



**Marketing of High-Valued Fruits in Bangladesh
- An Empirical Investigation.**

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A DISSERTATION SUBMITTED FOR THE DEGREE OF

MASTER OF PHILOSOPHY (M.PHIL.)

OF THE

UNIVERSITY OF DHAKA

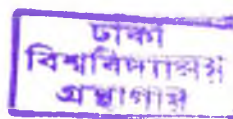


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August, 2012



Dedicated To

My Beloved Parents

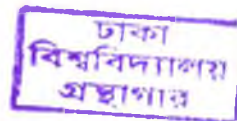


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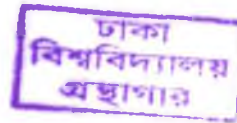
CERTIFICATE

This is to certify that the thesis entitled “*Marketing of High-Valued Fruits in Bangladesh - An Empirical Investigation*” submitted by Mohammad Abu Bakar Siddique, to the University of Dhaka for the fulfillment of the requirements of the degree of Master of Philosophy (MPhil). The work carried out under our supervision is an original piece of research work and has not been submitted previously in part or full for any degree or diploma of Dhaka University or any other Universities.

The contents of the thesis have been approved and recommended for the award of **Master of Philosophy (MPhil)** Degree.

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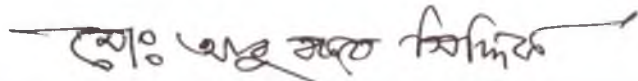
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DECLARATION

I do hereby declare that the thesis entitled “*Marketing of High-Valued Fruits in Bangladesh - An Empirical Investigation*” submitted by me to the University of Dhaka, Dhaka, Bangladesh for the degree of Master of Philosophy (MPhil) is of my own work.

This thesis has not been submitted anywhere before for any academic degree.



MOHAMMAD ABU BAKAR SIDDIQUE

August'2012

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ACRONYMS AND ABBREVIATIONS.

1. ARS : Agriculture Research Station.
2. BADC : Bangladesh Agriculture Development Corporation.
3. BAPA : Bangladesh Agro Processor Association
4. BARI : Bangladesh Agriculture Research Institute
5. BBS : Bangladesh Bureau of Statistics.
6. BFFEA : Bangladesh Frozen Foods Exporters
7. BFVAPEA : Bangladesh Fruits & Vegetable Allied Products
8. BLRI : Bangladesh Livestock Research Institute.
9. BRC : British Retail Consortium
10. BRRI : Bangladesh Rice Research Institute.
11. BSTI : Bangladesh Standards & Testing Institute.
12. CHT : Chittagong Hill Tracts.
13. DANIDA : Danish International Development Agency.
14. DCS : Dairy Cooperative Society
15. EC : European Commission.
16. EPB : Export Promotion Bureau.
17. ETP : Effluent Treatment Plants
18. EU : European Union
19. FAO : Food & Agriculture Organization
20. FOB : Free on Board.
21. GDP : Gross Domestic Product
22. GMPF : Group on Good Agriculture.
23. GoB : Government of Bangladesh
24. HACCP : Hazard Analysis and Critical Control Point.

- 25.HIES : Household Income and Expenditure Foundation
- 26.HORTEX : Horticulture Export Development Foundation.
- 27.HVAP : High Value Agricultural Products.
- 28.HYV : High-yielding Variety.
- 29.ICS : Investment Climate Service.
- 30.IPM : Integrated Pest Management.
- 31. ISO : International Standard Organization.
- 32.LDC : Lower Development Country.
- 33.MOA : Ministry of Agriculture.
- 34.MRD : Mekong River Delta.
- 35.MT : Metric Ton
- 36.NAFTA : North American Free Trade Agreement.
- 37.NTB : Non-tariff Barriers.
- 38.QPM : Quality Planting Material
- 39.ROK : Republic of Korea
- 40.SAM : Social Accounting Matrix
- 41.SEDF : South Asia Enterprise Development Facility.
- 42.SIO : Semi Input-Output
- 43.UAE : United Arab Emirates.
- 44.USDA : United States Department of Agriculture.
- 45.WB : World Bank
- 46.WHO : World Health Organization.
- 47.WTO : World Trade Organization.

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CHAPTER - ONE

Introduction, Objective, and Methodology

Human life (physical, mental and spiritual) is immensely influenced by the quantity and quality of food consumed. As the saying goes, “a man is what he eats.” Several studies have linked the physical and behavioral traits of the people of specific geographical locations to the composition of food and water available to them.

Obviously, one of the most important requirements for ensuring healthy population on this planet is to provide quality food in sufficient quantity. Not only should food meet the gross energy requirements of human body, there should be a proper balance of major, micro and trace nutrients to ensure complete human development. Poor nutrition contributes to 1 out of 2 deaths (53%) associated with infectious diseases among children aged under five in developing countries. Iron deficiency with its attendant anemia is the most prevalent micronutrient disorder on a worldwide basis. All forms of malnutrition's broad spectrum are associated with significant morbidity, mortality, and economic costs, particularly in countries where both under- and over nutrition co-exist as seen in developing countries undergoing rapid transition in nutrition and life-style. In today's world, food must be wholesome and safe for human consumption. Wholesome food availability obviates a large number of ailments and disorders leading to better quality of life and reduced expenditure on health care. It is not surprising; therefore, that food safety and quality concerns are increasingly evident today among producers, processors, marketers, regulators and consumers alike.

Fruits are an integral part of food needed to meet the mineral requirements of human body and to strengthen body defense mechanisms against various biotic and abiotic stresses. On average, fruits have been contributing to about 4% to human nutrition. Fruits consumed as fresh or in processed form have shown specific health benefits. Increased awareness about the health-related benefits of fruits consumption is leading to increased trade in fruits, especially, driven by the consumers of developed countries. There was a double-digit growth in the export of mangos and avocados during 1989-2001, while the overall fruit exports grew at 4.2% during the same period. While several southern hemisphere and banana exporting countries have been quick to take advantage of the growing fruit grade, the same does not hold good for the countries of Asia. In fact, among the top thirty exporters of fruits in the world, only three (Thailand, China and the Philippines) stand out from Asia.

Asia is the cradle of human civilization and domestication of crops and animals, which began first on the continent. It is, therefore, expected that the whole range of temperate and tropical fruits are grown in Asia. Asian tropical fruits such as durian, mango, pomegranate, guava and starfruit have their unique traits in the world of fruits. Asia takes some 44% of the total fruit producing area in the world and contributes about 42% to the total world fruit production, with the largest and the second largest fruit producers located on this countries, a brief description of the major Asian fruits is included in Annex to provide the reader a flavor of these unique creations of Mother Nature.

Table 1.1. Major fruits and fruit producing countries in the Asia-Pacific region

(Unit: thousand tons)

Country	Major Fruits							
	Citrus	Mango	Pears	Grape/Pomelo	Banana	Papaya	Pineapple	Persimmon
Bangladesh	44	1047	-	56	624	112	244	-
China	48885	4351	15231	2,868	9848	158	1,519	3046
India	7818	16337	382	260	29780	4196	1,420	
Indonesia	-	4018	-	-	5755	675	1,390	-
Korea Rep.	1.1	-	-	-	-	-	-	390
Japan	90	-	284	-	17	-	1	189
Malaysia	6.2	25	-	8	249	49	416	-
Pakistan	-	1784	19	-	141	7	-	-
Philippines	188	823	-	33	9101	165	2,169	-
Sri Lanka	-	67	-	-	384	25	52	-
Thailand	5300	2550	-	294	1584	211	2,120	-
Viet Nam		574	-	22	1481	-	477	-
World	11776	37124	22731	67,200	6208	11568	13,889	4057

Source: The Statistical Division (FAOSTAT) of the Food and Agriculture Organization of the United Nations (FAO) - 2010

In spite of the natural advantages that the Asian fruits have in terms of variety, production scale and nutrition, the export volume of the fruit is rather low. Therefore, while there appears to be an ample scope for increasing the intra-Asia and inter-continental trade in Asian fruits, it is important to understand the constraints in tapping the trade potential. This trade will not only provide more income for farmers in the Asian and Pacific countries, but also offer greater variety and associated health benefits to the world consumers.

Bangladesh is an agro-based country. In rural areas, most of the people depend on the agriculture. More than 80% of people living on less than \$2 a

day in Bangladesh live in rural areas. The spatial distribution of poverty makes capitalizing on these opportunities is fraught with challenges. The demand for food in Bangladesh and around the world is changing rapidly. Driven by economic growth, rising incomes, and urbanization, demand is shifting away from traditional staples toward high-value food commodities. High-value agricultural commodities include fruits, vegetable, spices, fish, and livestock products, many of them are processed before reaching the markets. In Bangladesh, additional demand for these commodities is projected to be worth about 8 billion dollar by 2020 (in 2005 prices). This represents an enormous opportunity for food producers, processors, and sellers. Owing to the greater labor intensity characteristic of high value agricultural production, it also provides an opportunity to generate rural employment and raise rural incomes.

The aim of the research is to study the agriculture marketing status for most high-value fruits in order to define marketing efficiency and limitations and to suggest scientific solution and practice mechanism of marketing system efficiency for high value fruits.

The study will investigate following marketing aspects of high yielding fruits in Bangladesh:

1. Existing production system of high yielding fruits in Bangladesh.
2. Marketing patterns and structure of high valued fruits in Bangladesh.
3. Performance of high valued fruits in Bangladesh over time.
4. Price spread of high valued fruits.
5. Current problems of high value fruits marketing in Bangladesh.
6. Suggest measures to increase efficiency of marketing system

The research is mainly based on primary and secondary data. The primary data were also collected by two methods, First, by visiting high yielding fruits grower's garden and wholesale market of Dhaka city, in addition to field observations, second, gathering questionnaire out of random sample survey which represents all forms at end types of fruits marketing channels in metropolitan city in Bangladesh.

For the data analysis, both qualitative and quantitative approaches were used. Other statistical technique will be carried out to assess the marketing condition of high yielding fruits and supply chain management.

CHAPTER - TWO

High-Valued Agriculture in Bangladesh – Review of Literature

This chapter provides a selective review of the empirical research on the poverty impact of high-value agriculture and modern marketing channels. The amount of empirical research varies across topics, being quite limited on the backward linkages of high-value agriculture but more extensive on the poverty impact of contract farming. Given the extensive literature on some topics, the approach in this chapter is to discuss few cases in detail and summarize briefly the results from related studies. The chapter is divided into two sections, one reviewing studies of the impact of high-value agriculture, the other examining research on the impact of modern marketing channels particularly supermarkets and contract farming. A clear distinction between the two topics is difficult because many empirical studies compare farmers involved in high-value agricultural production for supermarkets or for export to farmers producing staple crops for traditional markets. In such cases, it is difficult to separate the effect of high-value agriculture from the effect of modern marketing channels.

Studies of the poverty impact of high-value agriculture

To our knowledge, no research has attempted to estimate the overall impact of the growth of high-value agriculture on poverty in developing countries. A number of studies, however, demonstrate that agricultural growth is pro-poor. For example, Warr (2001) uses time-series data for four Southeast Asian countries to examine the relationship between growth of different economic sectors and poverty reduction. He finds evidence that poverty

reduction is related to growth of the agricultural sector and growth in service but not to growth of industry. Similar results have been obtained using time-series data for states in India (Datt and Ravallion, 1998) and provinces in China (Ravallion and Chen, 2004). Similar econometric approaches could be used to examine the impact of growth of specific subsectors, such as high-value agriculture, on poverty.

Backward linkages to agricultural input markets

Similarly, only a few studies have discussed the backward linkages of high-value agriculture. In the 1950s, the concept of linkages focused on those between the agricultural sector and non-agricultural sector in the context of alternative growth strategies. It was argued that public investment should favor the industrial sector because agriculture had few forward and backward linkages more recent research on linkages has used input-output models and social accounting matrices to estimate multipliers, which describe the overall impact on income of a one dollar increase in demand or supply of a given commodity (Delgado et al, 1998).

Kimenye (2002) discusses the backward linkages associated with green bean production for export in Kenya. She argues that green bean production has more backward linkages through the demand for chemical inputs, irrigation equipment, and tractor services than traditional agriculture, but does not estimate the magnitude of these linkages nor their poverty impact. Ali and Abdellah (2002) use a hypothetical example to show that the same initial increase in crop income create a multiplier effect of 3 in vegetables and less than 2 in cereals. This is attributed to the importance of purchases of

fertilizer, pesticide and irrigation water in vegetable production. On the other hand, Bautista and Thomas (1998) use a SAM for Zimbabwe and find that the GDP multiplier is larger for small-scale food production than for horticulture. The explanation is that the GDP multiplier includes forward, backward, and consumption linkages, and in Zimbabwe horticultural crops are primarily grown by large-scale commercial farms with much smaller consumption linkages.

The impact of high-value agriculture on farm income has been the subject of numerous studies using a variety of methods. Among high value products, impact of horticulture and livestock on farm incomes is most commonly studied. There is a relatively smaller literature on the impact of dairy and fisheries on farm incomes. A number of studies compare the returns per hectare or per day of growing high-value crops compared to more traditional crops. Von Baun and Immink (1994) found that export horticultural production in Guatemala generated gross margins per hectare 15 times as large as maize production and that the gross margins per labor day were twice as large. Weinberger and Lmupkin (2005) summarize the results of seven studies comparing the gross margins of vegetable production and those of rice. The returns per labor-day are higher for vegetables in six of the seven studies. Minot and Ngigi (2004) estimate that the gross margins per hectare for green bean production are about 15 times greater than that of maize in Kenya. However, vegetables are only grown on a small portion of most farms, in part because of the high labor requirements, so these findings do not necessarily imply a significant effect on overall income and hence poverty.

Some studies use qualitative methods, such as surveys that ask farmers about their perceptions regarding high-value agriculture. For example Mullens et al (1996) surveys dairy farmers about the impact of a program to promote intensive dairy production. They report a broad consensus among farmers that dairy production had improved their welfare, both in terms of higher income and increased milk consumption, though at the cost of more work for women.

In a survey of 307 rural households in the northern uplands of Vietnam, Minot et al (2006) finds that 83 percent of the respondent report higher standards of living compared to seven years ago. When asked for the reason, the most common responses were higher yields (64 percent), more income from livestock (50 percent), and adoption of new crops with higher profits (38 percent). Such studies are subject to the well-known limitations of qualitative surveys, but farmer perceptions of the causes of changes in welfare can potentially “control” for a wider range of factors (including weather, skills, and health) than can be incorporated in quantitative analysis.

Other studies demonstrate that farmers involved in commercial production of high-value commodities are better off than farmers that are not. For example, Von Braun et Al (1991) study small-scale farmers in Rwanda and find that the commercial production of potatoes is associated with higher incomes and better nutritional status. Weinberger and Lumpkin (2005) compile results from six studies showing that horticultural smallholders earn 20 to 497 percent more than non-horticultural smallholders. Because other factors such as irrigation and farm size are not held constant, these results do not necessarily demonstrate that commercialization *causes* higher incomes.

More persuasive are studies that compare the incomes of high-value producers and other farmers, using methods to control for farm size and other factors. McCulloch and Ota (2002) examine the linkage between export horticulture and poverty reduction with a survey of 263 households in Kenya, including packhouse workers, farm workers, horticultural smallholders, and non-horticultural smallholders. Smallholders involved in horticultural production for export had twice as much farm land and four times as much income per adult equivalent. The authors use regression analysis to show that horticultural growers have higher incomes even after controlling for farm size, education, irrigation, and other factors.

Alderman (1987) studies the impact of the Karnataka Dairy Development Project which promoted the creation of dairy cooperatives to facilitate the sale of milk from rural to urban areas in India. The study uses a sample of 806 households in 42 villages, half of which had dairy cooperatives. Econometric analysis suggests that household expenditure (a proxy for income) was 8 percent higher in villages with dairy cooperatives after controlling for education, farm size, and assets. Because cooperative villages had somewhat higher milk prices, more milk production, and equal non-dairy income, this author attributes this difference to the cooperatives.

Panel data is particularly useful because analysis of changes in income helps to control for time-invariant household characteristics both observed (e.g. farm size) and unobserved (e.g. skills). Von Braun and Immink (1994) examine the impact of export horticulture using a sample of 399 Guatemalan farmers who were interviewed in 1983 and again in 1985. About half of the farmers were members of a cooperative that organized the export of snow

peas and other vegetables, allowing the authors to compare changes in income²⁰ among those who adopted export vegetable production and those who did not. They find that income increased 38 percent among recent adopters of export vegetable production relative to the increase among other farmers. The increase in income was even greater, 60 percent, among small farmers who adopted export horticulture production.

None of these studies, however, takes into account the fact that those who adopt high-value agriculture probably gain more than other farmers would gain by adopting. The problem of non-random selection creates an upward bias in estimates of the benefits of adopting new crops.

Employment

With regard to employment, numerous studies document the fact that vegetable production is much more labor intensive than grain production. Weinberger and Lumpkin (2005) compile results from seven Asian studies showing that vegetable production uses 1.5 to 5.3 times more days of labor per hectare than grain production. Similarly, the study of Guatemalan vegetable growers cited above found that employment increased by 45 percent on farms adopting export horticulture (von Braun and Immink, 1994).

The study of Kenyan horticulture described above shows that horticultural packhouse workers are no better off than otherwise similar wage-earners in the non-farm sector, suggesting labor mobility between the two. However, farm workers on large-scale horticultural farms (both contract farmers and

exporter-owned farms) were better off than non-horticultural smallholders after holding other factors constant (McCulloch and Ota, 2002).

In the case of large-scale horticultural production, the main impact on poverty is probably through employment. Barron and Rello (2000) study the impact of tomato agro-industry in Mexico and its impact on employment in poverty stricken rural areas. Tomatoes are grown on large farms in northern Mexico for export to the United States. Thousands of migrant workers work in this sector, most of whom migrate annually from the poorer states of southern Mexico. Tomatoes production requires 122 days of labor per hectare compared to just 29 days per hectare for maize production. The authors find that wages are similar to wage in other regions of commercial agriculture, though lower than wages in the manufacturing industry. In a survey of households in southern Mexico supplying tomato workers, two-thirds of the households had less than 3 hectares of land. They conclude that the tomato industry provides jobs and income for poor families from southern Mexico. However, during the study (1995-1997), there was a trend towards saturation of labor markets with significant negative effects on real wages.

Less evidence exists on the labor intensity and employment effects of other types of high-value agriculture, such as fruit and livestock production. It is likely, however, that labor intensity varies widely depending the commodity, the scale of production, and prevailing wage rates. However, a number of studies examine other aspects of employment in the growing fruit export sector in developing countries.

Jarvis and Vera Toscano (2004) describe the impact of the Chilean fruit export sector on household income and employment. As of the late 1980s, the fruit sector employed about 300 thousand seasonal workers and 120 thousand permanent workers. Based on the fruit area, this implies about 1.5 temporary workers per hectare and 0.6 permanent workers per hectare. The authors say that, while early studies claimed that workers were being exploited, more recent empirical research emphasizes that this employment contributes significantly to the incomes of relatively poor households. Their 1992 survey of 690 grape workers, 90 percent of whom were women, indicates that the workers were well informed about wages and benefits with different employers, that women earned more per day than men (partly because of their higher productivity), and that those wages contributed to more the half of household income for 25 percent of the female workers. A regression analysis of daily earnings in different jobs taken by the workers (the average worker had five jobs over the year) reveals that agricultural labor paid better than non-agricultural labor. Although the authors found evidence of job discrimination against women, they also conclude that female workers enjoyed the financial independence that the work gave them and that most would prefer to work there for a longer period of the year.

Food prices

The impact of high-value agriculture on poverty via food prices is the subject of some discussion but little in-depth analysis. Any adverse effect should be most evident in countries experiencing rapid substitution from grain production to high-value agricultural production. Between 1980 and 2002, fruit and vegetable area in China increased more than five-fold, rising from 6 million hectares to 33 million hectares, at the same time as wheat and

rice area declined 18 percent, from 63 million hectares to 52 million hectares. However, higher yields have allowed grain production to keep pace with population growth (FAO, 2006). Similarly, Vietnam has diversified into coffee, fruits and vegetables, and other high-value crops without reducing rice production. The declining share of land allocated to rice cultivation has been more than offset by increased cropping intensity and yields in rice (Minot et al, 2003). Information on food price changes for a larger set of countries would bolster the case, but preliminary evidence suggests that even rapid growth in high-value agriculture may not imply higher food prices for consumers.

Studies of the poverty impact of modern market channels

This section provides a selective review of empirical evidence on the impact of modern marketing channels on poverty in developing countries. This section considers the impact of modern marketing channels on farmers, on employment, on traditional traders, and on consumer food prices.

Farm income

The empirical research on the impact of modern marketing channels on *farmers* tends to focus on the impact of contract farming and impact of the growth of supermarkets. Each of these will be considered in turn.

Contract farming

The research on contract farming in developing countries is fairly extensive, going back to the 1970s. In an early review of the literature, Minot (1986) finds that farmers generally benefit from contract farming because it provides them with inputs on credit, technical assistance, and (often) a

guaranteed price, allowing them to produce a higher-value commodity than would otherwise be possible. At the same time, contract farming should not be considered a broad-based strategy for rural development because it is only cost-effective when large-scale buyers (such as processors or exporters) need to introduce a new crop, to obtain special product characteristics, to stagger the harvest over the year, or to control some aspect of the production methods. Contract farming is typically used to organize production of a perishable high-value commodities for a quality-sensitive market. However, cases in which buyers or farmers violate the terms of the contract are common, and a good number of contract farming schemes fail for one reason or another (Minot, 1986).

Other studies provide a more skeptical view of the benefits of contract farming. Little and Watts (1994) compile a set of seven case studies of contract farming in sub-Saharan Africa. The case studies focus on the historical and political context of contract farming, conflicts between farmers and the contracting firms, the imbalance of power between the two parties, intra-household tensions over the division of labor and the allocation of new revenues, and the increasing rural inequality as contract farmers grow wealthy enough to hire farm laborers. In his summary of the cases, Little (1994) concludes that “incomes from contract farming increased for a moderate (30-40 percent) to a high (50-60 percent) proportion of participants” (p 221). However, this income was not enough to live on and farmers had to rely on other farm and nonfarm income. In addition, he concludes that contract farming often exacerbates income inequality by favoring middle- to large-scale growers. In several cases, households lost land that was appropriated for government-run contract farming schemes.

In review of the experience of contract farming in Africa in the early 1990s, Porter and Phillips-Howard (1997) conclude that farmers were generally better off as a result of their participation in contract farming, in spite of a number of social problems that arose in the communities. Similarly, Singh (2002) identifies a series of problems associated with contract vegetable production in Punjab state in India: imbalanced power between farmers and companies, violation of the terms of the agreements, social differentiation, and environmental unsustainability. Nonetheless, his surveys reveal that most farmers have seen incomes rise and are satisfied with the contract arrangement.

A number of studies examine the proportion of contract farmers that are smallholders, as an indicator of the pro-poor impact of contracting. Guo et al (2005) use data from farm-level surveys in China covering several products to estimate the likelihood of participating in a contract farming scheme as a function of household characteristics, crop mix, and farm size. The results indicate that small farmers are less likely to participate in contract farming than larger farmers. Similarly, Runsten and Key (1999) look at contract farming by tomato processing industry in Mexico. Multi-national agro-processors from the United States first contracted with large growers but then involved also the small growers. Part of the reason was that as a lucrative market for fresh tomatoes developed, firms found it increasingly difficult to enforce contracts they had with larger growers.

