

**High-Value Agriculture Products in Bangladesh : An Empirical
Study on Agro-Business Opportunities and Constraints**

A

Ph. D. Thesis

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Chapter- One

Rationale, Objectives and Methodology of the Study

Prelude

The aim of this introductory chapter is to discuss the changing and growing patterns of high-value agriculture (HVA) commodities, its importance and effects on the growth of the economy, employment creation, reduction of poverty and impact on modern distribution channel. The chapter is divided into three sections. Section I discusses the importance of high-value agriculture in general. Section II evaluates rationale of the study and finally, section III identifies the objectives of the study and its methodology.

Importance and Effects of HVA

The agricultural economy of Bangladesh is heavily dependent on rice. Almost three-quarters of total cropped land in Bangladesh are devoted to paddy cultivation and per capita rice consumption is one of the highest in the world. Food grain consumption for an average person has stabilized over time at about 160 and 180 kg/person/ year in urban and rural areas respectively. Rice is the main food grain product while wheat makes up just 2 percent and 6 percent of the total food grain consumption (urban and rural respectively). Rice is important in the consumption basket of poor and rich alike; the poorest quintile consumes 139 and 146 kg of rice per capita in urban and rural areas respectively (BBS 2012). Several important changes have taken place-and continue to take place-in the domestic agricultural markets of Bangladesh.

We have identified six major changes in the domestic agricultural markets of Bangladesh over time. First, since the 1960s food grain production and prices have changed drastically and the change is more discernible since the 2000s. The share of rice has increased from 10 percent in 1966-67 to 61 percent in 2012. This change in production patterns has led to a change in price seasonality. Such an increase in rice production is due to the ample use of chemical fertilizer, shallow tube wells and the development of high-yielding rice varieties. In the 1960s, the price spread was 15 percent between peak and trough; it has declined to less than 10 percent in the last decade (BBS 2012).

Second, the quantities of rice marketed have dramatically increased over the years. The production of rice tripled since the 1960s. Marketing the proportion of the harvest a farmer sells has increased by a factor of six or more. Rice and paddy markets are very active. About one-third of rural households are net sellers of rice. A large number of farmers who sell paddy at harvest will buy back rice at some point in the year (BBS 2012).

Third, the contribution of public sector procurement in food grain markets has declined over time, from 25 percent in 2000 to only 9 percent in 2010 (BBS 2013). Private food grain imports started in 1993. As a result, large quantities are now being imported through private channels. Similarly, government procurement from local rice and wheat production declined from 4 and 5 percent (respectively) at the end of the 1980s to 2 percent and 0 percent in 2007/08 (BBS 2013).

Fourth, the importance of high-value and perishable commodities, such as, fruits and vegetables, fish, meat, and dairy products in the food consumption basket has been increasing. The share of these products was already evaluated at 40 percent and 49 percent of the food consumption basket in rural and urban areas respectively. Using demand projections based on reasonable growth rates in incomes and population, it is estimated that Bangladesh would demand an extra \$8 billion of these high-value products by 2020 (World Bank 2008).

Fifth, there is a shift toward the consumption of better quality food products. Based on a recent survey, it is estimated that the lower-quality coarse rice makes up 28 percent of their total rice sales. Ten years ago, the share of coarse rice in the total wholesaler turnover was evaluated to be as high as 45 percent (BBS 2013). The increasing demand for quality rice is also seen in the rise of the share of automatic mills in the milling sector and of the share of consumers purchasing packaged rice.

Sixth, the importance of modern retail and the processing industry has been growing. Agro-processing is estimated to have grown at 8 percent per year between 1985 and 2005. Rice mills are the most important in this sector, generating 40 percent of employment (Bangladesh Economic Survey 2008). Processing of high-value products is still limited, however. Modern food retail is currently also very small, making up less than 1 percent of urban food retail markets, but it is growing rapidly as in a number of other Asian countries.

Food grain markets and staple markets indicate that both are working well. First, the share of the producer in the final retail price is high. Data of the price structure for two common qualities of rice as well as potato based on a survey conducted at the end of 2009 in Dhaka and two major production areas (about 200 kilometers from Dhaka) show that the share of the producer in the final retail price is estimated to be as high as 74 percent and 68 percent for coarse rice and medium rice respectively. One-third of this realized price for the farmer was going to reward his production factors. Even for a perishable commodity such as potato the producer's share was as high as 70 percent at harvest time (BBS 2012).

Second, food grain markets have become well integrated over time and space, possibly driven by the large investments in road infrastructure by the Bangladeshi government and larger availability of mobile phones. This result implies that information on food grain markets circulates well, so that food grains flow from surplus to deficit areas when needs arise. There also seems to be little collusion

between traders to fix prices. The increasing importance of the private sector in agricultural trade, low barriers to entry in trade and a competitive environment seem thus to have contributed significantly toward improved food security for the country.

Price instability is an important challenge for the government of Bangladesh. Price stabilization in Bangladesh is an especially political question as the economic benefits and impacts on poverty alleviation are limited. Although the government intervenes in product markets in order to stabilize prices, its impact has been constrained given that procurement prices and Open Market Sales (OMS) prices do not function as floor and ceiling prices as the quantities bought and sold at this price are limited. For example, OMS over total market supply never reached more than 2 percent in the four years prior to 2010. Instead of price stabilization, the government policy has been to provide targeted subsidies to the poor through the Public Food Distribution System (PFDS).

The changing demands in domestic and international markets for high-value product markets create challenges as well as opportunities for existing food supply chains. Growing demand for high-value products might provide extra opportunities, especially for rural areas. First, it generates greater employment. The export of shrimp and fish directly employs more than 600,000 persons and it is estimated that 70 percent of the jobs related to agro-processing in Bangladesh are generated in rural areas. Second, the high-value product markets lead to higher income for farmers. For example, when assigning net profits of the export value chain of shrimp to the different stakeholders it is shown that the biggest share of the extra earnings directly benefits the farmers.

There are also significant challenges in high-value markets. For example, 90 percent of Bangladesh's milk production is produced by smallholder and landless farmers in rural areas, but due to a weak and fragmented value chain only 9 percent reaches the growing urban markets, requiring the country to import 30 percent of its total dairy consumption needs. Large formal sector processors (BRAC and PRAN Dairy) have

built chilling plant collection centers throughout the country but most are operating significantly below capacity indicating that building hardware infrastructure alone is not sufficient. Two-thirds of smallholder farmers and half of landless farmers own dairy cows, but their dairy practices are usually limited to traditional subsistence farming techniques.

Trade is an important tool for achieving food security and price stability for several reasons. First, well-designed trade liberalization based on comparative advantage will increase economic growth and raise income through specialization. Second, the liberal trade policy allows for importing food products at a lower cost from the regional and world markets. However, such a situation can also be risky at times when exports are restricted as seen in the recent global food crisis. Third, imports of farm inputs such as fertilizer, machinery and seeds are often critical to enhance the productivity of the agricultural sector. However, whether Bangladesh can take advantage of the contribution that trade can make to improved food security and price stability depends not only on its own production decisions but also on its success in coordinating the national trade policies with the regional and multilateral trade opportunities.

Bangladesh is overall a net agricultural importer. The country's food imports accounted for 16 percent of the total imports in 2013. Main food imports are concentrated in cereals (almost \$1 billion' in 2008), vegetable oils, sugar, and vegetables. Exports of agricultural products by Bangladesh have steadily increased, almost tripling in the last two decades, from \$306 million in 1990/91 to \$870 million in 2008/09 (BBS 2013). Exports of raw jute, frozen foods, vegetables, fruits, tobacco and other primary products have increased over time, but exports of tea declined due to increased domestic demand and declining productivity. The fishery sector (mainly shrimp) dominates Bangladesh's food exports reaching more than \$700 million in 2013.

Agricultural imports are an important part of any food security strategy in Bangladesh. For example, private sector imports have assured a price ceiling at import parity levels in the aftermath of the floods in 1998 and 2004. Moreover, the stimulation of domestic production of food grains to relieve the country's dependence on food imports may not suffice to improve its trade balance or guarantee price stability. Higher local food grain production could, for example, lead to a deepening of the net trade deficit on fertilizers which reached \$700 million in 2008, almost as high as the value of imports of cereals. Even though higher reliance on imported chemical fertilizer might increase local production and possibly reduce food imports, it would at the same time expose Bangladesh to further volatility in the world markets, given the strong correlation between fertilizer and energy prices.

There is a high degree of concentration in exports and imports of key products with the three most important trade partners representing 75 percent of market share in most products. This is potentially risky and efforts should be made to diversify the trade pattern. This high level of concentration is partly related to the structure of world markets: palm oil from Malaysia and Indonesia; soyabean/oil from Argentina, Brazil, and the United States; sugar production from Brazil, Thailand, and India. The share of rice imports from India has also increased over time because (a) it is quicker and cheaper to bring in rice from India; (b) it is possible for importers to bring in small quantities of rice by road; and (c) India exports parboiled rice, which is preferred by most Bangladeshis. It seems, therefore, that the scope of diversification for these products will remain limited.

Over the past three decades, Bangladesh has undertaken a series of policy measures toward liberalization of agricultural trade. Bangladesh has removed quantitative restrictions on trade flows, reduced tariffs, and established a market-based floating exchange rate. Policy reforms were carried out for both input and output markets in agriculture. The private sector and nongovernmental organizations (NGOs) are now allowed to import any improved inputs for research and development and to develop facilities for producing foundation seeds. They are also allowed to import and sell

seeds with the exception of five notified crops (rice, wheat, sugarcane, potato, and jute). Output market-related reforms were carried out relating to the food procurement and distribution system, import of food grains, reduction in tariff rates and removal of quantitative restrictions.

At the global level and for all products combined, Bangladesh now faces an average tariff of 4.4 percent on its exports, much lower than the tariff it applies to its imports (17.2 percent). This reflects, on the export side, the country's participation in various preferential schemes (such as the General System of Preferences). On the import side, Bangladesh has the status of a least developed country (LDC) in the World Trade Organization (WTO) which makes it subject to special and differential treatment.

Agriculture, on average, is more protected than industry. However, the gap between the average tariffs applied to agriculture and industry is much smaller, at 19.7 and 16.7 percent respectively, than observed in the rest of the world (BBS 2012). In the agricultural sector, food products are more protected, at more than a 21 percent tariff than nonfood products at 14 percent (BBS 2012). This pattern is in line with world averages, but it still reflects significant tax levels for the food consumers. The most protected products are sugar, fisheries, dairy products, rice, and vegetables. Compared to its South Asian partners, Bangladesh applies equal or higher tariffs for imports. On exports, the tariffs faced by Bangladesh follow a more heterogeneous pattern, driven by products subjected to high protection globally such as sugar (91 percent), paddy rice (77 percent), wheat (52 percent), and processed food (58 percent). Bangladesh faces the highest tariffs from India, especially for agricultural and food products: 80 and 70 percent for paddy and processed rice, respectively; and 106 and 98 percent for wheat, vegetables and fruits respectively (Economic Survey of Bangladesh 2012).

Bangladesh has relied heavily on export subsidies to boost growth of shrimp and vegetable exports in the last ten years. The efficiency and sustainability of providing subsidy is limited though subsidies have been successful and have increased income

in the export sector of Bangladesh. Export subsidies can help to launch an activity, give farmers incentive to innovate, and help traders to establish new networks; they may not be maintained in the long run for several reasons.

