67
2	50	75	56
3	44	66	50
4	34	59	42
Richest	14	25	18
Total	38	54	43

Source: Analysis of the 1998 Vietnam Living Standards Survey.

Table 7-9. Expenditure elasticities of fruits and vegetables

Product	Expenditure elasticity
Water morning glory	0.40
Kohlrabi	0.46
Cabbage	0.70
Tomato	0.88
Other vegetables	0.48
Orange	1.45
Banana	0.79
Mango	1.38
Other fruit	1.12
All vegetables	0.54
All fruits	1.09
Fruits & vegetables	0.74

Source: Regression analysis using Working-Lesser model with data from the 1998 Vietnam Living Standards Survey. Consumption expenditure used as a proxy for income.

Table 7-10. Determinants of demand for fruits and vegetables

Dependent variable: Budget share of fruits and vegetables			
R ²	0.10		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0107307	.0007417	-14.47***
Household size	-.0027936	.0001937	-14.42***
Household head sex	-.0012361	.0007924	- 1.56
household head education	-.0000899	.0000987	- 0.91
Spouse education	-.0003073	.0000907	- 3.39***
Children share (1-15 yrs)	-.0010641	.0017295	- 0.62
Elderly share (>64 yrs)	.0028191	.0015489	1.82
Other cities dummy	-.0022414	.0015175	- 1.48
Towns dummy	-.0083728	.0014769	- 5.67***
N Upland dummy	-.0176251	.0016467	-10.70***
Red R Delta dummy	-.0125325	.0015777	- 7.94***
NC Coast dummy	-.0167443	.0016620	-10.08***
SC Coast dummy	-.0027666	.0016870	- 1.64
C Highlands dummy	-.0109710	.0018250	- 6.01***
South East dummy	-.0004710	.0015748	- 0.30
Mekong Delta dummy	-.0053596	.0005069	- 3.56***
Intercept	.1515590	.0068284	22.20***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-11. Determinants of Demand for Fruits

Dependent variable: Budget share of fruits			
R ²	0.05		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	.0014654	.0004364	3.36***
Household size	-.0008825	.0001140	- 7.74***
Household head sex	-.0010838	.0004662	- 2.32**
Household head education	.0000721	.0000581	1.24
Spouse education	-.0000098	.0000533	- 1.84
Children share (1-15 yrs)	.0013223	.0010175	1.30
Elderly share (>64 yrs)	.0036755	.0009112	4.03***
Other cities dummy	.0007795	.0008928	0.87
Towns dummy	-.0021242	.0008689	- 2.44**
N Upland dummy	-.0046016	.0009688	- 4.75***
Red R Delta dummy	-.0028634	.0009282	- 3.08***
NC Coast dummy	-.0033804	.0009778	- 3.46***
SC Coast dummy	-.0035715	.0009925	- 3.60***
C Highlands dummy	-.0029672	.0010737	- 2.76**
South East dummy	-.0008342	.0009265	- 0.90
Mekong Delta dummy	.0013074	.0008865	1.47
Intercept	.0102997	.0040172	2.56**

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-12. Determinants of Demand for Vegetables

Dependent variable: Budget share of vegetables			
R ²	0.16		
Number of observations	5981		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0121928	.0005390	-22.62***
Household size	-.0019194	.0001408	-13.63***
Household head sex	-.0001668	.0005760	- 0.29
Household head education	-.0001652	.0000718	- 2.30**
Spouse education	-.0002116	.0000659	- 3.21***
Children share (1-15 yrs)	-.0024563	.0012568	- 1.95*
Elderly share (>64 yrs)	-.0009645	.0011258	- 0.86
Other cities dummy	-.0031296	.0011035	- 2.84***
Towns dummy	-.0063614	.0010740	- 5.92***
N Upland dummy	-.0131327	.0011972	-10.97***
Red R Delta dummy	-.0097808	.0011471	- 8.53***
NC Coast dummy	-.0134680	.0012082	-11.15***
SC Coast dummy	.0007689	.0012269	0.63
C Highlands dummy	-.0081159	.0013267	- 6.12***
South East dummy	.0002413	.0011452	0.21
Mekong Delta dummy	-.0067927	.0010959	- 6.20***
Intercept	.1414742	.0049619	28.51***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-13. Determinants of Demand for Water Morning Glory

Dependent variable: Budget share of water morning glory			
R ²	0.07		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0037893	.0002124	-17.84***
Household size	-.0004278	.0000555	- 7.71***
Household head sex	.0005014	.0002269	2.21**
Household head education	2.34e-06	.0000283	0.08
Spouse education	-.0000202	.0000260	- 0.78
Children share (1-15 yrs)	-.0007249	.0004953	- 1.46
Elderly share (>64 yrs)	.0002984	.0004436	0.67
Other cities dummy	-.0000180	.0004346	- 0.04
Towns dummy	-.0018581	.0004230	- 4.39***
N Upland dummy	-.0040858	.0004716	- 8.66***
Red R Delta dummy	-.0019926	.0004518	- 4.41***
NC Coast dummy	-.0030595	.0004760	- 6.43***
SC Coast dummy	-.0027023	.0004831	- 5.59***
C Highlands dummy	-.0030441	.0005226	- 5.82***
South East dummy	-.0010924	.0004510	- 2.42**
Mekong Delta dummy	-.0035406	.0004316	- 8.20***
Intercept	.0400610	.0019555	20.49***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-14. Determinants of Demand for Kohlrabi

Dependent variable: Budget share of kohlrabi			
R ²	0.26		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0010383	.0000918	-11.31***
Household size	-.0001710	.0000240	- 7.13***
Household head sex	.0001719	.0000981	1.75
Household head education	.0000157	.0000122	1.29
Spouse education	.0000218	.0000112	1.94
Children share (1-15 yrs)	-.0002167	.0002140	- 1.01
Elderly share (>64 yrs)	4.54e-06	.0001917	0.02
Other cities dummy	.0001715	.0001878	0.91
Towns dummy	-.0005288	.0001828	- 2.89**
N Upland dummy	.0021193	.0002038	10.40***
Red R Delta dummy	.0025475	.0001952	13.05***
NC Coast dummy	.0000449	.0002057	0.22
SC Coast dummy	-.0016589	.0002088	- 7.95***
C Highlands dummy	-.0010200	.0002258	- 4.52***
South East dummy	-.0015260	.0001949	- 7.83***
Mekong Delta dummy	-.0018721	.0001865	-10.04***
Intercept	.0106091	.0008450	12.56***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-15. Determinants of Demand for Cabbage

Dependent variable: Budget share of cabbage			
R ²	0.05		
Number of observations	5981		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0009561	.0001414	- 6.76***
Household size	-.0002101	.0000369	- 5.69***
Household head sex	.0001694	.0001511	1.12
Household head education	-.0000284	.0000188	- 1.51
Spouse education	-.0000195	.0000173	- 1.13
Children share (1-15 yrs)	-.0009334	.0003297	- 2.83**
Elderly share (>64 yrs)	-.0004632	.0002953	- 1.57
Other cities dummy	.0001226	.0002893	0.42
Towns dummy	-.0002689	.0002815	- 0.96
N Upland dummy	.0010605	.0003139	3.38***
Red R Delta dummy	.0006231	.0003008	2.07**
NC Coast dummy	-.0009272	.0003168	- 2.93**
SC Coast dummy	-.0022020	.0003216	- 6.85***
C Highlands dummy	.0004651	.0003479	1.34
South East dummy	.0003483	.0003002	1.16
Mekong Delta dummy	-.0008404	.0002873	- 2.93**
Intercept	.0122913	.0013017	9.44***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-16. Determinants of Demand for Tomatoes

Dependent variable: Budget share of tomatoes			
R ²	0.045		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0004551	.0001421	- 3.20***
Household size	-.0002439	.0000371	- 6.57***
Household head sex	.0001317	.0001518	0.87
Household head education	.0000241	.0000189	1.27
Spouse education	-.0000201	.0000174	- 1.16
Children share (1-15 yrs)	.0001692	.0003313	0.51
Elderly share (>64 yrs)	.0008964	.0002967	3.02***
Other cities dummy	.0003248	.0002907	1.12
Towns dummy	-.0000419	.0002829	- 0.15
N Upland dummy	-.0013951	.0003155	- 4.42***
Red R Delta dummy	-.0006679	.0003023	- 2.21**
NC Coast dummy	-.0020226	.0003184	- 6.35***
SC Coast dummy	-.0016958	.0003232	- 5.25***
C Highlands dummy	-.0002709	.0003496	- 0.77
South East dummy	.0015438	.0003017	5.12***
Mekong Delta dummy	-.0002945	.0002887	- 1.02
Intercept	.0085255	.0013082	6.52***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-17. Determinants of Demand for Other Vegetables

Dependent variable: Budget share of other vegetables			
R ²	0.20		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0059572	.0003992	-14.92***
Household size	-.0008583	.0001043	- 8.23***
Household head sex	-.0011267	.0004265	- 2.64**
Household head education	-.0001757	.0000531	- 3.31***
Spouse education	-.0001713	.0000488	- 3.51***
Children share (1-15 yrs)	-.0006807	.0009308	- 0.73
Elderly share (>64 yrs)	-.0015925	.0008336	- 1.91
Other cities dummy	-.0036219	.0008167	- 4.43***
Towns dummy	-.0035509	.0007948	- 4.47***
N Upland dummy	-.0107224	.0008862	-12.10***
Red R Delta dummy	-.0101791	.0008491	-11.99***
NC Coast dummy	-.0073995	.0008945	- 8.27***
SC Coast dummy	.0090639	.0009079	9.98***
C Highlands dummy	-.0041339	.0009822	- 4.21***
South East dummy	.0010895	.0008476	1.29
Mekong Delta dummy	-.0001195	.0008110	- 0.15
Intercept	.0697724	.0036750	18.99***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-18. Determinants of Demand for Oranges

Dependent variable: Budget share of oranges			
R ²	0.06		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	.0012341	.0002028	6.08***
Household size	-.0002660	.0000530	- 5.02***
Household head sex	-.0000255	.0002167	- 0.12
Household head education	.0000203	.0000270	0.75
Spouse education	5.23e-06	.0000248	0.21
Children share (1-15 yrs)	.0015076	.0004730	3.19
Elderly share (>64 yrs)	.0017280	.0004236	4.08
Other cities dummy	.0009705	.0004150	2.34**
Towns dummy	-.0011539	.0004039	- 2.86**
N Upland dummy	-.0020557	.0004503	- 4.56***
Red R Delta dummy	-.0002894	.0004315	- 0.67
NC Coast dummy	-.0012241	.0004545	- 2.69**
SC Coast dummy	-.0020692	.0004614	- 4.49***
C Highlands dummy	-.0016559	.0004991	- 3.32***
South East dummy	-.0016096	.0004307	- 3.74***
Mekong Delta dummy	-.0021348	.0004121	- 5.18***
Intercept	-.0053972	.0018674	- 2.89**

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-19. Determinants of Demand for Bananas

Dependent variable: Budget share of bananas			
R ²	0.03		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	-.0011510	.0001931	- 5.96***
Household size	-.0004064	.0000504	- 8.06***
Household head sex	-.0003314	.0002063	- 1.61
Household head education	.0000295	.0000257	1.15
Spouse education	-.0000565	.0000236	- 2.39
Children share (1-15 yrs)	.0003006	.0004503	0.67
Elderly share (>64 yrs)	.0011778	.0004033	2.92**
Other cities dummy	-.0002235	.0003951	- 0.57
Towns dummy	-.0007593	.0003845	- 1.97*
N Upland dummy	-.0012737	.0004287	- 2.97**
Red R Delta dummy	-.0004582	.0004108	- 1.12
NC Coast dummy	-.0001637	.0004327	- 0.38
SC Coast dummy	-.0012134	.0004392	- 2.76**
C Highlands dummy	-.0026178	.0004752	- 5.51***
South East dummy	-.0006492	.0004100	- 1.58
Mekong Delta dummy	-.0009279	.0003924	- 2.36**
Intercept	.0175113	.0017779	9.85***

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-20. Determinants of Demand for Mangoes