A few studies give examples of buyers shifting from small-scale to large-scale farmers or the reverse. One example, cited in World Bank (2006), is an

exporter in Thailand that started producing its own horticultural products on company land and later shifted to smallholder contract production. Minot and Ngigi (2004) describe the evolution of several contract farming schemes in Kenya, including one (Del Monte pineapple) that gave up on contract production and others that have shifted from large-scale to small-scale production. These findings confirm that the comparative advantage of smallholders is not a static concept, but it can change as farmers and buyers experiment and learn from their experience. It also implies that public policy may be able to play a role in supporting the participation of small farmers in these supply chains.

Other studies provide more direct evidence in the form of income or gross margin comparisons. For example, Birtal et al (2005) compare the gross margins of poultry, dairy, and vegetable contract farmers with independent farmers producing the same commodities. The gross margins for contract dairy farmers were almost double that of independent dairy farmers, largely because contract growers had lower production and marketing costs. The gross margin for contract vegetable growers was 79 percent greater than that of independent vegetable grower's income, and for poultry, the gross margins of contract farmers was 13% higher. Although they do not use regression analysis to control for other factors, they show that contract farmers had higher gross margins for small-, medium-, and large-scale farmers. A logit analysis of participation in the contract farming schemes indicates that farm size and education are not significant predictors, implying that small farmers are not excluded from contracting.

A few studies of contract farming take into account the fact that contract farmers are generally not a random sample of the population; they may differ from the population in ways that also affect income. For example, if farmers that sign up for contract schemes are more hardworking or more skilled than others, the difference in income between contract farmers and other farmers will reflect both the effect of contracting and the effect of those characteristics. This bias can be corrected using a Heckman selection regression model or an instrumental variables model.

Warning and Key (2002) study contract farming in peanuts in Senegal. NOVASEN, a private company, contracted 32,000 growers and produced approximately 40,000 tons of peanuts annually. The authors estimate gross profits using a two-step Heckman procedure to control for selection bias. They find that the increase in gross agricultural revenues associated with contracting is statistically significant and large, equal to about 55 percent of the average revenue of non-contract farmers. Various measures of assets were not significant predictors of participation in the contract farming scheme, suggesting that contractors were typical rural households.

Another study, carried out in Indonesia by Simmons et al (2005), examined contract growers of poultry, seed maize, and seed rice. They also use a Heckman model to control for selection bias. The poultry contracts and seed maize contracts resulted in improved returns to capital, while no significant impact was found in the case of seed rice. Contract seed growers were more likely to be large farmers compared to independent growers, but contract poultry production tended to be smaller than independent poultry growers. They conclude that the contracts increase income and welfare, reducing

absolute poverty. Ramaswami et al (2006) re-analyze the poultry survey data from the above-cited study by Birthal et al (2005), except that they use an instrumental variable regression analysis to control for selection bias. They find that average gross margins are similar between contract growers and others, but the regression analysis indicates significant gains from contracting. The explanation is that contract growers are less experienced and have less access to credit than other growers. Thus, they gain more from the management assistance and the credit provided by the firm than would more capable farmers who already have access to credit. Thus, the incomes of contract farmers are significantly higher than they would have been without the contract, but only slightly higher than the incomes of the more-skilled independent growers. In addition, the authors also show that the variability of gross margins across production cycles is much lower for contract growers than for independent growers, revealing another benefit of contracting.

Supermarkets

There is widespread concern that smallholders will be excluded from lucrative markets for high-value commodities due to the growth of supermarkets. Processed foods are either imported or purchased from processors, so the impact on farmers is indirect (supermarkets may increase the demand for processed foods). Thus, research on the impact of supermarkets on poverty focuses on fresh fruits and vegetables and dairy products. Small supermarkets catering to cost-conscious consumers tend to purchase from the traditional wholesale markets. But as the supermarket chain expands and as consumers become more quality-conscious,

supermarkets begin to establish their own supply chains (including dedicated distribution centers), set private standards, and establish lists of preferred growers. These growers are generally medium- and large-scale farmers who can more easily meet the volume and quality requirements and provide a steady supply throughout the year (see Reardon and Berdegué, 2002; Reardon et al, 2003; Weatherspoon and Reardon, 2003; and Shepherd, 2005).

These trends are most advanced in the middle-income countries of Latin America, where supermarkets generally account for over half of retail food sales and the existence of large-scale farms allows supermarkets to link up largely with large farmers. Although there are numerous descriptive studies of the growth and procurement patterns of supermarkets, there are few studies that measure the role of smallholders in supplying supermarkets. Balsevich et al (2003) estimates that 80 percent of fresh fruits and vegetables supplied to supermarkets came from medium or large growers or packers. Information on producer prices for suppliers to supermarkets and traditional markets, as well as income profiles for different types of growers would strengthen the case that small farmers are excluded and that they lose from exclusion.

The trends in Asia are mixed, with extensive supermarket penetration in middle-income countries such as Thailand, Malaysia, and the Philippines and minimal presence in low-income countries such as Vietnam, Bangladesh, and India. As mentioned above, the penetration of the supermarkets differs across products being relatively lower in fresh fruits and vegetables than in processed food Hu et al (2004a) examines the impact

of supermarkets in China, whose sales have been growing at more than 40 percent per year and now account for 11 percent of retail food sales. Supermarkets have begun to organize their supply chains and bypass wholesale markets, but they are hampered by the fact that farms are small and unorganized. Another study examines the effect of supermarkets on supply chains and small farmers in China, focusing on the growing demand for food safety (World Bank, 2006).

Another study by Hu et al (2004b) indicates that supermarkets have promoted consolidation in the dairy processing sector, as small processors merge and large ones buy small ones. At the same time, supermarkets have catalyzed the development of a unified national dairy market, creating trade from the poor, pastoral provinces in the west to the higher-income, urbanized provinces in the east. The authors do not provide data on the characteristics of the dairy farmers in the east supplying supermarkets, but this trend may incorporate poor farmers.

Chowdhury (2005) reviews the trends in high-value agriculture, vertical coordination, and supermarkets in Indonesia. Based on rapid reconnaissance and interviews with supermarkets, he argues that supermarkets do not favor large-scale farms, partly because small farms dominate Indonesian agriculture: two-thirds of all farms have less than one hectare. Furthermore, he cites research indicating that supermarket suppliers get prices that are almost 50 percent higher than suppliers to traditional markets.

A detailed study of the tomato marketing in Ho Chi Minh City, Vietnam, also finds that supermarkets offer its suppliers higher farm-gate prices than

the traditional marketing channels do. The authors do not explore the farm size of tomato farmers in the two channels to test the hypothesis that small farmers are being squeezed out. This may be because supermarkets only control 2 percent of the tomato sales in Ho Chi Minh City, so their effect on the regional tomato market is still almost negligible (Cadilhon et al, 2006).

In sub-Saharan Africa, the expansion of supermarkets is the most advanced in South Africa, where they have a 55 percent share of retail food sales. Weatherspoon and Reardon (2003) estimate that 40 percent of fresh fruits and vegetables are sold through supermarkets and that most are sourced from medium- and large-scale farmers in South Africa. On the other hand, the expansion of South African supermarket chains such as Shoprite into other African countries has facilitated the increasing use of smallholders in other countries to supply South African markets.

Neven et al (2005) analyze the impact of supermarkets on small farmers in Kenya using interviews with supermarkets regarding their procurement patterns. One chain (Uchumi) obtains just 10 percent of its fresh fruits and vegetables directly from small farmers and 40-50 percent from brokers and wholesalers, while another (Nakumatt) sources 60-70 percent directly from small farmers. The authors argue that smallholders are not currently being squeezed out of horticultural markets because, as medium and large growers begin supplying supermarkets, small farmers have less competition in traditional markets. But eventually, the growth of the market share of supermarkets will put pressure on small farmers to either meet supermarket standards or be squeezed out of horticulture. Currently, only 6 percent of fresh fruit and vegetables in Nairobi are sold through supermarkets.

As a major horticultural exporter, Kenyan farmers are also affected by supermarket trends in the United Kingdom and elsewhere in Europe. Growing consumer interest in food safety and traceability has shifted export horticulture toward larger contract farms and vertically integrated processor-exporters, according to Dolan and Humphrey (2001). Nonetheless, Jaffee (2003) estimates that smallholders still account for about half of Kenyan fruits and vegetables exports.

Again, it is important to recognize that the rising demand for food safety and higher quality may work against small farmers in the short-term, but to the extent that they can learn new skills and otherwise adapt, the trend may be less negative or even positive in the longer term (Van der Meer, 2006). Few studies to date have addressed these dynamic issues in studying the impact of supermarkets on small farmers.

Traditional traders

What is the effect of the growth of supermarkets on traditional traders? Most studies focus on traditional food retailers. Gutman (2002) documents the impact of the growth of supermarkets on the traditional retailers in Argentina. The end of the 1990s, supermarkets/hypermarkets accounted for 57 percent of retail food sales in Argentina, reducing the share of traditional retailers to 17 percent. The Economic Censuses of 1984 and 1993 showed a drop of 30 percent in the number of retail stores in general and an accompanying drop of 26 percent in employment in food retail. Gutman

estimates that 125,000 jobs were lost because of the decline of the traditional retail and only 22,500 jobs were created in the supermarkets.

Faiguenbaum et al (2002) look at the impact on the traditional retailers of the emergence of the supermarkets in Chile. Between 1991 and 1995, the number of retailers in general food, beverages and liquor, meat, fish, and dairy products declined by more than 20 percent. Although most shopkeepers are considered to fall into the middle and lower income groups in Latin America, it is difficult to quantify the impact on poverty without more information on the income profile of traditional retailers and how they responded to these closures.

In Thailand, the transformation toward supermarkets is rapid enough to result in a 14% decline in the number of traditional retailers in 2001 compared to a 20% growth in the number of supermarkets (USDA, 2002). In contrast, in Indonesia the number of “independent grocers” continues to rise even as the market share of supermarkets and hypermarkets increases (USDA, 2003).

Consumer price of food

What is the impact of the growth of modern marketing channels on poverty through the consumer price of food? Few studies have examined the effect of contract farming and other methods of linking farmers to markets. One example is Alderman (1987), who examined prices, marketing patterns, and income in villages with and without a dairy cooperative. He found that milk prices were higher in villages with a cooperative because the link to urban

markets raised the village price. This linkage benefited dairy producers and consumers in the cities, but hurt non-producing milk consumers in the villages.

More discussion has focused on the impact of supermarkets on consumer prices. As described in earlier, the prices charged by the supermarkets could be higher than those charged by traditional retailers because of the bundled services that supermarkets offer such as convenience, cleanliness, and the shopping experience. Alternatively, modern retail outlets could take advantage of economies of scale and thereby offer lower prices to the consumers. It is likely that the pricing strategy of supermarkets depends on the price-consciousness of their consumers.

Empirical studies suggest that the price relationship may vary by type of product. Neven et al (2005) compare prices in Nairobi supermarkets with the prices of similar products in traditional retailers. The prices of nine fresh produce items were, on average, 6 percent higher in supermarkets, while the prices of processed food products were, on average, about 3 percent lower. Consumer surveys revealed that the urban poor bought processed foods in supermarkets and fresh produce in wet markets, as would be expected given these price relationships.

A similar analysis was carried out by Ghezan et al (2002) for horticultural products in Argentina. They find that the prices for fruits and vegetables were, on average, 6 percent and 14 percent higher, respectively, than in traditional retail outlets. However, the average price for all food and beverages was 5 percent lower in supermarkets. In spite of the large market

share of supermarkets in Argentina (70 percent in 2000), small fruits and vegetables shops continued to dominate horticultural retail sales. The authors cite survey results indicating that 71 percent of fresh fruits and vegetables were bought from traditional retail outlets.

One of the most comprehensive studies of the impact of modern marketing channels was carried out by the firm Global Insights (2005). The objective of the study is to determine what the U.S. economy would be like if Walmart did not exist. Although it refers to the U.S. economy, the methods and results are relevant in this context. The methods include econometric analysis of panel data for 24 urban areas over 20 years and a macroeconomic simulation model.

The results suggests that Walmart has reduced consumer prices by about 3 percent and wages by about 2 percent, resulting in a 1 percent increase in real income. They suggest that the cost savings of Walmart are due to higher total factor productivity and being able to obtain imports at lower prices than other stores. Although data constraints would make it difficult to carry out a similar study in most developing countries, this study reveals the potential for using economy wide models to evaluate the poverty impact of modern marketing channels.

Summary

Numerous empirical studies have explored the impact of high-value agriculture and modern marketing channels, but they tend to focused on just a few types of impact. For example, there are few studies that examine the backward linkages from high-value agriculture, though these linkages should be more important for high-value agriculture than for staple food crop

production. The effect of backward linkages is particularly important in the case of livestock industry, where the demand for feed affects upstream maize producers. Many studies confirm that farmers growing high-value agricultural commodities are generally better off than others, but many of these studies do not control for other factors (such as irrigation) or take selection bias into account. There is strong evidence that fruits production is more labor intensive than staple food crop production, but less attention to other types of high-value agriculture such as fruit and livestock production. In addition, few studies attempt to measure the relationship between additional labor demand and poverty reduction. Finally, few studies have considered the impact of high-value agriculture on food prices, though initial indications are that the impact is likely to be negligible in many cases.

Empirical research on modern marketing channels tends to focus on supermarkets and contract farming. Studies indicate that, as supermarkets in developing countries expand and begin to cater to quality-sensitive consumers, they pay higher prices for high-value commodities than the traditional traders but they also start to establish preferred supplier lists which often exclude small farmers. Although these studies hint at an adverse impact, more information would be needed to measure the impact on incomes and poverty.

The effect of contract farming on participants generally seems positive. However, the impact on poverty is mixed because in some cases only medium- or large-scale farmers choose to contract or are invited to contract. A few recent studies have used methods which control for other variables and take into account the problem of selection bias.

A few studies indicate that growth in the supermarket sector can be rapid enough to cause an absolute decline in employment in the traditional retail sector. However, it is not clear how common this is and how much impact this has on poverty.

Finally, several studies suggest that supermarkets may have lower retail prices for processed food and higher prices for fresh fruits and compared to traditional markets. Again, this is suggestive, but does not provide enough information to assess the impact of supermarkets on the poor.

CHAPTER - THREE

Fruit Production and Export From Asian Countries

In this chapter, fruit production in a few major countries of the region and the export of fresh fruits from these countries are reviewed and discussed. Overall status of the fruit production in Asia will be summarized at the end of this section.

Bangladesh

Bangladesh is blessed with a large variety of fruits. Among the fruit species: banana, mango, pineapple, jackfruit, papaya, guava, lemon, lime, pummelo, litchi, coconut and jujube, are the major fruits, while anola, starfruit, bullock's heart, custard apple, Indian olive, pomegranate, bael, hogplum, jamun, wax apple, wood apple, palmyra palm, apple kul, bau kul, red lady papaya, strawberry, sapota and rose apple are important minor fruit species. The annual production of fruits in 2010 was about 3954 thousand tons from an area of about 516 thousand hectare, the area under fruits cultivation is only 2.1% of the net cropped area. While fruits are mainly grown in the homestead, there are a few commercial orchards of mango, pineapple, banana, papaya and guava in some localized areas of Bangladesh, The average production of fruits both in homesteads and commercial orchards is about 8,4 tons per hectare, which is very low compared to that of other tropical and sub-tropical countries of the world.

China

Fruit is one kind of cash crop for farmers in China and plays an important role in generating income for peasants. China has been the top producer of fruits in the world since the 1990s. Fruit production in China comprised 15.2% of the world total production in 2003; apple and pear accounted for 35.5% and 53.1 %, respectively. Citrus growing acreage and production has recently been increasing, China produced more than 16 million tons of citrus fruits, equaling 16% of the world's market for citrus fruits, and became the second largest producer of citrus in the world, after Brazil in 2005.

According to the Chinese Ministry of Agriculture (MOA, 2005), in 2004, the total fruit acreage covered 9.8 million hectares with 83.941 million metric tons (MMT) of production (Table 2.1). Among all the fruits, apple ranked the first with 23.675 MMT, followed by citrus at 14.958 MMT and pear at 10.642 MMT; these three fruits accounted for 58.7% of the total production. During the past 4 years, the total fruit production increased by 9.7% annually, but the acreage only increased by 1.5%. It can be seen from table 2.1 that the increase during the period of 1980 to 1992 was a slow incline, but increased at a faster pace after 1992. Export of fresh fruits in China has been increasing since 1990s, and reached 1.75 MMT in 2004. The export volume kept at a low level during 1980-1992; however, it registered a sharp increase after 2001. The fruits China produced were mainly for domestic consumption. The net balance of trade for China in 2005 was positive with

about 2.5 MMT net exports of fruits and fruit products, with US\$ 1.38 billion trade surplus.

Table 2.2 gives a detailed list of the import and export of fresh and processed fruits for 2005. As compared to 2004, an increase of 15.7% in exports was recorded. On volume basis, apple accounted for 40.5% of the total, followed by citrus (22.8%) and pear (18.1%). China exported 58.1% of the fresh fruit and products were exported to Asia, 23.2% to Europe, and 16.1% to Northern America. Exports to ASEAN accounted for 28.8% (Table 2.5). In 2005, China exported about 0.3 MMT of canned citrus, which accounted for about 60% of the total canned fruit export. The main market was NAFTA(47.1%), followed by the EU (18.6%). Apple juice exported in 2005 amounted to a total of 0.65 MMT; 39.1% of which destined for NAFTA, and 30.3% for EU,

China imported about 0.984 MMT of fresh fruit during 2005, an increase of 8.3% over the previous year. Out of all fruits, bananas from Southeast Asia (mainly from Philippines), longans from Thailand and kiwi fruit from New Zealand were the top three. In October 2003, an agreement between China and Thailand on the removal of non-tariff barriers (NTB) for vegetables and fruits was in effect. This agreement has enhanced the optimization of resources on both sides (Zhang & Tao, 2005). Thailand has the upper hand at producing longans and other tropical fruits, and China stands out with excellent apples and pears. Although there are still some issues that need to be resolved in this agreement, it has facilitated the fruits trade between the two countries. In 2004, China signed NTB agreements for fruits and vegetables with 5 other countries including Singapore, Malaysia, Indonesia,

Philippines and Brunei; and in 2005, the cooperation expanded to more ASEAN countries. In 2005, China imported 0.253 MMT fruits from Thailand, and exported 0.125 MMT. For the Philippines, import and export volumes were 0.307 MMT and 0.117 MMT, respectively.

Table 2.1. Fruits production during 2001-2004 in China

(Production in thousand tons; area in thousand hectares)

Years	2001		2002		2003		2004	
	Production	Area	Production	Area	Production	Area	Production	Area
Apple	20,015	2,066	19,241	1,938	21,102	1,901	23,675	1,877
Citrus	11,607	1,324	11,990	1,405	13,454	1,506	14,958	1,627
Pear	8,796	1,062	9,309	1,042	9,798	1,062	10,642	1,079
Peach	4,562	452	5,230	547	6,148	607	7,011	663
Banana	5,272	245	5,557	248	5,903	256	6,056	265
Grape	3,680	334	4,479	392	5,176	421	5,675	414
Lychee	954	558	1,523	555	1,124	559	1,556	586
Pineapple	869	61	827	56	822	53	808	51
Kiwi fruit	242	48	283	50	330	52	409	53
Total	60.453	9,200	69,520	9,098	75,515	9,437	83,941	9,769

Source: MOA (2005).

ASEAN became the significant supplier of fresh fruits to China with 72.2% of the total import in 2005. It is also the important export destination, with 28.8% of the total exports from China.

In conclusion, fruits production in China has increased rapidly since 1992, with the total production in 2004 recorded at 84 MMT. In 2005, more than 3.6 MMT of fresh fruits and fruit products were exported to other countries/regions including Asia (58.1%) and Europe (23.2%), with export revenues amounting to US\$ 2 billions. Apple, citrus and pear ranked the top three in the production and export volume.

Table 2.2 : Export categories of fresh and processed fruits in China

Categories	Export volume (MT)	Change to previous year (%)	Export value (1,000US\$)	Import volume (MT)	Change to previous year (%)	Import value (1,000 US\$)
Fresh Fruits subtotal	2,037,014	15.7	752,204	984,158	8.3	512,615
Banana	23,550	0.5	7,492	355,508	-6.6	100,031
Other fruits	307,332	28.1	153,114	393,419	44	205,916
Pineapple	5,395	-6.3	1,278	663	367.3	335
Citrus	465,622	29.1	143,287	61,550	-8	44,629
Grape	21,257	19.4	9,970	57,490	-2.5	82,353
Kiwi fruit	4,487	-12.3	3,586	82,101	-9.5	53,606
Apple	823,988	6.5	306,256	33,204	-10.9	25,411
Pear	368,333	15.8	122,177	81	-83.8	52
Peach	17,050	9.2	5,043	141	2.5	281
Canned fruits subtotal	505,929	5.5	331,855	5,193	-24.3	3,994
Pineapple	72,084	-6.3	37,002	2,833	74.5	1,781
Citrus	299,479	5.9	198,739	246	108.5	468
Pear	34,511	15.8	18,701	4	-89.1	4
Peach	76,784	9.4	61,839	2,111	-58.5	1,740
Other fruits	23,072	18.4	15,575	0	0	0
Fruit Juice subtotal	703,629	33.2	518,600	68,853	18.8	73,179
Citrus	4,055	22.7	4,209	61,483	27.4	63,149
Pineapple	4,960	-34.6	5,161	305	37.6	266
Grape	803	74.2	1,018	2,541	-1.2	3,851
Apple	650,608	33.6	459,709	465	-65.4	418
Other fruits	43,203	45.0	48,503	4,059	26.9	5,496
Other processed fruits	401,462	12.4	433,264	86,847	-0.6	69,185
Total	3,648,034	16.8	2,035,923	1,145,051	8.0	658,973

Source: CY2005, China Custom.

Table 2.3: China's Export of Fruits

Areas/organizations	Volume (MT)	Ratio (%)	Value (1,000 US \$)	Ratio (%)
Asia	2,120,514	58.1	1,067,039	52.4
Europe	845,991	23.2	471,614	23.2
Oceania	64,966	1.8	48,119	2.4
South America	10,873	0.3	7,454	0.4
Africa	19,650	0.5	12,905	0.6
North America	586,039	16.1	428,792	21.1
ASEAN	1,049,572	28.8	391,880	19.2
EU	478,037	13.1	310,207	15.2
NAFTA	588,018	16.1	430,292	21.1
Others	1,532,407	42.0	903,545	44.4
Total	3,648,034	100.0	2,035,923	100.0

Source: CY2005, China Custom.

India

India is the second largest producer of fruits in the world, because its diverse agro-climatic conditions allow a wide range of tropical, sub-tropical and temperate fruits to be produced. The production in 2004 was estimated to be 49.2 MMT, accounting for about 10% of the world's fruit production; the shares ranging from 4% of citrus fruits to 43% of mango. Table 2.4 gives the data on production of major fruits in India and the corresponding figures in the world. Fruit production in India covers an area of 4.96 million hectares. However, India's fruit production only contributes 1% to the export earnings from agricultural products. Indian fruit production yields and exports are more than the average for the world: production at 5.3% compared to 2.2%; yields at 2.1% compared to 0.9%; and exports at 8.2% compared to nearly 2%. India's share in the global exports of fruits is less than 5%. Table 2.5 indicates the major destinations for the fresh fruits from India.

Global imports are forecasted to reach 4.3 MMT by 2010, with 87% (3.8 MMT) destined from developed country markets. The ED is expected to remain the world's largest import market, followed by the United States, together accounting for 70% of import demand. Europe is expected to remain the main market outlet for tropical fruits, with France as a major importer and the Netherlands the major European transshipment point for imported fruits.