First, the cost of a subsidy program will rise with an increase in the value of exports. This then becomes an important fiscal burden for the country. Second, the subsidy creates artificial specialization, a concern especially for the shrimp industry that concentrates resources in specific markets that may have potentially negative environmental externalities. Third, it will be difficult to implement good practices in the region and eliminate trade distorting policies if some countries want to keep their own trade tools.

The EU market grants the largest value of preferences to Bangladesh. India follows with preferences totaling a twentieth of the value of the EU's preferences. Crustaceans and sugar products exported mainly to the EU market benefit from large preferential margins due to high tariff rates to most importers in the European Union. Despite favorable effect of preferences for Bangladesh, it also indicates the risk of overspecialization for Bangladesh if its preferences were to be eroded under the Doha Trade Round. The utilization rate of existing preferences in the EU markets for frozen shrimp and prepared shrimp was between 60 and 70 percent. In the U.S. market, the rate of utilization of the preferential scheme for various vegetables is also low, but the amount at stake is more limited. In any case, both examples illustrate the potential difficulty of taking advantage of the existing preferences in these markets.

The South Asian Free Trade Area (SAFTA) agreement came into force in January 2006, paving the way for the most significant step toward intensified trade integration in the region. Bangladesh's gains in the current SAFTA agreement, however, are not obvious especially since it will generate large trade deviations that will particularly hurt Bangladesh with its high initial tariffs. Simulations show that Bangladesh is the only member of SAFTA for which liberalization in SAFTA leads to (small) negative changes in real income. The current agreement limits Bangladesh's potential exports

of sensitive products to key partners (especially India) that will maintain high protection on many products. The full Free Trade Agreement scenario-exempting Bangladesh's sensitive products-will not improve the overall outcome significantly. Only a more ambitious scenario tackling inefficient trade-distorting subsidies will improve its situation.

The Doha Round of trade negotiations was launched in 2001 and although negotiations have moved slowly, it is expected to produce a conclusion of the round in 2011 or 2012. Without an ambitious Duty Free Quota Free (DFQF) initiative in the Doha Round, Bangladesh will suffer adverse effects with a decline in exports and real income. These results arise from the combined effects of preference erosion, increases in agricultural prices in world markets and an absence of domestic reforms driven by the Doha negotiations. To avoid such a situation, it will be important for Bangladesh to diversify its export structure (products and markets) as well as move up in the quality range to avoid the main effects of preference erosion and the increase in price competition.

Theoretical Framework

The high-value agriculture affects four ways on incomes and poverty of farmers; (i) through backward linkages, (ii) by affecting the income and poverty of farmers, (iii) influences the demand for labor, either by growers or by traders, processors, and others in the marketing channel, and (iv) by changing the prices of food faced by consumers. The first one is called the input linkage. The second one is termed the farm linkage. The third one known as the employment linkage and the last one is called the consumer price linkage.

Backward linkage is measured against the loss of forest resources and environmental damage provided that high-value agriculture is taking place on newly cleared land. In this case, the backward linkages of high-value

agriculture must be weighed against that of traditional crop production on the same area of land.

In the long-term, the poverty impact of the backward linkages of high-value agriculture depends on (i) the intensity of use of different factors (ii) the degree of mobility of those factors, and (iii) the ownership of factors by the poor. Labor intensity of the input sectors is the main indicator to assess the poverty impact of the backward linkages of high-value agriculture.

Income and poverty impact among farmers is measured by the cost-benefit of the involvement of farmers in HVA production, that is, why many farmers do not adopt high-value commodities and why some farmers do adopt them. Four disadvantages to adopting high-value agricultural commodities are (i) insufficient information; (ii) perceived risks are production risk due to weather, disease, and pests, and marketing risk, (iii) lack of finance and (iv) suitable natural conditions.

The final consumers are the key to successfully adopting high-value commodities. The absence of quality consciousness and food safety standard among the final consumers are low and for this reason adopting the HVA commodities in developing countries are relatively easier. On the contrary, higher-income urban consumers will generally have higher quality and food safety standards, or more precisely, enough income to pay a premium for quality and safety.

An agricultural commodity may be deemed “high-value” in the sense of having a high average returns per hectare. However, the returns vary from farmer to farmer depending on the farm size, land quality, natural conditions, labor availability, skills, distance to market and market infrastructure.

Production of the high-value agricultural commodity may be a good prospect to a farmer when government intervention relieves some of these barriers. The farmer may learn about the crop from an extension agent or neighbor. He or she may enter into a contract with a buyer that reduces the marketing risk. The buyer or another lender may agree to provide inputs on credit for high-value agriculture. And finally, the construction of a new processing plant or improvement of roads may reduce the transportation cost from the farmer to the buyer.

Government Intervention and Regulatory Framework

Producing and marketing high-value products successfully requires a range of interventions and investments including a change in policies toward an enabling environment conducive to private trade; infrastructure development; improved access to credit; research and development; capacity building and taking the advantage of international trade.

A better regulatory framework and management structure of local markets are needed. Local markets are currently governed by a multitude of institutions and the fees charged to traders and farmers are often not clear and transparent. Moreover, the fees collected on markets often go toward other purposes than market development and service provision for farmers and traders serving merely to increase transaction costs for participants in the value chains leading to lower prices for producers and higher costs for consumers.

As high-value product value chains are more demanding in food safety and quality standards. Greater attention is required for certification and quality enforcement (for both inputs and outputs) and for adherence to quickly changing standards. This must include the strengthening, reforming and enforcement of institutions such as the Department of Agricultural Marketing (DAM), the Hortex Foundation and specific quality certification systems.

Export market policies need to be reformed to better contribute to Bangladesh's growth. Although price distortions in Bangladesh are currently low the government has relied heavily on subsidies, tax exemptions and export benefits to promote agricultural exports. The effectiveness and efficiency of these subsidies remain unclear. For example, the seafood processing sector remains attractive for continuous investment, even though capacity is largely underutilized. The estimated subsidies for fruit and vegetable exports were 60 percent of their FOB value, calling into question the fiscal sustainability and appropriateness of this scheme.

Appropriate marketing infrastructure is also essential for sustained growth of HVA. Efficient transportation and product handling is a crucial requirement for trade of agricultural products. This requires investments and improved maintenance of road and port infrastructure as well as improvements in railway container handling and enhanced air cargo capacity. These investments should be carefully weighed against the expected export potential.

Assembly and wholesale market infrastructure is deficient and Bangladesh would benefit from upgrading these markets. Most of the assembly, wholesale and retail markets tend to be highly congested and lack much-needed basic facilities such as potable water, toilets, sewage systems, loading spaces, and storage facilities. Poor market infrastructure contributes to important losses in high-value food market chains from 10% to 11% (World Bank 2008).

To enable Bangladesh to adhere to the increasingly important food safety requirements for high-value products investments are needed in laboratory and testing infrastructure to make them compatible with international standards. This will require modern equipment, skilled manpower, and enforcement of Hazard Analysis and Critical Control Points (HACCP) operations to control all types of food contamination. The Bangladesh Standards and Testing Institution (BSTI) currently lacks the capacity and equipment to carry out some of the more demanding tests.

Proof of adherence to these tests will be increasingly important in export markets as well as for more demanding local markets.

Lack of consistent and reliable power along with the difficulties of connection will continue to be a bottleneck for value-addition plans in horticulture, meat and dairy, poultry, fish and shrimp products. Major new power plants are required to generate the additional small- and industrial-scale capacity that Bangladesh needs. To stimulate investments in processing, this constraint should urgently be tackled.

Access to timely credit might benefit stakeholders in agricultural value chains in several ways. First, small and medium farmers in particular are shown to rely on credit markets to pay for input costs. Easier access to inventory credit or “farmer credit cards” might help to address this constraint. The first intervention attempted a warehouse receipt system received mixed reviews in Bangladesh. Farmers’ credit cards in India (kisan credit cards) have been a rather successful intervention in reducing the importance of the informal sector in credit markets, often characterized by predatory interest rates. Second, even without credit access, the presence of a large number of small traders working with low levels of working capital has contributed significantly to the competitive trading environment in Bangladesh.

Third, additional research into the improvement of input markets as well as the output of high-value products is needed. Traditionally, the majority of the limited resources in agricultural research in Bangladesh have been directed toward rice, developing new varieties that have contributed to dramatically increased production levels. Similarly, the development of productive high-value products will require significant and sustained investment in several areas: the development and distribution of better seed varieties for horticulture plants—a major bottleneck in the current value chains; improved breeds for livestock and fisheries; disease and health management; processing of high-value products; and post-harvest management. These investments must be a priority for improved functioning of high-value product chains.

There is also a lack of research and information on the functioning of output markets. Studies are hampered by the lack of reliable data on these sectors and investments are needed to improve the information base. Market actors, especially the exporters, miss out on opportunities because information is not available or current. Market studies are needed to better understand how to comply with the requirements of potential importing countries. An assessment of the constraints in access to information on marketing performance is also a necessity.

Because of higher investments and risks, the poorest households are less likely to participate in these markets. Encouraging farmers to pool resources and market produce together can reduce marketing costs through economies of scale; however, such cooperatives-outside the milk marketing sector have a poor track record in South Asia and Bangladesh.

There is currently not enough emphasis on evaluation and impact studies of investments and interventions in the marketing sector. There is a lack of large-scale studies that might carefully document the effects of investments and policies that quantify the impact on different population groups. Because of the lack of such reliable data few cost-benefit analyses of the impact of market interventions have been done hampering the rational setting of priorities. Such solid evaluations are a priority for the development of this sector.

The establishment of agro-export and processing zones along with better vertical linkages between the farmers and buyers (such as contract farming and vertical integration) can help to overcome some of the risks inherent in the marketing of high-value products. For example, contract farmers in Bangladesh benefit from such contracts. The lessons learned, for example with respect to contract farming and producer organizations, would help guide future initiatives in this area.

Capacity building is required for various market participants. Extension systems at the farm level are especially important given the often quickly changing requirements

of food quality and safety regulations and the availability of new technologies in high-value agricultural markets; such systems should use private-public partnerships and include marketing extension programs.

Well-functioning commodity and industry organizations can be an effective vehicle to ensure efficient functioning of the value chain. These can help to build much required trust between different actors in the value chain as well as with the government. They can also be used toward effective information sharing on market challenges and opportunities for particular sectors. Strengthening the capacity of these organizations is important. Such institutional structures might have high payoff for improved organization of the value chain.

International trade opportunities

Exports of fish, shrimp and other food products are growing. Two interventions are needed. First, improved processing can help Bangladesh cope with both the expected increased price competition from emerging competitors and with the potential erosion of trade preferences. To be successful, such a strategy should be supported by investments in increasing quality and promoting conformance with the public and private standards of the destination markets.

Second, the impact of the export cash subsidy program should be carefully assessed and possibly replaced by long-term investment policies that instead reduce fixed production and trading costs in order to support the sector. All of this will create a better platform for more diversified exports as these facilities will be used for other products and to help access other markets and these measures should also help to improve the quality of exports.

Even though Bangladesh already benefits from trade preferences, it appears that many food sectors have underutilized their preference potential for the EU market. Many food and tobacco sectors in which Bangladesh effectively exports to some markets

have largely neglected preferential margins. The livestock sector (namely dairy products) and some quality cereals show high potential for benefits.