Dependent variable: Budget share of mangoes			
R ²	0.10		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	.0007582	.0001112	6.82***
Household size	-.0000312	.0000291	- 1.08
Household head sex	-.0001381	.0001188	- 1.16
Household head education	-4.15e-06	.0000148	- 0.28
Spouse education	1.09e-06	.0000136	0.08
Children share (1-15 yrs)	.0003067	.0002593	1.18
Elderly share (>64 yrs)	.0004912	.0002323	2.11*
Other cities dummy	-.0007964	.0002276	- 3.50***
Towns dummy	-.0008099	.0002215	- 3.66***
N Upland dummy	-.0022713	.0002469	- 9.20***
Red R Delta dummy	-.0020800	.0002366	- 8.79***
NC Coast dummy	-.0021805	.0002492	- 8.75***
SC Coast dummy	-.0016685	.0002530	- 6.60***
C Highlands dummy	-.0002363	.0002737	- 0.86
South East dummy	-.0004299	.0002362	- 1.82
Mekong Delta dummy	.0004339	.0000226	1.92
Intercept	-.0027381	.0010240	- 2.67**

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-21. Determinants of Demand for Other Fruit

Dependent variable: Budget share of other fruit			
R ²	0.03		
Number of observations	5985		
	Coefficient	Std. Err.	t-stat
Ln per capita expenditure	.0006241	.0002374	2.63**
Household size	-.0001789	.0000620	- 2.88**
Household head sex	-.0005888	.0002536	- 2.32*
Household head education	.0000265	.0000316	0.84
Spouse education	-.0000478	.0000290	- 1.65
Children share (1-15 yrs)	-.0007925	.0005535	- 1.43
Elderly share (>64 yrs)	.0002785	.0004957	0.56
Other cities dummy	.0008289	.0004856	1.71
Towns dummy	.0005989	.0004726	1.27
N Upland dummy	.0009991	.0005270	1.90
Red R Delta dummy	-.0000359	.0005049	- 0.07
NC Coast dummy	.0001878	.0005319	0.35
SC Coast dummy	.0013796	.0005399	2.56**
C Highlands dummy	.0015427	.0005840	2.64**
South East dummy	.0018545	.0005040	3.68***
Mekong Delta dummy	.0039362	.0004823	8.16***
Intercept	.0009237	.0021853	0.42

***significant at 1% level; **significant at 5%; *significant at 10%

Table 7-22. Comparison of fruit and vegetable consumption in 1993 and 1998 by expenditure category

	Expenditure quintile					Total
	Poorest	2	3	4	Richest	
1993						
Vegetable consumption (kg/capita)	29	40	48	59	89	53
Fruit consumption (kg/capita)	2	4	7	14	36	13
F&V consumption (kg/capita)	31	45	56	74	126	66
Average number of fruits & vegetables consumed	4.5	5.4	5.8	6.3	6.9	5.8
1998						
Vegetable consumption (kg/capita)	23	36	47	60	91	54
Fruit consumption (kg/capita)	3	6	11	17	43	17
F&V consumption (kg/capita)	26	42	58	77	134	71
Average number of fruits & vegetables consumed	5.6	6.9	7.4	7.8	8.4	7.3

Source: Analysis of 1993 and 1998 Vietnam Living Standards Surveys.

Table 7-23. Comparison of fruit and vegetable consumption in 1993 and 1998 by region

Product	Region							MRD
	Urban	NU	RRD	NCC	SCC	CH	SE	
1993								
Vegetable consumption (kg/capita)	88	31	51	44	54	74	67	31
Fruit consumption (kg/capita)	34	2	5	3	9	15	13	13
F&V consumption (kg/capita)	123	34	57	48	63	88	80	44
Average number of fruits & vegetables consumed	7.0	5.5	6.0	5.0	3.7	4.5	5.5	6.1
1998								
Vegetable consumption (kg/capita)	91	27	45	30	53	41	76	47
Fruit consumption (kg/capita)	41	4	9	8	14	7	23	12
F&V consumption (kg/capita)	131	31	54	38	67	48	99	59
Average number of fruits & vegetables consumed	8.2	6.7	7.7	6.9	6.5	8.0	7.4	6.9

Source: Analysis of 1993 and 1998 Vietnam Living Standards Surveys.

**Table 7-24. Comparison of fruit and vegetable consumption
in 1993 and 1998 by product**

Product	Pct of households consuming		Consumption (kg/person)	
	1993	1998	1993	1998
Beans	42	55	0.9	1.4
Morning glory	80	95	13.9	17.4
Kohlrabi	49	54	5.7	4.0
Cabbage	76	82	8.3	7.4
Tomato	78	88	6.5	6.4
Other vegetables	78	91	15.2	17.4
Citrus	34	59	1.5	3.0
Banana	67	87	7.0	9.0
Mango	28	49	0.8	1.4
Other fruit	47	73	2.6	4.1

Source: Analysis of 1993 and 1998 Vietnam Living Standards Surveys.

Chapter 8

Role of government in the fruit and vegetable sector

1 Introduction

Previous chapters have examined production, processing, trade, and consumption of fruits and vegetables in Vietnam. However, the development of the fruit and vegetable sector and post-harvest activities is also strongly influenced by the activities of various branches of government. This includes public institutions such as agricultural research institutions, state seed companies, state-owned processors, and institutions involved in plant protection. The government also plays a role in the fruit and vegetable sector through its policies regarding land use, credit, and investment. Information on these institutions and policies was collected through informal interviews with various participants in the sector, documents, and secondary data. This chapter describes the role of government in the fruit and vegetable sector, focusing on post-harvest activities.

2 Research institutions

2.1 Research Institute for Fruits and Vegetables

The Research Institute for Fruits and Vegetables (RIFAV) was created in 1990 as a unit of the Vegetable and Fruit Export Company (Vegetexco). In 2000, it was made independent of Vegetexco as part of the general policy of separating the commercial activities of state-owned enterprises such as processing and export from the public service activities such as research¹.

RIFAV has a mandate to carry out research on fruits, vegetables, and ornamental crops, though it tends to focus on a number of fruits that are important in the north of Vietnam: citrus, longan, litchi, and pineapple. The Institute has its headquarters in Ha Tay, where research concentrates on longan and citrus. A branch in Phu Tho carries out research on litchi, breadfruit, persimmon, and other fruits. And another branch in Nghe An works on pineapple, mango, and other fruits.

In the area of vegetable research, RIFAV works on improving germ plasm, production methods for producing vegetables in the off-season, and the economic aspects of vegetable production. The Institute has had a long-term collaborative relationship with the Asian Vegetable Research and Development Center (AVRDC), based in Taiwan. This collaboration is part of a multi-national program involving Laos and Cambodia and focusing on integrated pest management, disease resistance, socioeconomic studies, and training. The Institute also received assistance from Israel, France, and the Australian Centre for International Agricultural Research, and France.

¹ Much of the information in this section comes from an interview with Dr. Vu Manh Hai, Deputy Director of RIFAV, on 6 June 2001.

In recognition of the marketing problems faced by fruit and vegetables farmers, RIFAV created in 2000 a Department of Marketing. Initially, the Department is focusing on litchi and longan marketing. The litchi harvest is concentrated during just one month of the year, creating a glut on the market and relatively low prices. The Department will explore various approaches to solving this problem, as well as studying the rapidly growing trade in litchi from the north to the south and from Vietnam to China.

RIFAV carries out research on post-harvest technologies, focusing on drying and other preservation methods. Within the government, there has been some debate on whether all post-harvest technology research should be centralized in the Post-Harvest Technology Institute (PHTI). Researchers at RIFAV feel that post-harvest technology in fruits and vegetables is significantly different from that of field crops such as rice and maize. Furthermore, they believe that RIFAV should continue work in this area because PHTI tends to focus on post-harvest technologies for field crops.

Roughly 30 percent of the budget of RIFAV comes from internationally funded projects and programs and 70 percent from domestic sources. Among the domestic sources, about 60 percent is provided by the Ministry of Science and Technology (MOSTE), 20 percent from the Ministry of Agriculture and Rural Development (MARD) and 20 percent from income-generating activities. These income generating activities include the sale of seed and planting materials and contracts with the provincial departments of agriculture.

2.2 Southern Fruit Research Institute

The Southern Fruit Research Institute (SOFRI) was formed in 1994 to carry out research on fruit for the Mekong Delta. In 1997, SOFRI graduated to the “institution” level and given the mandate to serve the southern part of the country. SOFRI carries out research on a wide variety of crops, the most important of which are citrus, pineapple, mango, longan, and durian. The research includes the development of improved varieties, multiplication of planting materials, and improved production methods. The Institute also carries out research on post-harvest activities and marketing, although there is less emphasis on this aspect².

SOFRI enjoys technical assistance and financial support from a number of different international organizations. The Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) has provided assistance since the establishment of SOFRI in 1994. In fact, CIRAD contributed to the November 1994 workshop to establish the direction and priorities of the work of SOFRI. Starting in 1996, the government of India has assisted in capacity building by providing scholarships for Masters and Doctoral training at Indian universities. Four staff members

² This section is largely based on an interview with Dr. Nguyen Minh Chau, Director of SOFRI, on 14 June 2001.

have been trained under this program. The Food and Agriculture Organization (FAO) had a project to carry out an inventory of fruit fly infestation in Vietnam, an important first step in satisfying the phyto-sanitary requirements of some importers. ACIAR is providing support through a number of projects focused on pest control. One study is looking at pre-harvest control of fruit flies using bags and pesticide treatment. Another is extending the fruit fly inventory, and a third is examining methods for controlling yellow ants in durian production. In 2000, the New Zealand government began another project on improved methods of fruit fly control and extending the shelf-life of mangoes and dragon fruits.

SOFRI disseminates the results of its varietal improvement research in various ways, including the sale of disease-free fruit seedlings. SOFRI sells about 500 thousand seedling per year. However, the strong growth in fruit production in the Mekong Delta has led to rapid expansion in the number of private nurseries. Dr. Chau, the Director of SOFRI, estimates that private nurseries sell about 4.5 million fruit tree seedlings per year. Many of the nurseries do not have the technical capacity (or perhaps the economic incentive) to ensure that their seedlings are disease-free. Provincial state enterprises have also become involved in distributing fruit seedlings, though they too do not always follow good practices to avoid selling diseased seedlings.

As part of its efforts to improve production methods, SOFRI offers training courses on plant protection, seed multiplication, cultural practices, and post-harvest activities. The trainees include both extension agents and private nurseries. In the training provided to nurseries, they establish informal standards of good practice. At some point, SOFRI would like to have the legal authority to certify nurseries that follow good practices for growing disease-free seedlings. This would allow farmers to know whether they are buying from a certified nursery and, indirectly, whether the seedling is likely to be disease-free.

SOFRI is exploring the possibility of expanding its mandate to include vegetables as well. Their position is that RIFAV focuses on the north, so that the only research on vegetables in the south is carried out by the Southern Seed Company. As a commercial-oriented state-owned enterprise, the Southern Seed Company puts most of its effort into producing hybrid vegetable seed, leaving users of non-hybrid vegetable seed in the South under-served. In order to expand in this way, however, SOFRI would need to develop the necessary skills and to obtain authorization from the government.

2.3 Post-harvest Technology Institute

The Post-Harvest Technology Institute (PHTI) is currently affiliated with the Ministry of Agriculture and Rural Development (MARD).. From 1996 to 2000, PHTI was made a part of the Vietnam Food Corporation (VINAFOOD). This arrangement was not satisfactory because VINAFOOD is a commercially-oriented state-owned enterprises involved in trading rice and other grains. As such, it had little motivation to fund the public-service-oriented PHTI in its research on a wide variety of agricultural commodities. Under VINAFOOD, PHTI received no core budget and

was obliged to cover its cost with contracts from provincial departments of agriculture, training programs, and the sale of driers. Now that PHTI is again with MARD, it receives roughly 60 percent of its budget from MARD, 30 percent from MOSTE, and 10 percent from contracts with state enterprises and provincial departments of agriculture.

The goal of PHTI is to produce and disseminate new technology that will reduce post-harvest losses, expand markets for agricultural commodities, and generally increase farmer income. The technology is intended to serve the needs of small- and medium-sized farmers. PHTI is composed of two centers, the headquarters in the north (Hanoi) and a center in the south (Ho Chi Minh City). Although PHTI/North and PHTI/South are administratively linked, the research and extension activities of each are distinct and relatively independent.