The export market for fresh fruits is highly competitive among the top exporters. Gaining access to foreign markets is critical to countries that export much of their production if they wish to stay in competition. Free

trade agreements is one method used to provide increased market access and to encourage increased exports. In addition to negotiating trade agreements, top exporters use various export promotion and marketing techniques to increase their share in foreign markets.

Table 2.4: Production of major fruits in India vis-a-vis World for 2004

Fruit	Production (MMT)	
	India	World
Banana	16.22	72.42
Grapes	1.55	67.07
Mango	11.60	27.04
Papaya	2.57	6.79
Pineapple	1.23	15.70
Others	16.06	332.02
Total	49.23	511.04

Source; National Horticulture Database, 2005. National Horticulture Board, Ministry of Agriculture, Government of India

Table 2.5: India's export of fresh fruits in terms of quantity and value, 2004-2005

Country	Mango		Grapes		Others		Total	
	Quantity (1, DOOM'0	Value (Million INR)	Quantity (1.000MT)	Value (Million INR*)	Quantity (1.000MT)	Value (Million INR)	Quantity (1,000M T)	Value (Million INR)
Bangladesh	32.5	297.10	14.7	83.04	58.0	631.50	105.2	1011.6
Germany	-	-	1.1	43.71	0.7	17.43	1.8	61.14
Netherlands	0.5	21.27	6.8	359.50	-	-	7.3	380.77
Nepal	3.4	26.96	1.5	12.20	30.0	242.14	34.9	281.30
Saudi Arabia	-	-	-	-	3.9	84.16	3.9	84.16
South Africa	2.3	74.80	-	-	-	-	2.3	74.80
United Arab Emirates	9.5	270.00	4.3	218.70	2.5	329.00	16.3	817.70
United Kingdom	1.2	71.81	5.2	290.00	2.0	74.50	8.4	436.31
Others	3.0	107.61	2.4	99.59	33,4	261.27	38.8	468.47
Total	52.4	869.55	36.0	1106.74	131.5	1640.00	219.9	3616.29

Source: Ministry of Commerce and Industries Data Sheet, 2005, Government of India.

(One US\$ is equivalent to about 46 INR.) "INR means Indian Rupee.

Indonesia

The total harvested land of fruits in Indonesia is less than 1 million hectares, much lower than the harvested land of paddy, the single largest commodity of food crops, which amounts to nearly 12 million hectares. The decreasing harvested land of fruits attributed to the increasing growing land of durian, rambutan, mangosteen, and other local-traditional fruits cultivated under small-scale and even back-yard practices. The harvested land of mangos growing at the highest rate (80.2% per year), and the lowest growth rate was found on ananas. The total production of fruits in Indonesia has been continually increasing from 8.1 MMT in 2000, reaching 14.35 MMT in 2004 (Table 2.6),

Indonesian exports of fresh fruits has been fluctuating in the past seven years in both the total volume and the total value of major fresh fruit exports (Table 2.9), while the fruit education has remained relatively stable (Table 2.7). Major fresh fruit exports are mangosteen, pineapple, mango, banana, and papaya. The total export value of Indonesian fresh fruits reached US\$ 15.95 million in 2002 and decreased to US\$ 9.89 million in 2004. Fresh fruit exports accounted for only about 10% of the total fruit production in Indonesia. For importing countries of Indonesian fresh fruits were the neighboring Asian countries: Hong Kong for mangosteen and Malaysia for pineapple. More recently, the Middle East countries have started importing mango and banana.

Table 2.6. Harvested land and fruit production in Indonesia

Commodity	Year					Growth 04-03 (%)	Average growth (%)
	2000	2001	2002	2003	2004		
Harvested land (thousand ha)							
Mango	44.18	44.21	184.66	158.90	185.77	16.92	80.18
Orange	37.12	35.37	47.82	69.14	72.31	4.58	19.91
Banana	73.54	76.92	74.75	85.69	95.43	11.37	6.95
Durian	23.02	49.81	41.03	53.77	48.28	-10.21	29.89
Mangosteen	5.19	4.61	8.05	9.35	8.47	-9.42	17.56
Other fruits*	223.22	272.03	294.27	345.12	296.86	-13.98	8.33
TOTAL	406.27	482.94	650.59	721.96	707.12	-2.06	15.62
Fruits production (MMT)							
Mango	0.87	0.92	1.40	1.53	1.44	-5.82	15.08
Orange	0.64	0.69	0.97	1.53	2.07	35.38	35.19
Banana	3.75	4.30	4.38	4.18	4.87	16.69	7.17
Durian	0.24	0.35	0.53	0.74	0.67	-8.89	32.56
Mangosteen	0.03	0.03	0.06	0.08	0.06	-21.44	36.04
Other fruits*	2.88	3.67	4.32	5.50	5.23	-4.91	276.55
TOTAL	8.41	9.96	11.66	13.55	14.35	5.88	14.39

Source: CBS and DG of Horticulture Production 2005.* Other fruits include pineapples, rambutans, salok and etc.

Table 2.7: Export volume of fruits during 1999-2005 in Indonesia

(Unit: thousand tons)

Commodity	Year							Average growth (%)
	1999	2000	2001	2002	2003	2004	2005	
Pineapple	163.7	154.7	158.7	181.10	148.05	169.76	231.99	7.37
Fresh	1.13	2.98	2.02	3.73	2.28	2.43	0.64	18.37
Processed	162.6	151.7	156.7	177.36	145.77	167.32	231.35	7.50
Banana	76.14	2.22	0.29	0.58	0.24	1.19	3.65	76.65
Tamarin	6.22	7.33	5.69	7.02	8.67	20.97	15.80	26.59
Mangosteen	4.74	7.18	4.87	6.51	9.30	3.05	8.47	34.39
Mango	0.64	0.49	0.45	1.57	0.58	1.88	0.94	54.73
Citrus	0.61	0.74	1.04	0.89	0.66	0.27	0.57	14.43
Orange	0.59	0.40	0.84	0.60	0.38	1.30	0.77	35.65
Fresh	0.28	0.31	0.67	0.48	0.15	0.64	0.52	56.54
Processed	0.31	0.09	0.16	0.12	0.23	0.66	0.25	33.05
Grapes	0.42	0.41	0.43	0.07	0.25	0.19	0.04	12.16
Rambutan	0.23	0.23	0.20	0.37	0.60	0.13	0	-7.37
Other fruits	5.08	5.18	4.96	16.80	7.22	5.21	7.34	32.08
Other juice fruits	5.15	5.08	7.55	4.69	4.67	3.09	0	-20.81
Total	264.9	187.3	188.0	225.37	189.65	210.18	270.66	2.45

Source: Central Bureau of Statistics (BPS) - Indonesia (2005).

Philippines

The Philippines is a world leader in fruit and vegetable production, particularly pineapples, mangos, and coconuts. The Philippines has more than 300 edible fruits and nut species but only a few are commercially cultivated. In terms of volume of production, banana, pineapple and mango are the major fruits grown, followed by citrus, papaya, jackfruit and durian. The fruit industry contributes significantly to the country's economy in terms of employment, income, and foreign exchange generated from sales of both fresh and processed fruits. The fruit sector occupies almost 600 thousand hectares, including at least 20 different fruit crops. It is estimated that about 10 million people are dependent on the fruit industry alone. During the period 1999 - 2003, horticultural exports from the Philippines comprised only 1.69% of total exports on average, and majority of it was fruits, which was 1.60% of total exports. The value of the exports of fruits, vegetables, ornamental plants, and cut flowers increased 7.53% year-on-year on average during the same period.

Republic of Korea

Total production of fruits has increased gradually over the past decades. Particularly, the production of citrus, oriental pears, persimmons, and peaches has increased, but apples and grapes remain unchanged or decreased slightly (Table 2.8).

Table 2.8. Fruit production in Republic of Korea

(Unit: thousand tons)

Fruit	1998	2000	2002	2004
Citrus	511	563	642	584
Pear	259	324	386	452
Grape	397	475	422	368
Apple	459	488	433	357
Persimmon	260	287	281	299
Peach	151	170	187	200
Plum	39	51	57	72
Etc.	73	66	71	78
Total	2,153	2,428	2,500	2,410

Source: Ministry of Agriculture and Forestry, Republic of Korea, Statistical Yearbook of the Agriculture and Forestry (2005).

The Republic of Korea (ROK) produced 2.41 MMT of fruits in 2004 from 157 thousand hectares. Citrus and oriental pears have become the major fruits grown in 2004, followed by grapes, apples, persimmons, peaches and plums. The total fruit production per capita in 2004 was 50.6 kg, which is well behind the world average of 64.6 kg per capita. Individual shares of fruit production per capita were 12.3 kg of citrus, 9.5 kg of oriental pears, 7.7 kg of grapes, and 7.5 kg of apples. International trade in fruit has grown rapidly since the mid-1980s, with the annual rate of growth of international exports averaging 10% during 1985-95, although with a slight fall to 7.7% during the period 1990-95.

The Republic of Korea (ROK) exports small volumes of horticultural crops mainly to the United States, Japan, Canada, Taiwan, Hong Kong, and a few

countries in the South-East Asia. The export value of horticultural products has been stable over the last five years. In 2004, the export value (Table 2.9) of vegetable crops was US\$ 230 million (3% of total vegetable production); that of fruits was US\$ 86 million (3% of total fruit production).

Table 2.9. Export value of horticultural crops from Republic of Korea

(Unit: million US\$)

Commodity	2000	2001	2002	2003	2004
Vegetables	187	190	169	194	230
Fruits	45	56	82	7	86
Flowers '	30	32	32	45	49
Total	262	278	283	210	355

Source: Ministry of Agriculture and Forestry, Republic of Korea, Statistical Yearbook of the Agriculture and Forestry (2005).

Four major fruits including oriental pear, apple, citrus, and persimmon are exported to the Countries mentioned above. The export volume of oriental pear has been increasing for the last five years, whereas the other three fruits remained more or less stable. In 2005, the total export values (Table 2.10) of oriental pear, apple, persimmon, and citrus accounted for US\$ 56.1, 7.8, 5.6, and 3.4 million, respectively. The export value of these fruits is only 3% of the total fruit production in Korea. Quality competitiveness of the ROK fruits is relatively high, but they have low competitiveness in price because of high production cost. Labor cost and land price are relatively higher than those in many other countries. Furthermore, consumers' awareness of the brands for Korean fruits has not only been well-established in international markets, but also in domestic markets.

Table 2.10: Export value of fruits from Republic of Korea

(Unit: million US\$)

Fruit	2001	2002	2003	2004	2005
Pear	19.6	34.1	30.1	35.2	56.1
Apple	3.0	14.2	7.7	5.2	7.8
Citrus	4.9	5.7	4.3	5.6	3.4
Persimmon	4.4	4.6	2.3	3.6	5.6

Source: Ministry of Agriculture and Forestry, Republic of Korea, Statistical Yearbook of the Agriculture and Forestry (2005).

Thailand

Fruit production is one of the most important businesses in Thailand; it contributes to a great share of the country's national income. The country is known for fresh tropical fruits, such as rambutan, mangosteen, mango, guava, durian, coconut and pineapple. Most of these fruits are seasonal with the exception of mangosteen, longan, mango and pineapple, which are available throughout the year. As a result of agricultural diversity, Thailand is never in short supply of fresh fruits. The total tropical and subtropical fruit production in the year 2000 amounted to an average figure of 10.5 MMT. Thailand has the capacity to export fresh fruits globally all year round. The country is currently exporting more than thirty types of fresh, dry and frozen fruits to every corner of the world, including the United States, Europe, the Middle East, and Asia-Pacific. In 2002, the country exported 1.2 MMT (US\$ 600 million) of fruits.

Viet Nam

The area of fruit plantation in Viet Nam has grown rapidly in the 1990s at 6.5% per year. The area has also increased between 2000-2005 but at slower rate. In 2005, fruit trees accounted for 766 thousand hectares, an increase of 2.6 from 2004 due to improvements on orchards and increase of highly commercially valued fruit trees. In spite of this growth, fruit only accounts for about 5% of the total crop area. Growth rates vary widely across commodities, with the fastest growing commodities including litchis (litchi, longan, and rambuttan), citrus and dragon fruits. However, bananas are stagnant and pineapples have fallen in the last 10 years. While fruit production is more widespread in the North, the degree of commercialization is the greatest in the Mekong River Delta (MRD). The MRD is not only the nation's richest rice producer, but also the largest fruit planters. The MRD has an average per capita of more than 0.23 hectares of natural land area. It is also very fertile and creates favorable conditions to growing rice, fruit trees and commercial-oriented plants. According to preliminary estimates, the area of fruit in the MRD has reached more than 300 thousand hectares. About 12% of the whole output is exported and the remainder is locally consumed (Table 2.13). Major exported fruit includes pineapples, longans, litchis, blue dragons, bananas, mangos, and more.

Table 2.11: Vietnamese fruit export turnover during last 5 years

Year	Export Value (million US\$)
2000	213.1
2001	344.3
2002	221.2
2003	151.5
2004	178.8
2005	235.0

Source: Viet Nam Ministry of Agriculture and Rural Development (2006).

The Vietnamese have had much experience in plantation and intensive cultivation of fruit, especially commercial fruit trees. In many provinces, local people consider horticulture as an occupation and fruit production as a poverty reduction method. According to the latest survey and calculation, socio-economic efficiency of fruit trees is relatively high, particularly in the MRD with a value that is 4-5 times higher than rice cultivation. The economic value of a horticulture-specialized area can be 10 times higher than that of rice cultivation.

Most of the growers have been growing fruits since 1990, reflecting the rapid growth in fruit production and the expansion in the number of growers since the economic reforms were launched. The management system for fruit production is not particularly advanced. The majority of producers rely on mechanical canal irrigation where possible, with the usage of tube and drip irrigation becoming less used. The vast majority of producers use pesticides to control insect attacks, 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.

Almost all fruit output is sold fresh. Less than 2% of the output is 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 % of the fruits and vegetables produced are sold to wholesalers and assemblers. Processors, exporters, and state-enterprises play small roles in farm-level marketing.

Fruits are diverse in terms of size and legal status. Small traders tend to be unregistered private enterprises, while medium and larger ones are often registered private. Among the large traders are provincial and central state-owned enterprises. The use of cold storage is quite rare, although a large majority of traders have storage facilities. Only 3-4% use cold storage. This percentage is slightly higher among larger traders and exporters. Traders purchase most of their produce from farmers in spot-market transactions and one-third is purchased by other traders and processing industry. Traders are reluctant to contract with growers because of uncertainty regarding the market price. While domestic traders sold mostly to processors, exporters sold directly to foreign customers.

Furthermore, export to China and Japan reduced sharply, while the export to Russia increased remarkably. According to FAO (2004), in the next few

years, demand for fruit in the global market will increase at the rate of 3.6%, while fruit production will only increase at 2.8%. This will provide Viet Nam an opportunity to introduce its fruit into new markets.

Vietnamese fruit is still a regional fruit compared to other countries, especially, Thailand. The results from a recent survey of the Viet Nam Fruit Producers Association (Vinafruit) in border provinces show that Vietnamese fruit had scored very low. Vietnamese fruit scores low because of damage (from harvesting, packaging, transportation), infestation, fast perishability, non-uniformity, poor appearance, poor packaging, high 862 content, etc. This makes Vietnamese fruit only enter China in limited amounts.

Summary

The Asia-Pacific region contributed about 42% to the world's total fruit production during 2004, which stood at 511 million metric tons. Together, China and India shared 26 % of the total production. Table 2.12 provides a summary of fruit production data for the majority of Asian countries, with Indonesia, Iran, Japan, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam contributing significantly to the total fruit basket of the Asia-pacific region. Other important fruit producing countries include Bangladesh, Nepal, Republic of Korea and Myanmar. The region is a major producer of some of important tropical fruits, such as bananas, mangos, pineapples and citrus, which accounted for about 56% of the total fruit production in the region. The major producing countries for several of these fruits are China, India, Thailand, Indonesia, Philippines, Pakistan and Viet

Nam. Also, the region can be considered as the most important producer of minor fruits, such as durian, mangosteen, langsung and rambutan.

Table 2.12: Fruit (excluding melon) production in Asia

(Unit: thousand tons)

Country	1993	2000	2001	2002	2003	Annual Growth Rate 1993- 2003 (%)
DEVELOPING COUNTRIES						
<i>SOUTHEAST ASIA</i>						
1. Cambodia	260.2	321.7	322.2	322.2	322.7	2.2
2. Indonesia	7 25.0	8 275.3	9192.4	10320.6	9012.6	1.2
3. Lao PDR	144.9	191.4	198.8	209.3	209.5	4.6
4. Malaysia	1,165.	1,182.0	1,180.0	1,155.0	1155.0	0.0
5. Myanmar	1,012.	1,416.0	1,562.0	1,550.0	1,570.0	4.7
6. Philippines	8,591.	10,657.5	11,119.5	11,516.5	11,804.2	3.1
7. Thailand	7,276.	7,844.9	7,769.8	7,547.0	7,521.1	0.8
8. Timor-Leste	8.4	5.4	6.4	7.4	7.4	7.5
9. Viet Nam	3,593.	4,342.2	4,447.8	4,447.8	5,096.2	3.1
<i>SOUTH ASIA</i>						
10. Bangladesh	1,355.	1,361.0	1,406.9	1,467.0	1,467.0	0.6
11. Bhutan	65.3	65.0	65.0	36.6	46.3	-3.6
12. India	33,885	44,316.9	45,041.3	45,951 .	45,911.3	3.3
13. Maldives	11.7	15.8	12.1	12.5 F	12.5	0.6
14. Nepal	519.5	549.4	590.3	585.7	589.0	2.0
15. Pakistan	4,746.	5,32077	5,436.7	5,459.1	5,459.1	1.0
16. Sri Lanka	780.3	832.1	842.2	850.3	854.8	0.6
<i>CENTRAL ASIA</i>						
17. Kazakhstan	125.1	263.3	214.4	212.0	190.3	5.6
18. Tajikistan	236.7	280.2	262.1	226.8	177.8	-1.5
19. Uzbekistan	945.3	1,395.2	1352.2	1,326.2	1,287.1	3.1
<i>OTHER ASIA</i>						
20. Afghanistan	-	-	-	-	-	-

21. China	1,265.0	1,350.0	1,385.0	1,396.5	1,401.5	0.8
22. DPR Korea	9,239	12,287.0	12,671.6	12,863.7	12,712.0	3.2
23. Mongolia	.2	.1	.1			
24. Rep. of Korea	2,072.	2,625.4	2706.7	2,725.6	2,749.1	2.6
<i>PACIFIC ISLANDS</i>						
25. CookIslands	5.65	4.59	4.55	2.95	2.18	-5.2
26. Fiji Islands	11.54	21.41	22.82	22.82	22.82	6.2
27. Kiribati	5.30	5.70	5.85	6.10	6.1	1.0
28. Marshall Islands	-	-	-	-	-	-
29. Micronesia	-	-	-	-	-	-
30. Nauru	02^	0.28	0.28	0.28,	0.28	0.0
31. Niue	0.58	0.58	0.58	0.58	0.58	0.0
32. Palau	-	-	-	-	-	-
33. Papua New Guinea	1399.5	1666.30	1710.00	1 762.00	1782.20	2.5
34. Samoa	21.40	42.25	42.55	44.35	44.35	6.7
35. Solomon Islands	14.25	16.89	18.30	19.33	19,33	3.4
36. Tonga	15.45	9.46	9.80	9.80	9.80	-2.3
37. Tuvalu	0.52	0.65	0.65	0.65	0.65	2.5
38. Vanuatu	18	20.35	20.40	20.90	20.90	1.2
SUB-TOTAL	118,618	1711.1	178,542.	184,405.	183,668.4	4.5
DEVELOPED COUNTRIES						
39. Japan	4.408.	3,794.1	4,060.9	3,860.2	3,782.1	-1,2
ASIA & PACIFIC	126,468	179,134.9	186,929.5	192,759.7	191,822.1	4.3
REST OF WORLD	264,944	292,560.6	285,312.1	285,136.7	288.427.4	1.0
WORLD	391,412	471 695.5	472,241.6	477,896.4	480,249.5	2.2

Source: FAOSTAT (2004).

China has an impressive growth rate of 8.2% during 1993-2003 for its fruit production sector. The Asia and Pacific region on the whole registered 4.3% growth rate as compared to the world average of 2.2% over the same period.

World fresh fruit trade

The EU is the leading destination as well as source of supply in the global fruit and vegetable trade. During 1999-2001, the EU countries accounted for nearly half of the world's imports and over 40 percent of the exports. Though the EU is importing almost one-third of its fresh fruit imports from the banana-exporting and Southern Hemisphere countries, the imports from Asia is low: 0.5% of the fresh fruits, 3.3% of the fruit and vegetable juices (Huang, 2004). The European agro-food industry itself is a leading global exporter and it affords significant added value and offers scope for growth within new EU Member States, development of regional economies and exploitation of cultural diversity and tradition.

International trade is dominated by temperate varieties of fruit, that are most heavily consumed in the large markets such as Europe and the United States, even if bananas show the fastest growth in consumption during the 1990s (11% per year), and peaches the lowest (2% per year). World production of such fruit is around 261 million tons per year, with China, Brazil, the United States and Italy being the principal producers accounting for about 37% of world production.

During the 1990s, growth averaged 3% per year, with China achieving outstanding annual growth rates that averaged 20% per year, and that have

transformed it from the fourth largest producer at the start of the decade into the world's largest producer of fruit. Another country that has achieved extremely high rates of production growth is Ecuador (12% per year), with this figure represented principally by growth in banana production.

For production of fruits, apples and pears showed the greatest increase, with average annual growth rates of 7% and 6% respectively. Among apple producing countries, the fastest growth rates were achieved by China (26%), Egypt (50%) and Poland (9%), while notable among pear producing countries were China (14%), Chile (12%) and Egypt (11%).

Less than 10% of production is sold internationally in the form of fresh fruit, even if there is no precise data on consumption in the domestic markets of the principal producer countries. This is due to the fact that data reflect import volumes, but does not identify the use of fruit, which after having been imported, may be used in pulp, fresh juices, ice creams, confectionery or other processed products.

The largest exporters of fresh fruit are Spain, the United States, Italy, the Netherlands, France and Ecuador, which together account for 54% of sales by value, the Netherlands / Belgium/ Luxembourg and France act as distribution centers for Europe, which accounts for 47% of exports, while the United States has a 36% share. With regard to imports, Germany, the United States, Britain and France absorb 42% of international trade in fresh fruits, with Germany as the largest importer (16%), followed by the United States (11%).

The leading example of specialization is Spain, which supplies the world orange market, a specific niche, since most orange production is processed into juice (Brazil is a typical case). Spain, responsible for 49% of world orange supply, is the world's largest exporter of fresh fruits. Despite the fact that its production has been declining at an annual rate of 2%, exports have risen by an average of 5% per year over the last decade. Another case of specialization is Ecuador, the world's third largest producer of bananas, whose contribution to world trade is limited to this product, even if it has a 17% share of the market for supplying this, the most widely sold variety of fresh fruit. As a result of its banana production, Ecuador is the fourth largest international exporter of fresh fruits, with production having increased at a rate of 2% per year, and exports by as much as 12% year.

The United States is the leading example of diversification, with a significant share of all the markets analyzed: import, export and production (with the exception of banana production). Most notable is the reversion of the US position in the orange market, having boosted production at a rate of 7% per year, while imports have fallen (by 13% per year), and exports risen (by 11% per year), in a market that has grown at 5% per year.

The Netherland is active in the fresh fruit market, as it is in several others, as a commercial distribution center. Although it is absent from trade in oranges, peaches and grapes, all markets dominated by other European countries and by the United States, it has increased the value of its exports at a rate of 39% per year in those commodities where it is present. France also acts as a European distribution center for pineapples and bananas. In the case of pineapples, it has a clear strategy of increasing imports for re-export, while

in the case of bananas; its increased share of international trade seems to have been determined by the reduction in domestic consumption, since imports have remained stable.