Limiting trade liberalization to SAFTA countries does not provide an attractive market for Bangladesh exports; a wider agreement involving more countries would be more beneficial. At this stage, multilateral liberalization seems a better strategy since it will avoid losses related to trade deviation. However, SAFTA might be valuable under certain circumstances: (i) if it includes additional measures targeting trade-distorting subsidies, cooperation policies to avoid export taxes and export bans; (ii) if it is aimed to reduce informal trade beyond tariff reduction (which will not be sufficient); and (iii) if regional policy helps Bangladesh to reap the gains of the agreement by reducing transportation costs and limiting the market powers of larger economies through regional competition policy.

Bangladesh has been successful in exporting cereals and high-value products such as shrimp and fish, in part, as a result of preferential trade agreements. With well-targeted policy reforms and investments Bangladesh has the opportunity to increase exports in these areas while meeting relevant quality and safety standards. Such an approach is essential to prepare Bangladesh for a more liberalized international trade environment once the Doha trade negotiations are finalized.

SECTION-II

Rationale of the Study

The importance of high-value agriculture (of section one and two above) and literature review (chapter two) on high-value agriculture products provide ample scope and justification to investigate the existing status and opportunities for high value agriculture commodities in Bangladesh, for over the decades a silent revolution on this arena has been taking place without any policy support from the government. The fact is that this growing sector has not been extensively and scientifically investigated by any quarter. This study is an attempt to fill this gap.

Agriculture is one of the prime sectors of Bangladesh economy as it contributes 18 percent to the GDP and 62 percent to the livelihood of the nation (BBS, 2013). Thus, agricultural growth and development is inevitable for the development of the country. And development of agriculture is only possible only through transformation of subsistence agriculture to agribusiness or commercialization. Promotion of high-value agriculture (HVA) through the production and marketing is one of the vital steps for commercialization. However, the development of Bangladesh agriculture is fraught with a number of difficulties like the lack of infrastructural supports, prevalence of subsistence farming, poor irrigation and other input facilities, limited access to low cost agricultural technologies and high transportation costs etc.

Agricultural commercialization is a complex and dynamic process involving various linkages between the farm and the firm/industry encompassing the areas related to technology, markets, finance, institutions, infrastructure and social structure. The key agents of commercialization are the farmers, traders, and processors. The core problem for the agribusiness development in Bangladesh is the lack of effective value chain linkages among input providers, farmers, traders, processors, and service providers in which they all are aware of their mutual linkages and organize

themselves in such a way that they can benefit from such linkages in the network. A demand-driven approach is needed where the key players themselves make investment decisions related to technology, infrastructure, marketing and capacity. Further, methods to improve marketing channels require greater coordination in terms of contracts, vertical and horizontal integration and joint efforts of all stakeholders.

Recognizing these facts, in 2000, the Agriculture Perspective Plan (APP) was brought up as a blue print of the agricultural development vision of Bangladesh that would work as a road map to all plans for the next two decades. The plan is based on more demand driven (market led) approach than the previous plans which were production oriented. The plan has clearly identified the rule of game “competitiveness”; the competitiveness through comparative advantage in production and competitiveness through the marketing efficiency. The comparative advantage in production has been conceptualized by the production of high value crops and commodities and their commercialization to attain the scale of operation. Similarly, the competitiveness through marketing efficiency had been envisaged through agribusiness promotion and development of market, market infrastructure and marketing system.

The demand for food in Bangladesh is changing rapidly. Economic growth, rising incomes, and urbanization are combining to shift food demand from traditional staples and toward high-value foods. “High-value agriculture” refers to fish, livestock products, fruits, spices, and vegetables that have a higher market value than traditional food grains (World Bank 2008). This represents an opportunity for food producers, processors and sellers. Because the production of many HVA commodities tends to be labor intensive. It also represents an opportunity to generate rural employment and raise rural incomes. This changing domestic demand is paralleled by growing global demand for HVA products- global demand that provides additional opportunities for producers and exporters in Bangladesh. Unfortunately, this opportunity of HVA products in Bangladesh has not been scientifically and comprehensively assessed by any researcher as yet. This necessitates the emergence of this study.

Section-III

Methodology of the Study

Statement of the Problem

Rapidly rising international agricultural-input prices, especially the food prices, are restricting the ability of households to meet essential subsistence needs, threaten economic growth through rising import bills making current account deficits, pushing farmers further marginalized because of their limited access to land, weak productive capabilities and a production and marketing cost squeeze associated with rising input and transport costs. For some observers, the policy shift now required is a return to agricultural development. Indeed, as shown in *The Least Developed Countries Report 2007* (United Nations 2008), there has been a serious neglect of agricultural research and development, which is so important for increasing agricultural production and improving the living standards of small-scale producers. What is therefore required is not a shift in sectoral focus, but rather a deeper change in approach which puts production, productive capacities and productive employment opportunities at the heart of policies to promote development and poverty reduction (United Nations 2008). Production and marketing of high value agricultural commodities, according to *The Least Developed Countries Report 2008*, may be one of the vital steps for robust and inclusive pattern of economic growth for countries like Bangladesh.

Broad Objective of the Study

The overall objective of the study will be to identify the high valued agricultural commodities, their status in terms of production and demand, opportunities and constraints and probable approaches especially focusing on market access and establishing vertical linkages.

Specific Objectives of the Study

The specific objectives of the study are:

- (i) to identify production status, opportunities of high valued agricultural products.
- (ii) to assess current market access and vertical linkages with agro-industries; estimate the marketing costs and marketing margins by analyzing the price differential within chains. and
- (iii) to identify constraints and opportunities, and hence suggest approaches for intervention/support in improving market access and vertical linkages in the value chain.

Approach to the Problem

For much of the past 40 years, agriculture in Bangladesh has been dominated by efforts to increase production of food grains (primarily rice) to ensure food security. As a result of public and private investments in irrigation, dissemination of improved technology and a favorable policy environment, food grain production reached and, in fact, exceeded targeted availability in the late 1990s, which was a major milestone for Bangladesh (Dorosh and Shahabuddin 2004). This breakthrough has coincided with a period of sustained economic growth, rising incomes and rapid urbanization that has fostered widespread changes in consumers' demand for food (World Bank 2008). Consumers throughout Bangladesh are buying more high-value foods including fish, meat, fruit, vegetables and processed products (World Bank 2007). These structural changes in domestic food demand provide enormous new opportunities both on and off of the farm (World Bank 2011).

Although these domestic factors may be the single most important catalyst for high-value agriculture and related agro-business in Bangladesh the changing global context presents additional opportunities. Growing global demand for HVA products, rising

cost structures in agriculture and fisheries in industrialized countries and trade liberalization have opened up new markets for exports from developing countries such as Bangladesh (Jaffee and Sewadash 2005). By 2001-02 the three most important segments in world agricultural trade were: (1) fruits, vegetables and cut flowers; (2) seafood; and (3) fresh and processed meats (FAO 2010). These three segments accounted for 43 percent of world trade in 2001-02 compared to 29 percent in 1980-81 and rising to 66 percent in 2010-11 (FAO 2012).

Bangladesh has benefited from these structural changes in world agro-food trade emerging as a competitive supplier of seafood (especially shrimp). Trade in HVA commodities accounts for almost 95 percent of total food and live animal exports from Bangladesh; seafood exports alone account for 90 percent of this trade (World Bank 2008). Enormous developments in emerging technologies have improved product quality, improved cost efficiency and reduced a variety of risks- all of which have increased the opportunities for agro-business based on high-value agriculture (World Bank 2003).

Notwithstanding some inbuilt problems, numerous successes in high-value agriculture within Bangladesh illustrate the potential opportunities. The area under vegetable production increased by 4.26 percent and production increased by 4.1 percent per year; potato production rose by 8.11 percent; aquaculture expanded by about 20 percent; commercial production of eggs and poultry meat increased by 7 and 9 percent per year respectively between 1990 and 2004 (Dorosh and Shahabuddin 2004). With mixed success, Bangladesh has also linked small-scale vegetable farmers to international markets and Bangladesh exports about US\$ 75 million of fruit and vegetables annually (EPB 2010).

While there is no dearth of home-grown successes in HVA and associated agro-business there is a prevailing sentiment that many opportunities have been missed. Strategic vision and an action plan for promoting HVA and ago-business have been lacking. The preoccupation with food grains has not entirely precluded efforts to address production issues in high-value agriculture, but attention to post-harvest

issues and marketing has been extremely inadequate. As a result, many successes have not been scaled-up, and at times, the very incentives that have been introduced to develop high- value agriculture and agro-business have misguided, stunting rather than accelerating growth.

Research Question

What opportunities and challenges are present or likely to arise for agro-business in Bangladesh as demand grows for high-value agricultural commodities and as agricultural production changes in response? This study has made an attempt to answer that question.

Hypothesis Development

Since the study is exploratory in nature, as such no specific hypotheses is tested (mainly due to data limitations on high value agriculture products in Bangladesh). Instead, this study attempts to formulate some propositions that might help other researchers to develop and test hypotheses.

Research Design

- (1) Information needed: The study gathered information on a range of issues including commodity competitiveness and the institutional, technological, infrastructural, policy and regulatory factors that are likely to influence the Nature of study: The study is qualitative in nature but descriptive in style.
- (2) extent to which Bangladesh can take advantage of existing and potential opportunities of high-value agriculture products.
- (3) Questionnaire development: Two separate semi-structured questionnaires were developed: one for the farmers and the other for channel intermediaries.

- (4) Questionnaire administering method: Personal interviewing technique was used in collecting data and information.
- (5) Scaling technique: 5-point Likert scale was applied to elicit responses from the target respondents. Apart from scaling, case studies were conducted to identify both commodity-specific as well as cross-cutting issues, analyze opportunities and constraints, and identify current strengths and weaknesses and actions that will enhance competitiveness and growth.
- (6) Sampling plan and sample size:
- (i) Target population: farmers and middlemen/processors constituted the target population.
 - (ii) Sampling frame: no standardized sampling frame is available as the agricultural market of Bangladesh is highly unorganized.
 - (iii) Sampling unit: commercial producers of high value agriculture products and channel intermediaries (wholesaler and retailers mainly) were the sampling unit for the study.
 - (iv) Study area: The study was located in those areas where high value agricultural commodities are produced commercially. For example, for mango, the study area located in Rajshahi, for Potato, the area was located in Munshiganj etc. This study investigated six HYV commodities and the area was selected based on the production of those commodities. The production information was taken from Bangladesh Agricultural Census conducted by the BBS.
 - (v) Sampling technique: non-probability, mainly the area sampling technique was used.

- (vi) Sample size: Appropriate proportional sample from each of the six broad sample categories were selected applying the formula of proportional sample size determination.
- (vii) Focused commodities; The study examined five categories of high-value agriculture products which include mango, fish, potato, maize and poultry and dairy products.
- (viii) Data analysis: All relevant non-parametric tests (since the data are non-metric in nature and relating to two or more samples) were conducted to arrive at any meaningful conclusion of the study.

Chapter plan

The study is consisted of nine chapters. Chapter one discusses the importance of the study, analyze theoretical framework, rationale, objectives and methodology of the study. Chapter two reviews the literature. Chapter three gives an overview of the high-value agriculture products in Bangladesh and related agro-business opportunities. Chapters four to eight analyzed five high-value agriculture products of Bangladesh (mango, fish, potato, maize, poultry and dairy). Chapter nine concluded the study discussing key policy options and recommendations for taking advantage of the opportunities and overcoming the challenges identified through the case studies.