PHTI/North works mainly on rice, cassava, fruits and vegetables, and cashewnuts. In the area of post-harvest processing of fruits and vegetables, PHTI/North concentrates on litchi, longan, and plums³. Traditional litchi driers use smoke to dry the fruit, but the smoke flavor meant that it could only be exported to China where this flavor is appreciated. PHTI has developed a drier that dries the fruit more quickly and does not use smoke. The cost of the drier is about VND 1.2 million, so it is within the reach of commercial litchi growers. Several training courses have been given on the use of the new drier and over 300 of them have been sold to farmers.

In 2001, PHTI began a new research program, funded by Vegetexco, on post-harvest processing of plums. The focus will be on preserving fresh plums for the domestic market and the making of plum jam for export. In 2000, Vegetexco exported 100 tons of plum jam to Russia and other countries formerly in the Soviet Union. Vegetexco hopes to expand plum jam exports to 1000 tons.

The southern branch of PHTI used to focus almost exclusively on milling and other post-harvest activities associated with rice production. The emphasis has shifted over time, however, and currently most of the work of PHTI/South is devoted to post-harvest processing of fruits, primarily longan and dragon fruit. This work focuses on methods for drying and packaging, control of maturation to lengthen the harvest period, storage, and some research on control of fruit flies. PHTI/South seems to rely more heavily on contract work and less on MARD funding. According to the Assistant Director of PHTI/South, this center receives just 10 percent of its funding from MARD and about 90 percent from contract work. Most of the contracts are with provincial departments of agriculture who need assistance in marketing fruit produced by farmers in the province. In addition, PHTI/South is contracted by state-owned enterprises and universities to provide equipment and/or training in post-harvest methods⁴.

³ The information on PHTI/North is based mainly on an interview with Dr. Nguyen Kim Vu, Director of the Post-Harvest Technology Institute.

⁴ This information is based on an interview with Ngo Trieu Hong Ha, Assistant Director of PHTI in Ho Chi Minh City on 12 June 2001.

3 Seed supply system

One of the main avenues for delivering new technology to farmers is through the seed supply system. The quality of seeds and planting material have a large influence on the yields, disease resistance, and market value of the harvested output. Because they differ in many respects, we consider vegetable seed and fruit tree planting material separately.

3.1 Vegetable seed supply

Although statistics are difficult to obtain, seed specialists believe that most of the vegetable seed sold in Vietnam is imported. According to figures from the General Department of Customs, seed imports were about US\$ 4.6 million in 1999⁵. Although this figure is not specifically for vegetable seed, it is likely that vegetable seed represents a large share of this figure. This is because vegetable seeds are more internationally-traded than other seeds, in part due to their higher value per kilogram compared to other seeds. Of the total value, about 43 percent was imported from Thailand and 27 percent from Japan.

The largest seed companies in Vietnam are the two state-owned enterprises affiliated with the Ministry of Agriculture and Rural Development. The National Seed Company No. 1 is responsible for providing seed for the north of the country. It sells mainly imported seed. National Seed Company No. 2, more widely known as the Southern Seed Company, is responsible for the South. This company sells hybrid maize seed, bean seed, vegetable seed, rice seed, grain processing equipment, and other agricultural materials. In 2000, the gross revenue of the Southern Seed Company was VND 66 billion. Hybrid maize seed is their most important product, accounting for 65 percent of the total revenue. Vegetable and watermelon seed is second in importance after maize, accounting for 20 percent of the total. Vegetable seed sales have grown rapidly, rising from VND 2.8 billion in 1996 to VND 13 billion in 2000. Currently, the company sells 30 different varieties of vegetable seed, including both imported and locally produced seed. Since vegetable seed offers the company the highest margin, the goal is to increase sales in this area⁶.

The Southern Seed Company is involved in three activities in vegetable seed: the purification and selection of open-pollinated varieties, the importation and selection of vegetable seed, and the production of hybrid seed varieties. The company produces hybrids of watermelon, tomato, chili, and bitterwort, though hybrids represent a small share of the total.

⁵ This figure refers to imports under code 1209 described as “Seeds, fruit, and spores, of a kind used for sowing” in the *Vietnam Customs Yearbook on Foreign Merchandise Trade – 1999* on page 469.

⁶ Information about the Southern Seed Company is based mainly on interviews with Ngo Van Giao, Director of the company, Nguyen Van Thanh, Deputy Director, Dinh Van Bich, Marketing Manager, and Nguyen Hoang Tuan, Manager of the Department of Production.

The company has a staff of 200 workers, distributed among three seed farms, two processing plants, and the offices. Seed testing and research are carried out on the company's own seed farms, while seed multiplication is carried out largely by contract seed farmers.

The two state seed companies compete with a growing private seed sector, consisting of smaller companies, often with international linkages. The East-West Seed Company is a joint venture between a Thai seed company and Vietnamese investors. The company has been operating in Vietnam for 4-5 years and now has offices in Ho Chi Minh City and Hanoi. The company imports vegetable seed from Thailand and produces tomato seed locally. The Know You Seed Company is a wholly-owned subsidiary of a Taiwanese company. Thang Long Seed Company is a locally-owned company involved in seed import, as well as small amounts of seed production. And the Trang Nang Seed Company is a privately owned seed company started by an overseas Vietnamese investor who was invited to return. This company both produces and imports vegetable seed.

Some of these private seed companies produces seed for export. Gino Ltd., a seed company in Ho Chi Minh City founded by a retired public-sector researcher, produces hybrid seed, mostly vegetable seed. Seventy percent of the sales of the company are in the form of exports to Japan, Taiwan, and, to a lesser extent, South Korea (see Box 8-1). In addition, a Taiwanese joint venture in Dalat produces chili seeds for export to Taiwan.

Box 8-1. A private seed producer

In 1992, Dr. Nguyen Thi Dao left the Ho Chi Minh City Seedlings Center to form Gino Company, a private vegetable seed producer. Gino does not just import vegetable seed for distribution, but is instead actively involved in developing and selecting new strains of hybrid vegetable seed. When Gino's first hybrid seedlings were introduced in 1992, almost all the vegetable seed sold in Vietnam was imported. With her Ph.D. in botany from the Soviet Union, Dr. Dao has developed over 500 new strains, 60 of which have been successfully introduced to farmers. Gino currently sells several varieties of seedless watermelon, salad greens, baby tomatoes, and papaya. In 1995, Gino began to supply seeds and seedlings to importers in Hong Kong and Taiwan. Her latest plan is to open a branch in Binh Duong to focus on the development of fruit seedlings.

Source: Vietnam News Service, 21 January 2002.

3.2 Supply of fruit tree planting material

Fruit tree planting materials are usually sold in the form of seedlings. According to the IFPRI-MARD Survey of Commercial Fruit and Vegetable Producers, fruit farmers obtained planting materials in approximately equal proportion from other farmers, private businesses (nurseries), and government enterprises. One of the larger suppliers of fruit seedlings is Donatechno, a state enterprises affiliated with the province of Dong Nai. Other provincial enterprises are also involved in the sale of fruit seedlings. For example, a Ben Tre provincial enterprise sells large numbers of citrus seedlings. And a Ho Chi Minh City enterprise recently produced 150,000 fruit seedlings for sale to nearby growers. Unfortunately, in this case only 20-30 percent of these were purchased by farmers.

This may have been because the price was too high (VND 15,000 per mango seedling). Others have suggested that the quality of the seedlings sold by the enterprise have not always been very good, damaging the reputation of the enterprise for farmers.

As mentioned earlier in this chapter, SOFRI sells roughly 500 thousand seedlings. These are high-quality seedlings that are produced under conditions to ensure that they are disease-free. However, SOFRI competes against an unregulated market consisting of numerous private nurseries who do not ensure disease-free status. It is estimated that private nurseries sell a 4.5 million seedlings per year in the Mekong Delta. In particular, citrus production has grown rapidly, leading to the emergence of numerous suppliers of citrus seedlings, most of which are produced with little regard for quality or disease-free status.

3.3 Seed policy issues

Interviews with state and private seed companies indicate three areas of debate regarding seed policy: seed certification, seed import policy, and trademark protection. Each is discussed below.

Seed testing

Currently, there is little control of the quality of vegetable seed and fruit seedlings by government authorities. The government is establishing a Center for Seed Testing and new legislation is being drafted, but the system is not yet operational. The main motivation for producing high-quality seed is to maintain the reputation of the company, but this can be a powerful incentive in the case of companies that already have a well-known and respected name.

Seed testing can take various forms. First, it can evaluate seed on various criteria: physical purity, varietal purity, germination rate, absence of seed-borne diseases, truth in labeling, and performance. Second, seed control can be implemented at the field level (by inspecting fields where the seed is produced), at the market level (by inspecting seed being sold), or at the post-market level (by addressing complaints by seed users). Third, seed testing can be voluntary or mandatory. Fourth, seed testing can be used to set standards, below which the seed cannot be sold, or it can be used to determine how a seed can be labeled.

With regard to vegetable seed, it is important to note that even in industrialized countries with highly developed seed industry institutions, vegetable seed is not inspected for varietal purity. Part of the reason is that there are many different vegetables and many varieties of each vegetable that testing each one is costly and impractical. In addition, vegetable seeds are sold by large private companies in a competitive market, creating a strong incentive to keep their customers satisfied. Instead of certifying varietal purity, the usual practice is to ensure that vegetable seed meets minimum standards for germination (the percentage of seeds that sprout) and physical purity (absence of foreign matter). This seed is referred to as “standard seed” rather than “certified seed.”

Given this background, it would be unnecessary and over-ambitious to implement a program of testing vegetable seed for varietal purity and seed health. Initially, it would probably be sufficient to establish germination standards for vegetable seeds which can be used in the resolution of problems faced by seed users. Voluntary certification could be offered by state and private institutions for seed companies that feel they would benefit from such a label.

The case of fruit seedlings is different, partly because a fruit tree takes years to come to maturity. Thus, if a company sells bad seedlings, the effect on its sales and reputation are delayed for several years. This creates a stronger justification for public intervention in fruit seedling testing and certification. One option would be to implement a program of voluntary certification of seedling health based on field inspection and market-level testing. In the short-term, the supply of disease-free seedlings is too small to impose mandatory standards on seedling health. In the longer term, however, Vietnam should move in the direction of requiring a minimum level of seedling quality through mandatory testing.

The testing of fruit seedlings could be carried out by the Southern Fruit Research Institute (SOFRI), by the Department of Plant Protection of MARD, or by a new unit within the Ministry. Although SOFRI has the technical expertise necessary, it is not clear that it would have the administrative capacity to test fruit seedlings on a national level. Provincial Departments of Agriculture and Rural Development have the administrative structure, but not the expertise. Both SOFRI and the provincial authorities face conflict of interest issues because they sell fruit seedlings themselves. One option would be for SOFRI to establish the procedures and criteria for testing, provide training to provincial staff, and certify the ability of the provincial authorities to certify. The issue of conflict of interest would have to be solved, either by equitization of provincial seed companies or by ensuring that the certification service is independent of both the seed companies and political interference.

Trademark protection

Although competition among seed companies is usually fair, sometimes seed companies use variety names that are similar or identical to the names of varieties sold by other companies. Several examples were identified in interviews with seed market participants:

- The Southern Seed Company developed a new hybrid watermelon variety and named it Antiem 95. The variety was popular and, within a short time, another company was selling a watermelon variety called AT 95.
- Gino Ltd. sells a variety of tomato called “Ca chua No. 5”. Since the release of this variety, other seed companies have started selling tomato seeds with the same name.
- In Tien Giang, a farmer registered a variety name for durian fruit, but the name was already in widespread use. The issue has been taken to court to resolve.
- An international seed company is reported to be interested in selling its hybrid maize in Vietnam, but it has not because of the lack of copyright protection for its varietal name.

The most obvious cost is that farmers buy what they think is one variety and often get something else. In addition, effective lack of copyright protection hurts the producer of the original variety. Less obvious but perhaps more important is the effect on research. The incentive to produce new varieties is weakened if the researcher/investor fears that someone may steal the name of a successful variety.

Seed import policy

The issue in seed importation is to balance the interest in allowing free flow of potentially useful new varieties with the interest in protecting local agriculture from possibly negative effects of diseases and pests in the imported planting material. Currently, the importation of seed is not very complicated. The management of the Southern Seed Company believes that vegetable seed imports are too easy. They argue that vegetable seed importers should be required to either submit to MARD the results of testing it has carried out in Vietnam or to contract the testing to local research institutes.