Another notable example is China, which has significantly increased its production of the most widely sold varieties of fruit at international level, namely: bananas (growth of 13% per year), oranges (7% per year), apples (26% per year), pears (14% per year) and peaches (15% per year). While the country has increased its imports of peaches (29% per year), and has a net deficit in apples, the overall increase in production (18% per year), and its share of world supply (12% per year), suggests that it has adopted a strategy of supplying the world market, most notably with temperate fruits (apples and pears) as well as with table oranges.

The principal varieties of fruit sold and consumed throughout the world are oranges, apples, grapes, bananas, peaches, pears and pineapples. Of these, bananas, pears and pineapples are predominantly consumed in their natural state, oranges and apples as juice, while most grape production is transformed into wine or juice, and peaches into nectar or canned -fruit in syrup. This explains why the largest producers are not the main exporters of these products in their natural state (with the exception of Italy, which is the leading producer of grapes and also the largest exporter).

Despite the preference for varieties of fruits traditionally consumed in Europe and the United States, there has been an increase in recent years of imports of so-called exotic fruit, typically from tropical climates, such as guavas, mangos, papayas and kiwifruit. According to the FAO (Agra

Europe, 1998), international consumption of tropical fruits should increase by around 40% between 1995 and 2005, equivalent to an annual growth rate of 3.5%. This growth should be accompanied by an increase in supply, although prices may decline due to intense competition between exporters. Most of the 56 million tons of production (1997 data) is directed towards domestic consumption by producer countries. Mangos (40%), pineapples (23%), papayas (9%) and avocados (4%) are the principal products. International trade accounted for only 1.8 million tons in 1996, representing some 3% of production.

Demand for fresh fruits is concentrated in Europe and the United States, which absorb around 60% and 11% respectively of international imports. The European and US markets are extremely dynamic, and are notable as major producers and exporters of fresh fruits. Some of the larger players in this market achieve annual revenues in excess of US\$ 1 billion, notably the two US groups, Dole Foods (US\$ 4 billion) and Chiquita (US\$ 2.4 billion in 1997). According to Rabobank International (1997), four trading companies control 80% of world trade in fruits.

International trade has grown more than total production (by 7.7% per year against 3% per year during the 1990s), leading to an increased supply of products and a consequent downward pressure on prices that has tended to profit margins. Mangos are a good example, with prices in Europe falling 30% since 1988 (Agra Europe, 1998), in conjunction with a 66% increase in import volumes.

World fruit production is 511 million tons (FAO statistics, 2004). About 60% of this is consumed fresh in the country of production, 30% is processed and 10% is exported as fresh fruit. The value of world fruit exports was US\$ 21 billion in 2001. The main fruits were citrus (21%), bananas (19%), grapes and apples. The value of trade in tropical fruits (mangos, papayas, pineapples and others) was slightly under US\$1 billion (5%).

Developing countries account for virtually all exports of bananas and tropical fruits, and about half the trade in citrus. The value of exports such as avocados, melons, and pears is higher in developing than in developed countries with a concentration of exports from a few countries. Developing countries have been less successful at adding value to their fruit and vegetables and have a lower share in the exports of processed products: 36 percent in 2001.

Market Opportunities ?

Major Trends

The major drivers for innovation in food products are health (16%) and well-being (12%) (CIAA,2004). Other important drivers are easy-to-use and price. In the evaluation of the top-20 of the most successful food introductions in the Netherlands over the last 4 years show that health is gaining importance, along with well-being. Ethical values/conscience and "on-the-go" are believed to be two drivers that are gaining importance. There is an increasing societal awareness of the opportunities to improve the quality of life through healthy eating and sustainable production, which can lead to the improvement of the overall environment (ETP, 2005). The trend that people tend to get heavier in developed countries (obesity) supports the healthy choice. Product introductions that score on a combination of the major drivers have a better chance of being successful.

Effects on Fruit Consumption

Low fruit and vegetable intake is currently among the top 10 selected risk factors for global mortality (WHO, 2002). Nevertheless, fruit and vegetable consumption in many European countries is below the recommended daily intake. A recent elaborate survey in the Netherlands on eating habits showed that fruit and vegetables intake even decreased by 15 to 20 % during the last 10 years and it is expected that this trend will continue over the coming years (RIVM, 2004). Similar trends are apparent in other ED countries. In recent years, the issue of sustainability has been given much attention and

increased amounts of products from organic or sustainable production systems have entered the market. This development has, however, not led to an overall increase in fruit consumption.

The different consumption patterns in Europe and the different behavior of consumer subgroups may partly be explained by the different availability of high quality products and the socio-economic status. However, other cultural, behavioral and psychological factors of which we know almost nothing about may play an equally important role. This data are of major value for relating dietary habits with health, underscoring the importance of fruits and vegetables without giving clear directions on possible strategies to increase consumption (Woltering, 2005).

The turnovers in both organic and fair-trade products have grown significantly in fruit products in the last ten years. Specifically the sales of organic tropical fruits are expanding rapidly, especially organic bananas which are popular with consumers seeking organic and fair-trade products. There are large differences in the sales of organic food in different EU countries; the average sales of organic fruits comprise only a small percent of the total sales (Organic Monitor, 2005). In non-organic produce there is a growing demand for residue-free products, in accordance with the trend for more sustainable production methods.

The first fair trade label was established on coffee by Max Havelaar in the Netherlands in 1988. Now there are 14 European countries, plus the United States, Canada and Japan that sell fair trade labelled products. The "Fair-trade" and "Max Havelaar" labels guarantee consumers that certain standards

were met in the production and trade of the products where the labels appear. Fair trade certification guarantees not only fair prices, but also the principles of ethical purchasing. These principles include adherence to the ILO agreements such as those banning child and slave labor, guaranteeing a safe workplace and the right to unionize, adherence to the United Nations charter of human rights, a fair price that covers the cost of production and facilitates social development, and protection and conservation of the environment. The fair trade certification system also promotes long-term business relationships between buyers and sellers, and greater transparency throughout the supply chain.

Many food producers have taken the initiative to introduce new products over the past years, trying to be successful with the translation of the consumer trends into product innovations. There has been a large growth in the fresh cut vegetable segment (healthy and convenient). Packed fresh cut fruit products have been introduced, but are not as diversified and voluminous yet. Ready to eat fruits (mango, avocado and pear) have been introduced, and are sold at a premium price. In some niche areas, large percentage growth is perceived. For example, the sales of blueberries in the Netherlands have grown with over 850% in a 3 year period. Sales of raspberries have increased over 250%. Both products fit in the healthy trend (vitamins, antioxidants) and are convenient to eat.

The most successful fruit innovations come from the processing industry. Two of the most successful product introductions in the Dutch consumer product market in the last few years are the "Breaker" and "Fruit2day". Both products contain (processed) fruit. The "Breaker" is a combination of

yoghurt and fruits in a flexible bag. The "Fruit2day" is a bottle with printed fruits design that contains the same ingredients as two pieces of fruits. It runs the slogan: "two ounces of veggies and 2 pieces of fruit a day keeps the doctor away". The reasons for their success are the combination of multiple consumer requirements: "healthy" , "easy to use" and "on the go" . As a result of their success, the two most successful product introduction in 2005 are another combination of dairy and fruit, for example, a small 'bottle containing processed fruits and vegetables. A strong marketing effort to promote their products is an important reason for success.

Opportunities and Challenges for Asian Fruits

Greater consumer awareness as outlined above indicates that there are reasons to be optimistic about the opportunities to increase fruit consumption. The new consumer consciousness on health is driving the fruit consumption. It is generally agreed that increased consumption of fruits greatly contributes to a healthier lifestyle. Easy to use and convenient is something that needs to be kept in mind when developing or introducing new fruit products. Consuming fresh products needs to become more attractive and trendy. The growth in sustainable and fair trade products is also an opportunity that could still be further exploited. Creating added-value products and marketing will be important. Added-value can also be based on the different levels of the food pyramid: consistent high quality, chain quality and ethical values.

Food tastes are local even though production capabilities are global. It is important to learn how to build global type production economies, yet to be

able to market into countries where food tastes are local. One issue, for example, is simply packaging. Labeling requirements are different from country to country, so what people expect to see on packages also differs (Bell, 2006). Local products, that are to some extent unknown to the European consumer, could be an opportunity. Since many people travel to other countries to feel the local culture and try the local food, this could lead to buying these products at home. Marketing and organizing the supply chain to ensure good quality products are crucial aspects. One of the results of the growing interest in sustainability can be the preference with specific consumer groups for products that have used less energy in transport. If in the product labeling the "food miles" will be introduced, this could lead to change in buying behavior. Since Asian fruits can only be imported, it is more a matter of using the right transportation method, such as reefer transport.

CHAPTER – FOUR

High-value Agriculture in Bangladesh: Opportunity and Constraints

Bangladesh possesses deficit balance in global business in the context of the global arena. In the twenty-first century, there is a wide scope to mitigate deficit in the global business. Although Bangladesh is still an undeveloped country, the primitive characteristics of LDCs do not exist here. But the country is still lagging behind to take any sort of appropriate measures for the agriculture sector which should be complementary with WTO.

The shifting composition of domestic food demand—away from food grains and towards high-value agricultural products, including fruit, vegetables, fish, meat, and dairy products—is perhaps the single most important source of opportunities for agricultural diversification, value addition, and agrobusiness in Bangladesh. Data from successive rounds of the Household Income and Expenditure surveys (HIES) of Bangladesh provide evidence of these shifting consumption patterns. As shown in table 4.1, between 1973/74 and 2004/05 per capita consumption of food grains (rice and wheat) only increased slightly in rural and urban areas. On the other hand, per capita consumption of many high value agricultural products including potatoes, fish, fruit and meat has been steadily increasing, albeit from fairly low consumption levels.

shahabuddin

Table 4.1: Average per capita consumption (Kg/Person/Yr), 1973/74 - 2004/05

Food									% Annual Change 1973/74	% Annual Change 1973/74
	1973/74	1973/74	1983/84	1983/84	1995/96	1995/96	2004/05	2004/05	2004/05	2004/05
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Foodgrain	160.1	161.1	179.2	157.3	188.9	158.5	183.4	163.9	0.4%	0.1%
Rice	129.2	104.5	155.9	129.9	177.1	144.0	176.4	150.3	1.0%	1.2%
Wheat	30.9	56.6	23.3	27.4	11.8	14.6	3.6	10.2	-6.7%	-5.4%
Potatoes	3.4	6.5	13.1	19.7	17.0	23.0	22.9	24.8	6.4%	4.4%
Pulses	7.3	6.9	9.6	8.0	4.7	7.0	4.7	6.9	-1.4%	0.0%
Sugar	4.1	5.8	1.5	1.7	3.5	3.7	2.9	3.7	-1.0%	-1.5%
Edible oil	1.8	2.9	2.3	3.5	3.1	6.2	5.3	8.5	3.5%	3.5%
Fish	9.3	9.7	10.6	14.5	15.4	18.7	14.7	18.3	1.5%	2.1%
Vegetable	32.5	37.7	38.8	46.4	56.3	51.9	50.6	45.6	1.4%	0.6%
Fruits	5.5	7.1	6.2	7.7	9.2	14.1	12.5	12.9	2.7%	1.9%
Milk	10.0	10.8	8.3	12.6	9.9	13.2	10.8	12.3	0.3%	0.4%
Meat	1.8	3.2	2.6	5.3	3.3	8.8	5.1	8.6	3.5%	3.3%

Source: Authors' calculations, based on Shahabuddin 1989 and the 1995/96 and 2004/05 HIES

Demand for these high-value commodities tends to be highly income elastic, and with continued income growth and urbanization, consumption of these products should continue to increase. Consumption data disaggregated by expenditure quintile and location indicate that across expenditure idles; urban households consume a more varied diet, eating fewer food-grain products and more high-le products (table 4.2). Average rural consumption of food grains was about 183 kilograms per person year in 2004/05, compared to 164 kilograms per person in urban areas. There is a very strong income ct. For example, while the wealthiest households in urban areas consume only about 10 percent more than the poorest households, they consume 10 times more milk, 13 times more poultry, 7 times more meat, 5 times as many eggs, 5 times as much fruit, 3 times as much fish, and 42 times as much fine compared to the poorest urban households.

Table 4.2: Average per capita consumption by expenditure quintile in urban and rural areas (Kg/Person/Yr), 2004/05

URBAN						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Rice	13948	150.04	155.89	153.52	152.43	150.27
Fine rice	0.44	0.91	3.43	6.16	18.32	5.84
Other rice	139.04	149.13	152.47	147.36	134.11	144.43
Other cereals	4.85	7.69	13.60	17.20	24.75	13.61
Wheat	3.13	5.10	10.65	13.38	19.16	10.27
Sugar	1.26	2.18	3.07	4.66	7.23	3.68
Pulses	3.66	5.40	6.75	8.11	10.84	6.95
Vegetables & rootcrops	64.81	76.61	83.30	87.17	104.93	83.34
Fruit	5.02	8.30	10.15	15.13	25.74	12.86
Milk (liters)	2.67	6.32	9.32	16.70	26.72	12.33
Eggs (nos.)	18.60	26-53	39.69	47.90	66.92	43.88
Poultry (meat)	0.72	1.53	2.93	4.08	9.74	3.79
Fish	9.78	14.05	18.01	21.32	28.56	18.33
Other meal	1.55	2.71	4.11	6.34	10.11	4.96
RURAL						
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Rice	146.45	169.69	176.97	186.08	202.69	176.38
Fine rice	0.17	0.76	0.56	0.43	3.33	1.05
Other rice	146.28	168.93	176.41	185.65	199.36	175.33
Other cereals	3.24	4.23	5.44	8.04	13-75	6.94
Wheat	2.09	2.27	2.88	4.20	6.62	3.61
Sugar	0.77	1.37	2.33	3.63	6.51	2.92
Pulses	2.88	3.70	4.64	5.65	6.79	4.73
Vegetables & rootcrops	63.94	71.99	79.70	87.44	99.91	80.59
Fruit	4.66	8.27	10.74	16.18	22.81	12.53
Milk (liters)	2.50	5.23	8.44	12.90	24.97	10.81
Eggs (nos.)	9.04	14.00	27.39	27.59	52.52	26.11
Poultry (meat)	0.48	0.98	1.64	2.73	5.23	2.21
Fish	7.20	11.22	14.16	17.47	23.65	14.74
Other meat	0.48	1.09	2.06	3.18	7.82	2.93
<i>Source: Authors' calculations, based on the 2004/05 HIES</i>						

The average household in Bangladesh spends 37 percent of its food budget on rice and about 43 percent on various high-value agricultural products, including fish, meat (poultry and other), eggs, dairy products, vegetables, fruit, and spices (table 4.3). Over the past 10 years, total expenditures on most high-value food items have increased. In urban areas, real expenditures on spices increased by 83 percent between 1995/96 and 2004/05. Urban expenditures on poultry meat, fruit, other meat, fish, and dairy increased by 37 percent, 15 percent, 13 percent, 12 percent, and 1 percent, respectively. Increases in rural expenditures for the comparable period were 78 percent for poultry, 69 percent for other meat, 62 percent for fruit, 36 percent for spices, 11 percent for fish, and 8 percent for dairy. In absolute terms, the average urban household spends more on all categories of food when compared to the average rural household, with the exception of rice; urban households spend about 7 percent less on rice than the average rural household.

Households are also beginning to spend more on dining out, particularly in urban areas. Based on international trends, the demand for greater variety and year-round availability of different types of food is expected to grow. Demand is also likely to increase for ready-to-cook and ready-to-eat foods and for different food attributes, including health, safety, convenience, and process attributes (that is, the manner in which food is grown or raised, processed, and marketed). Taken together, these rapidly changing food patterns present many new opportunities for agricultural diversification and value addition in Bangladesh.

Table 4.3: Average per capita expenditures by quintile in urban and rural areas Per/yr), 2004/05

URBAN							
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total	Budget Share (%)
Rice total	2,397	2,654	2,864	2,916	3,099	2,786	29.4
Fine rice	10	23	76	147	427	136	1.4
Other rice	2,387	2,631	2,788	2,769	2,672	2,649	27.9
Other grains	85	140	158	227	340	190	2.0
Pulses	156	238	309	372	484	311	3.3
Fish	522	856	1,237	1,589	2,508	1,341	14.1
Meat	133	264	413	652	1,072	504	5.3
Poultry (meat)	58	128	245	365	909	340	36
Eggs	56	90	134	179	327	157	1.7
Milk & milk products	67	193	257	484	788	357	3.8
Vegetables	512	677	805	867	1,171	806	85
Fruit	87	168	243	431	892	364	3.8
Oils and fats	236	335	457	516	677	444	4.7
Sweets and sugar	71	113	166	244	480	214	2.3
Miscellaneous	23	49	88	127	314	120	1.3
Tobacco & betel leaf	252	365	473	480	551	424	4.5
Spices	406	618	848	929	1,167	793	8.4
Dining out	230	306	369	367	409	336	3.5
RURAL							
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total	Budget Share (%)
Rice total	2,409	2,817	2,965	3,161	3,561	2,982	40.4
Fine rice	3	13	12	12	79	24	0.3
Other rice	2,406	2,804	2,953	3,149	3,482	2,959	40.1
Other grains	45	83	111	160	293	138	1.9
Pulses	92	126	167	215	281	176	2.4
Fish	377	603	770	997	1,480	845	11.5
Meat	46	106	202	324	814	298	4.0

Poultry (meat)	42	82	135	230	440	186	2.5
Eggs	29	46	70	91	156	78	1.1
Milk and milk products	42	94	161	263	524	217	2.9
Vegetables	417	523	612	699	828	616	8.4
Fruit	66	125	170	275	460	219	3.0
Oils and fats	172	226	279	346	478	300	4.1
Sweets and sugar	3B	73	113	177	357	152	2.1
Miscellaneous	9	14	23	39	98	37	0.5
Tobacco and betel leaf	205	291	356	438	616	381	5.2
Spices	307	409	505	601	826	530	7.2
Dining out	86	146	209	293	364	220	3.0
<i>Source: Authors' calculations, based on the 2004/05 HIES</i>							

Demand projections indicate that by 2020 Bangladesh could need an additional 6.5 million metric tons of vegetables 0.7 million tons of spices, 1.9 million tons of fish, 1.6 million tons of fruits, 2.6 million tons of dairy products and 1.4 million tons of meat and eggs to meet domestic demand. In 2005 prices, this additional demand is valued at about US\$ 8 billion and represents a farm-gate value of approximately US\$ 5 billion. These projections are based on estimates of expenditure elasticities computed from the 2004/05 HIES and an assumption of per capita income growth of 3 percent per annum between 2005 and 2020. The medium variant UN population projections for 2020 for rural and urban Bangladesh are used to estimate population growth.

Export Opportunities: Patterns of Trade and the Importance of Standards Compliance

Opportunities for diversification and value addition are not limited to those arising from changes in food consumption in the domestic market. As a result of greater trade liberalization (reduction in tariffs), favorable demand patterns, and rising costs structures in agriculture and fisheries in developed countries, opportunities for developing countries to participate in high-value agricultural trade have also multiplied. Since the 1980s, the structure of global agricultural trade has changed considerably (Aksoy and Beghin 2005). The share of traditional export products such as coffee, tea, textile fibers, and sugar in global agricultural trade has declined (from 22.1 percent to 12.8 percent of world agricultural exports), while exports of fruit and vegetables, fish, and seafood have increased substantially as a share of world trade (from 19.7 percent to 31.1 percent) (table 4.4). Although middle-income countries have accounted for the greatest proportion of the expansion in nontraditional exports from developing countries, low-income countries, including Bangladesh, have also experienced considerable growth in exports of high-value products (Jaffee and Sewadeh 2005).

Compared to other Asian countries, Bangladesh appears to be relatively more dependent on high-value-agricultural exports, particularly exports of fish and fish products. Data from 2000 to 2004 indicate that 95 percent of total earnings from exports of food and live animals from Bangladesh came from exports of high-value agricultural products (table 2.5). Bangladesh's export earnings from trade in high-value agricultural products.

Product	Developing- Country Exports			Industrial- Country Exports			World Exports		
	80/81	90/91	00/01	80/81	90/91	00/01	80/81	90/91	00/01
Tropical products									
Coffee, cocoa, and tea. raw and processed	18.3	11.0	85	2.5	2.9	3.6	8.5	5.6	5.4
Nuts and spices	24	2.7	28	07	0.7	0.8	13	1.3	1.5
Textile and fibres	8.0	6.2	3.3	4.5	3.9	2.6	5.9	4.7	2.6
Sugar and confectionary	10.5	4.6	43	39	2.8	2.3	6.4	3.4	3.1
Subtotal	39.2	24.5	18.9	11.6	10.3	9.3	22.1	15.0	128
Temperate products									
Meats. Fresh and processed	7.2	8.3	60	148	15.7	15.4	119	13.2	12.0
Milk and milk products	03	0.7	1.1	7.9	7.9	7.6	5.0	5.5	5.2
Grains, raw and processed	93	4.9	7.0	21.6	13.8	11.6	169	10.9	9.9
Animal feed	75	7.9	8.5	7.7	5.1	5.3	7.7	6.0	6.4
Edible oil and oil seeds	46	5.7	55	48	4.4	4.4	47	4.8	4.8
Subtotal	28.9	27.5	28.1	56.8	46.9	44.3	46.2	40.4	38.3
Seafood, fruits & Veg.									
Seafood, fresh and processed	6.9	15.9	194	55	8.2	8.0	6.0	10.8	12.2
Fruits, vegetables, and cut flowers	14.7	22.2	215	13.1	17.2	17.3	13.7	18.9	18.9
Subtotal	21.6	381	409	18.6	25.4	25.3	197	29.7	31.1
Other Processed Product									
Tobacco and cigarettes	2.6	3.1	33	30	4.2	4.8	28	38	4.2
Beverage, alcohol & non-alcoholic	1.1	1.8	3.6	6.9	9.5	11.5	4.7	6.9	6.6
Products & processed foods	6.7	5.0	52	30	3.8	5.0	44	4.2	5.1
Subtotal	10.4	9.9	12.1	12.9	17.5	21.3	11.9	14.9	1.9
Total	100	100	100	100	100	100	100	100	100

Source: Aksoy and Beghin 2005

During the past decade, real earnings from exports of fish and fish preparations and fruit and vegetables, the two largest segments in Bangladesh's food export trade, have grown by an average of 1 percent and 6 percent per year, respectively (table 4.5). The overall export growth in fish and fish products and fruit and vegetables from Bangladesh has been slightly stronger when compared to that of several other Asian countries, including India, Indonesia, Pakistan, the Philippines, and Thailand, although exports from China and Vietnam have grown much faster. Maintaining competitive prices and meeting basic quality parameters remain essential in high-value agricultural trade. Much greater scrutiny is being given to risks associated with microbial pathogens, pesticide residues, residues of veterinary medicines, and environmental and naturally occurring toxins.