CHAPTER - TWO

Review of Literature

This chapter reviews the brief theory and empirical evidences on the high-value agriculture commodities and identifies the research gaps. The past studies on high value agriculture (HVA) vary across topics. But studies on HVA are very limited, mainly focused on the backward linkages of high-value agriculture. But more literature is available on the poverty impact of contract farming.

This chapter briefly delineates the results from related studies. The chapter is divided into two sections, one reviewing studies of the impact of high-value agriculture in general, the other examining research on the impact of modern supply chain particularly supermarkets and contract farming.

One author observed that the 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 (Delgado et al, 1998). In such cases, it is difficult to separate the effect of high-value agriculture from the effect of modern distribution channels.

In SAFTA countries, including Bangladesh, empirical works on high value agriculture is virtually limited. A limited number of studies were conducted in India, focused mainly on cooperative farming and contract farming, but the result is inconclusive. We therefore, present examples from the early adopters of HVA.

Section-I

Studies of the Impact of High-Value Agriculture (HVA)

Empirical studies that measure the probable impact of the growth of high-value agriculture in developing countries are very scant. A few studies, however, demonstrate that agricultural growth is pro-poor (Warr 2001), (Datt and Ravallion 1998), (Ravallion and Chen 2004).

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 sector but not to the industrial sector. Datt and Ravallion, (1998) and Ravallion and Chen, (2004) find the similar results using time-series data for India and China.

The General Theory

The idea of backward linkages of high-value agriculture was first thought of in the 1950s (Delgado et al, 1998). Initially, the concept compares between the agricultural sector and non-agricultural sector in the context of alternative growth strategies. It was argued that since agriculture had few forward and backward linkages, therefore, public investment should favor the industrial sector.

Recent studies have, however, 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) show that the HVA income increase 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. Their study did not also figure out the backward linkage with that of poverty

Bautista and Thomas (1998) find that the GDP multiplier is larger for small-scale food production. The explanation is that the GDP multiplier includes forward, backward, and consumption linkages but many crops are grown by large-scale commercial farms with much smaller consumption linkages. None of the above study measures the impact of HVA in increasing farmers' income.

Studies on Increasing Farmers' Income

Different researchers have used a variety of methods to calculate the impact of high-value agriculture on farm income. Most studies that measure the impact of HVA were on horticulture and livestock. Relatively few studies on the impact of dairy and fisheries on farm incomes are available. A few 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 of horticultural production in Guatemala generated gross margins per hectare 15 times as large 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.

Farmers' perception based studies on HVA in increasing their incomes are also available in the literature. Mullens et al (1996) surveys dairy farmers about the impact of a program to promote intensive dairy production. They reported that majority of the farmers of 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 Vietnam, Minot et al (2006) finds that 83 percent of the respondents 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).

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.

McCulloch and Ota (2002) examine the linkage between export horticulture and poverty reduction in Kenya. 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. Econometric analysis suggests that the 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. 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.

Employment Creation

Numerous studies reported 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. von Braun and Immink, (1994) found that employment increased by 45 percent on farms adopting export horticulture.

McCulloch and Ota, (2002) found that in Kenya the horticultural pack-house 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 were better off than non-horticultural smallholders after holding other factors constant.

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 them migrate annually from the poorer states of southern Mexico. Tomato production requires 122 days of labor per hectare compared to just 29 days per hectare for maize production. The authors find that the tomato industry provides jobs and income for poor families from southern Mexico.

Jarvis and Vera Toscano (2004) describe the impact of the Chilean fruit export sector on household income and employment. 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 employment contributes significantly to the incomes of the relatively poor households.

Jarvis and Vera Toscano (2004) also found that (out of 690 grape workers, 90 percent of whom were women), women earned more per day than men 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 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.

Food prices

Recent evidences from the countries experiencing rapid substitution from grain production to high-value agricultural production suggest that high value crops impact on poverty reduction via food prices. FAO (2006) study found that 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 the wheat and rice area declined 18 percent from 63 million hectares to 52 million hectares.

Minot et al, (2003) observed that 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. 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 on HVA in Bangladesh

Hortex foundation of Bangladesh (2013) examined the growth potential of fruits and vegetables from Bangladesh. About 100 types of fruits and vegetables are exported from Bangladesh to more than 40 countries in the world. According to the study, exports of fruits and vegetables from Bangladesh significantly increased from \$50 million in 2007 to \$183 million in 2013. This has significantly increased the farmers' income and improved their standard of living.

Bouis and Scott (1996) analyzed the demand for potato in Bangladesh. Their study found that with the rise of potato production, relative prices for potatoes versus wheat fell and per capita consumption of potato increased considerably. Based on the estimated demand characteristics for potatoes in Bangladesh, various simulations were run to examine the effect on the demand for potatoes of exogenous changes in the prices of particular foods and income, the study reported that, in Bangladesh, the positive income effect of the rice price declines more than compensates for the substitution effect of rice becoming an ever cheaper source of calories vis-à-vis potatoes, so that potato consumption increases and also increases the farmers' income.

According to Scott (1988), significant increase in potato production in Bangladesh is largely due to (i) availability of good quality planting material to smallholder farmers

on a timely basis; (ii) improvement of extension services to make more efficient use of costly chemical inputs; (iii) development of varieties suited to specific regional growing conditions; and (iv) increasing the availability of storage facilities.

Palmer-Jones (1994) cited the reason for the growth of high value agriculture commodities in Bangladesh has been the rise of real income sharply during 1980s. This rise in real income mainly came from the extension of agricultural varieties and considerable increase of the exports of some HVA products mainly to the Middle East countries where huge Bangladeshi people are working.

Jansen (1994) observed that since 1980s, a number of secondary crops have experienced very rapid increase in production of Bangladesh. Typically, these crops are of high value, short duration, labor intensive grown primarily for sale rather than for on-farm consumption. Potatoes, tomatoes, cabbages and lentils are perhaps the most promising examples. As a result, Bangladesh has looked increasingly to secondary crops as a source of increased output, foreign exchange, or for import substitution.

Hoq, Raha and Sultana (2012) examined the value addition in vegetable production, processing and export of HVA from Bangladesh. Applying conventional profitability analysis they found that the export of vegetables is more profitable due to high value addition. Value addition would have been more if the processing, handling, grading and transportation system could be improved. Study also revealed that bitter melon cultivation is more profitable and BCR is also the highest (3.27) and the UK market was more profitable for vegetables export.

Hasan (2005) analyzed the contract farming for production and export of high value vegetables in Bangladesh. He observed that contract farming for HVA generates more revenue to the medium-sized farms than the small farms holders. The study also noted that prospect for vegetable export from Bangladesh is more profitable in the Middle East countries especially to Saudi Arabia.

Zohir (1993) investigated the problems and patterns of crops diversification in Bangladesh. His findings suggest that the financial returns from a large number of HVA are higher than those from rice cultivation. He also observed that for future growth of HVA, increasing in export facilitates by the government, promotion of agro-processing industries and more research on HVA are needed.

Rahman (1930) uses a partial equilibrium approach to compute the magnitude of the indirect taxation on agriculture and related disincentives. He found that the transfer of resources out of the agriculture due to the protectionist trade and exchange rate policy is estimated at around 20% of the average agricultural value added from 1987 to 1990. The indirect effects of exchange rate policies constantly lowered the protection to agriculture commodities in Bangladesh.

Jeffery and Benson (1993) attempted to identify problems associated with diversified crops based on farmers' perception in Bangladesh. The survey results suggest several constraints to crop diversification, such as, low profitability, high input costs, risk in selling non-rice crops, susceptibility to weather variation and pest. They identified four factors for the growth of HVA, namely farm size, access to extension and credit, alternative source of income and farm assets.

Manadal and Dutta (1993) investigated the comparative performance between rice and high value potato and vegetables production in Bangladesh. They find that potato and vegetables are more profitable than irrigated rice. They suggested some interventions for further improvement of high value crops including improving the farmers' knowledge and perception about the amount, time and application methods of irrigation for non-rice crops; make available and popularize small-scale irrigation machines; promote improved manual pumps such as treadle pumps and hand tube wells which are appropriate to vegetable production and provide extension services to the farmers.

Wadud (2013) assessed the impact of microcredit on farm income applying propensity score matching technique to a sample of 682 farms. Results reveal that microcredit contributes to generation of income for farms. The average income of microcredit receiving farms is 9.46 percent higher than that of the microcredit non-receiving farms. Based on the result, he concluded that policies which extend microcredit and ensure fair, timely, and low-cost delivery of microcredit to marginal and small farmers could lead to an increase in agricultural farm output and income in Bangladesh.

Hasan et al (2013) evaluated the profitability of small scale commercial okra and snake gourd farming of Mymensingh district using Cobb-Douglas production function. The findings of the study revealed that small-scale farming of okra and snake gourd was highly profitable from the viewpoint of individual farmers. However, okra is more profitable than the cultivation of snake gourd. Profitability of these two products could have been more if the problems such as shortage of capital, high input prices, low prices of the output, lack of quality seeds and inadequate extension services are removed.

Amin and Miah (2013) evaluated the profitability of commercial bean farming and its impact on livelihood improvement of the small, medium and large farmers in Pabna district. They found that commercial bean farming is highly profitable for small, medium, and large farmers and observed positive impact on livelihood improvement of all categories of farmers. Per hectare net return from commercial bean farming for small, medium, and large farmers were Taka 356077, Taka 347403, and Taka 343156 respectively. The study also found that all kinds of livelihood assets of the selected farmers increased significantly through commercial bean farming.

Mian and Huda (2013) investigated the profitability of maize production in Lalmonirhat district of Bangladesh applying various econometric techniques. They found that maize is a highly profitable crop irrespective of farm categories and profitability was the highest for small farms followed by large and medium farms.

They also found that maize farming brought a positive contribution to household food security in the study area, particularly for small farm households who are generally vulnerable in the case of food security.

Islam and Hossain (2013) analyzed the profitability of selected cereal crops in the north-western part of Bangladesh using farm level survey data. The study showed that growing cereal crop was profitable as net return for paddy (Taka 2048), wheat (Taka 3236) and maize (Taka 4550) per *bigha* were found as positive. The study found positive contribution of high value agricultural crops as compared to traditional crops.

Sarkar and Mandal (2013) investigated the employment effect of farm and non-farm activities in rural landless households of Bangladesh. Their study found that due to the production and expansion of high value agricultural crops more employment was generated and the wage rate of landless households in rural areas has been increased compared to traditional agricultural crop production.

Ali and Hossain (2013) studied the various aspect of poultry production in Bangladesh. The authors observed that poultry industry provides various opportunities to increase GDP growth rate plus ensures equitable distribution through arranging food security as well as increases self employment by creating purchasing power and reducing poverty at a large scale.

Dev (2013) studied the production and marketing of shrimp cultivation in Khulna district. Despite some limitations of shrimp farming the study found that growers are highly benefited from cultivating shrimp that substantially increased the farmers' income. The study observed that if the existing supply chain system could have been improved, foreign exchange earnings from this sector would be increased dramatically. Sustainability of this industry requires massive government support, especially providing subsidy to the small and medium growers.

Section-II

Studies on modern Supply chain

This section examines the impact of modern supply chain on farmers' income, on employment, on traditional traders' income, and on consumer food prices.

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.

Minot (1986) also noted that, contract farming should not be considered a broad-based strategy for rural development because it is only cost-effective when large-scale buyers 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 perishable high-value commodities for a quality-sensitive market.