On the other hand, it is not clear that the government should require local vegetable seed companies to demonstrate that its products are varietally pure, high-yielding, and disease resistant. As noted above, even in industrialized countries, there is no certification of quality or varietal purity for vegetable seed. If the principle of “standard vegetable seed” discussed earlier is adopted, then there is no reason for the government to set a higher standard for imported seed.

Box 8-2. International trade in genetic material

Fruit researchers in Vietnam have expressed concern about the export of valuable fruit strains to competing countries. The most commonly cited example is the dragon fruit. At one time, Vietnam was the only producer of dragon fruit. Growers in Thailand and Taiwan were able to obtain seedlings and have developed a dragon fruit industries, exporting the fruit in competition with Vietnam. By some accounts, the Thai dragon fruit are now superior to those exported by Vietnam. Other examples include the Nam Roi pomelo and the Hoa Loc mango.

Regulations require a license to import or export fruit planting materials. The regulation is intended to prevent the export of valuable strains and to block the import of low-quality or diseased planting materials. However, it is difficult to control illegal trade in planting materials. Buyers often get the materials through intermediaries or via unofficial trade at border gates. Local customs officials do not have the technical expertise to recognize valuable strains.

Several solutions have been proposed. The government has recently discussed granting copyrights on genetic material, but there are many questions about the implementation of such a proposal. Professor le Van To, deputy director of the Post-Harvest Technology Institute argues that it is preferable to invest in post-harvest technology to raise fruit quality rather than new varieties. Nguyen Quy Hung of the Southern Institute for Agricultural Technology argues that controlling borders is futile; rather, Vietnam should focus on reducing its costs of production by agricultural zoning and larger-scale production. Dr. Vo Mai, president of the Vietnam Fruit Association points out that, although Vietnam has lost genetic material to some of its competitors, it has also gained from the importation of genetic material.

Source: Vietnam News Service, 18 June 2001.

4 Plant protection

Plant protection refers to the efforts to minimize the damage caused to agricultural commodities by pests and disease without negatively affecting the health of farmers and consumers of those commodities. This includes:

- protecting local crops from pests and disease without risking the health of farmers and consumers in the country.
- controlling imported goods to ensure that they are neither a risk to consumers, nor infected with pests or diseases that would affect local crops, and
- controlling exported goods to ensure that they meet regulations in importing countries regarding consumer safety and plant disease and pests.

Fruits and vegetables are of special concern because farmers often use pesticides. As noted in Chapter 3, about 90 percent of all commercial fruit and vegetable producers use pesticides to control pest attacks. The use of integrated pest management and biological methods was limited to the Red River Delta and parts of the south. A survey of fruit growers in the Dong Nai river basin indicates that almost all use pesticides⁷ Because fruits and vegetables are often traded and consumed in fresh form, biological contamination and pesticide residues are a more serious issue.

Plant protection is closely related to the sanitary and phytosanitary (SPS) issues that play a major role in negotiations over international trade in agricultural commodities. Sanitary issues refer to ensuring a safe food supply for consumers, while phytosanitary issues concern the protection of crops from imported pests and diseases. SPS issues are becoming increasingly important in international trade, in part because of growing consumer concern about pesticides and other chemicals in the food supply. In addition, SPS issues are sometimes used as a protectionist tool under pressure from farmers in industrialized countries now that multilateral trade agreements have reduced the ability to protect their interests with tariffs and quotas. SPS regulations are probably the most important barrier to international trade in fresh fruits and vegetables.

In order to allow the legitimate use of SPS regulations, while restraining the protectionist use of them, the Uruguay Round of the General Agreement on Trade and Tariffs (GATT) included an agreement on SPS issues which established the following principles:

- *Harmonization*: Countries are encouraged to adopt standardized regulations, such as the Codex Alimentarius, a set of food safety regulations established by the Food and Agriculture Organization.
- *Science-based policy*: Countries are allowed to adopt regulations that are stricter than international standards provided that the risks are documented with scientific evidence.

⁷ Claudia Ringler, IFPRI, personal communication.

- *Transparency:* Countries must publish their SPS regulations and make them available to trading partners, providing updates when necessary.
- *Equal treatment:* Domestic production must be subject to the same regulations as imports, and imports from different countries must be treated equally.

The National Assembly of Vietnam is in the process of drafting regulations to bring Vietnam into compliance with the SPS Agreement.

At the center of these issues is the Department of Plant Protection (DPP) of the Ministry of Agriculture and Rural Development. The DPP has three functions: the extension of safe methods of pesticide use and integrated pest management, pesticide registration and control, and plant quarantine activities (plant import controls). These functions are carried out by a staff of around 3000 DPP officers, including 200 posted at international borders. In spite of the large staff of border inspectors, even the DPP admits that they are not able to fully control agricultural imports, particularly from China.

4.1 Pesticide control

Limiting the amount of pesticides in the food supply requires a strategy that combines supply control, research, farmer education, and testing. Vietnam has taken initial steps in all four areas, but more progress is needed.

Supply control: The Pesticide Registration Council has responsibility for determining which pesticides can be used in different circumstances. In general, Vietnamese regulations follow international standards regarding pesticide use. In particular, Vietnam has followed the lead of other countries in banning some types of pesticides because of their negative environmental and/or health effects. Lack of resources and staff have hampered the ability of the Department of Plant Protection in enforcing these regulations. Implementation is complicated by the fact that pesticides that have been banned internationally and in Vietnam are still sold and used in China. Since these banned pesticides are perceived to be more effective than approved pesticides by Vietnamese farmers, they are smuggled into the country by traders. The long, porous border with China makes import control difficult.

In addition, implementation of the regulations on pesticides is difficult because some pesticides are illegal for some crops but not for others. For example, one pesticide is legal for use on tea but not for use on coffee.

A third difficulty, affecting exports, is that different countries have different regulations regarding maximum residue levels (MRLs). Singapore and Hong Kong are much stricter than Vietnam. For example, just among Asian countries, there are 152 MRLs for different food products and different countries. One of the goals of the ASEAN Free Trade Agreement is to harmonize pesticide MRL regulations. This is difficult because the ASEAN countries vary in their consumer

attitudes toward pesticide risk, their ability to implement integrated pest management and control residues, and their willingness to pay higher prices for food grown with reduced pesticide residues.

Research: Integrated pest management methods have been developed for rice production. Researchers are only beginning to turn their attention to IPM for fruits and vegetables. Research is needed in pest control methods that will both manage pests and disease and allow the final product to meet food safety standards.

Farmer education: Although it is difficult to document, it is widely believed that farmers apply more pesticide than is necessary. This may be related to lack of information about the appropriate dose, errors in mixing or applying the pesticide, or simply a desire to ensure “extra” protection from pests. In addition, farmers are said to lack basic information regarding the period before harvest during which pesticides should not be applied. Given these practices, pesticide use on fruits and vegetables could be reduced with better farmer education, even without supply control and new research.

Box 8-3. Weaver ants as a form of integrated pest management

There is increasing concern about the use of pesticides in Vietnamese fruit and vegetable production. First, regulations on maximum residue levels (MRLs) in importing countries are becoming an important constraint on Vietnamese fruit and vegetable exports. Second, there is increased awareness of the fact that local supplies of fruits and vegetables sometimes exceed the recommended residue levels. Third, the negative impact of pesticide use on the health of farmers and farm laborers has been documented.

In response to these concerns, there have been calls for greater attention to integrated pest management methods in fruit and vegetable production. In the 1980s, hardly any pesticides were applied to fruit crops in Vietnam. The lack of access to imported chemicals forced farmers to use biological means to control pests. For example, the weaver ant (*aecophylla smaragdina*), which makes its nests by weaving leaves together, has long been used to keep citrus and mango pests under control. Chinese farmers used weaver ants as far back as the 3rd century AD. Citrus farmers in Vietnam actively cared for these insects, including the establishment of colonies, providing food and protection, and building bridges to facilitate their spread throughout the orchard.

Between 1991 and 1998, however, the value of pesticide active ingredients imported in Vietnam increased by 600 percent, reaching US\$ 120 million. The rapid growth in fruit production and the increased application of pesticides has meant that the traditional knowledge related to weaver ant “husbandry” has been eroded. A recent study recommends gathering and disseminating traditional knowledge related to weaver ant husbandry and other forms of biological control of pests.

Source: Pesticide Action Network, 2001.

Testing and accountability: One of the most effective ways of changing farmer behavior is to provide an economic incentive. If farmers know that their produce may be tested and that the value of their harvest will be lower (perhaps zero) if pesticide residues are found, they will take measures to reduce residues. In the past, food testing was done by the Department of Public Health using gas chromatography. In addition to being relatively expensive, the method gives results the next day, too late to prevent consumption of perishable goods. The Federation of Commodity Control, a state-

owned entity, started in 1993 and has recently adapted a method used in the United States called acetylcholinesterase (AChE). Each test can be done for VND 150,000 and results are available quickly. The Department of Plant Protection of the province of Ho Chi Minh City has begun carrying out 200-300 tests per month of produce in the field and in supermarkets, using the FCC laboratory. When FCC began testing, 10-15 percent of the tests indicated excessive residue, but currently just 1-2 percent of the test are positive. The tests are the basis of a “safe zone” of minimal pesticide use in Cu Chi, outside Ho Chi Minh City. Farmers send samples for testing and receive a certificate which they use when selling their produce. The test is also being used in Dong Thap, and other provinces have expressed an interest in learning to do the test. The FCC plans to train other provinces in the use of the AChE test, but wants to proceed slowly to maintain quality and preserve the reputation of the test⁸.

4.2 Phyto-sanitary control

Phyto-sanitary control refers to restrictions on international trade to prevent the movement of crop pests and diseases. The degree of phyto-sanitary regulations on imported agricultural commodities varies widely from country to country. China has phyto-sanitary restrictions on paper, but enforcement is almost non-existent, particularly across the long mountainous border with Vietnam. Taiwan, Hong Kong, and Singapore are also relatively relaxed about phyto-sanitary issues. The United States and Japan are much more restrictive, and Australia has perhaps the most restrictive phyto-sanitary import controls.

Phyto-sanitary restrictions often require some combination of pre-harvest, harvest, and post-harvest treatment to prevent fresh fruits and vegetables from containing mites, scale, and eggs of fruit flies. Restrictions related to fruit flies are the largest impediment to exporting fresh fruit to countries such as Japan, Australia, and the United States. For example, Vietnamese dragon fruits were exported to Japan, until fruit fly eggs were found. Since then, Vietnamese dragon fruit has been banned from Japan.

Under the SPS Agreement, exporting countries can be asked to carry out a Pest Risk Assessment (PRA). The PRA includes an inventory of pests affecting each crop, an analysis of the geographic distribution of each pest, and the treatments that will be implemented for each exported product. Because of the cost of these assessments, they are usually carried out only for a small number of crops that are likely to be exported in fresh form. After the PRA, research is needed regarding the most cost-effective way of controlling the pests. This may include pre-harvest treatment (bags, cultural practices, and pesticide applications) as well as post-harvest treatment (fumigation, hot or cold treatment, etc). In previous decades, methyl bromide was used to control fruit flies. Since its ban, research has focused on hot and cold treatment to kill the fruit fly eggs. When the pest control

⁸ This information based on interviews with Mr. Pham Van Ngu, Manager of the Food and Vegetable Department of FCC and Dr. Tran Van An, Chief of the Toxicology Laboratory of FCC.

options are understood, the final step is to negotiate a bi-lateral plant quarantine agreement (or protocol) which specifies the conditions under which agricultural commodities can be traded.

As mentioned above, the Australian Centre for International Agricultural Research (ACIAR) and the New Zealand government are providing assistance for research on ways of treating mango and dragon fruit for fruit flies. The research consists of identifying ways of reliably killing fruit fly eggs without damaging the fruit. Vapor heat, dry heat, and hot water treatments are being studied, but it will take time to determine the temperature and duration that are appropriate for each type of fruit. The eventual goal is to establish a quarantine agreement that allows fresh fruit exports from Vietnam to Australia and New Zealand. The protocol will specify the system of monitoring and control of the pest, production methods, post-harvest treatment, and random testing of the fruit.

A similar procedure exists for establishing a protocol for fresh fruit export to the United States. In December 2000, the U.S. Department of Agriculture (USDA) organized a seminar to discuss the procedure for developing a phyto-sanitary protocol for export to the United States. A decision was made to focus initially on dragon fruit and mangosteen. After the PRA is carried out, the analysis is then submitted to the Agricultural Plant Health Inspection Service (APHIS) of the USDA. APHIS then sends a team to Vietnam to work with Vietnamese authorities on the details regarding production, processing, and export procedures. The entire process may take three years or more to complete⁹.