	BD	China	Indonesia	India	Pakistan	Philippine	Thailand	Vietnam
Food and live animals exports In 2004 (US\$ millions)	521	19,462	5.5M	7,262	1,089	2,475	12,0522	4,679
Share of high-value agricultural (HVA) products In trade, 2004								
Meat and meat preparations	0%	6%	0%	6%	2%	0%	6%	1%
Dairy products and eggs	0%	1%	1%	1%	0%	3%	1%	0%
Fish and fish preparations	90%	35%	43%	20%	11%	5%	33 A	47%
Fruit and vegetables	4%	33%	8%	18%	16%	60%	19%	13%
Total HVA products, 2000-2004	95%	75%	52%	45%	29%	88%	60%	61%
Total HVA products, 1994-99	67%	57%	54	50%	22%	83%	66%	40%
Real average annual export growth , 1994 -2004								
Food and live animals	1%	10%	0%	1%	1%	-1%	-1%	8%
Meat and meat preparations	-32%	1%	-6%	8%	34%	13%	1%	15%
Daily products and eggs	-5%	4%	24%	17%	7%	43%	18%	-13%
Fish and fish preparations	1%	6%	-1%	0%	-4%	-2%	-3%	11%
Fruit and vegetables	6%	3%	-2%	3%	4%	0%	-1%	16%
<i>a Fruit and vegetable exports exclude dried legumes: Source: UN Comtrade Database (SITC Revision 3)</i>								

Performance of High-Value Agriculture

Although paddy continues to dominate agricultural production in Bangladesh (occupying 75 percent of cropped area), the production of high-value agricultural commodities has increased in response to growing domestic demand and prevailing export opportunities. Vegetables, fruit, and ices account for only 7-8 percent of total cropped area, but area under these commodities has been daily growing. The area under potatoes increased by an average of 6 percent per year between 1985 and 2005, although total potato area is still less than 2 percent of total cultivated area. Area under other vegetables increased by 4.26 percent per year between 1990/91 and 1999/2000 (Dorosh, del Ninno, and Shahabuddin 2004), and area under spices grew by 5.76 percent per year in the same period. Despite occupying only 7 percent of agricultural land, horticultural production generates close to 20 percent of crop gross domestic product (GDP).

In the past 10 years, growth in the fisheries and stock sectors has been stronger than growth in crop agriculture. Crop and horticulture GDP grew at an average annual rate of 3.1 percent between 1996-97 and 2005-06, in real terms, compared to the rates of 4.2 percent for animal farming and percent for fishing (table 4.6). Growth in the agricultural sector as a whole has slowed since 2001, with the exception of the animal farming subsectors. In 2005/06, crops and horticulture accounted for 56 percent of agricultural GDP, while livestock, fisheries, and forestry made up 13.5 it, 22.3 percent, and 8.2 percent, respectively. The contribution of the fisheries subsectors to total agricultural GDP grew significantly from 15.6 percent in 1990/91 to 22.3 percent in 2005/06.

	1996/97- 2000/01	2001/02- 2005/06	1996/97- 2005/06
Agriculture and forestry	4.9%	2.9%	3.4%
Crops and horticulture	4.8%	2.0%	3.1%
Animal farming	2.7%	5.5%	4.2%
Forest and related services	4.9%	4.7%	4.8%
Fishing	6.4%	3.0%	3.5%

Source; BBS

Agro-processing and the Emergence of the Organized Food Retail Sector
 Agro-processing is an important manufacturing industry in Bangladesh. The share of manufacturing value added from the food, beverage, and tobacco processing industries increased from 25 percent in to about 33 percent in 2005, Although the industry small in Bangladesh compared to many other Asian tries, it has been growing at almost 8 percent per comparable to growth rates in India 7.8 percent and China 9.4 percent (table 4.7).

The vast majority of agro-food processing firms are small, with fewer than 50 workers. There are about 246 medium-sized food processing firms and large firms (firms with more than 100 workers) (table 4.8). Data from the Economic Census of 2006 show that food-processing firms account for 19 percent manufacturing industries (with 10 or more workers) about 8 percent of total employment in manufacturing firms (with 10 or more workers). Rural areas generate roughly 70 percent of the jobs related to processing.

Rice mills account for the largest share of Employment in the industry, generating 40 percent of employment. In addition to these firms, a sizable number of firms engage in other processing activities, including manufacturing animal feed, fertilizer, or chemicals; ginning, pressing, and baling fiber; manufacturing tobacco products; and producing beverages.

Table 4.7: Value added in food processing				
Food, Beverages and Tobacco (Percent of Manufacturing Value Added)				
	1985	1995	2005	
Bangladesh	25	28	33	
China	12	14	13	
India	12	10	12	
Indonesia	26	19	23	
Pakistan	32	23	35	
Philippines	37	32	40	
Size of Food, Beverage and Tobacco processing sector (constant 2000\$ million)				
	1985	1995	2005	Average annual growth (%), 1995-2005
Bangladesh	690	1,477	3,179	8.0
China	9,193	34,189	83,770	9.4
India	2,971	5,133	10,923	7.8
Indonesia	3,645	7,593	13,428	5.9
Pakistan	1,586	1,984	5,537	10.8
Philippines	3,760	4,596	8,259	6.0
<i>Source; World Development Indicators, 2010</i>				

Using enterprise survey data, the productivity of Bangladeshi agro-processing firms can be compared to that of firms in neighboring countries. The median value added per worker in Bangladesh for smaller firms (less than 50 employees) is about US\$ 2,000—almost double what is achieved in Vietnam and marginally ahead of the Philippines, but less than half of that in India and one-third of the US\$ 6,600 value added per worker in Thailand.

	Firm size (%)			
	Number of Firms	Small	Medium	Large
Manufacturing enterprises	32,911	78	8	13
Agro- processing enterprises	6,139	93	4	3
Rural agro-processing enterprises	3,974	93	3	3
Urban agro-processing enterprise	2,165	93	4	3
Manufacturers of edible vegetable oil	133	92	3	5
Manufacturers of dairy products	97	90	4	6
Manufacturers of grain mill products	226	93	5	2
Rice millers	3,885	97	3	0
Manufacturers of bakery products	1,145	93	4	3
Manufacturers of cocoa, chocolate and sugar confectionery	100	94	24	
Processors of tea and coffee	97	13	16	70
Manufacturers and processors of other food products	456	81	7	12

Note: Small enterprises have 10-50 workers, medium enterprises have 50-100, and large enterprises have more than 100. Source: Authors' calculation, based on 2006 Economic Census data

A comparison of smaller and larger firms reveals little difference in the median productivity level in Bangladesh (table 4.9). However, data for other countries show significant economies of scale, with larger firms having considerably higher productivity. For example, in the Philippines large firms are four times as productive as small agro - processing firms.

Among the firms surveyed, the Thai firms were considerably more likely to be exporting. While 9 percent of the agro-processing firms in Bangladesh exported at least 10 percent of their output (a similar proportion to India and the Philippines), almost three-quarters of the Thai firms did. The capital intensity of the Bangladesh firms was comparable) that of the Philippines, with approximately US\$ 3,500 in plant and equipment per worker — about one-third of the rate in Thailand.

	<50 employees	50+ employees
Bangladesh	2.01	2.06
India	4.54	5.74
Philippines	1.91	7.68
Thailand	6.59	10.4
Vietnam	0.97	1.87

Source: Authors' calculation, based on various enterprise surveys

Constraints reported by firms in the agro-processing industry are broadly similar to those reported by other manufacturing firms in Bangladesh (table 4.10). But the relative priorities do vary when compared to the ranking of investment climate constraints of neighboring countries. Unreliable electricity topped the list of constraints in Bangladesh across sectors and over time (in all seven rounds of surveys from 2002 to the end of 2005). Macroeconomic instability and the cost of financing were second and third. Tax administration was fourth for agro-processing firms, while seventh overall. The lack of skills was fifth (fourth overall), while corruption was fifth overall (and sixth for agro-processing).

Agro-processing firms	Overall manufacturing firms
Electricity	Electricity
Macroeconomic stability	Cost of financing
Cost of financing	Macroeconomic stability
Tax administration	Skills/education of available workers
Skills/education of available workers	Corruption
<i>Source: Authors calculation, based on various enterprise surveys</i>	

Between 2002 and 2005, agro-processing firms report improvements in telecommunications, with very few firms identifying it as much of an obstacle at all by 2005 (table 4.11). Crime and disorder had also diminished in importance. Problems with customs and trade regulations recorded improvements, a particularly encouraging trend, given the potential for exports to become a more important channel for growth. An aspect of the investment climate that has become more challenging, however, is macroeconomic instability, reflected in greater exchange rate fluctuations.

Obtaining particular permits and clearances also seemed to be more problematic for agro-processing firms, particularly environmental permits.

Table 4.11: Largest improvements in the investment climate in Bangladesh, 2005-05

Agro-processing firms	Overall manufacturing firms
Telecommunications	Crime, theft, and disorder
Access to finance	Telecommunications
Crime, theft, and disorder	Customs and trade regulation
transportation	transportation

Source: Authors calculation, based on various enterprise surveys

Objective measures underscore why these issues are seen as problems. Firms report over 100 days with power outages on average, with many reporting almost daily outages. The average rose to 140 days for agro-processing firms in 2005. An average 3.5 percent of output was lost due to electricity outages. While such losses are extremely large (more than three times those in Thailand and even double those in Vietnam), they are still about half of those reported in India. What is worrying, however, is that the situation has not improved over time; if anything it has worsened recently. Sixty-two percent of managers reported that the frequency and duration of outages were higher in the end of 2005 than in the previous period. More than 70 percent said their revenues were down as a result.

	Bangladesh 2005 (end)	Bangladesh 2002	India 2002	Philippin 2003	Thailand 2004	Vietnam 2005
Electricity	1	1	2	4	2	4
Macro instability	2	11	13	1	1	3
Cost of finance	3	3	7	9	12	6
Tax admin	4	4	3	6	6	11
Skills	5	17	15	16	3	7
Corruption	6	2	1	3	9	9
Policy uncertainty	7	10	9	5	4	8
Tax rates	8	6	4	2	7	12
Access to finance	9	8	8	15	13	1
Customs	10	9	11	14	5	14
Licenses	11	13	10	12	16	17
Access to land	12	7	16	13	17	10
Transportation	13	14	14	11	15	2
Anti-competitive practices/informality	14	12	6	8	10	5
Crime	15	5	12	7	11	16
Labor reg	16	15	5	10	14	13
Telecommunications	17	16	17	17	8	15

Source: Authors' calculation

Another worrying constraint is the increasing shortage of skilled workers. This constraint showed the largest deterioration overall and was the fifth largest constraint for agro-processing firms. When asked which type of worker was hardest to recruit, "skilled workers" were identified by over three-quarters of firms—well above "managers" or "professional staff." The

increasing shortage is reflected by the greater time needed to hire skilled workers and the greater relative increases in their wages. Their wages have increased at almost double the rate of increases for unskilled workers.

International Comparison of Perceived Investment Climate Constraints

Electricity is the constraint that most consistently tops the list across countries, ranking first in Bangladesh, second in India and Thailand, and fourth in the Philippines and Vietnam (table 4.12). Concerns about skills are shared by firms in Thailand and to some extent Vietnam, but not by firms in India or the Philippines. Indian firms complain relatively more about corruption and labor regulations. Given the stringent restrictions in India surrounding worker protection and the reserved list (the list of activities restricted to small enterprises), this result is not so surprising. More objective measures of corruption (the incidence and size of bribes, for example) are no higher in India, but they are not seen as such an issue in Bangladesh. Transportation, a key dimension of infrastructure for manufacturing firms, particularly for sectors sensitive to delivery times, appears to be a significant constraint in only Vietnam. However, it should be noted that most of the surveys sampled firms in major cities, including the Bangladesh survey, in which most of the sample is from the greater Dhaka-Chittagong area.

The Emergence of the Organized Food Retail Sector

The organized food retail sector in Bangladesh has been growing rapidly. The first organized food retail outlet was set up in 1998, and by 2004 about 30 modern supermarkets operated in Bangladesh, of which 22 were located in Dhaka (Hussain and Ara 2004). These stores mainly cater to the emerging

urban middle class and currently make up less than 1 percent of the food retail market in large cities. By comparison, modern retail channels account for about 2 percent of food sales in India, 10 percent in China, 30 percent in Indonesia, and 40 percent in Thailand (World Bank 2007e). At present, supermarkets in Bangladesh mainly sell a range of processed products and a variety of imported items. Sales of fresh produce—including fruit and vegetables, poultry, meat, and fish—from these stores are small. Yet although the supermarket segment is still small, it has attracted considerable investment and can be expected to continue to expand rapidly.

In other countries, the emergence of supermarkets has spurred radical changes in the way food retail trade is organized. In countries where supermarkets have acquired a sizeable share of the retail market, the structure of production and wholesale marketing of produce has been transformed (Reardon and Timmer 2005). Growth of supermarkets has led to an increasing shift from individual store procurement to centralized procurement strategies, a network of distribution centers, and "preferred supplier systems." In many instances, supermarkets have shifted from relying on traditional wholesale markets and brokers in spot markets to developing long-term relationships with wholesalers and producers specialized in a specific product category and dedicated to the supermarket as their main client (World Bank 2007e). Rather than relying on wholesale markets and brokers, wholesalers contracted by supermarkets to supply unprocessed produce often establish contract farming arrangements to procure produce that meets the supermarkets' quality requirements. As supermarkets' share of food retail expands in Bangladesh, these trends are also likely to emerge there, creating new opportunities and challenges.

Implications for Poverty Reduction and Economic Growth

The growing importance of high-value agriculture and the transformation currently underway in food supply chains have important implications for reducing poverty and increasing economic growth. High-value agriculture reduces poverty through several direct and indirect pathways. The most obvious is the higher incomes that farm households can receive from producing high-value agricultural commodities. Yet as seen in table 4.13, the higher risks and greater investment involved in high-value agriculture make the poorest households less likely to participate in high-value agricultural production. For example, while only 12 percent of the poorest households report 'growing vegetables, 21 percent of the wealthiest households grow them. Similarly only 8 percent of the poorest rural households in Bangladesh report producing milk, compared to 21 percent of the wealthiest rural households. Production of eggs and participation in fishing and aquaculture seem to be exceptions: More than 50 percent of all rural households, regardless of wealth, produce eggs, and more than 30 percent are involved in activities related to fisheries.

The contribution of agricultural growth to gains in rural and national incomes is not limited to increases in farm incomes alone. Increases in agricultural production generally also involve increased demand for agricultural inputs, processing, and marketing services. As household incomes rise, consumer demand for both urban and rural products and services increases as well. To the extent that the supply of goods and services is elastic, these increases in demand can spur increases in production and further increases in demand. These multiplier effects of

agricultural growth and productivity gains from factor market reforms can be estimated using a semi-input-output (SIO) model based on a Social Accounting Matrix (SAM) that describes the flows of payments and receipts of production activities, commodities, factors of production, households, and other institutions. In the SIO model, output of tradable goods (rice, wheat, livestock, shrimp, food processing, textiles, and other industrial products), is assumed to be fixed (completely inelastic) and does not expand due to increases in demand. For these products, increased demand results in increased net imports. For elastically supplied products (other crops, poultry, fish, construction, and services), increased demand is assumed to induce increases in output.

Table 4.13: Percentage of rural households participating in high-value agriculture, by expenditure quintile. 2004/05

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Vegetables	12	14	1	19	2	17
Fruit	6	7	7	9	1	8
Spices Milk	6	7 13	10 15	11 17	12 21	9 18
Eggs	52	4	52	56	56	54
Chicken meat	10	10	10	14	16	12
Fish	33	32	31	33	38	33

Source: Authors' Calculation, based on the 2004/05 HIES

Table 4.14 shows the effects of a one-taka (Tk) exogenous increase in value added from the various tradable goods sectors. On average, a Tk 1 increase in the output of tradable goods in Bangladesh leads to a further Tk 1.07 increase in value added from nontraded goods and services. This gain occurs mainly because of consumer spending effects as incomes earned in various

activities are spent in the domestic economy. Multipliers are smallest in sectors such as knitwear, where there are few production linkages (most of the inputs are imported; most of the outputs are exported). The multiplier for the food industry is especially large because of major backward production linkages to the nontradable crops sector (pulses, fruit, vegetables, and so forth).

Table 4.14 also shows the gains in household incomes arising from increases in the output of various sectors and the accompanying multiplier effects. Not surprisingly, agricultural households (including agricultural laborers) reap most of the benefits of agriculturally led growth. They also benefit from industrial growth, though to a lesser degree, since they gain almost exclusively from the multiplier effects alone, and not from the direct effects of increases in industrial output and employment. The exception is the food industry. Although again there are only limited direct effects of increases in food industry output on agricultural household incomes, the indirect effects on nontradable agriculture are very large, so that a Tk 1.0 increase in value added of the food industry results in a Tk 0.94 gain in agricultural household incomes.

Table 4.14: Multiplier effects of various sectors

Value added multipliers		Change in value added	Change in household income			
			All HHs	Agricultural HHs	Rural non-farm HHs	Urban HHs
Paddy	0.96	1.96	1.42	0.74	0.32	0.37
Grains	0.56	1.56	1.24	0.63	0.27	0.34
Livestock	0.96	1.96	1.55	0.91	0.35	0.28
Shrimp	0.82	1.82	1.09	0.6	0.24	0.25
Food industry	1.43	2.43	2-23	0.94	0.52	0.77
Readymade garments	0.85	1.85	1.07	0.33	0.27	0.47
Knitwear	0.44	1.44	0.38	0.12	0.09	0.17
Other industry	0.74	1.74	1.17	0.39	0.28	0.5
Utilities	0.55	1.55	0.66	0.18	0.15	0.33

Source: Authors' calculation

These distributions of the benefits of increased economic output depend on the ownership of the factors of production (land, labor, and capital) as reflected in the SAM. Most of the returns to agricultural land (including here, agricultural capital) accrue to small- and large-scale farmers (0.245 and 0.305 shares, respectively), although the rural nonfarm and urban nonpoor groups also receive significant shares of agricultural land incomes (0.181 and 0.092), largely through land rents.

Because of data uncertainties and the simplifying assumptions used in the analysis, the results illustrate only the broad order of magnitude of the effects of increased agricultural output on incomes in the Bangladesh economy. Nonetheless, the broad structure of rural production, the distribution of land and other factors of production, and the structure of household incomes are reflected in the analysis.

It is important to note that the simulations imply an even distribution of the gains to returns to labor and capital across all owners of these factors. This assumption is valid if labor markets function well, so that increases in labor demand are reflected in general rises in wage rates that benefit all workers. Yet the location of activities matters a great deal for local labor markets and especially for returns to capital and backward linkages to agriculture. Investment in food processing for highly perishable fruit and vegetables will tend to benefit agricultural producers close to the factory; more isolated producers will see little increase in demand for their products, and the multiplier effects in their areas may be extremely small. The implication is that if many of the rural poor are to share in the benefits of overall growth and especially in investments in food processing, then poor rural households must be well integrated in product and factor markets where the investments take place.

CHAPTER – FIVE

Bangladesh's Fruits: Prospects for Fresh and Processed Production

There appears to be considerable opportunities for expanding production of fruits and vegetables to meet increasing domestic demand. Benefits would include improvement in average farm incomes, improved nutrition among Bangladeshi consumers and establishment of a secure base of production and post-harvest skills which would enable growers to avail themselves, over time, of higher-value distribution options in the processing and export channels for their crops.

Principal constraints to growth in the supply of fruits in Bangladesh include post-harvest losses (an average of 26 percent for the six focus commodities studied under this project) due to inadequate packaging, transportation and storage infrastructure, and lack of familiarity with good post-harvest practices; under-utilization of arable land for horticultural production, due both to the limited availability of appropriate land, and food security concerns among farmers; and poor yields, due to inadequate availability of energy, seed, grower training and extension services, quality management systems, and crop-specific agricultural research.

Just as Bangladesh's domestic fresh fruit has failed to take full advantage of existing opportunities, its export performance has left little impression on the world stage. Despite various initiatives since the early 1990s to promote exports, the value of fruits and vegetables export earnings for 2004 is

estimated at between US\$ 19 million and US\$ 46 million (equivalent to 0.2-0.5 percent of total export earnings). Fruits exporters, for the most part, have not taken advantages of opportunities to improve supply chain integration, improve product quality and packaging, develop new markets, and explore alternative modes of transportation.

This chapter looks at the performance of the principal fruit channels. Case studies of six commodities - mangoes, pineapples, papaya, strawberry, banana, and turmeric – are used to gain insights into fresh domestic and export prospects and the processing sector.

Demand and Market Size

Domestic consumption of fruits and vegetables has grown rapidly. Data indicate that per capita consumption of vegetables and root crops increased by 11.5 percent between 1995/96 and 2004/05, from 74 kilograms per capita to 81 Kgs per capita. Fruit consumption has grown even faster, increasing from 10 to almost 13 Kgs per capita per year, equivalent to a 25% increase. In real terms, per capita expenditures on fruits have also increased significantly. Although a wide variety of fruits and vegetables are consumed locally, almost 50 percent of vegetable expenditures are on three items; potatoes, eggplant and green leafy vegetables. Similarly, bananas, mangoes, and jackfruit account for 60 percent of fruit expenditures. Continued income growth and urbanization suggest that demand for fruits and vegetables will continue to rise. This growing domestic consumption represents the most immediate opportunity for expanded fruit and vegetable production in Bangladesh.

Exports of fruits and vegetables from Bangladesh have grown steadily, but the total export value remains small, averaging around US\$ 20 million per year since 2000. Estimates of fruits and vegetable exports from Bangladesh vary considerably, depending on the source of data. The two available sources are the UN Comtrade database and data from the Bangladesh Export Promotion Bureau (EPB). The reasons for the huge discrepancy between the two data sources are unclear and worth looking into. It is possible that the Comtrade data slightly underestimate total export values, because a few of Bangladesh's trading partners—for example, United Arab Emirates (UAE) and Kuwait – do not report data in the Comtrade database, but most of the major trading partners, including the United Kingdom (UK), Saudi Arabia, Bahrain, Oman and Qatar do report in Comtrade. The EPB numbers indicate a sharp fall in exports between 1998/99 and 2002/03, followed by an upsurge in 2004. The EPB data indicate an average annual growth of fruit exports of about 2 percent per year between 1992/93 and 2004/05. The Comtrade data show a steady increase in exports since the mid-1980s, with a dip in 1997 and again in 2002, and they suggest a much higher growth rate of about 8 percent per year between 1992/93 and 2004/05. Bangladesh exports a range of fresh and processed fruit, but more than 90 percent of exports consist of fresh vegetables.

Although Bangladesh exports fruits and vegetables to about 30 market destinations, the major buyers are located in two places; the UK and the Middle East. In the UK, the bulk of exports cater to the ethnic market; small volumes have also been sold in mainstream supermarkets, primarily by BRAC. In the Middle East, the major market outlets are Saudi Arabia, UAE,

Qatar, Bahrain, and Oman, and exports cater to the large Bangladeshi migrant population.

While most of its fruit and vegetable exports have been oriented toward the UK and the Middle East, Bangladesh has a range of other export market options. Among the most promising are markets in neighboring states of India (Assam, Tripura, Nagaland, Mizoram, Manipur, Meghalaya and Sikkim) and Southeast Asia.

	1985	1995	2005
Fruit, fresh	0.23	0.15	0.38
Fruit, processed	0.17	0.03	0.48
Vegetables, fresh and dried	2.69	10.55	19.30
Vegetables, processed	0.01	0.05	0.26
TOTAL	3.10	10.78	20.43

Sources: EPB, 2004

Bangladesh remains a net importer of fresh and processed fruits. In 2004 Bangladesh imported US\$ 60 million of fresh and dried fruits and vegetables and just over US\$ 5 million dollars of processed fruit and vegetable products. Major imported items included oranges, apples and mangoes.

Fruit and Vegetable Production and Processing

Fruit Production

Despite occupying only a small share of Bangladesh's agricultural land (7 percent), the horticultural sector generates almost 20 percent of agricultural GDP (table 5.2). Growth in fruit production has been steady, averaging 2 percent and 4 percent, respectively, in the last 10 years (1995/96 to 2004/05).