Little and Watts (1994) reviewed seven case studies of contract farming in sub-Saharan Africa and identified the conflicts between the 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.

Little (1994) observed 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 non-farm income. In addition, he concludes that contract farming often exacerbates income inequality by favoring middle- to large-scale growers.

Porter and Phillips-Howard (1997) find 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.

Singh (2002) identifies a series of problems associated with contract vegetable production in the Punjab state in India that include imbalanced power between farmers and companies, violation of the terms of the agreements, social differentiation, and environmental unsustainability. However, his surveys reveal that most farmers have seen incomes rise and are satisfied with the contract farming.

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.

Runsten and Key (1999) examined 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 the 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. Their 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.

Birthal 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.

Warning and Key (2002) studied 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.

Simmons et al (2005), examined contract growers of poultry, seed maize and seed rice in Indonesia. They found that 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. They conclude that the contracts increase income and welfare by reducing absolute poverty.

Ramaswami et al (2006) re-analyze the poultry survey data from the above-cited study by Birtal 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.

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, 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 Berdegúe, 2002; Reardon et al, 2003; Weatherspoon and Reardon, 2003; and Shepherd, 2005).

These trends are most advanced in the middle-income countries 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. Balsevich et al

(2003) estimates that 80 percent of fresh fruits and vegetables supplied to supermarkets came from medium or large growers or packers.

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.

Hu et al (2004) 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).

Hu et al (2004) 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 the 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.

Cadilhon et al, (2006) studied the tomato marketing in Ho Chi Minh City, Vietnam. They find 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.

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.

Neven et al (2005) analyze the impact of supermarkets on small farmers in Kenya using interviews with supermarkets regarding their procurement patterns. One chain obtains just 10 percent of its fresh fruits and vegetables directly from small farmers and 40-50 percent from brokers and wholesalers while another chain sources 60-70 percent directly from small farmers.

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).

Gutman (2002) documents the impact of the growth of supermarkets on the traditional retailers in Argentina. He found that supermarkets/hypermarkets accounted

for 57 percent of retail food sales in Argentina reducing the share of traditional retailers to 17 percent. 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.

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).

Alderman (1987), who examined prices, marketing patterns, and income in villages with and without a dairy cooperative 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.

Empirical studies suggest that the price relationship may vary by the 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.

Ghezan et al (2002) conducted study 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 small fruits and vegetables shops continued to dominate horticultural retail sales.

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 supply channels.

Finally, numerous empirical studies have explored the impact of high-value agriculture and modern marketing channels, but they tend to focus 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 as 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

High-value Agricultural Products in Bangladesh: General Scenario

Introduction

The demand for food in Bangladesh is changing rapidly. Economic growth, rising incomes and urbanization are combining to shift food demand away from traditional staples and toward high-value foods. “High-value agriculture” refers to fish, livestock products, fruits, spices and those vegetables that have a higher market value than traditional food grains. This represents an enormous opportunity for food producers, processors and sellers. Because the production of many high value agricultural commodities tend to be labor intensive, it also represents an opportunity to generate rural employment and raise rural incomes. This changing domestic demand is paralleled by growing global demand for high value agricultural products – global demand that provides additional opportunities for producers and exporters in Bangladesh.

For all of their promise, capitalizing on these opportunities will be fraught with challenges. High value agricultural products are generally far more perishable than the traditional staples and require more advanced post harvest technologies, faster and more controlled transport, and efficient marketing systems. The promise of generating higher income and increased export revenues by accessing international markets is matched by the challenges of meeting the exacting quality and safety standards that apply in those markets and by the prospect of having to compete with high quality imports from those markets. Simply determining which commodities Bangladesh can produce competitively and which are most likely to respond to growing demand in coming years will require careful analysis. Even when the opportunities afforded by high value agriculture are successfully seized upon, there is no reason whatsoever to assume that the benefits of this success will extend naturally or automatically to those who need them most urgently – poor smallholders and landless laborers.

The case studies presented in this volume examine five high-value agricultural commodities in Bangladesh. They identify a number of important opportunities, challenges, and requirements that agro-businesses in the country now face and are likely to face in coming years as they seek to respond to changing demand. Access to timely and reliable market information and to new technologies will go far in determining the competitiveness and profitability of a number of industries and subsectors treated here. Establishing an enabling environment and improving the investment climate for agro-businesses can substantially reduce the costs of doing business. For the same reason, upgrading the country's infrastructure, particularly in its troubled electricity infrastructure, is a critical priority. Greater attention to quality and food safety may increase some agro-business costs, but can also serve to manage and reduce risks and increase competitiveness. High value agriculture requires substantial technical expertise, and much will rise on the development of human capital to enable people to participate in the production and management of high value products.

The Context

For much of the past 42 years, agriculture in Bangladesh has been dominated by efforts to increase production of food grains principally rice to ensure food security. As a result of public and private investments in irrigation, dissemination of improved technology, and a favorable policy environment, food-grain production reached and, in fact, exceeded targeted availability in the late 1990s, which was a major milestone for Bangladesh (Dorosh, Del Ninno, and Shahabuddin 2004). This breakthrough has coincided with a period of sustained economic growth, rising incomes and rapid urbanization that has fostered widespread changes in consumers' demand for food. Consumers throughout Bangladesh are buying more high-value foods, including fish, meat, fruit, vegetables and processed products. These structural changes in domestic food demand provide enormous new opportunities both on and off the farm.

Although these domestic factors may be the single most important catalyst for high-value agriculture and related agro-business in Bangladesh the changing global context presents additional opportunities: Growing global demand for high-value agricultural products, rising cost structures in agriculture and fisheries in industrialized countries and trade liberalization have opened new markets for exports from developing countries such as Bangladesh (Jaffee and Sewadeh 2005). By 2000-01 the three most important segments in world agricultural trade were: (1) fruit, vegetables, and cut flowers; (2) seafood; and (3) fresh and processed meats. These three segments accounted for 43 percent of world trade in 2000-11 compared to 29 percent in 1980-81 (Aksoy and Beghin, 2013). Bangladesh has been benefited from these structural changes in world agro- food trade emerging as a competitive supplier of seafood (especially shrimp). Trade in high-value agricultural commodities accounts for almost 95 percent of total food and live animal exports from Bangladesh; seafood exports alone account for 90 percent of this trade. Enormous developments in emerging technologies have improved product quality, improved cost efficiency and reduced a variety of risks-all of which have only increased the opportunities for agro-business based on high-value agriculture.

Opportunities for expanding high-value agriculture abound, yet they are not without challenges for Bangladesh. Comparative advantage is a fundamental issue. For some high-value agricultural products Bangladesh clearly has a comparative advantage, but for others production may be competitive only in certain areas because of agro-ecological conditions. Even when there is a clear comparative advantage, high-value agricultural products tend to be highly perishable and the risks associated with marketing these commodities are very high. These inherent risks must be addressed through appropriate policies and investments in infrastructure so that it is economically viable for farmers to switch to these commodities and scale up production. Technical advice on production practices is scarce but essential, as most Bangladeshi farmers lack knowledge of the sophisticated management practices that are often required to produce high-value commodities. Infrastructure problems, particularly the unreliable electricity supply, are a major challenge for industries

involved in processing high-value agricultural products and add to the cost of doing business.

Notwithstanding these challenges, numerous successes in high-value agriculture within Bangladesh illustrate the potential opportunities. The area under vegetable production increased by 4.26 percent per year and production increased by 4.01 percent (Dorosh, del Ninno, and Shahabuddin 2004). Potato production rose by 8.11 percent per year. Aquaculture expanded by about 20 percent per year. Commercial production of eggs and poultry meat has increased by 7 percent and 9 percent per year respectively since 2000/01. Nor have achievements in high-value agriculture been limited to farms and ponds. As mentioned earlier fisheries exports have increased steadily since the mid-1980s; by 2013, total fisheries exports from Bangladesh reached US\$ 670 million. With mixed success, Bangladesh has also linked small-scale vegetable farmers to international markets and Bangladesh exports about US\$ 20 million of fruit and vegetables annually. The processing industry has grown especially with respect to the processing and freezing of seafood for export, but there have also been interesting developments in processing fruit, vegetables, spices and dairy products. Successful institutional arrangements have begun to emerge to minimize some of the high transaction costs inherent in high-value agriculture and to address critical quality issues.

While there is no dearth of home-grown successes in high-value agriculture and associated agro-business there is a prevailing sentiment that many opportunities have been missed. Strategic vision and an action plan for promoting high-value agriculture and agro-business have been lacking. The preoccupation with food grains has not entirely precluded efforts to address production issues in high-value agriculture, but attention to post-harvest issues and marketing has been extremely inadequate. As a result, many successes have not been scaled up, and at times, the very incentives those have been introduced to develop high-value agriculture and related agro-business have been misguided stunting rather than accelerating growth.

What opportunities and challenges are present or likely to arise for agro-business in Bangladesh as demand grows for high-value agricultural commodities and as agricultural production changes in response? This study seeks to answer that question. Its starting point is a series of case studies of high-value agricultural commodities and subsectors: aquaculture, poultry, fruits and vegetables, high-value aromatic rice, and dairy. These particular commodities and subsectors were selected for the study as they were seen to have potentially strong growth prospects. The case studies provide insight into a range of issues, including commodity competitiveness and the institutional, technological, infrastructural, policy and regulatory factors that are likely to influence the extent to which Bangladesh can take advantage of existing and potential opportunities. The case studies do not provide exhaustive analyses of opportunities and constraints but rather highlight current strengths and weaknesses and identify near- and medium-term actions those will enhance competitiveness and growth. The case studies are used to identify both commodity-specific as well as cross-cutting issues. Where possible the case studies present representative value chains for focus commodities, however due to data limitations the level of detail in these value chain descriptions may vary.

This study is based primarily on findings from fieldwork conducted in Bangladesh between March and April, 2013; it also draws on a large body of studies conducted earlier within Bangladesh.

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 diversifications, value addition, and agro-business in Bangladesh. Data from successive rounds of the Household Income and Expenditure Surveys (HIES) of Bangladesh provide evidence of these shifting consumption patterns.

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 quintiles, urban households consume a more varied diet, eating fewer food-grain products and more high-value products. Average rural consumption of food grains was about 183 kilograms per person per year in 2013, compared to 164 kilograms per person in urban areas. There is a very strong income effect. For example, while the wealthiest households in urban areas consume only about 10 percent more rice than the poorest households, they consume 10 times more milk, 13 times more poultry, 7 times more other meat, 5 times as many eggs, 5 times as much fruit, 3 times as much fish, and 42 times as much fine rice compared to the poorest urban households.

Table 3.1: Average per capita consumption by expenditure quintile in urban and rural areas (kg/person/yr), 2013

URBAN

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
Rice	139.48	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 and 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	86.92	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 meat	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 and 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

Source: Authors' calculations, based on the 2010 HIES

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 3.2). 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 2012/13. 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 demand patterns present many new opportunities for agricultural diversification and value addition in Bangladesh.

Table 3.2: Average per capita expenditures by quintile in urban and rural areas (Tk/yr), 2013

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	254	413	652	1,072	504	5.3
Poultry (meat)	58	128	245	365	909	340	3.6
Eggs	56	90	134	179	327	157	1.7
Milk and milk products	67	193	257	484	788	357	3.8
Vegetables	512	677	805	867	1,171	806	8.5
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 and 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	2409	2817	2965	3161	3561	2982	40.4
Fine rice	3	13	12	12	79	24	0.3
Other rice	2406	2804	2953	3149	3482	2959	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	1480	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	38	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

Source: Authors' calculations, based on the 2010 HIES

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 2010 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 3.4). 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 2010 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 3.5). Bangladesh's export earnings from trade in high-value agricultural products, however, are relatively small compared to those of most other Asian countries, with the exception of Pakistan.