South Korea currently accepts imports of fresh pineapple, banana, and coconut, but other fresh fruit imports are banned until after a protocol has been established. South Korea also requires the implementation of a Pest Risk Analysis. South Korea is funding a research project with the Ministry of Science and Technology (MOSTE) to develop an integrated system of production, processing, and transport that will allow the export of mango, litchi, and dragon fruit to South Korea. An official of Vegetexco reports that the MOSTE has requested MARD to respond to the interest of South Korea in implementing the Pest Risk Analysis.

5 State-owned processors

The largest fruit and vegetable exporter in the country is the Vietnam Fruit and Vegetable Export Company, better known as Vegetexco. Vegetexco is a state-owned enterprise under the control of the Ministry of Agriculture and Rural Development (MARD). During the 1980s, Vegetexco played a key role in implementing government-to-government trade agreements with east bloc countries. Once the Ministry of Trade had completed an agreement, Vegetexco would be given responsibility for organizing production. It assigned quotas to various state farms and producer

⁹ This information is based on interviews with Mr. Henry Smick and Mr. Dao of the USDA offices in Vietnam.

cooperatives, provided inputs and carried out the processing. Vegetexco exported bananas, canned pineapples, and fresh pineapples to the former Soviet Union and Eastern Europe.

The collapse of the Soviet Union had serious consequences for Vegetexco. Pineapple exports fell sharply and the company was forced into a new role of buying from independent farmers and finding new markets for its output. Although it remains the largest exporter of fruits and vegetables, the market share of Vegetexco has declined as provincial state companies and private companies have entered the market. The annual export revenue of Vegetexco is about US\$ 15-20 million, representing less than 10 percent of the value of fruits and vegetables exported in 2000¹⁰.

Vegetexco exports very little fresh fruits and vegetables, focusing almost exclusively on processed fruits and vegetables. In fact, canned pineapple continues to be the main export product, accounting for more than 50 percent of the total. Other Vegetexco exports include dried banana, salted mushroom, canned mushrooms, pineapple concentrate, pineapple juice, and canned litchi and longan. Procurement is from Vegetexco's own farms and from contracted farmers, though the later is said to represent about 90 percent of the total.

Although data are not available to prove this, it is likely that the declining share of Vegetexco in fruit and vegetable exports is linked to the fact that it concentrates on exporting processed goods. Internationally, the demand for canned fruits and vegetables is stagnant, while that of fresh fruits and vegetables is growing rapidly. Thus, Vegetexco has remained within a stagnant portion of the export market, while private exporters and joint ventures have concentrated on the high-growth fresh market.

Box 8-4. Public investment in fruit and vegetable processing

“The fruit and vegetable processing sector will receive VND332 million in 2002 under plans from the Ministry of Agriculture and Rural Development. The capital will be used to build processing plants in 10 provinces across the country, with an annual combined capacity of 51,000 tonnes. An official from the ministry said its investments in fruit and vegetable processing will boost export turnovers by US\$570 million in 2002.”

Extracted from *Dau Tu* (Investment), cited by Vietnam News Service, 2 August 2001

When asked about competition with private exporters, Vegetexco managers noted that in the private sector, the managers tend to work much longer hours than those in state enterprises. In addition, Vegetexco managers were expected to make a profit on each trade, whereas private traders could make a loss on an occasional trade if it helped to build and maintain their reputation for reliability. In separate interviews, private fruit and vegetable exporters point out that Vegetexco has the size and reputation that allows it to make contracts with foreign buyers. Vegetexco managers have many opportunities to visit trade partners at trade fairs and during export marketing tours. This

¹⁰ Based in part on interviews with Mr. Nguyen Van Ki, Vice General Director, and Ms. Dao Minh Ha, Vice-Manager of the Department of Marketing for Vegetexco in Ho Chi Minh City.

gave them the contacts and marketing information to obtain contracts. In some cases, smaller private traders supply Vegetexco with the produce for export.

6 Land-use planning

Since the introduction of the contract system in 1981 and particularly since the *doi moi* reforms of the late 1980s, Vietnamese farmer households have been given increasing freedom to make their own production decisions and to profit (or lose) as a consequence of those decisions. In spite of this trend, the government retains an ability to “plan” agricultural production in the sense of setting and pursuing production targets for specific commodities. An important part of this process is land-use planning. Authorities at the district and provincial level prepare land-use plans that specify which areas are appropriate for which crops. These plans, often produced with technical assistance from the National Institute for Planning and Projection (NIAPP), take into account national goals for specific commodities.

The implementation of these plans takes the form of various positive and negative incentives. Until recently, some changes in land use, such as switching from rice to another crops, were simply illegal. Other changes in land use were encouraged through the provision of subsidized goods and services:

- Technical assistance from the extension service can be focused on farmers who wish to change their cropping pattern in a way that is consistent with the land-use plan.
- The provinces have funds with which to subsidize fertilizer, seed, and other inputs for farmers that cooperate in helping to meet production targets.
- It is not possible to obtain a loan from the Vietnam Bank for Agricultural Development (VBARD) unless the purpose of the loan to expand production in a way that is consistent with the production targets in the plan.

Until recently, national regulations prevented the conversion of riceland to the production of other crops with the idea of maintaining a minimum rice output thought to be necessary for national food security. These regulations prevented farmers from switching from rice to other crops, particularly fruit trees.

In the late 1990s, following eight consecutive years of substantial rice exports and a sharp decline in world price of rice, the idea of diversifying out of rice and into high-value commodities such as fruits and vegetables became more acceptable. This shift in attitude culminated in the change of policy regarding riceland conversion. Currently, the national government does not *require* that the provinces prevent the conversion of riceland to other crops, but it does not require the provinces to allow farmers to convert riceland either. Instead, it allows local authorities some discretion in the implementation of riceland conversion.

There is still some disagreement within government regarding the degree to which local authorities continue to prevent the conversion of riceland to other crops. Some officials in the Ministry of Agricultural and Rural Development believe that crop decisions have been completely liberalized, allowing farmers to decide how to allocate land among crops without government interference. Researchers in the Mekong River Delta, however, report that many local officials continue to prevent farmers from converting riceland to other crops.

Box 8-5. Promoting pineapple in Bac Giang

Farmers in Bac Giang have been successful growers of litchi for domestic consumption and for export to China. Now, local authorities are attempting to follow up on this success by introducing pineapple production for export. The program involves setting up 1000 hectares of pure Cayen pineapple and another 2350 hectares of inter-cropped pineapple area by 2003. This would produce enough to supply a planned processing plant with an annual capacity of 400,000 tons. Provincial authorities are providing land, credit, and planting materials to motivate farmers to plant pineapple. They held 91 classes and trained more than 10,000 farmers in pineapple growing methods.

In spite of these efforts, farmers have been reluctant to participate in the program. First, the Cayen variety being promoted is not suited for local tastes and is only suitable for export. Farmers are hesitant to rely entirely on the processing plant and the export market for their sales. Second, litchi is said to be more profitable. A farmer can plant 1 hectare of litchi for an investment of VND 10 million (US\$ 675) and generate revenues of VND 15 million per year. In contrast, pineapple requires a larger investment (VND 50 million) and yields a smaller annual revenue (VND 7 million).

Source: Vietnam New Service, 27 August 2001.

In general, land-use planning is necessary to identify and protect environmentally sensitive areas such as fragile hillsides, to prevent over-use of common-pool resources such as rivers and lakes, and to prevent the use of farming practices that hurt downstream farmers such as annual crop production on acid-sulfate soils. All of these cases involve negative externalities, in which the government is protecting people from bad decisions by others. However, it is much more difficult to justify economically land-use regulations which are based on the comparative advantage of different crops. In essence, this type of land-use regulation attempts to save farmers from their own decisions. Suitable production zones for different crops are often based on soils, climate, altitude, and availability of irrigation. These assessment, however, generally omit important marketing variables such as the distance to the market, the condition of the roads, and the local level of prices. This helps explain the frequent criticisms of production campaigns: that they are often successful in producing a bumper harvest of the target commodity, but the lack of marketing outlets creates a glut which drives down prices and discourages farmers. In this context, the important point is that no “scientific” assessment of crop potential can take into account the entire range of factors that affect the profitability of a crop.

7 Summary and conclusions

The institutions carrying out research on fruits and vegetables appear to be focusing on important issues, but their efforts are limited by lack of funds and insufficient coordination. The research institutions are concentrating on providing disease-free fruit-tree planting material, meeting the demand for “clean” vegetables, fulfilling the phyto-sanitary requirements of importing countries, preserving fruit for export and domestic consumption, and staggering production to avoid the harvest-season glut. At the same time, the efforts of the research institutions are modest compared to the size of the sector and the volume of annual exports. For example, research on non-hybrid vegetable varieties appears to be neglected in favor of fruit research.

MOSTE and MARD need to more clearly divide responsibilities among the three research institutes. These Ministries need to decide whether vegetable research for farmers in the South should be carried out by RIVAF or SOFRI or both. RIFAV would require more resources to expand operations in the south, while SOFRI would need both more resources and a new legal mandate in order to cover both fruits and vegetables. Similarly, the development of post-harvest methods for preservation is the topic of research by SOFRI, RIFAV, PHTI/North, and PHTI/South. Although a complete separation of activities may not be necessary, a clearer distinction in the role of each would reduce duplication of effort.

Although research institutes must continue to be involved in income-generating activities in the short run, public funding should eventually cover most or all the costs of carrying out research and extension activities in the fruit and vegetable sector. Vietnamese agricultural research institutes tend to get involved in income-generating activities such as selling seed and providing training courses on a commercial basis. In the short run, these activities are necessary to allow these institutes to cover their costs. Eventually, however, the public good activities carried out by the institutes should be fully covered by public funds, allowing them to focus on activities that cannot be carried out within the private sector.

Public research institutions should focus on the development of disease-free fruit tree planting materials and the selection and dissemination of non-hybrid vegetable seed. The economic justification for public funding for research into new varieties is that, once produced, new varieties can be copied at little or no cost, making it difficult for the breeder who developed the new variety from capturing all the benefits associated with the investment in research. This argument applies to the development of disease-free fruit tree planting materials and the development of non-hybrid vegetable seed, but it does not apply to hybrid vegetable seed. This is because hybrid seed, by its nature, cannot be easily copied.

The commercial and public-good oriented functions of the state-owned seed companies should be separated, allowing equitization of the former and full public funding of the latter. Varietal breeding, seed selection, seed testing, and the development of new cultural practices all have public

good attributes and should be carried out by fully-funded institutes of agricultural research. Seed multiplication and seed distribution are largely commercial activities that should be carried out by the private sector. In the short term, state-owned enterprises involved in both types of activities should be split into research and multiplication enterprises, with only the latter receiving public funding. In the longer run, the multiplication units should be equitized to facilitate the development of a competitive seed sector. The unsubsidized seed companies will probably continue to carry out varietal research, but it will probably be limited to hybrid vegetable seed and other seeds that are difficult to reproduce at the farm level.

A system to certify the varietal purity of vegetable seeds is unnecessary and probably over-ambitious. Even industrialized countries with advanced seed systems do not attempt to certify varietal purity in the vegetable seed sector, partly because of the great heterogeneity in the sector. The desire by seed companies to build and maintain their reputations provides adequate assurance of quality. On the other hand, Vietnam could move toward a system of testing vegetable seed for absence of foreign material and for germination rate, selling “standard” vegetable seed rather than “certified” seed. Initially, the testing would determine whether or not the seed could be labeled as “standard seed” rather than whether or not it could be sold at all.

Restrictions on the sale of imported vegetable seed should be no greater (and no less) than restrictions on the sale of local seed. Imported vegetable seed is important for both vegetable growers and seed producers. Since it is not worth testing the varietal purity of local vegetable seed, it is difficult to justify tighter restrictions on imported vegetable seed. Arguments about the dangers of imported seed (often made by domestic seed producers) must be weighed against the value of introducing new technology (in the form of new seed varieties) to Vietnamese farmers.