Table 5.2 : GDP of crops and horticulture at current prices, 2003-04 (US\$ millions)

	Year				
	2000/01	2001/02	2002/03	2003/04	Share for 2003/04 (%)
Paddy (aus, aman, boro)	226.100	220.721	236.651	254.163	65
Wheat	10,362	10,131	9,804	8,431	2
Other cereals	393	1,518	1,735	2,324	1
Beverages	10,485	10,918	11,660	12,910	3
Fibers	9,221	10,792	10,208	10,597	3
Vegetable	30,749	30,976	32,888	38,083	10
Fruit	16,838	18,147	20,189	22,443	6
Spices	12,592	12,193	12,664	15,091	4
Others	1,195	1,225	1,297	1,313	0
Horticultural crops (total)	61,371	62,541	67,038	76,930	20
Pulses	7,905	8,024	8,273	8,234	2
Oilseeds	5,889	5,611	5,600	6,007	2
Sugercane	8,184	7,959	8,589	8,410	2
Other Crops	735	753	700	831	0
Crops & Horticulture (Total)	340,637	338,963	360,238	388,835	100

Source : BBS, 2004

Value chain analysis of selected fruits and vegetable crops shows a clear advantage in grower returns for the focus crops over rice. Individual value and supply chains were developed for the six focus crops. This analysis revealed that there are opportunities for significant increases in grower returns that would result from a measured re-allocation of a certain percentage of appropriate land away from the production of Boro rice, in favor of the production of the six focus commodities studies in this analysis (table 5.3).

VALUE CHAIN LINKAGE ASSESSMENTS FOR BANANA



BACKWARD LINKAGES

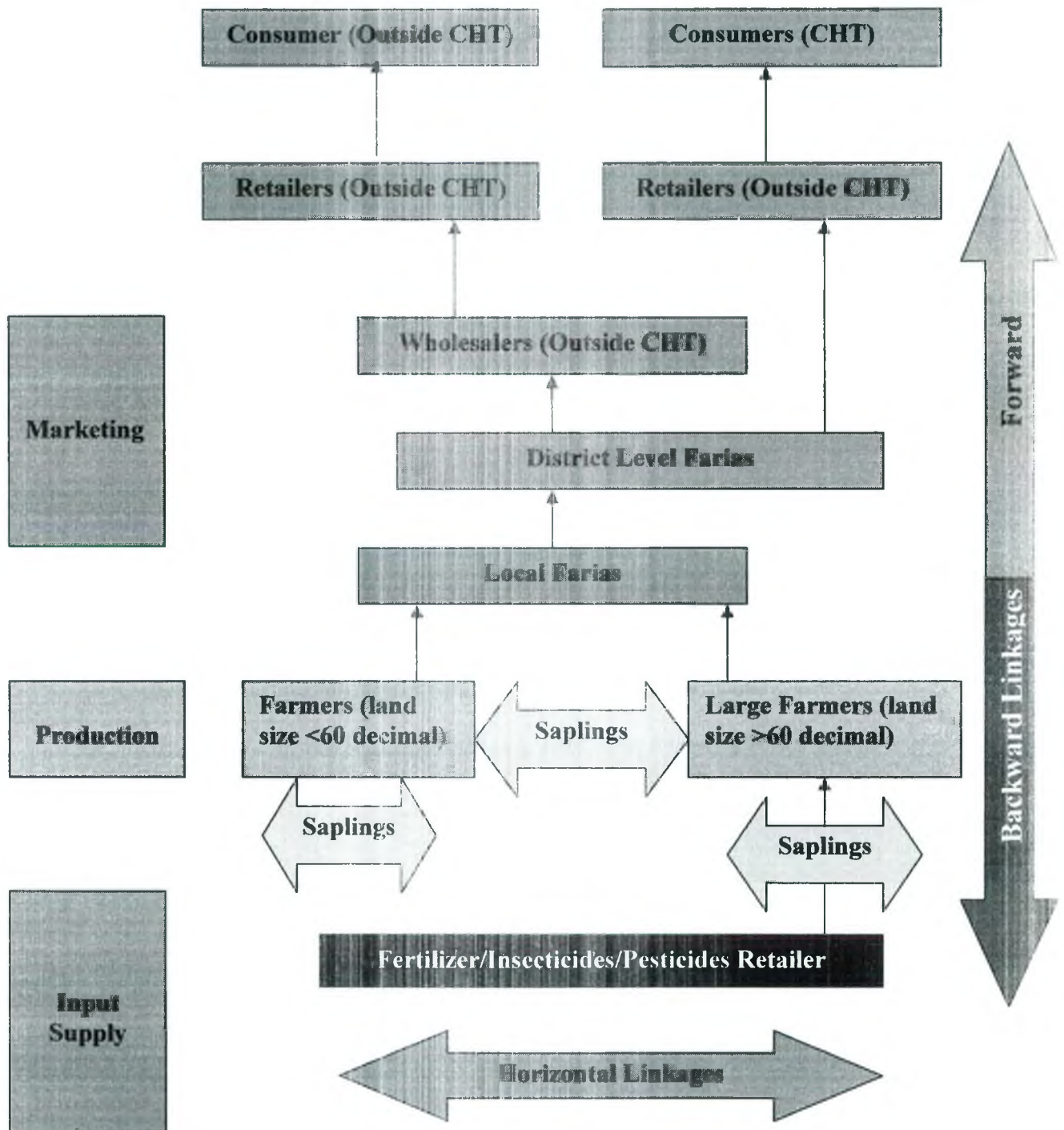
Farmer usage of farm inputs such as fertilizer, insecticides and pesticides is currently very low for banana cultivation. Banana farmers living in areas close to the hats and bazaars have regular contact with the input sellers as they purchase inputs for rice and vegetable. There is inadequate availability of new and improved variety banana saplings and tissue culture. Towards improving input supply linkages, multinational companies like Syngenta have operational bases in CHT and will undoubtedly be interested in promoting insecticides and pesticides with local input suppliers and banana farmers because they improve production yields. BARI has an Agricultural Research Station (ARS) at Raikhali in Rangamati. The project can partner with BARI to test the higher-yielding BARI KOLA 3 and 4 in Raikhali ARS. There are no commercial sapling suppliers. Production of sapling at commercial scale might also not be feasible for high requirement of land. Tissue culture can be promoted amongst the farmers in partnership with the ARS to increase supply of better quality saplings.

FORWARD LINKAGES

Producers' banana moves through three trading levels: local-level farias, district level farias and then the wholesalers. Local farias first collect the banana from the farmers in their villages and then transport it to market centres like Reserve Bazaar in Rangamati, Guimara Bazaar in Khagrachari and Sadar market in Bandarban. From here the district level farias purchase the banana and sell it to the wholesaler located in outside markets. Wastage

and low prices for farmers and local farias arising from poor infrastructure access (roads, collection centres and market sheds) resulting in immediate spot-sale at available prices compounded by poor transport/packaging are the major challenges in forward linkages. Investments in market access and production infrastructure are not commensurate with the matched the growth in trade and of trader and producer numbers in the CHT. In Rangamati for example, local lake-based farias collect products from producer communities around Lake Kaptai during the early morning and transport them in chartered boats to Rangamati: they trade-on products from the boats, but by noon on most days when they must return to the inner lake areas and in the absence of market area storage, they are forced to sell at discounted prices. In Bandarban and Khagrachari, the traders sell from open spaces without any protection/storage also forcing them to sell at discounted price early in the day. Wednesday and Saturday are the two hat days in Bandarban and hence the products have to be sold on the same day. Low trader margins are reflected in prices paid to farmers. There is no organized lobbying for market access infrastructure. The linkages in the banana value chain are shown in Figure 5.1 below.

Figure 5.1: Banana's Value Chain Linkages in CHT (Authors' analysis)

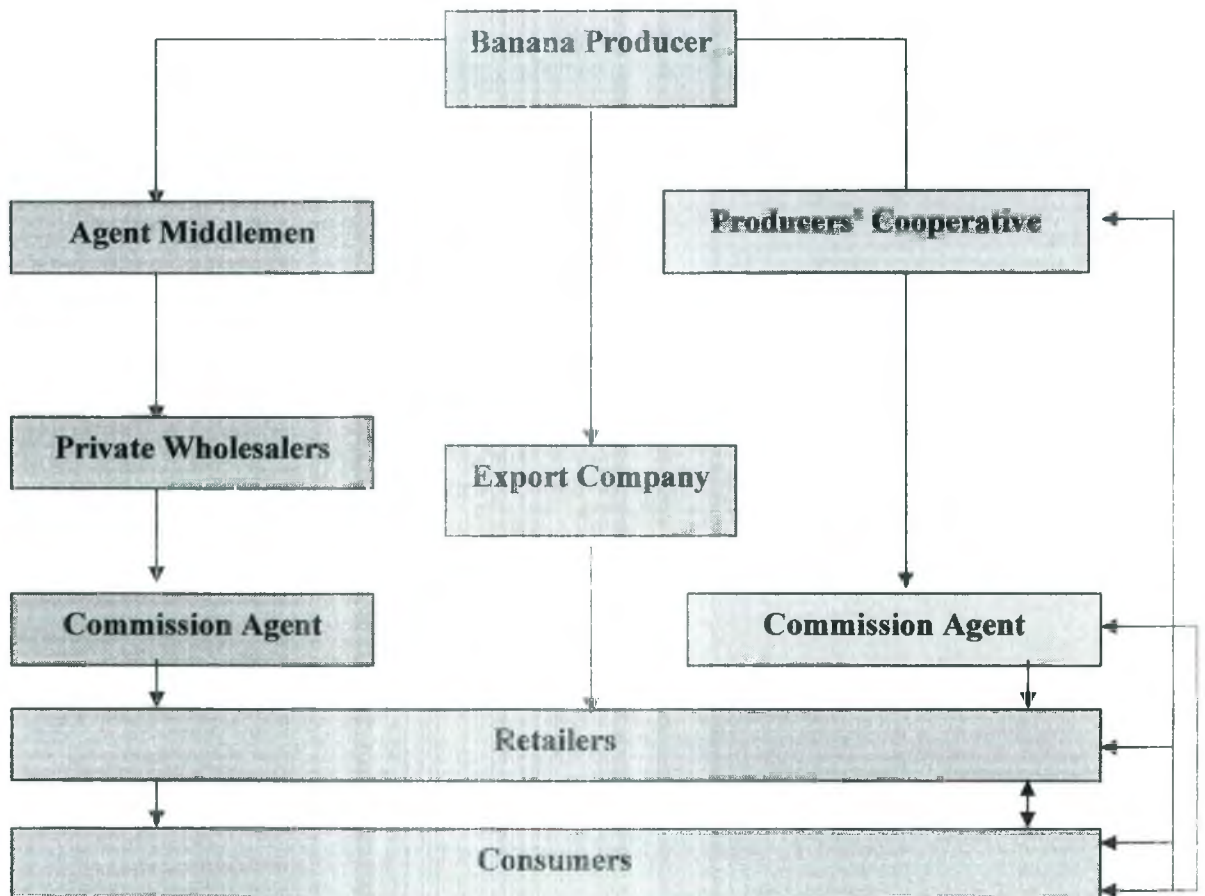


HORIZONTAL LINKAGES

Farmers depend upon each other for supply of saplings. However, organized, group/cooperative-based selling is almost non-existent in CHT. Lack of cooperation amongst farmers inter alia limits exchanges of knowledge and information: the LOCAL workshops confirmed that while a few farmers in all the three districts have achieved excellent production results, success stories including inherent knowledge is not being shared with other farmers/communities. Mixed fruit traders associations are present in all three CHT districts but these do not have regular activities.

SUPPLY CHAIN FOR BANANA

Figure 5.2 : Supply Chain for Banana (Author's calculation)



Fruit Processing

The role of processed fruits and vegetables in the domestic and export economics is quite small, although several large-scale enterprises (among them PRAN, Square, Eurasia Food Processing, and BD Foods) appear committed to expanding this sector. In Bangladesh the modern organized fruit processing industry comprises relatively small volumes of canning, freezing, and dehydrating. Yet jams, jellies, and pickles are made in large quantities, chiefly by small-scale entrepreneurs in the home or cottage sector and extruded snacks, puffed rice, and potato chips are made and sold in the domestic market by SMEs. Some units, especially large ones, have modern facilities operating hygienically in conformity with the United States good manufacturing practices (GMP). On the whole, however, most facilities need upgrading and the personnel require considerable training on a wide range of topics.

Crop	Total cost of production (Tk/ha)	Net return (Tk/ha)
Boro rice	24,885	9630
Mango	25,008	25,228
Pineapples	27,621	29,729
Potato	40,544	42,070
Okra	25,308	14,192
Bitter gourd	29,775	56,068
Chili	33,533	63,277

Source : Ministry of agriculture 2004; BARI 2003; DAE 2003

Even under the most liberal assumptions, it appears the transformation of horticultural products into processed food products account for less than 1

percent of total horticultural production. Bangladesh produces 8 million tons of horticultural produce each year. Pran, which is believed to account for more than half of the horticultural produce that moves through processed channels, consumes an estimated 12,000 -15000 tons per year.

Exports of processed horticultural products are in their infancy. Neither BBS nor EPB maintain separate statistics on exports of processed horticultural products, although Comtrade data indicate that total exports of processed fruits and vegetables were less than US\$ 1 million in 2005 (table 5.1). Process remains focused primarily on the domestic market. This strategy appears to arise partly from their desire to serve an undersupplied domestic market and partly to improve their manufacturing and product development systems in a forgiving environment. During this testing/roll out phase, exports appear to occur only on an opportunistic basis, although several processors indicated their determination to expand more seriously into export channels once production and new product challenges had been met.

Constructions and Opportunities

Domestic Fresh Market

Despite steady growth in domestic demand, there are numerous factors which have constrained the growth in production volumes. Product losses occur across the entire post-harvest supply chain. Farmers are handicapped by inadequate knowledge of efficient harvest and storage practices. Market information is frequently unavailable, and harvest timing is asynchronous with market requirements. Overland transportation is frequently slow and invariably unrefrigerated. Road conditions are often difficult, and slow

train\sits are rendered even slower by numerous stops for the negotiation and collection of informal tolls. Wholesale markets are poorly equipped to hold and store product beyond the day of receipt. The impact of this array of constraints can be seen in table 5.4. Detailed studies by the Bangladesh Agricultural research Institute in 2006 indicate that post -harvest losses range form a low of 14 percent, in the case of chilies, to a high of 37 percent in the case of tomatoes.

Market infrastructure badly needs upgrading. Assembly and wholesale markets typically play vital roles: Preserving the quality of primary produce; facilitating smooth transaction; packaging and pre-shipment treatment; and shipping to destinations inside and outside the county. Yet the highly congested urban markets of Bangladesh are generally old, dirty, and lack such basic support facilities as god owns, cold or cool storage, potable water, drainage, and access for vehicles to load and unload produce. Inadequate post harvest technology and poor market infrastructure contribute to high losses as fruits are transported from farm to market (table 5.5)

Crop	Producer	Collector	Wholesaler	Retailer	Total
Mango	2	5	22	4	33
Pineapple	2	4	8	4	18
Banana	2	4	8	6	20
Papaya	6	10	15	4	35
Lime	4	3	14	2	28
Beans	4	6	13	5	28
Carrot	3	6	12	4	25
Cabbage	4	7	9	5	25
Bitter gourd	4	6	11	6	27
Tomato	5	10	15	7	37

Okra	3	10	13	8	34
Eggplant	2	5	6	7	20
Chilies	2	3	5	4	14
Potatoes	3	4	12	6	25
Average % loss	3.3	6.3	11.6	5.1	26.3
<i>Source: BARI 2006</i>					

The Limited availability and use of reliable planting materials and hybrid seed are a major challenge for fruit and vegetable production and result in very low productivity. Poor access to high quality seed and planting material is a continuing bottleneck. The percentage of vegetable and potato seed supplied from formal or professional sources is extremely low. The use of substandard seed reduces the yield and quality of produce and ultimately reduces farmer profits. Only about 50 percent of vegetable seed is obtained from formal sources; the comparable figure for potato seed is less than 5 percent (de Wilde, Islam, and Zaman 2003). The development of the seed industry must be enhanced, including the introduction of biotechnology and tissue culture for large-scale production of high quality seed and preparation of high quality planting materials (de Wilde, Islam and Zaman 2003) Use of high quality seed is particularly important when crops are grown for processing and /or export currently the private sector has limited capacity to produce the breeder and basic seed for horticultural crops. Public institutions will need to bridge this gap for the foreseeable future, with complementary support from the private sector for additional multiplication, marketing, and distribution of seed (World Bank 2005). The public sector also needs to strengthen its regulatory role in ensuring that high quality seed is being supplied in the market. The Seed certification Agency lacks the human and financial resources to inspect, certify, and thus assure the quality of seed (FAO 2004)

Table : 5.5 : To high losses as fruits are transported from farm to market

Crop	Production	% loss	Total loser (*000mt)	Rate/kg	Total Losses (million Tk)
Mango	243.0	33.0	80.0	9.2	737.8
Pineapple	213.0	18.0	30.3	4.2	126.5
Potato	3907.1	25.0	976.8	5.0	4883.8
Bitter gourd	26.0	27.0	7.0	5.0	35.1
Okra	24.0	46.	11.0	5.0	55.2
Chilies	138.7	14.0	19.3	6.5	125.6

Source: Author's analysis

Research is insufficiently focused on improving the yields and adaptabilities of horticultural crops, as well as on preventing post harvest losses and reductions in quality. If horticulture is to be developed to its potential, Bangladesh requires a research system that can address the full range of constraints and opportunities that horticulture represents for the national agricultural economy. Areas requiring public sector research include the development of integrated pest management (IPM) practices; the monitoring of pesticide use; monitoring for heavy metal contamination; research on low-cost technologies for cleaning, packing, storing, and transporting produce to reduce post harvest losses; promoting intensive agricultural practices such as drip irrigation, fertigation, and high density planting; and developing scientific methods for seed selection and propagation (World Bank 2005) .

There does not appear to be any "Center of Excellence" for the development and disseminating of improved standards for post-harvest handling of horticultural products. There is room in Bangladesh for dramatic improvements in visual quality, preservation of organoleptic attributes,

reduction in shrink, and extension of shelf life. Fortunately, much of the knowledge base for such improvements exists elsewhere in the world. The major tasks would not be to invent or discover new processes but rather to adapt and implement existing practices in Bangladesh.

Export Fresh Market

Good transportation infrastructure is critical to success in export horticulture. A recurrent complaint among Bangladesh fruit and vegetable exporters has been insufficient access to air cargo space. Although horticultural exporters have benefited from subsidized air freight rates and preferential access to air cargo space from Biman Airlines, the subsidized air freight capacity of Biman meets only 30-40 percent of the estimated demand for Bangladesh fruit and vegetable exports. While additional cargo space is available from the numerous foreign carriers serving Hazrat Shahjalal International Airport, their unsubsidized rates are uncompetitive with those of Biman. The Biman rate structure thus serves both as an export stimulus, with respect to the cargo that it can accommodate, and as an export "ceiling," with respect to the 60-70 percent of demanded and exportable product that becomes unaffordable and uncompetitive when shipped at market rates to markets served by Biman.

While the subsidized rates and preferential access that Biman affords have been important for the recent growth of fresh fruit and vegetable export, it now appears that the program is stifling horticultural export growth. Traditional exporters and the Bangladesh Fruits Vegetable and Allied products Exporters Association (BFVAPEA) (which represents them) focus

most of their energy on increasing the subsidized cargo capacity available from Biman, on maximizing their individual access to this capacity, and on mitigating the frequency and extent of Biman's rate increases. Faced with growing deficits, Biman has significantly increased air freight rates for fresh produce. Rates increased by some 25 percent per annum, on average, between May 2003 and October 2006.

Exporters' sharp focus on Biman appears to preclude progress on multiple fronts that would assure future competitiveness. With the sole exception of BRAC, exporters seem to have made no significant effort to improve supply chain integration, product quality and packaging, and value addition to develop new markets; or to explore alternative transportation vectors such as ocean freight or air cargo charters in short, to take any of the steps that would ensure long term growth in horticultural exports. At the same time, Biman's revenues continue to suffer under the weight of the subsidy, further compromising its ability to maintain and upgrade its fleet and service.

Estimates of subsidies for fruit and vegetable exports from Bangladesh 2003/04. The Government of Bangladesh has declared the following package of incentives and facilities for export promotion: an income tax exemption for export earnings, whereby all exporters with businesses registered in Bangladesh will get a 50 percent exemption in income taxes; an exemption in the insurance premium; bond facilities for export oriented industries; facilities for duty free importation of capital machinery for export oriented industries; the ability to import 10 percent of required spare parts for machinery every two years, duty free; a tax holiday; and a duty draw back scheme.

In addition to these standard export incentives, fruit and vegetable exporters are entitled to a cash subsidy. Under the export incentive package that took effect on July 1, 2006 exporters of fresh fruit and comparable figures for exporters of potatoes, processed agro products that use at least 80 percent of local raw materials, and processed agro-products that use at least 70 percent of local raw materials are 15 percent, 30 percent, and 20 percent, respectively. Aside from cash subsidies, fruit and vegetable exporters also receive a special inducement price (SIP) for cargo shipped on Biman. At the rates prevailing in 2006, the aggregate subsidy (cash subsidy plus the SIP) for the volume of fruit and vegetable exports in 2003/04 was almost US\$ 16 million equivalent to more than 60 percent of total FOB value in 2003/04 (see table).

Table - 5.6: Fruit and vegetable Export subsidies

	FOB export values (US\$ 000s)	FOB Subsidy (%)	FOB Subsidy Value (US\$ 000s)	SIP subsidy/t (US\$ 000s)	SIP subsidy (US\$ 000s)	Aggregate subsidy Values) (US\$ 000s)
Vegetable	24,700	30	7,410	405	8,155	15,575
Fruit	137	30	41	405	45	86
Potatoes	562	15	84	405	186	270
Other	\$9	30	3	405	3	6
Total	25,408	-	7538	-	8399	15,937

Note: assumes 45 percent to EU @ US\$ 386 per ton, 55 percent to Middle East @ US\$ 420 per ton (9000 tons to EU, 11,000 tons to Middle East) Source Author's Analysis

It is recommended that the special inducement price (SIP) Currently granted by Biman should be phased out gradually, according to a clear and well communicated schedule. Gradual elimination of the SP could be accompanied by a parallel increase in incentives paid by the government on exports of potatoes, vegetable, fruits, and processed products (table 5.6). The objective is to redirect subsidies toward more growth - oriented activities without reducing the overall value of the incentives paid to exporters at once.

By replacing the SIP subsidy with increased export subsidy, exporters would be motivated less by the portion of Biman's freight capacity that they win in a weekly lottery and more by their ability to increase their overall export movement. The disincentive to use carriers other than Biman would be reduced, as would the bias against market development to destinations not served by Biman. By eliminating the price advantage for acquiring

competitive advantage. Since subsidies do not typically serve as a sound basis for long-term export competitiveness, additional measures should be adopted to help the horticultural export industry develop over time into a viable, competitive economic force in a subsidy free environment.

As the incentives favoring Biman are eliminated, traditional and nontraditional exports and their associations will need to upgrade their skills in securing the best rates and service levels from associations will need to upgrade their skills in securing the best rates and service levels from alternative commercial carriers and charter providers. Within the horticultural export industry, there is very little knowledge of the complexities of negotiating service contract with passenger airlines for preferential price/volume rates. There is even less knowledge of the major logistical and financial arrangement required to bring in dedicated charter flights. In other countries exporters have had some success in establishing private companies to negotiate air freight rates. Organize air charters and resolve transportation problems.