Table 3.3: Structure of agricultural exports, 1980/81-2010/11 (% of world trade)

Product	Developing-Country Exports			Industrial-Country Exports			World Exports		
	1980/81	1990/91	2000/01	1980/81	1990/91	2000/01	1980/81	1990/91	2010/11
Tropical products									
Coffee, cocoa, and tea, raw and processed	18.3	11.0	8.5	2.5	2.9	3.6	8.5	5.6	5.4
Nuts and Spices	2.4	2.7	2.8	0.7	0.7	0.8	1.3	1.3	1.5
Textile and fibres	8.0	6.2	3.3	3.9	3.9	2.6	5.9	4.7	2.8
Sugar and confectionary	10.5	4.6	4.3	2.8	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	12.8
Temperate products									
Meats, fresh and processed	7.2	8.3	6.0	14.8	15.7	15.4	11.9	13.2	12.0
Milk and milk processed	0.3	0.7	1.1	7.9	7.9	7.6	5.0	5.5	5.2
Grains, raw and processed	9.3	4.9	7.0	21.6	13.8	11.6	16.9	10.9	9.9
Animal feed	7.5	7.9	8.5	7.7	5.1	5.3	7.7	6.0	6.4
Edible oil and oil seeds	4.6	5.7	5.5	4.8	4.4	4.4	4.7	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 and vegetables									
Seafood, fresh and processed	6.9	15.9	19.4	5.5	8.2	8.0	6.0	10.8	12.2
Fruits, vegetables, and cut flowers	14.7	22.2	21.5	13.1	17.2	17.3	13.7	18.9	18.9
Subtotal	21.6	38.1	40.9	18.6	25.4	25.3	19.7	29.7	31.1
Other processed products									
Tobacco and cigarettes	2.6	3.1	3.3	3.0	4.2	4.8	2.8	3.8	4.2
Beverages, alcoholic and non-alcoholic	1.1	1.8	3.6	6.9	9.5	11.5	4.7	6.9	8.6
Other products and processed foods	6.7	5.0	5.2	3.0	3.8	5.0	4.4	4.2	5.1
Subtotal	10.4	9.9	12.1	12.9	17.5	21.3	11.9	14.9	17.9
Total	100	100	100	100	100	100	100	100	100

Source: Author's own calculation based on FAOSTAT-2012.

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 3.4). 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 although complying with food safety and agricultural health standards are increasingly important for trade in these commodities. Much greater scrutiny is being given to risks associated with microbial pathogens, pesticide residues, residues of veterinary medicines, and environmental and naturally occurring toxins.

Table 3.4: Trade in high-value agricultural products, selected Asian countries

	Bangladesh	China	Indonesia	India	Pakistan	Philippines	Thailand	Vietnam
Food and live animals exports in 2004 (US\$ millions)	521	19,462	5,534	7,262	1,089	2,475	12,052	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%	25%	33%	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	87%	57%	54%	50%	22%	83%	66%	40%
Real average annual exports growth, 1994-2004								
Food and live animals	1%	10%	0%	1%	1%	-1%	-1%	8%
Meat and meat preparations	-22%	1%	-6%	8%	24%	13%	1%	15%
Dairy 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%

Source: UN Comtrade Database (SITC Revision 3); figures are based on data reported by importing countries

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 spices account for only 7-8 percent of total cropped area, but area under these commodities has been steadily growing. The area under potatoes increased by an average of 6 percent per year between 1985 and 2012 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. (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 livestock sector has been stronger than the growth in crop sector. Crop and horticulture GDP grew at an average annual rate of 3.1 percent between 1996/97 and 2011/12, in real terms, compared to growth rates of 4.2 percent for animal farming and 3.5 percent for fishing (table 3.6). Growth in the agricultural sector as a whole has slowed since 2001 with the exception of the animal farming subsector (table 3.6). In 2011/12, crops and horticulture accounted for 56 percent of agricultural GDP while livestock, fisheries, and forestry made up 13.5 percent, 22.3 percent, and 8.2 percent respectively. The contribution of the fisheries subsector to total agricultural GDP grew significantly from 15.6 percent in 1990/91 to 22.3 percent in 2011/12.

Table 3.5: Real growth in components of agricultural GDP

	1996/97- 2000/01	2001/02- 2005/06	1996/97- 2011/12
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 1985 to about 33 percent in 2013. Although the industry is small in Bangladesh compared to many other Asian countries which has been growing at almost 8 percent per year comparable to growth rates in India (7.8 percent) and China (9.4 percent).

The vast majority of agro-food processing firms are very small with fewer than 50 workers. There are only about 246 medium-sized food processing firms and 184 large firms (firms with more than 100 workers) (table 3-8). Data from the Economic Census of 2010 show that food-processing firms account for 19 percent of manufacturing industries (with 10 or more workers) and 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 food processing.

Rice mills account for the largest share of employment in the industry generating 40 percent of employment. Manufacture of bakery products accounts for another 14 percent and processing of tea and coffee accounts for 19 percent. Processing of high-value products remains quite limited. According to the 2010 Economic Census data, only 40 firms process and preserve fish, 97 manufacture dairy products, 6 process fruit and vegetables and only 1 processes meat and meat products. In addition to these firms, a sizeable number of firms engage in other agro-processing activities including manufacturing animal feed, fertilizer, or chemicals; ginning, pressing, and baling fiber; manufacturing tobacco products; and producing beverages.

Table 3.6: 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 2005\$ 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

Source: Authors' calculation, based on 2010 Economic Census data

Table 3.7: Food processing firms in Bangladesh, 2010

	Number of firms	Firm size (%)		
		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 enterprises	2,165	93	4	3
Manufacturers of edible vegetable oil (except hydrogenated)	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 and sugar confectionery	100	94	2	4
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 2010 Economic Census data

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 of 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.

A comparison of smaller and larger firms reveals little difference in the median productivity level in Bangladesh (table 3.8). 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.

Table 3.8: Median value added per worker for firms in agro-processing (in constant 2002 US\$), by firm size

	<50 employee	50+ employee
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

Among the firms, 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 to that of the Philippines with approximately US\$ 3,500 in plant and equipment per worker-about one-third of the rate in Thailand.

Table 3.9: Food processing firms in Bangladesh, 2012

	Number of firms	Firm size (%)		
		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 enterprises	2,165	93	4	3
Manufacturers of edible vegetable oil (except hydrogenated)	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 and sugar confectionery	100	94	2	4
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 2010 Economic Census data

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A comparison of smaller and larger firms reveals little difference in the median productivity level in Bangladesh (table 3.10). 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.

Table 3.10: Median value added per worker for firms in agro-processing (in constant 2002 US\$), by firm size

	<50 employee	50+ employee
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

Among the firms, 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 to that of the Philippines, with approximately US\$ 3,500 in plant and equipment per worker-about one-third of the rate in Thailand.

Table: 3.11: Investment climate constraints faced by agro-food processing firms

	Bangladesh 2005 (end)	Bangladesh 2002	India 2002	Philippines 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 regulation	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 3.11). 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 2013 about 30 modern supermarkets operated in Bangladesh of which 22 were located in Dhaka. 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 2007). 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. 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 2007). 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 3.12, 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.

Table 3.12: Percentage of rural households participating in high value agriculture, by expenditure quintile, 2013

	Quintile 1	Quintile 1	Quintile 1	Quintile 1	Quintile 1	Quintile 1
Vegetables	12	14	17	19	21	17
Fruit	6	7	7	9	11	8
Spices	6	7	10	11	12	9
Milk	8	13	15	17	21	15
Eggs	52	54	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 2010 HIES

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, and 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 3.13 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 3.13 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 to the food industry results in a Tk 0.94 gain in agricultural household incomes.

Table 3.13: Multiplier effects of various sectors

Effects of a Tk 1 increase in value added of the sectors shown

	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 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-Four

MANGO MARKETING SYSTEM IN SELECTED AREAS OF BANGLADESH

Introduction

This study was carried out to identify the most efficient and suitable marketing channels of mango in some selected areas of Bangladesh by using primary data collected from 90 farmers and 55 traders. Out of 55 traders, 15 were Bairals, 15 were Beparis. 9 were Aratdars were local, 6 Aratdars were urban, 10 Retailers were both local and urban. According to the volume of mango handled and longevity or participation of the intermediaries in the channel, five major channels were identified as dominant in the study areas. The channel Farmer Bairal- Bepari-Aratdar (Dhaka)-Retailer (Dhaka)-Consumer ranked first. The results showed that channel V, Farmer-Retailer Consumer, possesses the highest marketing efficiency followed by channel IV, III, and II. The performance indicators revealed that the channel I and channel II were not relatively efficient in the mango producing regions. Unstable price of mango was the first rank problem in the study area. Establishment of mango processing plant in the intensive growing areas may be the remedy of the problem, which will ensure fair prices for the farmer.

Mango is one of the important high yielding fruits of Bangladesh. The area under mango cultivation in 2013 was about 50991 hectares with a total production of about 242605 metric tons (BBS, 2013). There are some intensive mango growing areas in Bangladesh where mango produced commercially as well as marketed in other areas of the country. Mango needs to be moved along a distance to reach the ultimate consumers under the prevailing marketing system.

It is observed that the producers are not getting full benefit of higher prices as prevailed in the market. If the mango farmers do not get the benefit from higher prices, their net return per unit area will be less and it will continue to decrease with the adoption of improved technology.

Mangos are bulky and highly perishable in nature and preserving them in the cold storage is not always possible on account of high cost involved with it. Hence, spoilage of mango during transportation as well as during sales is quite high. In the peak period, there is an excess supply creating a glut in the market and causing a fall in the price and affecting the income of the farmers. As a result, the growers are not getting their due returns for their produce and the country is being deprived of potential revenue.

Marketing plays an important role not only in stimulating production but also in accelerating the pace of economic development. Efficient marketing system usually ensures higher level of producer's share, reducing the number of middlemen and restricting the marketing charges, and mal-practices during marketing of farm products. It is, therefore, essential to explore the efficient marketing channels and to suggest the producers the channels for obtaining optimum prices of their farm produce.

The present study was undertaken to analyze the marketing of mango in selected areas of Bangladesh. Hence, the present study has been conducted with the following specific objectives:

- i) to examine the economic efficiency of various mango-marketing channels through selected indicators and thereby determine the most efficient and suitable marketing channel in the study areas and
- ii) to identify the problems of marketing both at farmers' and traders' level.

Materials and Method

Three important mango growing areas were selected in terms of area cultivation, namely Dinajpur, Chapai Nwabgonj and Meherpur districts were selected for the present study. Within the districts, Dinajpur sadar of Dinajpur, Meherpur sadar of Meherpur, Sibgonj thana of Chapai Nwabjonj were purposively selected for the study. Two villages of each upazila were selected with the help of agricultural extension personnel. From the selected villages, a list of mango growers was prepared. Total ninety farmers were selected randomly taking 30 farmers from each district. The intermediaries involved in the mango marketing were categorized into 4 groups viz., Bairals, Beparis, Aratdars (both local and urban), retailers (both local and urban). One primary and one secondary market were selected from each growing areas. From these production areas, mango comes to the markets of Dhaka, Chittagong, and Khulna, Mymensingh and Comilla and other areas of the country. Wholesale and retail markets were selected from Dhaka and Gazipur which were the major consuming areas. A list of intermediaries was prepared from the selected areas. From the list, 55 intermediaries were selected for this study. Out of 55 traders, 15 were Bairals, 15 were Beparis, 9 were Aratdar (local), 6 were Aratdar (urban) and 10 were retailers. Simple random sampling technique was used to select the farmers and intermediaries. Data were collected during the period of June to August 2013.