The government needs to tighten regulations of the trademark rights of companies and institutes that develop new crop varieties. There are numerous cases of research institutes and seed companies developing a new variety and having the name “stolen” by others trying to take advantage of the reputation of the original variety. It is not clear whether the problem is lack of legislation protecting intellectual property or lack of enforcement, but in either case it creates a disincentive for companies to develop new varieties.

The government should prepare a strategy for controlling the use of pesticides in fruit and vegetable production. This strategy should include four components: supply (import) control, research on the agronomic and economic aspects of pesticide use, farmer education campaigns, and more systematic testing of fruits and vegetables in the market place. This strategy should improve both the safety of the domestic food supply and the marketability of exported fruits and vegetables.

As part of this strategy, there needs to be more systematic testing of pesticide residues in fruits and vegetables. This will require coordination between the Ministry of Health and the Department of Plant Protection of the Ministry of Agriculture and Rural Development. The testing could rely on the AChE methods being used by the FCC in Ho Chi Minh City and would involve a

combination of random testing in the markets and stores of the major urban centers and a testing service for retailers (probably supermarkets) that wish to provide a higher level of assurance of food safety.

Land use planning should focus on regulating land use in environmentally sensitive areas and minimizing environmental damages rather than being used as a tool to implement production targets.

Land use planning is necessary to regulate the use of common-pool resources (such as lakes, rivers, the ocean, and state land) and environmentally sensitive lands (protected areas). It is also necessary to prevent land users from polluting land, water, or air. But it is difficult to justify using land use planning to ensure that farmers select the “right” crops to grow. Farmers already have the incentive to use land as productively as possible, as well as probably having better information about various factors (including market access) which determine the profitability of alternative crops.

In general, the program to expand fruit and vegetable exports should focus on soft infrastructure, such as research and institutional development, rather than production targets and hard infrastructure, such as storage facilities and processing plants. Storage facilities and processing plants are commercial investments that the private sector will undertake under the right circumstances. Public investment in this type of infrastructure will often lead to excess capacity and implicit subsidies for state-owned enterprises. The government should focus instead on agronomic research to improve fruit and vegetable productivity and raise quality, research to satisfy the sanitary and phyto-sanitary requirements of importing countries, a more effective extension service, the development of farmer associations and business associations, and institutions to provide market information to growers and traders.

Chapter 9 Conclusions and Policy Implications

1 Conclusions

1.1 Patterns and trends in fruit and vegetable production

The area planted with fruits and vegetables has grown rapidly in the 1990s. The area planted with vegetables and beans has grown at 5 percent per year, while fruit area has expanded at 6.5 percent per year. These growth rates are twice as high as the growth rate for food crops (2.5 percent), though not as great as the growth rate for multi-year industrial crops.

In spite of this growth, fruits and vegetables still account for a small proportion of total crop area. Vegetables and beans account for just 5 percent of the total cropped area, while fruit trees represent just 4 percent of the total.

Growth rates vary widely across commodities. The fastest growing commodities are the litchi family (litchi, longan, and rambuttan) and citrus fruits. At the other extreme, banana area is stagnant, and the area planted with pineapple has fallen sharply over the 1990s.

The vast majority of rural households in Vietnam grow fruits and vegetables. About 85 percent of the rural households in Vietnam grow at least one fruit or vegetable crop. Bananas, water morning glory, and leafy greens are the most common. The proportion growing fruits and vegetables is higher in the North than in the South. The average rural household grows 3.4 of the 20 categories of fruits and vegetables for which data are available.

Poor rural households are more likely to grow vegetables than richer one. About 70 percent of the households in the poorest income category grow vegetables, compared to just 59 percent in the highest category. This is probably related to the labor-intensity of vegetable production which gives an advantage to households with plentiful labor. The percentage of farmers growing fruit does not vary across income categories.

Fruits and vegetables are grown primarily for sale rather than for home consumption. Two-thirds of the fruit and vegetable output is sold to the market. The marketed share is higher for fruits (74 percent) than for vegetables (63 percent). Furthermore, it is higher in the South (91 percent in the Mekong Delta) than in the North (46 percent in the Northern Uplands). Even among the poorest category of households, over half of the fruit and vegetable output is sold.

Although fruits and vegetables production is more widespread in the North, but the degree of commercialization is greater in the South. The marketed share of fruit and vegetable output is 91 percent in the Mekong Delta and 86 percent in the Southeast, but less than 50 percent in the Northern Uplands and the North Central Coast. In the Red River Delta,

just over half (54 percent) of the fruit and vegetable output is marketed. These regional patterns are partly related to the larger average farm size in the South.

There is conflicting evidence regarding the extent of fertilizer and pesticide use among fruits and vegetable producers. According to the Vietnam Living Standards Survey, less than half (47 percent) the vegetable growers apply fertilizer and less than one-quarter (22 percent) use pesticides. The VLSS indicates that the percentage of fruit growers using either product is even less. Yet, agricultural experts insist that fertilizer and pesticides are used by a majority of fruit and vegetable growers. It is not clear if the VLSS under-estimates pesticide use or if the experts are referring more commercial growers rather than the typical grower.

Barely one-third of vegetable growers purchase seed in a given year, implying that the use of recycled seed is widespread. This suggests that agronomic research and improvement of the seed supply system are important avenue for raising productivity in the sector.

Vegetable production is often more profitable than production of rice, but not always. The net revenue of vegetables is often above VND 10 million per hectare. By comparison, the net revenue for rice and other staple food crops is in the range of VND 4-6 million per hectare. On the other hand, vegetable production is significantly more labor-intensive than rice production, and its profitability is subject to problems of market access and price instability.

Over the 1990s, fruit and vegetable production has become more widespread. The percentage of Vietnamese farmers growing fruits and vegetables has increased from 78 percent in 1993 to 85 percent in 1998. Although the percentage has not changed in the Northern Uplands (where 96 percent already grew fruits and vegetables in 1993), nor in the two Deltas, it has grown significantly in the three central regions and in the Southeast. Fruit and vegetable production has become more common among poor farmers, as well as among those with higher incomes.

The degree of commercialization of the fruit and vegetable sector has also increased over the 1990s. The number of fruit and vegetable growers selling part of their output has increased from 65 to 70 percent and the share of output sold has risen from 59 to 68 percent. The increase in the share of output sold is greatest among the poorest farmers and among farmers in the Central Highlands.

1.2 Commercial growers of fruits and vegetables

Most of the growers in the sample started growing fruits and vegetables since 1990. This reflects the rapid growth in fruit and vegetable production and the expansion in the number of growers since the economic reforms were launched.

Three-quarters of household income for farmers in the sample came from fruit and vegetable production. This reflects the characteristics of the sample, which was intended to focus on specialized, commercial growers of fruits and vegetables. Commercial fruit growers tend to specialize in one crop, while commercial vegetable growers may grow several vegetables.

Income from post-harvest processing was quite small (3.5 percent of total income). Longan and litchi producers had the greatest income from processing activities, corresponding to the drying activities of these growers. For fruit and vegetable production (not including processing) citrus and mango producers had the highest income while tomato producers had the lowest income.

The growers in the sample felt that the profitability of fruit and vegetable production was good. On the other hand, the profitability was judged somewhat lower than in the previous year. The majority of producers cited adverse weather conditions as being responsible for the change in profitability, followed by the market price and then the volume of trade.

The most common type of labor used for agricultural purposes is family labor. Virtually all farms used family labor (both male and female) for agricultural production and over two-thirds of the farms used *only* family labor. Male and female family members appear to contribute equally to fruit and vegetable production. Temporary male and female labor were each hired by about one-quarter of the producers, but these laborers account for about half the total number of person-days of labor. Women account for more than half the temporary laborers.

The management systems for fruit and vegetable production are not particularly advanced. The majority of producers rely on mechanical irrigation systems and canal irrigation where possible, but the usage of tube and drip irrigation is virtually nonexistent. Very few producers are using windbreaks or netting for crop protection. The vast majority of producers use pesticides to control for insect attack, with biological control and integrated pest management being rare.

In general, producers rely on other farmers to provide seeds and organic manure, and on private traders to provide virtually everything else. Some specialty items, such as cuttings and seedlings for fruit production are purchased from state enterprises and

government institutions, particularly in the South. In the North, the use of government organizations is largely limited to areas close to Hanoi.

Almost all fruit and vegetable output in the survey was sold in fresh form. Less than 2 percent of the output was kept for home consumption or reserved for further processing. Produce sold on the fresh market does, however, undergo post-harvest activities such as grading and washing. The majority of produce is sold to assemblers and wholesalers, with very little sold to processors, exporters, or retailers.

About 80 percent of the fruit and vegetable output was sold to wholesalers and assemblers. Processors, exporters, and state-enterprises play only small roles in farm-level marketing, although the some of the output ends up there at a later stage in the marketing process.

Overwhelmingly, post-harvest activities are carried out on the individual farm level rather than at cooperatives or centralized processing facilities. The most common post-harvesting activities carried out by producers are grading (76 percent of producers) and drying (14 percent of producers). The majority of grading is done for fruit produce, while washing and ripening are carried out for vegetable produce. Longan, litchi and tomato producers are the only ones carrying out drying and preserving. Over 98 percent of litchi producers and 42 percent of the longan growers are involved in drying fruit before sale. About three-quarters of the tomato producers are involved in ripening produce before sale.

Almost all producers (over 91 percent) were aware of quality and grading standards for fruit and vegetable production. Ninety-five percent of those based their growing and post-harvest decisions on those standards. Overall, producers believed that size, shape and color were the most important characteristics in the quality standards. Other characteristics, such as smell, texture and flavor, are considered less important.

Over 57 percent of producers reported some post-harvest problem, but losses from post-harvesting are generally quite small, averaging 1.4 percent of total processed product. The major post-harvest problems included transportation (27 percent), handling (17 percent), and being unable to sell their produce after harvest (17 percent).

Sixteen percent of those surveyed indicated that they had had contracts for their production. The majority of the contracts were for pineapple and cucumber production (80 percent of contracts). Almost all the producers without contracts indicated that the lack of buyers willing to provide contracts was the main constraint to adoption of a contract system. The majority of contracts were with state enterprises (72 percent) and producer cooperatives (21 percent). The most common type of contract arrangement was a stipulation of the variety of produce grown and the time of harvest with a guarantee to purchase product. In spite of occasional disputes, these contractual relations were relatively stable.

While 84 percent of producers in the South indicated that they had received extension services over the previous year, only 34 percent of producers in the North had received extension services. Most respondents received information from the Extension Services Department. The majority of producers (63 percent) rated the extension organizations as “Fair” quality, with a further 21 percent and 16 percent rating them “Poor” and “Good” quality respectively. Research centers were well regarded, with 59 percent of producers rating them as “Good” quality. State-owned processors and farmer cooperatives were generally rated “Poor”.

About one-quarter of producers in the survey used credit to fund their agricultural activities. Of those producers who had taken out credit, most indicated that this was sufficient for their needs. For those producers who did not have enough credit to fund their operations, the main reason given was that credit applicants had difficulties dealing with the bank. Two-thirds of those with loans received them from the Agricultural Bank. Fruit producers were more likely to have significantly greater levels of borrowing than vegetable and mixed fruit-vegetable producers.

1.3 Fruit and vegetable traders

Fruit and vegetable traders are diverse in terms of size and legal status. Small traders tend to be unregistered private enterprises, while medium and large ones are often registered private enterprises. Also among the large traders are provincial and central state-owned enterprises.

The average trader in the sample had 47 workers. This figure includes a small number of family members and a large number of temporary (seasonal) hired workers.

Only a minority of traders obtain formal-sector credit. Almost all the surveyed traders used family funds for start-up capital, and 36 percent obtained formal-sector loans as well. Barely one third had outstanding loans at the time of the survey, implying that most traders are self-financed.

The use of cold storage is quite rare. Although a large majority of traders (84 percent) have storage facilities, just 3 percent use cold storage facilities. This percentage is somewhat higher among larger traders and exporters.

Traders purchase most of their produce from farmers in spot-market transactions. About 57 percent is purchased directly from farmers and 37 percent from other traders, such as assemblers. Just 12 percent have contracts with growers. Traders are reluctant to contract with growers because of uncertainty regarding the market price.

The traders in the sample are involved in various post-harvest activities. Eighty-six percent provide packaging or bagging, 62 percent grading, and 43 percent sorting.

The average gross revenue among the traders is VND 7.5 billion, compared to VND 5.6 billion in raw material purchases. Exporters tend to have much higher revenues (VND 25 billion, compared to VND 3.6 billion). Domestic traders in the North and South have similar gross revenues.