Despite considerable capacity at the port of Chittagong to accommodate the unmet export demand for Bangladesh fruits and vegetables, at rates significantly lower than even the subsidized Biman rates. Most exporters do not use sea freight. While some export commodities could not withstand the rigors of the voyage, many could certainly tolerate the additional transit time. Greater use of sea freight would reduce the average cost of all perishables exported from Bangladesh and thus improve their competitiveness in the market. In addition, it would reduce pressure on an

overtaxed air freight system and provide a logical differentiation between cargo values.

The Port of Chittagong is well served by several of the world's premier carriers of perishables including Maersk, American President Lines, NYK, an Hapag Lloyd and it boasts sufficient container yard capacity and refrigerated plug slots to support increased throughput of perishables. Although no tariffs have been field (or requested) for the carriage of fresh fruits or vegetables, rates listed in existing tariffs for refrigerate containers carrying frozen cargo imply that sea freight to Dubai would amount to US\$ 0.22 -0.25 per kilogram. In contrast, air freight charges range from Biman's subsidized rate of US\$ 0.64 per kilogram to the open market rate of US\$ 1.00 per kilogram.

To assess the feasibility of exporting fresh fruits and vegetables by sea, exports in collaboration with organizations such as the Bangladesh Agricultural Research Institute (BARI) and HORTEX would first need to identify comparable commodities that are currently exported in this way. Excellent data exist for general post harvest handling of a wide variety of commodities, including most ocean freighted commodities. These data must be verified and reconfirmed within the context of Bangladesh to ensure that they are consistent with the local varieties and climate. Shipping lines such as Maersk could be approached to assist in this effort and serve as a technical resource. The next steps would be to develop tariffs and initiate trial shipment. Once exporters, carriers, and importers are satisfied with the guidelines and confident in the results at the ports of destination, exporters would need to optimize the guideline and confident in the results at the ports

of destination, exporters would need to optimize efficiency by reducing cost, negotiating service contract, and refining the integration of the supply chain, beginning at the farm level.

While exporters have been preoccupied with transport constraints, they have arguably paid insufficient attention to market access. Many convenient and /or high value export markets remain health and food safety requirement. There is currently no capacity in Bangladesh for undertaking pest risk analyses, negotiating protocols with trading partners to meet plant health requirements, and guaranteeing compliance once protocols are established. To address this problem, the ministry of agriculture needs to develop the ability to conduct pest risk analyses and negotiate and implement work plant as part of the process of gaining horticultural access to promising markets.

Several commonly acknowledged risks are associated with fruit and vegetable exports from Bangladesh: (1) multiple risks of microbiological contamination in the productions and post-harvest handling systems for exported fruit and vegetables; (2) chemical contamination, particularly with regard permissible, correct application rates and appropriate pre-harvest intervals for different chemicals; and (3) heavy metal contamination, particularly with regard to high levels of arsenic, lead, an cadmium in vegetable exports.

Bangladeshi suppliers and exporters face little immediate external (official or private) pressure to modify practices to comply with food safety or other requirements, but the export trade, particularly exports destined for EU or North American markets, seems vulnerable to interruption in the event that

greater official (or other) scrutiny is given to fruit and vegetable exports from Bangladesh, either under a targeted surveillance program or simply as a result of periodic testing of food products. Prudence would dictate some level of industry testing of export graded produce to determine signs of underlying hazards, followed by the development of specific measures perhaps in cooperative initiative involving a group of exporters and agricultural research institutions to overcome food safety issues.

There is a growing urgency for developing national quality management systems to train and ultimately accredit grower and packers in the major international certification regimes. These include the international organization for standardization (ISO); hazard analysis and critical control point (HACC); good agricultural practices (GAP); good manufacturing practices (GMP); Europe GAP; and the British Retail Consortium (BRC). Institutions within Bangladesh (Such as the Bangladesh Standard and Testing Institute) are ill-equipped to perform many of the tests and to offer the certifications required in export markets to ensure that fruits, vegetables and products derived from them are free from chemical residues, dyes, or heavy metals, While this failure may not represent an immediate threat to exporters, the time is drawing near when most, if not all, markets of interest will insist that imported produce carry test results confirming compliance with plant health and food safety standards.

Exporters have been unable to explore new markets because they lack market information and because institutions have failed to assist them in identifying new opportunities. Hortex has in the past attempted to provide market information, but its efforts are hampered by declining financial support and

by general dissatisfaction among clients with its services and orientation. The EPB has assisted exporters by imparting training, organizing trade fairs, and furnishing information, but its effectiveness has also been limited. Since the markets of East Asia and of countries in the Association of Southeast Asian Nations (ASEAN) represent promising targets for Bangladesh to expand exports of potatoes and vegetables, the EPB and other official agencies should dedicate resources to exploring and developing new opportunities in these markets. The consumption bases in the countries of East and Southeast Asia are significant, Bangladesh's cost structure should be competitive, and many sea and air freight options are available to deliver products to these markets. Exporters need market information, price reports matching services, and credit facilities to attack these markets.

In addition to markets in Southeast Asia, the seven neighboring states of northeast India also represent an attractive potential export market for Bangladesh's horticultural exporters. At present however, trade between the two countries is unbalanced, given the comparable economic status across the two borders, this imbalance appears to be high. Non tariff and para tariff barriers are reported to be widespread at Bangladesh's northern border. The importance of the Bangladesh market to India's horticultural exporters would seem to give Bangladesh a leg up in seeking a more level playing field for the sale of its own products to northeast India.

Processed Market

Prospects for growth in the fruit and vegetable processing industry are severely compromised by the unreliable power supply. As discussed previously, electricity outages constituted the top business constraint for agro processing firms in Bangladesh. In 2005 agro processing firms reported 140 days of outages on average. Managers reported that the frequency and duration of outages were higher at the end of 2005 than in the previous period. More than 70 percent said that their revenues were down as a result.

Attention to hygiene and food safety in the processing industry is inadequate, and there is a strong need to ensure that processors adhere to minimum standard of quality and food safety. Neither public nor private sector resources offer any meaningful assistance in the areas of new product development testing for food safety or hygiene, quality management, or certification to insure compliance with public and private requirements as practiced in Europe, North America, Australia, and parts of Asia. Research support to assist the processing industry with processing techniques, equipment application and manufacture, and new product development is almost nonexistent.

Summary of Recommendation

Exports of fruits and vegetables are less than 30,000 tons, whereas very conservative estimates place post harvest losses at more than 2, 00,000 tons. Developing the processing sector is critically important for expanding and diversifying the fruit and vegetable sector and may also offer strong prospects for expanding exports. Specific recommendations for the short and medium terms are presented below.

Alleviating Fresh Domestic Constraints

Short term (1- 3 years):

1. Make better use of existing cold storage capacity for domestic distributions: Any improvement in maintaining the cold chain intact would have a salutary effect on product quality and reduce post harvest losses. In the near term, the absence of any cold storage capacity at the urban markets means that refrigerated transport to these points from farm gate should have limited positive impact. For product destined to processors, on the other hand, temporary storage in any of the 320 (largely underutilized) storage facilities would provide a double benefit, prolonging useful life for farmer produce while generating incremental income for facility owners.

2. Establish handling and transit guidelines for each commodity, based on the specific operating conditions within Bangladesh.

3. Expand available of better seed and planting material: strengthen seed certificate and quality control system.

4. Address the problem of informal tolls: Eliminate informal highway tolls as well as informal payments for routine handling of export shipments at the port of Chittagong and the airport.

5. Promote innovating research: Research must focus on resolving problems with horticultural yields, adaptability, post harvest losses, and reduced quality.

6. Build capacity for promotion of agricultural marketing, market research, and market information systems: there is a need to incorporate appropriate technology (such as radio broadcasts and SMS messages via cell phone) to provide farmers and their marketing agents with real time information on market prices and volumes for the range of domestic markets where fresh fruits are sold.

7. Review agricultural marketing legislation and identify options for improving market infrastructure: the review should include the Market management and leasing policy of 1996 and the agricultural Markets Produce Regulation Act of 1964 to identify reforms necessary for effective and efficient marketing. The review should also assess the effectiveness of market Management committees and strategies for improving their effectiveness.

8. Contract farming arrangement should be officially encouraged and facilitated as a means of reducing the costs of intermediation and the risk of crop diversification, while integrating horticultural producers into the fresh produce supply chain: Contract farming holds excellent potential as a way for farmers to overcome market imperfection, to minimize the costs of intermediation, and to gain market access in an efficient and transparent manner. Several fresh exporters and processors in Bangladesh Already make significant use of contract farming as a way to credit, inputs and technical assistance, while providing them with assured markets at pre-determined prices.

9. Direct farms - to - market programs, should be fostered and expanded: As evidenced by the success of initiatives such as the Northwest Crop Diversification Project (box 5.2) the organization of local regional and urban markets by farmers and their cooperative organizations provided another interesting approach for integrating farmers more fully into the supply chain, and reducing the cost of intermediation.

Medium term (3-5 years)

1. Provide farmers, service providers and agro processors with reliable access to power: the reliable provision of electricity is a national problem in Bangladesh not one that is restricted to the horticultural sector. Still, the prospects for growth in this sector are being severely compromised by this problem, and would greatly benefit from its resolution.

3. Improve market infrastructure: Based on options identified in the review of marketing legislation and market management practices, assess necessary investments, including the construction of post harvest management and processing facilities that will reduce waste and encourage value addition.

Promoting Exports

Short terms (1-3 years)

1. Phase out the SIP granted by Biman and replace it with an increased subsidy: Removing the SIP should give exporters and incentive to focus on improving supply chain integration; product quality and packaging;

developing new markets; and exporting the viability of exports through different modes of transportation, such as sea freight. It will also remove some of the financial burden imposed on Biman.

2. Evaluation the effectiveness of BSTI: Determine BSTI's effectiveness in undertaking market surveillance, testing, and certification to address of safety risks, Consider institutional reforms to strengthen the performance of BSTI.

3. Strengthen Local capacity in export logistics: Individual exporter and BFVAPEA require capacity building in export logistic, especially in negotiating better logistical arrangement. The first step would be to develop a proposal and action plan.

4. Explore the potential of sea freight as an alternative to air freight: In conjunction with shipping lines and public sector institutions, exporters should identify commodities suited for export by sea, establish handing and transit temperature guidelines, and conduct trial shipment.

5. Develop new horticultural markets: The EPB could dedicate resources to develop new horticultural markets in southeast and east Asia. Options for exports to northeastern Indian markets should also be explored.

6. Address the problem of informal tolls: Eliminate informal highway tolls as well as informal payments for routine handling of export shipments at the port of Chittagong and the airport.

7. Address the problem of informal tolls: Address the poor performance of Hortex to transform it into an effective institution.

Medium terms (3-5 years)

1. **Reevaluate the export subsidy:** Assess the effectiveness of the export subsidy in terms of increasing export revenues, and take step towards substantially reducing the size of the subsidy. Subsidies need to be used more effectively.
2. **Build institutional capacity to meet the prerequisites for accessing new markets:** As part of the process for gaining access to promising new markets for fruit export, especially in East Asia, develop capacity within the Ministry of Agriculture to conduct pest risk analyses and negotiate and implement work plans.

Developing the Processing Industry

Short term (1-3 years)

1. **Encourage public private partnership:** Public- Private Partnership can facilitate research on processing techniques, the use and manufacture of equipment, and the development of new products.
2. **Address the issue of unreliable power supply for the processing industry.**

CHAPTER - SIX

Summary and Policy Options

The previous chapters have reviewed opportunities and growth prospects for selected commodities and industries, culminating with a set of recommendations to address constraints specific to each. This chapter takes a broader perspective and examines cross-cutting issues that emerge as priorities for promoting high-value agriculture and related agro-business development throughout Bangladesh.

Upgrading the Enabling Environment for Agro-business to Remove Impediments to Growth and Lower the Costs of Doing Business Removing policy distortions/pursuing policy opportunities. As highlighted in each of the case studies, urgent attention is needed for strengthening food safety legislation and enacting laws and regulations for quality control for all types of agricultural inputs, including feed, agro-chemicals, and medicine. Many existing regulations are simply outdated (such as those related to food safety) and others are absent (especially in key areas, such as consumer protection and ensuring the quality of animal feed and other inputs). These deficiencies are detrimental to consumer welfare, allow the private sector to pursue unscrupulous practices, and ultimately slow the growth of high-value agriculture and related agro-business.

Many of the subsidies, export incentives, and tax benefits formulated to promote the growth of high-value agriculture and related agro-business are actually stifling growth; they are distorting the production environment

while ignoring underlying problems affecting competitiveness. The various policy interventions that have been put in place should be reviewed to reassess their effectiveness and the efficiency with which they are administered. Several studies confirmed that many policy interventions originally designed to promote growth no longer appear to have the desired impact and must be reconsidered. Some of the specific incentives identified in the studies that warrant review include:

- The Special Inducement Price (SIP) currently granted by Biman. Gradually phasing out the SIP would reduce the disincentive for fruit and vegetable exporters to use carriers other than Biman and reduce the bias against market development in destinations not served by Biman. By eliminating the price advantage that favors Biman, exporters would be encouraged to pursue more conventional avenues for acquiring competitive advantages.
- Incentives extended to processing plants. Many processors may import machinery and equipment duty-free, benefit from a tax holiday, and obtain loans from state agricultural banks at two-thirds the commercial interest rate. Many processing plants use the incentive framework to finance or reduce taxes on other businesses, and the industry remains continuously attractive to new entrants. The BFFEA estimates that processing capacity is 270,000 tons per year and that only 23 percent of this capacity is used. Statistics suggest that five more processing plants operated in 2006 than in 2005, despite the lack of product to supply them.

Further reform in regulations that constrain the ease of doing business in Bangladesh will also promote the growth and competitiveness of agro-business. In the latest Doing Business indicators, Bangladesh ranks 88th among 175 nations in terms of overall ease of doing business (World Bank 2007c). Bangladesh does fairly well in protecting investors (ranking 15th) and providing access to credit (ranking 48th), yet it is among the worst performers with respect to enforcing contracts (ranking 174th), registering property (ranking 167th), and trading across borders (ranking 134th) (table 8.1). Bangladesh has undertaken significant reforms to address regulations that are unnecessarily burdensome to starting, operating, and closing a business, but even so, its ranking among the 175 countries declined slightly in 2006 from 2005, when it placed 81st (World Bank 2007c).

Bangladesh		Ease of doing business (rank)	88
South Asia		GNI per capita (US\$)	470
Low come		Population (millions)	141.8
Starting a business (rank)	66	Protecting investor (rank)	15
Procedures (no.)	8	Extent of disclosure index (0-10)	6
Time (days)	37	Extent of director liability index (0-10)	7
Cost (% of income per capita)	87.6	Ease of shareholder suits index (0-10)	7
Minimum capital (% of income per capita)	0.0	Strength of investor protection index (0-10)	6.7
Dealing with licenses (rank)	67	Paying taxes (rank)	72
Procedures (no.)	13	Payments (no. per year)	17
Time (days)	185	Time (hours per year)	400
Cost (% of income per capita)	272.3	Total tax rate (% of profit)	40.3
Employing workers (rank)	75	Trading across borders (rank)	134
Difficulty of hiring index (0-100)	11	Documents to export (no.)	7

Rigidity of hours index (0-100)	40	Time to export (days)	35
Difficulty of firing index (0-100)	40	Cost to export (US\$ per container)	902
Rigidity of employment index (0-100)	30	Documents to import (no.)	16
Nonwage labor cost (% of salary)	0	Time to import (days)	57
Firing cost (weeks of salary)	51	Cost to import (US\$ per container)	1.287
Registering property (rank)	167	Enforcing contracts (rank)	174
Procedures (no.)	8	Procedures (no.)	50
Time (days)	425	Time (days)	1442
Cost (% of property value)	10.5	Cost (% of claim)	45.7
Getting credit (rank)	41	Closing a business (rank)	93
Strength of legal rights index (0-10)	7	Time (years)	4
Depth of credit information index (0-6)	2	Cost (% of estate)	8
Public registry coverage (% of adults)	0.6	Recovery rate (cents on the dollar)	24.9
Private bureau coverage (% of adults)	0.0		
<i>Source: World Bank 2007c</i>			

Upgrading infrastructure

Fruits processing firms in Bangladesh have consistently related electricity outages as their most serious constraint in Investment Climate Surveys (ICS) conducted between 2002 and 2005. The unreliable provision of electricity is a national problem and not restricted to agriculture or agro-business, yet it severely compromises prospects for growth in these sectors, which would greatly benefit from its resolution. Planting decisions made by farmers, and operating and investment decisions made by processors are unduly affected by concerns over the likelihood of rising electricity costs or service interruptions.

Improvements in market infrastructure are also desirable. The development of efficient and competitive markets is essential for promoting growth in high-value agriculture. While Bangladesh has quite a high density of markets—of its 16,476 markets, 2,050 are designated as growth centers and 92 are "notified" markets (Agrico Ltd. 2004) — many markets need significant improvements in infrastructure to cope with highly perishable fruit, vegetable, fish, and animal products. A large part of the problem seems to arise from how markets are managed. Responsibilities for day-to-day market operations, fee collection, and infrastructure development are split among different entities. Generally there is no relationship between fees collected from a market and services provided to traders.

In notified markets, market charges are fixed by the District Market Advisory Committee, and there is a gazette notification on charges. In other markets, it is the responsibility of the Upazilla Nirbahi Officer to set charges with approval of the District Deputy Commissioner (Mallorie and Ashraf 2005; Agrico Ltd. 2004). "Responsibility for the collection of market charges most often rest with private leaseholders, who are required to pay a fixed amount to the Upazilla Council or City Corporation and are then free to collect charges. Even though charges are "theoretically" fixed, both market lessees and "an adhoc assortment of private interest groups and 'musclemen' extract whatever rent they can out of market participants" (Agrico Ltd. 2004). There is very lax oversight of how much is actually collected, and charges are rarely posted clearly at the market entrance.

Responsibility for day-to-day running of markets lies with the Market Management Committee (where they exist) and Trader Associations (in the

absence of Market Management Committees). Market Management Committees have no responsibility for control, revenue collection, or infrastructure development. Their function is limited to conflict resolution (Agrico Ltd. 2004). Many of these committees do not function very well, and in any case their ability to take action is constrained by the lack of resources. Only 15 percent of the funds collected during the lease period are spent on the development of the concerned market, while the rest goes towards government revenue, the Upazilla Development Fund, and salaries of the UP secretary and others. A review of relevant marketing legislation, including leasing policies and how market revenues are used, is required to identify areas for reform. A well-thought-out strategy for market development and operation is needed.

Developing human capital

The technical skills and knowledge required to produce and manage high-value agricultural products need to be improved. University curriculum needs upgrading and training programs should be developed to improve the pool of skilled technicians and extension agents available to farmers and enterprises. Investments in farmers' training systems are also needed.

Promoting good governance

Farmers require continued assistance to reduce the informal tolls levied against fresh produce as it is carried from farm to market. The added costs that such tolls impose are ultimately shared by the final consumers as well as the farmers, and they disadvantage both parties. A continued effort should

also be made to reduce informal payments for routine handling of export shipments through the Port of Chittagong and Zia International Airport. Like informal road tolls, these facilitating payments serve as a brake on export growth; they reduce farmers' incomes and consumers' welfare.

Enhancing Knowledge Management for Agro-business

Improving technology generation, Adaptation, and dissemination for high priority commodity systems

A significant investment is needed to build the knowledge base that will better enable the private sector to participate and compete in high-value agriculture and related agro-business. Agricultural research in general in Bangladesh has been underfunded (World Bank 2005b). Between 1997/98 and 2004/05, expenditures for agricultural research as a share of total agricultural GDP ranged from 0.20 percent to 0.34 percent. This level of expenditure is considerably lower than it is in developing countries as a whole, which averaged 0.62 percent of agricultural GDP, and significantly lower than expenditures on agricultural research in developed countries, which averaged 2.80 percent of agricultural GDP.

Food crops, primarily rice, have received the largest share of agricultural research resources, and research on horticultural crops, fisheries, and livestock has received less attention (World Bank 2005b). The Horticulture Research Center conducts limited research on fruit and vegetable crops, and the Post Harvest Technology Division of Bangladesh Agriculture Research Institute investigates issues in fruit and vegetable processing (World Bank

2005b). The limited resources and capacity available to these institutions have not sufficed, however, to undertake significant research on post-harvest management issues of significance to growers and processors. Research in the fisheries and livestock sectors has not fared any better. BFRI has done some work on breeding and genetics, feed and nutrition, integrated fish farming, disease and health management, and socio-economic aspects of aquaculture, and BLRI is responsible for livestock research to increase production.

Models must be developed for joint public and private financing and management of research institutions to conduct research with practical applications on topics important to producers and enterprises engaged in high-value agriculture and related agro-business. The case studies identified several areas where such research would be beneficial:

- Fruit and vegetable processing, where research is needed to assist with processing techniques, equipment application and manufacture, and new product development.
- The high-value rice industry, where closer coordination between plant breeders and those involved in trade, specially the rice milling industry, is needed to develop improved varieties of traditional fine rice with such characteristics as palatability, aroma, higher milling out-turn, and lower cost of production.

Benchmarking for enhanced productivity and reduced transactions costs

There lack of reliable agricultural and industry data on most high-value agricultural commodities is a major constraint and requires immediate attention to provide credible information for formulating policy. Benchmarking costs and productivity along the value chain will provide an important tool for assessing competitiveness and addressing bottlenecks.

Scaling up best practices and lessons learned from agro-business development interventions to date

Best practices in high-value agriculture and related value chains within Bangladesh need to be identified, documented and scaled up. There are many innovative approaches that have been piloted and refined (for examples, see boxes 3.1 and 3.2 and annex 1), but knowledge of successful interventions is not widely disseminated and therefore rarely scaled up.

Taking a Proactive Stance Towards Food Safety and Quality Management

Improving consumer and producer awareness of food quality and safety

Significant benefits can be attained by improving consumers' and producers' awareness of various food safety risks and how to minimize them. Several exporters, food processors, and farmers catering to export supply chains have been trained in GAP and GMP and have received HACCP and ISO certification. These isolated efforts to improve agricultural and

manufacturing practices need to be mainstreamed and not confined to export supply chains. In addition to providing guarantees for distant buyers and consumers regarding the health and safety traits of the food products they are about to buy, these quality management systems serve as early warning systems. Such systems can help alleviate postharvest losses and have generally proven to benefit businesses by identifying shortcomings in their production processes and increasing consumers' confidence in their products.

Improving the regulatory environment

Establishing appropriate food safety regulations and ensuring compliance with the regulations is of critical importance for consumer welfare as well as maintaining and expanding trade in high-value agricultural products. A recurring theme from the case studies is that widespread problems related to food safety imperil human health and are detrimental for agro-food trade and the growth of agro-business in general. The problems arise from outdated food safety legislation, improper enforcement of legislation, and a lack of infrastructure. Commonly acknowledged risks include: (1) microbiological contamination in the production and postharvest handling systems for fruit and vegetables; (2) chemical contamination of food products, particularly pesticides in fruit and vegetables but also chemicals in fish and fish products; (3) heavy metal contamination, particularly the high levels of arsenic, lead, and cadmium in vegetables but also possibly in fish and fish products; (4) antibiotic residues in fish and fish products; and (5) the use of illegal additives and colorants and adulteration of various food products.