Analytical Technique

Marketing margin

Marketing margin included marketing cost and profit or loss of all intermediaries in the marketing chain. For determining marketing margin of any commodity, the following formula was used

$$GM_i = P_{Ri} - P_{Pi}$$

Where,

GM_i = Gross margin (Tk/quintal) for i^{th} intermediary

PR_i = Price received (Tk/quintal) by i^{th} intermediary

PP_i = Price paid (Tk/quintal) by i^{th} intermediary

$$NM_i = GM_i - MC_i$$

Where:

NM_i = Net margin (Tk/quintal) for intermediary

Mc_i = Marketing cost incurred (Tk/quintal) for i^{th} intermediary

Marketing efficiency measurement

Five performance indicators were used for measuring different marketing channels. These indicators are (i) Percent of product run through the channel (1₁), (ii) Producer's share (1₂), (iii) Marketing cost (1₃), (iv) Middlemen's' margin (1₄), (v) Price deviation i.e. differences of maximum and minimum prices of mango in a month (1₅).

The Producer's share was derived by the ratio of net average price received by the producers' to the weighted average price of mango which was calculated with the following formula and the channel which had highest producer's share was ranked (1) as first and vice versa.

$$\text{Percentage of producer's share} = \frac{P_{pi}}{P_{ri}} \times 100$$

Where:

P_{pi} = Producers' share in the i^{th} channel

P_{ri} = Average price of mango at the retail level in each channel.

i = Number of channels ($i = 1, 2, \dots, n$)

The cost of marketing was calculated and the lowest cost marketing channel was ranked 1 and that which has highest cost as the last. The same approach was followed in ranking the margin of middlemen in each channel. The deviation (d) between the highest and lowest prices in each month in the respective channels was computed. The price equalization among all the categories of farmers denote $d = 0$. That is, there

is no price deviation among the farmers' prices. If the differences are high, it implies highest price deviation and vice-versa. The final ranking of all the six indicators of all channels were computed by using the composite index formula.

$$R = \frac{R_i}{N_i}$$

Where,

R_i = Total value of ranks of all indicators (1₁-----1₅) all channels

N_i = Number of indicators.

The lowest mean represents the most efficient channel and vice versa.

Results and Discussion

Marketing channels

Marketing channels are the alternative roots of products flow from producers to consumers. In the study areas, the mango moved from the producer/seller to the consumers through some market intermediaries, such as Bairals, Beparis, Aratdars (both local and urban) and retailers (both local and urban). According to the volume of mango handled and participation of the intermediaries in the channel, five channels were identified as dominant in the study areas as shown in Table 4.1. **Farmer-Bairal-Bepari-Aratdar (local)-Aratdar (urban)-Retailer (Dhaka)-consumer, that is, channel I occupied the largest share (45%) in mango distribution in selected area.**

Intermediaries involved in mango marketing channel

Bairal

The people who have no own orchard land but involved in mango business are Bairal. They are the advance buyers of mangos. They are doing their business all over mango growing centers and making the business competitive. Frequent hazardous weather and attack by mango hoppers during the flowering and fruit setting stage make the

crop very uncertain. Therefore, in order to avoid the risk and uncertainty of the crop, most of the farmers in the selected districts sell their expected crop at the time of fruit setting or even before on the basis of estimation formed from the amount of bloom to the classified advance buyers locally known as Bairal. Bairal are doing business with little capital of their own; most of the times borrowing the capital from Aratdars.

Beparis

Beparis are of two kinds. They are either local or coming from other districts Like Dhaka, Chittagong, and Khulna etc. They buy harvested mango from farmers and Bairals in the local markets through the local Aratdar. The Beparies usually sell mango to the retailers in the local market or dispatch it to Aratdar of other big markets. They are doing their business in-group. In some cases, they borrow money from the dealing Aratdar.

Table 4.1. Mango run through the major channels in selected areas.

	Marketing Channels	percent of product run	Rank (1)
I.	Farmer - Bairal - Bepari - Aratdar (Local) Aratdar (Dhaka)-Retailer (Dhaka)-Consumer	45.00	1
II.	Farmer -Bepari-Aratdar(Local)-Aratdar (Dhaka) - Retailer (Dhaka)-Consumer	20.00	2
III.	Farmer -Bepari-Aratdar(Local)-Aratdar (Other district) -Retailer (Other district) Consumer	15.00	3
IV.	Farmer - Retailer (Other district)- Aratdar (Local) Retailer (Other district) - Consumer	13.00	4
V.	Farmer - Retailer(Local) - Consumer	7.00	5

Source: Filed survey

Aratdar

Aratdars are big traders. They are commission agents and have fixed establishment in the market and operated between Bairals, Beparies and Retailers. They charge fixed fees and commission from the Beparies and Retailers.

Retailer

Retailer was the last link in the mango marketing chain. There are two types of retailers: rural retailers and urban retailers. Rural retailers sell their mango in different local markets and urban retailers sell it with permanent shops in the urban areas. They buy mango from the Beparies through Aratdar and sell it to the urban residents- the ultimate consumers.

Cost of marketing by Farmer

The per quintal marketing cost of mango by farmer was Tk. 133.42. Among the cost items, transportation cost occupied the major share which was about 45 percent followed by harvesting cost (Table 2). Bargaining method was used to fix price. Farmers in the study areas used van and rickshaw to carry mango to the markets. In the study areas, middlemen used van and rickshaw with a distance of 4.88 and 5.12 km respectively.

Table 4.2. Cost of mango marketing by farmer.

Cost item	Average cost (Tk./quintal)	Percent of total cost
Harvesting	32.31	24.22
Grading	12.16	9.11
Packing/Basket	6.00	4.50
Loading	2.12	1.59
Transportation	59.42	44.54
Market tolls	6.25	4.68
Donation	5.00	3.75
Entertainment/ personal expenses	10.16	7.61
Total cost	133.42	100.00

Source: Filed survey

Cost of marketing by Intermediaries

Knowledge of the distribution of marketing costs among various intermediaries is very important for improving the efficiency of marketing system. Nature and extent of marketing cost varies from traders to traders. The marketing cost included the cost of transportation, cleaning, grading, binding, loading and unloading, tools and entertainment for the traders.

Average marketing cost per quintal of mango was calculated as Tk. 128.49 for Bairal, Tk. 446.03 for Bepari. Tk. 231.11 for Retailer (other district), Tk 237.07 for Retailer (Dhaka), Tk. 98.08 for Retailer (Local), Tk. 18.92 for Aratdar (local) and Tk. 25.16 for Aratdar (Dhaka and Tk. 22.36 for Aratdar (Other districts).

Cost of marketing for Beparis is the highest among the intermediaries due to high transportation cost, loading and unloading, tool & taxes etc. Commission is the highest cost item followed by transportation cost at Bepari level, lowest cost was found for Aratdar (local) (Table-4.3)

Table 4.3. Marketing cost of mango in different intermediaries.

Items	Bairal	Bepari	Retailer (Dhaka)	Retailer (other)	Retailer (local)	Aratdar (Dhaka)	Aratdar (other)	Retailer (local)
Transportation	55.16	109.33	32.18	37.21	-	-	-	10.20
Grading	14.84				-	-	-	-
Binding & Packing & Weighing	6.00	6.00			-	-	-	-
Loading & Unloading	3.00	24.72	6.12	6.12	-	-	-	3.78
(Transport to Aratdar)								-
Labour Wages	-	-		-	0.84	1.76	0.84	-
Salaries to employees	-	-		-	6.86	7.24	7.86	-
Wastage	-	-		-	-	-	-	-
Commission	-	133.11	187.00	176.00	-	-	-	-
Rent	-	-			-	-	-	-
Tools and Taxes	6.25	-	5.16	5.16	-	-	-	-

Entertainment & Personal expense	8.32	6.50	2.11	2.11	4.46	5.00	5.46	6.03
Electricity	-	-	1.00	1.00	0.68	1.61	0.68	1.10
Tips & donation	5.40	-	-	-	-	-	-	0.60
Mis (Tel, etc)	-	-	-	-	-	-	-	-
Harvesting	30.19	-	-	-	-	-	-	-
Cage	-	58.33	-	-	-	-	-	-
Gunny bag	-	20.28	-	-	-	-	-	-
Straw	-	5.14	-	-	-	-	-	-
Rof	-	3.61	-	-	-	-	-	-
Paper	-	2.18	-	-	-	-	-	-
Labour Charge for basket	-	21.67	-	-	-	-	-	-
Davage	-	57.00	-	-	-	-	-	36.72
Telephone	-	1.00	-	-	2.69	3.69	2.71	-
Subscription	-	3.16	-	-	-	-	-	-
Sweeper	-	-	0.80	0.80	-	-	-	0.70
Storage	-	-	2.70	2.70	-	-	-	-
Other	-	-	-	-	2.00	2.11	3.40	0.60
Total	128.49	446.03	237.07	231.11	18.92	25.16	22.36	93.08

Source: calculated by the author from primary data

Channel-wise marketing cost is shown in Table 4.4. It was observed that the channel I had the highest marketing cost (Tk. 855.67/quintal) followed by channel II, III, and IV. Lowest cost (Tk. 98.08) was found in channel V. High cost of transportation, loading and unloading and commission paid to Aratdar were the main reasons for higher marketing cost. Highest number of intermediaries were involved in channel I that was the main reasons for higher marketing cost.

Table 4.4. Marketing cost of mango in different channels.

Items	Channel				
	I	II	III	IV	V
Transportation	196.67	141.51	146.54	37.21	40.2
Grading	14.84	9.11	10.16	1.68	-
Binding & Packing	117.21	117.21	117.21	6.00	-
Loading & Unloading	33.84	30.84	30.84	1.10	3.78
Tools and Taxes	11.41	5.16	6.00	198	6.19
Commission	320.11	320.11	309.11	176.00	-
Salary	14.10	14.10	14.11	-	-
Labour wages	2.60	2.60	2.71	-	-
Tips & Donation	8.56	8.32	4.18	2.53	0.60
Damage & Spoilage	61.00	50.08	55.47	20.30	36.72
Sweeper	0.80	0.80	0.62	0.69	0.70
Shop rent	5.14	5.14	4.13	2.12	2.68
Telephone	7.38	6.90	4.68	0.72	-
Entertainment	26.39	10.31	8.62	3.16	6.03
Storage Charge	4.03	3.50	2.72	-	-
Harvesting cost	30.19	-	-	-	-
Electricity	1.29	1.38	1.16	0.69	1.10
Other	0.11	0.11	0.16	0.6336	0.06
Total	855.67	727.18	718.42	253.47	98.02

Source: : calculated by the author from primary data

Farmers' shares to consumers' price

Table 5 shows the producers' share of mango in different marketing channels. Farmer's share of mango in different marketing channels was the highest in channel V (the shortest route), followed by channel IV, and channels III and was lowest in channel I (the longest route). Channel I had the lowest share for the producer. Unnecessary marketing tiers develop when there is market imperfection or producer-seller are disorganized and while there is lack of market information or the cost of gathering information is high.