The main customers for domestic traders in the sample were processors, while exporters mainly sold directly to foreign customers. Processors accounted for 52 percent of the sales of domestic traders, while foreign customers represented 88 percent of the sales of exporters.

Almost all traders have telephones, but few have faxes, computers, or are members of associations. Just 6 percent are members of associations, though this percentage is higher for exporters and large traders.

Transport costs represent the majority (about 60 percent) of the operating costs of traders. Over 39 percent of traders experienced serious problems for their businesses due to poor access to roads, rail, and docks. Delays, circumspect routes, under loading and inefficient use of transport vehicles among others, due to poor access to transport infrastructure, contribute to both higher transport costs, as well as costs associated with damage to and the spoilage of perishable produce.

Over 30 percent of the fruit and vegetable traders report that the actions of police impede the movement of goods in Vietnam. These results echo those of an earlier IFPRI study that found that over 25 percent of domestic livestock traders had problems with random road side checks and fines by police (IFPRI 2000). In addition, restrictions on the movement of produce between provinces were experienced by about 14 percent of traders.

1.4 Fruit and vegetable processors

The majority of processors surveyed were privately-owned firms, relying on family labor and a relatively smaller amount of hired temporary labor. Processors operated on a seasonal basis, with peak and non-peak periods depending on the types of fruit and vegetable that they process. Only a small minority of processors were sufficiently diversified in the range of products that they processed to operate processing all year round.

The processors generally were involved in fairly basic processing of fruit and vegetables, with the most types of processing being drying, salting, and canning. Most processors only produced either one or two types of processed product and utilized only one major type of fruit or vegetable input.

Only around 15 percent of processors had been involved in contracts with suppliers to provide them with fruit and vegetable inputs. The main reason for the low level of involvement in contracts was that the processors believed that they were too small to

undertake such arrangements or that output prices were too variable. Most of those involved in contracting started the practice since 1998.

The major avenues of sale of processed products were to supermarkets, exporters, and buyers in other countries. While most processors had at least some of their product exported, only a small minority of these processors directly exported. The remainder sold their products to exporters or agents. While the processors who exported directly knew the country of destination of their products, none of the processors who exported through agents, or who sold to exporters knew the country of destination of their products.

Somewhat more than half the processors reported having outstanding loans. Most processors obtained loans from the Agricultural Bank, family and friends, and commercial banks. Family and friends, other enterprises, moneylenders, and other credit institutions usually did not require collateral. In contrast, banks usually required houses, buildings, or land as collateral. Smaller processors were more likely to be asked to put up their house as collateral, while the majority of medium and large processors were not required to put up any collateral.

Most of the processors indicated that they took measures to ensure the quality of inputs to their businesses. This included quality measures at suppliers' farms and quality measures at the processor. These measures were usually rudimentary, such as washing and removal of foreign matter. A small proportion of processors (usually large processors) also sterilized inputs before processing.

The most common measures taken during processing to ensure quality were ensuring that machinery was clean and ensuring that the processing environment was clean. Cleaning machinery and ensuring a clean processing environment were the major measures taken by all sizes of processor.

While the majority of processors indicated that they undertook measures to ensure quality control of products, only around 15 percent of processors were quality certified for fruit and vegetable processing. Not surprisingly, a higher proportion of large and medium processors were certified than small processors.

Almost all processors utilized storage facilities, but only 3 percent used cold storage. For small and medium sized processors, this was primarily a house or cottage. Larger processors also utilized houses and cottages for storage, but additionally utilized sheds and warehouses, some of which were chilled.

Despite the fact that processors utilized rudimentary storage facilities, losses in quantity and quality of processed products appear to be relatively low. Processors reported on average only a 0.51 percent loss in quantity and a 1.5 percent loss in quality of stored processed products. The loss in quantity was consistent across processor size and type but

smaller processors experienced a greater reduction in quality than medium and large processors.

The most common cause of loss in quality in stored produce was humidity and transport related problems. Humidity was the main cause of quality reductions in stored produce. Humidity was also the main cause of quality reductions in stored produce for fruit and vegetable processors. Transport related problems were the major causes of quality loss in the North, whilst humidity was the dominant cause of product quality deterioration in the South.

Since the amount of loss in quantity and quality of stored produce is relatively low, three-quarters of the processors take no action to reduce their losses in storage. 14 percent of processors do take action to reduce their losses by weatherizing their storage structures and 11 percent of processors repair holes in their storage structures.

1.5 Fruit and vegetable exports

The fruit and vegetable export sector was hard hit by the collapse of COMECON and the shift toward a market economy. Exports of bananas and pineapples to east bloc countries declined sharply over the period 1989-1993.

However, the fruit and vegetable export sector has recovered well, opening up new markets in Southeast Asia and elsewhere. This transition has been facilitated by export liberalization, which has allowed private exporters to seek new markets for new products.

The past five years, there has been a significant shift in attention toward fruit and vegetable production, particularly for export. After many decades of food shortages, food security is now ensured, at least at the national level. The change from rice importer to rice exporter makes it easier to justify the diversification of agricultural production from basic staple foods such as rice to high-value commodities such as fruits and vegetables and livestock. Second, since 1998, international rice prices have fallen significantly, resulting in lower farm-gate prices in Vietnam. At the same time, the returns to growing many kinds of fruits and vegetables are quite high, providing opportunities to generate more income per hectare. Third, the support from international organizations in the restoration of deforested land and in promoting rural income generation have led to numerous programs to provide technical assistance and inputs for fruit and vegetable production. This is particularly true in the Northern Uplands (North West and North East) and in the Central Highland areas.

Agricultural statistics regarding fruit and vegetable export patterns need improvement. The data are incomplete and apparently inconsistent, perhaps due to the problem of estimating informal exports and perhaps due to differing definitions. In any case, this information is necessary to establish a baseline from which to measure progress toward the 2010 plan.

The plan to export US\$1 billion fruits and vegetables by 2010 is both promising and worrisome. It is promising that the government is devoting greater attention to strategies to expand rural income through diversification into high-value agricultural commodities. It is worrisome because it appears to resemble centralized management of the agricultural sector, in which provinces and districts will be given responsibility for reaching targets. It is also worrisome because it is not clear if this is a plan to expand the role of state enterprises in fresh fruit and vegetable exports, an areas in which international experience suggests that state enterprises are not well suited.

China has become the most important market for Vietnamese fruits and vegetables. This trade has been stimulated by import liberalization in China, the long porous national border between the two countries, and the low level of quality and sanitary requirements on the part of Chinese consumers and traders.

However, trade with China is subject to intense competition and instability related to Chinese import policy. Vietnamese traders compete with each other, and, to some degree, with Chinese traders. Changes in Chinese policy or market conditions can have a dramatic effect on marketing opportunities for Vietnamese produce.

Exports to higher-income markets such as the European Union, Australia, and the United States are small but growing. Quality requirements, packaging, and sanitary and phyto-sanitary requirements are the main impediment to these remunerative exports.

Vietnamese imports of fruits and vegetables are small compared to exports, but they are growing. Apples and grapes from New Zealand and the United States, as well as tropical fruit from Thailand, will increasingly compete with Vietnamese produce in domestic markets.

Trade liberalization under the ASEAN Free Trade Agreement will definitely benefit Vietnamese consumers. It will probably benefit farmers as well, though more research is needed. Consumers will gain from greater variety and more competition in the sector. It is likely that farmers will gain on average because current trade patterns and low labor costs suggest that Vietnam has a comparative advantage in many fruit and vegetable commodities. The fact that the current tariffs are higher on processed fruits and vegetables than on fresh produce suggests that Vegetexco and other processors will be more adversely affected by import liberalization than farmers. However, the impact of trade liberalization in fruits and vegetables on Vietnamese farmers is an important question that merits additional research.

1.6 Domestic consumption of fruits and vegetables

Fruits and vegetables are consumed by virtually all households in Vietnam. All households in the 1998 Vietnam Living Standards Survey report vegetable consumption. Over 90 percent report fruit consumption in all household groups except the poorest

household category (83 percent of which consume fruit) and among households in the Northern Uplands (79 percent).

Per capita consumption of fruits and vegetables is 71 kg, roughly three-quarters of which are vegetables. The annual value of fruit and vegetable consumption (including home consumption) is VND 126,000 per person or VND 529,000 per household. This represents about 4 percent of the household budget.

Fruit and vegetable consumption patterns are influenced by local production patterns. For example, beans, kohlrabi, and cabbage being more widely consumed in the North, while mangoes, bananas, oranges, and other fruit are more widely consumed in the South.

As incomes rise, the consumption of all fruits and vegetables rise, but some more than others. The consumption of oranges, mangoes, and “other fruit” tend to increase rapidly as income rises. In contrast, the demand for kohlrabi and water morning glory is less sensitive to income growth.

Econometric analysis indicates that the income elasticity of vegetables is 0.54, while that of fruits is 1.09. This implies that the per capita consumption of vegetables will grow at roughly half the rate of per capita income, while that of fruits will slightly outpace income growth. Higher fruit consumption seems to be related to the number of older members of a household, while higher vegetable consumption appears to be associated with lower level of education by the spouse of the head of household.

About 43 percent of the fruits and vegetables consumed by Vietnamese households are produced at home. This percentage is higher for fruits, for rural households, and for households living in the North.

Over the 1990s, fruit and vegetable consumption patterns have become more uniform and less subject to local production. According to a comparison of the 1993 and 1998 VLSS, fruit consumption has increased in the North at the expense of vegetable consumption. At the same time, vegetable consumption has increased at the expense of fruit consumption in the Mekong Delta.

Overall fruit and vegetable consumption has increased in urban areas and in the rural South, but it has declined slightly in the rural North and in the Central Highlands. The decline in vegetable consumption was greater than the increase in fruit consumption.

The average number of different fruit and vegetable products consumed increased markedly between 1993 and 1998. This is true for all regions and for all income groups. The greater diversity in fruit and vegetable consumption is probably the result of import liberalization and improved domestic marketing.

According to an informal survey of urban retail outlets, a wide range of fresh fruits and vegetables are available. Almost all the vegetables are domestic, but there is a small but

increasing share of imported fruit, including apples, grapes, and citrus, imported from China and elsewhere. Domestic fruit juice producers offer a wide range of products, though there is some import competition. Candied and dried fruit are popular and the market for these products is dominated by domestic producers. Fruit jams are mostly imported, but domestic companies are breaking into the market. A range of canned vegetables are available in supermarkets but do not appear to be widely consumed. Most are domestic, except for canned tomato products, which are often from Thailand or elsewhere. Frozen vegetables are available in a few supermarkets, but are not widely consumed in Vietnam.

2 Policy implications

2.1 Market reform

Further liberalization of agricultural markets (including fruit and vegetable markets) would consolidate and expand the benefits of market reform. Market reforms have reduced poverty, expanded fruit and vegetable production and exports, and contributed to greater diversity in fruit and vegetable consumption. The process of market liberalization is mostly, but not entirely, complete. Many goods, including fruit and vegetable products, have import tariffs of 40 percent or more; state-owned enterprises continue to play a large role in agricultural markets, including seed production, fertilizer distribution, fruit and vegetable processing, and exports. Traders report restrictions on movement of goods between provinces and arbitrary police controls which impede domestic marketing. And large food retailers face restrictions against buying directly from farmers and against exporting directly.

Greater effort should be made to eliminate restrictions on internal movement of goods and arbitrary police control of trucks. This problem reduces the efficiency of markets for all goods, but it is particularly a problem for fruits and vegetables because transportation costs are a large part of the consumer price and because they are highly perishable. Since produce spoils quickly, even a short delay may significantly reduce the value of the shipment. Under such conditions, the bargaining power of the police is very strong.

Import liberalization, including the reduction of tariffs and quotas on fresh and processed fruits and vegetables, would generate net benefits for Vietnam. Although such imports will undoubtedly put competitive pressure on domestic growers of fruits and vegetables, they yield three types of benefits for the country. First, consumers gain from greater choice and lower prices. Second, fruit and vegetable exporters (and other exporters) gain from reciprocal trade liberalization by Vietnam's trading partners. Third, although painful in the short run, imported fruits and vegetables impose a useful discipline on domestic

growers, forcing them to improve efficiency, respond to consumer demand, and provide the packaging and quality that consumers respond to.