In 2003, FAO reviewed food control systems in Bangladesh (Johansson 2003). The recommendations included: (1) formulating a comprehensive food safety policy; (2) streamlining and improving coordination among the various ministries and agencies involved in food control; (3) enacting the Consumer Protection Act and Feed Act; (4) harmonizing the provisions/standards in various laws/rules; (5) Establishing and issuing guidelines on GAP and GMP for all foods, including fruit and vegetables; and (6) Developing and enacting a comprehensive labeling law with appropriate provisions for labeling local and imported packaged food in conformity with CODEX. These recommendations remain very relevant, but there has been some complacency in taking these recommendations forward and instituting reforms. The fact that there is no unified legislation and that responsibilities are spread across at 11 ministries makes coordination extremely difficult. Other countries in the region, including India, have overcome similar problems by revising legislation and improving enforcement. It is important for Bangladesh to give priority to updating its food safety legislation and to consider the benefits of moving towards a Unified Food Law or consider alternative mechanisms for improving its food control systems (table 6.1),

Bangladesh has had a variable record in complying with sanitary and phytosanitary standards. Despite its significant achievements, particularly in frozen food exports, Bangladesh must take a more strategic and proactive approach to standards compliance if it is to remain competitive in international markets (World Bank 2005c). Growing evidence indicates that for well-prepared countries and suppliers, rising standards represent an opportunity to modernize export supply and regulatory systems and adopt

safer and more sustainable practices. Countries that have taken a proactive stance, including staying abreast of technical and commercial requirements and anticipating future changes, have been able to reposition themselves in more remunerative market segments. Consignments from such countries are subjected to comparatively less inspection by trading partners. Good reputations gained through demonstrated compliance yield lower transaction costs for farmers and exporters. As pointed out in chapter 3, Bangladeshi shrimp could realize higher prices on the international market if exporters were to develop a reputation for supplying a high-quality product. Shrimp from Bangladesh receive lower prices in the world market compared to shrimp from other Asian countries such as Thailand or Vietnam because of a reputation for poor quality.

The case studies emphasize that future competitiveness in lucrative export markets depends on making urgently needed improvements in laboratory and testing infrastructure. For example, BST1 is not adequately equipped to perform many of the tests and certifications required in export markets or to ensure that fruit, vegetables, or products derived from them are free from chemical residues, dyes, or heavy metals. While this deficiency may not represent an immediate threat to the ability of national distributors and exporters to service today's customers in ethnic markets, the time is drawing near when most, if not all, markets of interest will insist that imported products carry test results confirming compliance' with plant health and food safety standards. It is urgent that the official agency be upgraded or that competent private companies are invited into the country to provide such certifications credibly, readily, and affordably.

1. Ministry of Agriculture	Plant protection Wing. DAE	Phytosanitary certificate for import/export of plants/plant products Fertilizer & Pesticides use control
2. Ministry of Food	Directorate General of Food (DGF)	Quality control of PFDS. stock, procured food grains/foodstuffs, imported food Food control in the market
3. Ministry of Health and Family welfare	Directorate General of Health: District and Upazilla Health Administration and Institute of Public Health	Food quality and sanitation control at Upazilla/District level Testing
4. Ministry of LGRD	City corporation and Pourashava Health Unit	Sanitary inspector, labs, and public analyst for food quality control in their command areas
5. Ministry of Fisheries and Livestock	a) Department of Fisheries (FIQC Wing) b) Department of Livestock	Fish quality control and certification for domestic market Animal health , Animal products Imported animals
6. Ministry of Industries	BSTI	Frame standards for food products Testing and certification marks and surveillance Test radiation levels, pesticides residues in imported food
7. Ministry of Science, information and communication Tech.	BAEC IFST BCSIR	Test radiation levels, pesticides residues in imported food Test food items
8. Ministry of Education	DG, Primary DG, Secondary Text Book Board Universities	Research and development Food safety, nutrition, and environmental issues in textbooks at all levels of
9. Ministry of Information	BIB, BTV, Radio Bangladesh	Build public awareness through media
10. Ministry of Home	Bangladesh police	Assist the inspection agencies
11. Ministry of Law, Justice and Parliamentary Affairs		Assist the inspection agencies Formulation vetting, parliamentary approval
Source: Bangladesh Country Paper, Prepared for the FAO/WHO Regional Conference of Food Safety for Asia and Pacific, Serembam, Malaysia, 24-27 May 2004		

It is often assumed that the management of food safety and agricultural health is predominantly the responsibility of the public sector, and indeed many crucial regulatory, research, and management functions are normally performed by government. In a variety of circumstances, importing countries require certain functions to be performed by a designated "competent authority" in the public sector. As indicated in table 8.3, the primary responsibilities of the public sector include diplomacy, awareness building, promoting good agricultural practices, and assessing and managing food safety and plant health risks. However, the private sector also has fundamentally important roles to play—in the process of standard-setting and in actual compliance with food safety and agricultural health requirements. Experience elsewhere demonstrates that capacity building in the private sector can complement (or even substitute for) public sector capacity, including capacity in research and development and conformity assessment (such as inspection, certification, and testing).

APPENDIX

Brief Descriptions of the High-Valued Fruits in Bangladesh

Brief descriptions of the important fruits are being included in the annex just to provide the reader a flavor of these unique creations of Mother Nature. Indigenous tropical fruit species and their geographical distribution of these fruits are also summarized in the annex for a quick reference,



Banana

The word "banana" is a generic term covering a number of species or hybrids in the genus *Musa* of the family *Musaceae*. Different cultures have religious and medical attributes to banana tree and fruits. Edible banana was originated in the Indo-Malaysian region extending to northern Australia. The ovaries contained in the first (female) flowers grow rapidly, developing parthenocarpically (without pollination) into clusters of fruits, called hands. The number of hands varies with the species and variety, The fruit (technically a berry) turns from deep green to yellow or red, and may range from 6 cm to 30 cm in length and 2 cm to 5 cm in width. The flesh, ivory-white to yellow or salmon-yellow, may be firm, astringent, even gummy with latex when unripe; turning tender and slippery, or soft and mellow or rather dry and mealy or starchy when ripe. The flavor may be mild and sweet or sub-acid with a distinct apple tone. The common cultivated types are generally seedless with just vestiges of ovules visible as brown specks.

Occasionally, cross-pollination with wild types will result in a number of seeds in a normally seedless variety.



Guava

Guava, *Psidium guajava* L, of the myrtle family (Myrtaceae), is almost universally known by its common English name or its equivalent in other languages. In Malaysia, it is generally known either as guava or jambu batu, but has also numerous dialectal names. Its place of origin is uncertain, but it is believed to be an area extending from southern Mexico into or through Central America. It is common throughout all warm areas of tropical America and in the West Indies, the Bahamas, Bermuda and southern Florida. Early Spanish and Portuguese colonizers were quick to carry it from the New World to the East Indies and Guam. It was soon adopted as a crop in Asia and in warmer parts of Africa.

The fruit is round, ovoid or pear-shaped berry, 5 cm or more in diameter and 4 - 12cm long. It has a thin greenish-yellow skin and a flesh of varying thickness which may be white, yellow-pink or red. The outer layer of flesh is a finely granular pulp; the inside is softer pulp with many small hard seeds. Some varieties are seedless. The flavor is variable and is distinguished by a characteristic and penetrating musky aroma of varying intensity. The flesh

may be white, pink, yellow, or red. The quality of the fruit of guavas grown in cooler areas is often not as good as those grown in warmer areas.



Jackfruit

Jackfruit, *Artocarpus heterophyllus* Lam of the family Moraceae, is also called jak-fruit, jak, jaca, and, in Malaysia and the Philippines, nangka; in Thailand, khanun; in Cambodia, khnor; in Laos, mak mi or may mi; in Viet Nam, mit. It is an excellent example of a fruit prized in some areas of the world and allowed to go to waste in others.

Jackfruit is believed to be indigenous to the rain forests of the Western Ghats of India. It spread early on to other parts of India, southeast Asia, the East Indies and ultimately the Philippines. It is often planted in central and eastern Africa and is fairly popular in Brazil and Surinam. Jackfruit is the largest tree-borne fruit in the world, reaching 40 kg in weight and up to 90 cm long and 50 cm in diameter. The exterior of the compound fruit is green or yellow when ripe. The interior consists of large edible bulbs of yellow, banana-flavored flesh that encloses a smooth, oval, light-brown seed. The seed is 2-3.5 cm long and 1-2 cm thick and is white and crisp within. There may be 100 or up to 500 seeds in a single fruit, which are viable for no more than three or four days. When fully ripe, the unopened jackfruit emits a

strong disagreeable odor, resembling that of decayed onions, while the pulp of the opened fruit smells of pineapple and banana.

There are two main varieties. In one, the fruits have small, fibrous, soft, mushy, but very sweet carpels with a texture somewhat akin to a raw oyster. The other variety is crisp and almost crunchy though not quite as sweet. The latter variety is the more important commercially and is more palatable to western tastes.



Jujube

Jujube or the Chinese date thrives best in warm, dry climates; it can also withstand the winter temperatures down to -30°C . The jujube originated in China where they have been cultivated for more than 4,000 years and where there are over 400 cultivars. The plants traveled beyond Asia centuries ago and today are grown to some extent in Russia, northern Africa, southern Europe, the Middle East and the southwestern United States.

The fruit is generally dark brown when ripe, oval to pyriform in shape, 2.5-5.0 cm in diameter, with a single stone. It will dry if left on the tree, similar to figs. The skin is smooth and thin until the drying of the fruit occurs, then it becomes wrinkled. The pulp is dryer than in most fruits. The immature fruit is green in color, but as it ripens as goes through a yellow-green stage with mahogany-colored spots appearing on the skin, as the fruit ripens

further. The fully mature fruit is entirely red. Shortly after becoming fully red, the fruit begins to soften and wrinkle. The fruit can be eaten after it becomes wrinkled, but most people prefer them during the interval between the yellow-green stage and the full red stage. At this stage the flesh is crisp and sweet, akin to an apple. Under dry conditions jujubes lose moisture, shrivel and become spongy inside. Tests in Russia indicate that the fruit has a high vitamin C content. The fruit has been used for medicine purpose for millennia by many cultures. One of the fruit's most popular uses is to process it as a tea for sore throat treatment.



Strawberry

Strawberry is one of the economically important edible fruits through out the world. It is ranked high among small fruits, esteemed as dessert and consumed for its flavor. The fruit contains a higher vitamin C concentration than orange or lemon. Several species of the genus are being cultivated for commercial purpose. *Fragaria x ananassa* Duch. (family Rosaceae) is one of the most popular strawberry species occurring in the temperate and subtropical region of the of the world. *Fragaria x ananassa* produces bright red fruits (a modified thalamus) in May–June. It is edible, sweetsour in taste and consumed raw. The strawberry fruits have potential to be used as jam, jelly, syrup and as a foundation in beverage and ice creams.

Strawberry is one of the most popular fruits in the world. It has been recently introduced in Bangladesh. Plant Breeding and Gene Engineering Laboratory, Dept of Botany, Rajshahi University, as been initiated a research programme since 1998, to develop strawberry (*Fragaria xananssa*) varieties suitable for cultivation in Bangladesh weather condition. Considerable progress has been achieved and three genotypes have selected through the induction of somaclonal variation. The selected genotypes are proved to be adaptive to Bangladesh and have high yield potential with very good quality fruits. In view of the potential commercial value, it is highly desirable to develop methods for rapid, efficient and large-scale multiplication of these strawberry genotypes using plant tissue culture technique.



Longan

Closely allied to the glamorous lychee, in the family Sapindaceae, the longan, or lungan, also known as dragon's eye, and as mamoncillo chino in Cuba, has been referred to as the "little brother of the lychee", or li-chihnu, "slave of the lychee". Botanically, it is placed in a separate genus, and is currently designated *Dimocarpus longan* Lour. The longan is native to southern China, in the provinces of Guangdong, Guangxi, Sichuan and Fujian, between elevations of 150-450 m. It is commonly grown in Thailand, Cambodia, Laos and Viet Nam and in the Taiwan Province of China. The tree grows but does not fruit in Malaysia and the Philippines.

Longan is less important to the Chinese as an edible fruit, but more widely used in oriental medicine. The drupaceous fruits are spherical to ovoid, 22-36 mm in diameter and 6-19 g in weight. The peel is tan or light brown, thin, leathery and smoother than that of the lychee. The pulp is whitish and translucent; thin in large seeded fruits and medium thick to thick in others. Each fruit has 1 seed; globular and shiny, brown to dark brown. The pulp does not adhere to the seed and is flavorful and sweet with 12-21% soluble solids.



Lychee (Litchi)

The lychee is the most renowned group of edible fruits of the soapberry family, Sapindaceae. It is botanically designated *Litchi Chinensis* Sonn and widely known as litchi and regionally as lichi, lichee, laichi, leechee or lychee. The lychee is native to low elevations of the provinces of Guandong and Fujian in southern China. Cultivation spread over the years through neighboring areas of southeastern Asia and offshore islands.

Showy fruits, in loose, pendent clusters of 2 to 30 are usually strawberry-red, sometimes rose, pinkish or amber, and some types tinged with green. Most are aromatic, oval, heart-shaped or nearly round, about 2.5 cm wide and 4 cm long; have a thin, leathery, rough or minutely warty skin, flexible and easily peeled when fresh. Immediately beneath the skin of some varieties is a small amount of clear, delicious juice. The glossy, succulent, thick,

translucent-white to grayish or pinkish fleshy aril which usually separates readily from the seed, suggests a large, luscious grape. The flavor of the flesh is subacid and distinctive.

Related to longans, lychees are sometimes on a dessert menu of Chinese restaurants. Once stripped of their nubby reddish-brown shells, these lychees look like large white grapes, each with a single large, glossy seed within its pale flesh. They have a sweet, flowery fragrance and flavor. Lychees are rich in vitamin C: ten pieces of fruit supply more than 100% of the Daily Value.



Mango

The luscious mango, one of the most celebrated of tropical fruits, is a member of the Anacardiaceae family. The mango is the apple (or peach) of the tropics, and one of the most commonly eaten fruits in tropical countries around the world. Native to southern Asia, especially eastern India, Burma, and the Andaman Islands, the mango has been cultivated, praised and even revered in its homeland since Ancient times. Buddhist monks are believed to have taken the mango on voyages to Malayasia and eastern Asia in the 4th and 5th centuries B.C.

There is a great variation in the form, size, color and quality of the fruit. They may be nearly round, oval, ovoid-oblong, or somewhat kidney-shaped, often with a break at the apex, and are usually more or less lop-sided. They range from 6.25-25 cm in length and from a few grams to 1.8-2.2 kg. The skin is leathery, waxy, smooth, fairly thick, aromatic and ranges from light- or dark-green to clear yellow, yellow-orange, yellow and reddish-pink, or more or less blushed with bright- or dark-red or purple-red, with fine yellow, greenish or reddish dots, and thin or thick whitish, gray or purplish bloom, when fully ripe. Some have a "turpentine" odor and flavor, while others are rich and pleasantly fragrant. The flesh ranges from pale-yellow to deep-orange. It is essentially peach-like but much more fibrous and extremely juicy, with a taste ranging from very sweet to sub-acid or tart.



Papaya

The papaya is a member of the small Caricaceae family, allied to the Passifloraceae. The papaya is believed to be native to southern Mexico and neighboring Central America. It is now present in every tropical and subtropical country.

There are two types of papayas, Hawaiian and Mexican and latest Red Lady Papaya. These pear-shaped fruit generally weigh about 1 pound and have yellow skin when ripe. The flesh is bright orange or pinkish, depending on variety, with small black seeds clustered in the center. Hawaiian papayas are easier to harvest because the fruit seldom grows taller than 2.5 m. Mexican papayas are much larger than the Hawaiian types and may "weigh up to 4.5 kg and be more than 40 cm long. The flesh may be yellow, orange or pink. The flavor is less intense than that the Hawaiian papaya but it is still delicious and tasty. They are slightly easier to grow than Hawaiian papayas. A properly ripened papaya is juicy, sweetish and somewhat like a cantaloupe in flavor, although musky in some types. The fruit (and leaves) contain papain which helps digestion and is used to tenderize meat. The edible seeds have a spicy flavor somewhat reminiscent of black pepper.

There are many possibilities to cultivate Taiwan's hybrid red lady papaya in the hill tracts district in Bandarban. Not only Bandarban but also in all over the country discretely red lady papaya are being cultivated. Agriculture statistics shows, there are 50% red lady papayas are cultivated in Bandarban. Red lady papayas are different in taste, aromatic and color from our local papaya. Green papayas are harvested after four months and ripe are harvested after 6 months since it has been cultivated. The variation of this papaya is seen in hill tracts district. The former Jhum cultivator Toyo Mro said, he started mixed fruits garden of wood apple, tamarind, olive, local mango, Rangaiya mango (Burmize Mango), banana, custard apple along including red lady papaya in five acre hilli land taking technical assistance from nongovernment organization World Vision in 2005 and next time by the help of upazila agricultural extension office and BADC. He earns Tk.

500 in every year selling red lady papaya where he expends Tk. 200 for per plant. He gets production and income from red lady papaya quickly than other fruits. He says joking that many cultivators try to make understand me the technical side of cultivating red lady papaya after learning from me.

This is showing that wideness of cultivation of red lady papaya and many farmers are being encouraged for mixed fruits garden instead of Jhum cultivation. Writer of this story met many red lady cultivators for his fruits marketing research and seen that development of living standard of red lady cultivators are increasing. Mainly red lady papaya is cultivated at Chimbuk, Porapara, Nowapara, Chamlipara, Bashontipur, Baganpara in Bandarban. Upazila agricultural officer Mr. Altaf Hossain said, there are 260 hector areas for cultivating red lady papayas out of 3600 hector total fruits garden. He hoped it would be increased in future. Successful red lady cultivator Toyo Mro said, seeds of red lady papayas are very costly and most of the time many seeds company are frauding to selling good seeds so that farmers loss money and time and they discourage to cultivate red lady papaya. They cannot sell red lady papayas by fare price without having good communication and marketing. Some red lady papaya cultivators of Bandarban have made a cooperative society and they would sell them in the different places of the country. Wholesaler of red lady papaya in Chittagong Shohidul said, this type of papaya is very sensitive as they are not damaged get slightly hurt by something, it has some spot then damaged within 24 hours. So when it is harvested must be taken care for stored and marketing. Shafiul Azam is a famous of an agricultural technical firm named Agri Vision said, any place for Bangladeshi soil and weather is favorable for red lady cultivation. It is said that Bandarban is the heart of red lady papaya cultivation in Bangladesh.

Nevertheless there are certain red lady papaya cultivation in Feni, Sayedpur, Gazipur, Mymensingh, Magura, Chittagong in Bangladesh.



Pineapple

Pineapple, a member of the Bromeliaceae plant family, is believed to have originated in north-northwest South America. It was cultivated there, probably for thousands of years, by Amerindians, and essentially all cultivated types are virtually unchanged from the time they were first discovered by Spanish explorers. Commercial varieties are seedless and are usually propagated by suckers which develop near the base or terminal of the fruiting stalk. The fruit is composed of the thickened rachis or stalk, in which the numerous fleshy fruitlets, botanically berries, are imbedded. The fleshy, persistent bracts make the surface of the composite fruit much roughened and tough.

The fruit is a terminal, cylindrical, compound structure at the apex of the stem and is formed by the fusion of the berrylike fruitlets that develop from the flowers. At its apex, the fruit bears a compressed, leafy shoot called a crown. The typically yellow fruit flesh is best eaten when sweet and moderately acidic, it may contain from 10 to 18% sugar and from 0.5 to 1.6% titratable acidity. This fruit is large, weighing 1 - 3 kg or more.



Sapodilla

The sapodilla, a member of the Sapotaceae family, is now known botanically as *Manilkara zapota* van Royen. The sapodilla is believed to be native to Yucatan and possibly other nearby parts of southern Mexico, as well as northern Belize and northeastern Guatemala. It was introduced long ago throughout tropical America and the West Indies and the southern part of the state of Florida.

The fruit may be nearly round, oblate, oval, ellipsoidal, or conical; varies from 5-10 cm in width. When immature, it is hard, gummy and very astringent. Though smooth-skinned, it is coated with a sandy brown scurf until fully ripe. The flesh ranges in color from yellowish to light- or dark-brown or sometimes reddish-brown; may be coarse and somewhat grainy or smooth; becomes soft and very juicy, with a sweet flavor resembling that of a pear. Some fruits are seedless, but normally there may be from 3 to 12 seeds which are easily removed as they are loosely held in a whorl of slots in the center of the fruit. Immature sapodillas are rich in tannin (proanthocyanadins) and very astringent. Ripening eliminates the tannin except for a low level remaining in the skin.



Starfruit (Carambola)

A fruit of the Oxalidaceae family is believed to have originated in Sri Lanka and the Moluccas, but it has been cultivated in south-east Asia and Malaysia for many centuries. The showy, oblong, longitudinally 5- to 6-angled fruits, 6.5-15 cm long and up to 9 cm wide, have thin, waxy, orange-yellow skin and juicy, crisp, yellow flesh when fully ripe. Slices cut in cross-section have the form of a star. The fruit has a more or less pronounced oxalic acid odor and the flavor ranges from very sour to mildly sweetish. The so-called "sweet" types rarely contain more than 4% sugar. There may be up to 12 flat, thin, brown seeds 6-12 mm long or none at all.



Tamarind

Of all the fruit trees of the tropics, none is more widely distributed nor more appreciated as an ornamental than the tamarind of the family Leguminosae. Native to tropical Africa, the tree grows wild throughout Sudan and was so

long ago introduced into and adopted in India that it has often been reported as indigenous there also, and it was apparently from this Asiatic country that it reached the Persians and the Arabs who called it "tamar hindi" (Indian date, from the date-like appearance of the dried pulp), giving rise to both its common and generic names.

The fruits, flattish, beanlike, irregularly curved and bulged pods, are borne in great abundance along the new branches and usually vary from 5-18 cm long and from 2-3 cm in diameter. Exceptionally large tamarinds have been found on individual trees. The pods may be cinnamon-brown or grayish-brown externally and, at first, are tender-skinned with green, highly acid flesh and soft, whitish, under-developed seeds. As they mature, the pods fill out somewhat and the juicy, acidulous pulp turns brown or reddish-brown. Thereafter, the skin becomes a brittle, easily-cracked shell and the pulp dehydrates naturally to a sticky paste enclosed by a few coarse strands of fiber extending lengthwise from the stalk.



Wax Jambu Apple

Native to the Malay and Southeast Asian region, it grows quite well in the subtropical climate. The waxy fruit, usually light-red, sometimes greenish-white or cream-colored, is pear-shaped, narrow at the base, very broad, flattened, indented and adorned with the 4 fleshy calyx lobes at the apex;

3.5-5 cm) long, 4.5-5.5 cm wide. The skin is very thin, flesh white, spongy, dry to juicy, sub-acid and very bland in flavor. There may be 1 or 2 somewhat rounded seeds, 0.5-0.8 cm wide or none.



Lemon

Lemon fruits are sour and juicy containing high vitamin C. They are consumed fresh for juice and used in making pickles and beverages. Lemon oil is also used for flavoring the soft drinks and confectionery products. Some local varieties are seedless such as, Elachi lebu, Pati lebu, Kaliganj lebu, Shasni lebu, etc

Lime (kagzi lebu) Another species *C. aurantifolia* smaller than lemon although both are commonly known as 'lebu' in Bangla. Lime and lemon are grown in over 9000 acres of land. Plants are grown in homesteads as well as in orchards from grafts, cuttings and sometimes from seedlings. A plant of 6-7 years can produce 150-200 fruits annually. Plants are small, bushy, and have irregular branches and sharp spines. Fruits are small, round, juicy, highly acidic, and have a thin and smooth skin. Mature fruits turn greenish-yellow on ripening and contain small polyembryonic seeds. They are available abundantly in the rainy season. Fruits are rich in vitamin C and used for fresh juice, in making pickles, and beverages.

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