2.2 Land use regulations

Land-use regulations that prevent the conversion of riceland to other crops are based on concerns about food security that are no longer relevant. Until recently, land-use regulations made it difficult to convert rice-land to other crops. Recent policy changes have given local authorities the ability to relax these regulations, but they continue to be applied on a case-by-case basis. These regulations are difficult to justify now that Vietnam is a major rice exporter. Changes in production do not even influence food security through rice prices, because prices are determined by world markets. Allowing farmers to plant as much or as little rice as they wish would improve farmer income without jeopardizing national food security. In many cases, relaxing such land-use regulations would allow farmers to switch to higher-value crops including fruits and vegetables.

The criteria for land-use regulations should be limited to environmental protection, rather than including assessments of the agronomic potential of each crop on that land. Land-use regulations are appropriate for protecting sensitive ecological zones, for preventing land-use patterns that cause erosion, for avoiding acidification of irrigation water from acid sulfate soils, and other types of environmental protection. On the other hand, it is unnecessary and counter-productive to regulate the use of farmland based on the presumed agronomic or economic potential of different crops. The best use of farmland depends not only on the topography, rainfall, and soil type (factors taken into account in land-use planning), but also on the distance to market, current market prices, the availability of labor, farmer skills, the prevalence of pests, and other factors, many of which vary from plot to plot and from year to year. Farmers already have the incentive to use the land to its maximum economic potential. Provided that environmental protection is assured, they should be allowed to use the land as they see fit.

2.3 Research and extension services

Strengthening agricultural research and extension in fruits and vegetables would yield large significant benefits to farmers and consumers. International experience shows that public investment in agricultural research yields high returns. Furthermore, the returns to fruit and vegetable research are likely to be particularly strong since funding for this sector has lagged behind its growing importance in production and exports. Even specialized commercial fruit and vegetable farmers report relatively infrequent contact with extension agents, and rate public extension services as only “fair”.

Agricultural research institutes should not have to generate a significant portion of their budgets through income-generating activities. The principle that state enterprises should cover their costs and avoid losses refers to commercial enterprises, not to activities that generate public good such as research institutes. Although the sale of seed and seedlings by research institutes creates an incentive for researcher to cater to the needs of farmers, research institutes should not be expected to rely on these sales for a large part of their budgets. These activities distract from the core mandate to generate new technology that is useful to farmers.

The justification for research on open-pollinated varieties of vegetables is greater than the justification for research on hybrid vegetable seed. The fact that many open-pollinated varieties can be recycled is a major reason that private seed companies are reluctant to carry out research in this area and a strong justification for public research. The incentives for private-sector development of hybrid vegetable seed are already strong, which reduces the justification for public-sector investment in this area.

Stronger copyright protection on varietal names would increase the incentives for fruit and vegetable research and adaptation. Interviews with seed companies and producers revealed numerous examples of abuse the names of popular varieties. In many cases, the names of popular varieties were given to seed of another variety. In at least one case, a seed grower attempted to register a varietal name that was already in widespread use. These abuses do not just harm the farmer who buys mis-labeled seed. They also make for vendors of authentic seed to stay in business and reduce the incentives for seed companies to develop new varieties.

2.4 Public investment

Government programs aimed at up-grading equipment and machinery used in fruit and vegetable processing are not a good use of public resources. It is frequently argued that Vietnam must invest in newer, more modern equipment in order to compete on in international markets. To some extent, this is true, but the importance of up-grading equipment has been exaggerated. The IFPRI-MARD surveys of fruit and vegetable processors reveal that processing equipment is not very old and that equipment is not perceived by processors as a major problem. Furthermore, the benefits of investing in new machinery accrue to the enterprise alone, not the fruit and vegetable sector as a whole. Thus, investments in equipment and machinery should be made by individual enterprises rather than by the government. Too often, government efforts to upgrade equipment are merely a disguised attempt to subsidize inefficient state-owned enterprises.

The government should facilitate private investments in storage (including cold storage) for the fruit and vegetable sector, but public investment in storage facilities is generally not a good use of public resources. The fact that storage (or cold storage) is needed by fruit and vegetable growers is not, by itself, a justification for public investment. Storage is not a public good in that it is easy to collect fees for storage services. Furthermore, the decision of where to locate the storage facility will strongly favor some users over others. Nonetheless, there is a role for local government in facilitating credit for such investments and/or organizing producers to invest collectively in storage.

The justification for public investment in infrastructure, such as roads, bridges, port facilities, and market places is stronger. These are true public goods since it is difficult to collect fees for their use and the benefits are widely shared among the community. Infrastructure that is specifically aimed at improving agricultural marketing, such as the construction of market places, is justified, but careful attention must be paid to the needs and preferences of potential users in order to maximize the returns to investment.

However, it is likely that public investment in the fruit and vegetable sector over-emphasizes “hard” infrastructure and under-emphasizes “soft” infrastructure. “Hard” infrastructure refers to warehouses, cold storage, and other buildings and machinery, while “soft” infrastructure refers to institutions and services that facilitate market transactions. This includes public services such as extension, plant protection, certification, and market information. It also includes institutions that are not created by the government, but which the government can facilitate, including farmer associations, credit clubs, and contractual relationship between farmers and processors.

2.5 Institutional development

Market information is increasingly important in fruit and vegetable marketing. As fruit and vegetable marketing extends over longer distance, the need for timely and accurate information about prices and market conditions grows. Because fruits and vegetables are highly perishable, storage (“speculation”) is less able to moderate prices, and market information is particularly valuable when prices are volatile. Market information services must focus on key products and markets to avoid over-extension. Furthermore, they must incorporate regular feed-back from users to ensure that they remain useful and relevant. The size of litchi and longan exports to China, as well as the volatility of the market, suggest that market information in this area would be valuable to producers and traders.

Contract farming has the potential to provide farmers with improved technology and a stable market, but it is not appropriate in all circumstances. Contract farming is sometimes seen as an ideal institution for transferring technology to farmers, providing inputs on credit,

and creating a stable market for agricultural goods. While contract farming can accomplish all this, it will only work in special circumstances. Contract farming works best when the buyer is large compared to the average farm size (otherwise, the buyer could just produce for itself). It works best when the buyer can pay a price consistently above the market price (otherwise, farmers will renege and sell on the market). And it works best when the buyer cannot easily obtain the commodity outside the contracted buyers (otherwise, the buyer will renege and buy elsewhere). Thus, contract farming is most often used by processors and exporters who want to buy a new or unusual commodity or variety. Examples might be a brewer that needs a special variety of barley, a canner that wants a special low-acid variety of tomato, an exporter that wants herbs or some other exotic crop, and so on. Contract farming is rarely used for basic grains, dry legumes, or other crops already grown widely in an area.

Thus, government efforts to impose contract farming on processors will be either unsuccessful or counter-productive. Government officials have recently implied that all processors should provide farmers with contracts, inputs, and technical assistance. As a statement giving official approval and support for the practice of contract farming, it is welcome. Any efforts to force processors to enter contracts with growers, however, would be difficult to enforce and, even if successfully enforced, would result in losses by processors.

By facilitating the creation of professional associations, the government would make fruit and vegetable markets more efficient. Producer and trader associations make it easier to cooperate on matters of common interest, examples being the creation of a system for collecting and disseminating marketing information, the establishment of grades and standards, the provision of feedback to agricultural researchers regarding producer priorities, support to extension services for members, and the exchange of views on policy with the government. The Vietnam Fruit Producers' Association (Vinafruit) was officially created in 2001, but the organizers report that the process of registering as an association took several years. There are always large organizational and financial obstacles to creating associations; resistance by government authorities should not be an additional obstacle.

2.6 Sanitary and phyto-sanitary issues

The government should devote more attention and resources to sanitary and phyto-sanitary (SPS) issues in fresh fruit and vegetable exports. SPS issues are perhaps the greatest obstacle to fruit and vegetable exports to middle- and high-income countries. Furthermore, it is likely that SPS issues will become even more important over time. As AFTA and WTO agreements reduce the ability of countries to protect their domestic agricultural producers from imports with tariffs and quotas, sanitary and phyto-sanitary issues will probably be used for protectionist purposes. Even without the protectionist motive, consumers in high-income

countries are becoming increasingly concerned with pesticide residues, bacterial contamination, and other food safety issues.

One part of the strategy for addressing SPS issues is the development of institutions that can provide credible certification services. Both private and public certification services exist in Vietnam, but their capacities must be increased. Certification services (either private or public) must build and preserve an international reputation for reliability and uncorrupt ability. Even a few cases of in which contaminated food is certified can permanently damage the reputation of the service. In the case of vegetables, the certification often focuses on the level of pesticide residues. In the case of fruit, the certification often concerns phyto-sanitary issues such as fruit fly contamination. Certification of organic production can provide higher returns to farmers and reassurance to consumers (domestic and international) willing to pay extra for this feature.

Another element of the SPS strategy is increased effort in pest and disease control. Under the SPS Agreement, it is in the interest of fruit and vegetable exporting countries to construct detailed inventories of the pests and diseases affecting exported fresh fruits and vegetables and to monitor diseases over time. The temptation to suppress outbreaks of pests or disease that might affect exports is great, and avoiding this temptation is one of the greatest challenges in designing a monitoring system.

A third element of the SPS strategy is greater research on pesticide residues and phyto-sanitary control. Research is needed on production methods to minimize pesticide residues, bacterial contamination, and phyto-sanitary contamination, as well as post-harvest methods to treat fruits and vegetables with these problems. In the case of pesticides residues, control is relatively easy through appropriate production methods, but the challenge is getting this information to farmers and ensuring that the practices are followed. In the case of phyto-sanitary, the solution is more complex, involving clean planting materials, pest control, and post-harvest treatment.

A fourth element in the SPS strategy is to develop bilateral SPS protocols with fruit and vegetable importing countries. These protocols involve a set of monitoring, testing, and treating procedures that, implemented all together, ensure that fruit and vegetable exports meet the standards of the importing country. Since establishing such protocols is expensive and time-consuming, efforts must be focused on commodities and importers where trade flows are (or could be) important.

2.7 Program to expand fruit and vegetable exports

The program to expand fruit and vegetable exports to US\$ 1.0 billion by 2010 should be reviewed with some care. It is not possible to comment extensively because it is not yet

clear how the plan will be implemented. Certainly, greater attention and investment in the fruit and vegetable sector is justified, and it is encouraging that program has an explicit focus on exports. On the other hand, the program appears to have elements of top-down central planning, which are unlikely to succeed in the long run. If the fruit and vegetable program follows the pattern of other commodity campaigns, the national production target will be disaggregated to provincial targets. Provincial authorities will then implement the plan, persuading farmers to plant the new crop using various levers including land-use regulations, subsidized loans, the provision of subsidized inputs, pressure from extension agents, and the promise of guaranteed prices to be paid by a provincial state-owned enterprise.

To the extent that farmers feel obliged to comply with the fruit and vegetable promotion campaign, this system goes against the basic principals of the doi moi reforms, which were to make the household the economic decision-making unit. It would also go against the lessons of agricultural development over the last 40 years, which indicate that programs that dictate farmers' decisions invariably introduce inefficient production methods and reduce farm income. The dramatic growth of the Vietnamese agricultural sector since 1988 certainly confirm the principal that growth is stimulated by giving farmers decision-making responsibility and allowing them to capture the benefits (and losses) associated with those decisions.

To the extent that farmers comply with fruit and vegetable targets because of the incentives provided, there is less chance that the household is being hurt, but one can still question the value of this use of public resources. If the subsidized prices of credit, inputs, and marketing are maintained year after year (as in the case of sugarcane), then the government has created a distorted and inefficient market, sustained only by public subsidies. The hope that subsidized production will become more efficient over time is, based on international experience, not realistic. If the subsidies are withdrawn after a year or two, the damage is more limited, but farmers are likely to become disenchanted with such campaigns. Furthermore, the large organizational effort to manage the campaign uses the valuable time and skills of extension agents and local officials that could be better spent disseminating improved technology, providing market information, controlling plant diseases, and improving marketing infrastructure..

Rather than creating artificial price incentives for growing fruits and vegetables, the government should promote the sector by improving the public services and institutions that serve the sector. This strategy would instead devote more resources to agricultural research, extensions, plant protection, market information, marketing infrastructure, a comprehensive SPS strategy, relaxation of land-use regulations, and the removal of official and unofficial barriers to the movement of goods.

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