Marketing cost and margins of the middlemen under different channels

Table 6 shows that the channel I of mango marketing incurs the highest marketing cost whereas the cost is the lowest in case of channel V (the shortest route). It reveals that if farmers sell their mango through Beparis who take the product to Aratdar and then pass on to Retailar, the marketing cost becomes high (channel I). On the other hand, if farmers sell their mango directly to the Retailar by- passing the Aratdar then the marketing cost is the lowest (channel V). Number of intermediaries and marketing tiers are major factors in increasing or decreasing marketing cost.

Table 4.5. Producers' share in mango price in different marketing channels.

Particulars	Channel I	Channel II	Channel III	Channel IV	Channel V
Producer's price	2379	2332	2382	2408	2488
Weighted average price at the retail level	3914	3872	3816	3799	3742
Percentage of producers' share	60.78	60.22	62.42	63.38	66.48
Rank (1;)	5	4	3	2	1

Source: : calculated by the author from primary data

Table 4.6 also shows the marketing margin of intermediaries of different channels. It reveals that the highest margin is in channel I and the lowest is in channel V. The highest margin is due to a large number of intermediaries involved in this channel as compared to other channels. Large number of intermediaries in mango marketing increase marketing cost and margin. So, the number of intermediaries involved in mango marketing may be reduced, but it would not be feasible to eliminate all of the intermediaries from the channel of mango marketing.

Table 4.6. Marketing costs and margins of the middlemen under different channels.

Particulars	Channel I	Channel II	Channel III	Channel IV	Channel V
Purchase price	2379	2332	2382	2408	2488
Sales Price	3914	3872	3816	3799	3742
Marketing Margin (1 ₃)	1535	1540	1434	1391	1254
	5	4	3	2	1
Marketing cost (1 ₂)	855.67	727.18	718.42	253.47	98.08
	5	4	3	2	1
Net Margin	679.33	812.82	715.58	1137.53	1155.92

Source: Field Survey

Deviation between maximum and minimum prices

Table 4.7 shows the price deviation of different channels for each month. Price deviation means the differences of maximum and minimum prices in a month. The differences between maximum and minimum prices of each month were calculated and finally the differences of all months were summed up and then the average deviation was calculated. It may be observed from the table 4.7 that channel V incurred lowest price deviation followed by IV and III. Price deviation was highest in channel I. It might be the reason of demand and supply conditions faced by the framer. The traders availed themselves of this opportunity and made price discrimination. Perishable nature of mango is another reason of high deviation of prices.

Table 4.7. Deviation between maximum and minimum price in different channels.

Particulars	Channel I	Channel II	Channel III	Channel IV	Channel V
June	132	148	84	166	105
July	212	200	190	108	936
August	98	104	136	72	136
Σd	442	452	410	346	337
D	147.33	150.66	136.66	115.33	112.33
N	3	3	3	3	3
Rank (1 ₄)	4	5	3	2	1

N = Total number of month (3 month)

D = The deviation between the highest and lowest prices in each month in the respective channel

Channel efficiency measures

The efficiency of different marketing channels was drawn on the basis of ranks of different performance indicators in different channels using composite index formula. The performance indicators revealed that the channel II and I were not relatively efficient in the agricultural marketing sectors in mango producing regions. It was due to low prices received by the farmers in the channel I and II as compared to other channels. The farmers' response to the marketing channels V, selling mango directly to the Retailers showed to be the most desirable. It may be concluded from the foregoing analysis that farmers' shares seemed to be very low in channel (I and II) while the cost of marketing and middleman's margins were high in these channels.

If the farmers could sell their mango through channel V then the profit would be the highest. But farmers sell small amount of mango in this channel and they cannot store mango for a long time because of the problem of spoilage. It can be concluded that channel I is beneficial for the farmer because the highest amount of mango sell through channel. Total amount of return were also earned in this channel and distant consumer would be benefited for availability of mango aplenty to them. Middlemen were working for the market manipulation with the available quantity of mango for the ultimate consumer. But when market imperfection or producer-seller is unorganized the middlemen would take the benefit of abnormal profit.

Table 4.8. Efficiency of marketing channels.

Marketing Channel	Performance indicator					Composite index (R_i/N_i)	Final Ranking
	1 ₁	1 ₂	1 ₃	1 ₄	1 ₅		
I	1	5	5	5	4	4.00	5
II	2	4	4	4	5	3.80	4
III	3	3	3	3	3	3.00	3
IV	4	2	2	2	2	2.40	2

R_i = Total value of the ranks of performance indicators.

N_i = Total number of performance

Problems of mango marketing

Several problems were identified and is presented in Table 4.9. The problems were categorized on the basis of priority ranking. Seven problems are identified for the farmers. Among the problems, inadequate transport facility ranked first followed by higher cost of transportation and preservation problem. In the case of traders, unstable price was the first ranked problem followed by selling on credit.

Table 4.9. Marketing problems of farmers and traders.

Problems	Rank of Problems
A. Farmers	
Inadequate transport facility	1
Higher cost of transportation	2
Preservation problem	3
Lack of feeder roads	4
Lack of shed in the market	5
Lack of processing plant	6
Strike / Political unrest	7
B. Traders	
Unstable price	1
Selling on credit	2
Lack of capital	3
Lack of market place	4
High transport cost	5
Lack of market information	1

Source: Filed Survey

Summary and Recommendations

It is found from the study that if the farmers sell their mango directly to the ultimate consumers then they will get more benefit, but it would not be possible because intermediaries were engaged to transfer mango from the farmers' field to distant consumers. It may, thus, be concluded from the above analysis that farmers' shares seemed to be very low in channel I, II, and III, while cost of marketing and middlemen margins were high in these channels. To enhance the share of the farmers, development of channel IV situation should be given priority incentives by the government to help to perform more marketing activities in their jurisdiction on the one hand and to create competitive conditions for the intermediaries in favour of the farmers on the other.

On the basis of the above discussion, the following recommendations may be followed for efficient marketing of mango:

- According to the farmer's opinion, price of mango is very low at peak harvesting period. Establishment of mango processing plant in the intensive growing areas may be of the remedies of this problem and it will ensure fair prices for the farmers.
- Entrepreneurs should be encouraged to establish processing plant adjacent to mango growing areas. Provision of loan may be made through nationalized bank to the private sector for establishing processing mill in rural areas.
- Market information should be provided to the farmers regularly. If they get the market information about their product, they would be able to know the real situation of their product and could decide to take the produces to high price distant markets.
- It would be better for the farmers in the area if they would organize themselves into a cooperative arrangement. Cooperative movement as a process brings a producer one step closer to final user of his product. As an organized body, they would also acquire a better bargaining power for their products over the powerful middlemen that manipulate and control the price of mango in the marketing system.

Chapter-Five

High Yield Potato Production, Marketing and Export Possibility from Bangladesh

Introduction

Potato has been cultivated in Bangladesh for more than a century and has recently occupied an important place in its list of major food and cash crops. It is a subsidiary food item consumed as a vegetable in Bangladesh while in many countries of the world it constitutes the staple food. After the introduction of cold storage facilities in the late eighties, it has turned out to be one of the most promising crops as it can now be consumed throughout the year. Potato consumption in Bangladesh is next only to two major cereals-rice and wheat, and low-income households consume cheap potatoes more than other vegetables (Moazzem and Fuzita, 2004). The present per capita consumption of potato is still much lower (about 24 kg per year) than in many other countries. However, the data is based on the production of potato and the population of the country and not on the basis of food intake (Hussain, 2008), and it also excludes exports. However, since the overall export volume is still very low compared to the total production, it may not impact the data very significantly.

The overall global production of potato has increased over the last few decades despite production in developed countries experiencing a steady decline. According to FAO data, in 1991 the volume of global potato production was 268 million tones whereas production reached 325 million tones in 2010. The global potato sector has been undergoing many changes since the early 1990s. Before 1990s, most potatoes were grown and consumed in Europe, North America and countries of the former Soviet Union. However, since then, there has been a dramatic increase in potato production and its demand in Asia, Africa and Latin America where the output rose

from less than 30 million tones in the early 1960s to more than 165 million tones in 2010. FAO data shows that in 2005, for the first time, the developing world's potato production exceeded that of the developed world. China has now become the biggest potato producer and almost a third of all potato is harvested in China and India. Currently, Bangladesh is ranked 12th in the global potato production list in terms of quantity.

Potato consumption, especially fresh potato, is decreasing in many countries, especially in the developed regions. Currently, more potatoes are processed to meet the rising demand from the fast food, snack and other concomitant food industries. The major drivers behind this development include growing urban population, rising income, the diversification of diets and lifestyles that leave little time for preparing the fresh product for consumption.

Potato, till today, is consumed round the year in Bangladesh mostly as a fresh vegetable. Activities towards promoting potato as a partial supplement to rice (rice is the major staple food) has not yet resulted in any significant success. The underlying reasons are the traditional food habits of Bangladeshi people and the high price of potato in recent years. Generally, the price remains reasonably low during the peak harvesting period and rises higher when loading of potatoes in cold stores is completed. The stated situation indicates that there is little scope for a significant increase in per capita consumption of fresh potatoes in the near future. However, the total human consumption of fresh potatoes is likely to increase, at least, in proportion to the rate of population increase thereby maintaining the same per capita consumption. Increased production exceeding human consumption as fresh produce can be expected if the processing and exports of potatoes increase significantly.

The main export market for fresh potato is the developed world and according to 2012 FAO statistics the top ten potato importing countries are Belgium, the Netherlands, Spain, Italy, Russia, the USA, Germany, the UK, France and Portugal. Bangladesh started the export of potato in the 1980s, and so far the highest amount of

potato exported from Bangladesh was about 16,500 tonnes last fiscal year (2010-11). Major export markets of Bangladesh potato and potato products include the Republic of Korea, Italy, Singapore, Malaysia, the UK, India and the UAE. The opening of new markets in Russia, Vietnam and Sri Lanka facilitated the recent growth in exports. (Source: DAE).

Data shows that Belgium and the Netherlands are the top importing countries but they also are in the list of top exporting countries. The unit value of the Netherlands' exports is higher than that of its imports which may explain the value addition there. However, in the case of the unit value of imports into Belgium is a little higher than that of exports. Similar features can be observed in the case of a few other countries as well. For example, Germany's per unit import value is much higher than per unit export value. Since FAOSTAT categorizes only potatoes and potato flour, it is not very clear how it considers other value added products under potatoes. However, it is clear that a number of countries import and also export potatoes either in the same form or in other value added forms. An examination of these country-wise trade policies may provide satisfactory leads to resolve this dilemma.

Data Sources and Methodology

The study adopted the value chain analysis method to unfold the industry dynamics, its market actors and different service provisions, constraints and opportunities. The overall research was carried out through desk research and in-depth interviews and Focus Group Discussions (FGDs).

The desk research involved reviewing the existing literature on the sector. The initial desk research helped develop a general understanding of the overall sector. It resulted in identifying different market actors and nodal points within the value chain which, in turn, helped select indepth interview respondents. They included industry experts, concerned government and research agencies, value chain actors and industry associations. A snow-balling approach was adopted to develop the entire value chain. The process started with identifying and interviewing end market factors such as exporters, then gradually moving up the value chain to the input supplier level. In all,

72 interviews were conducted with different value chain actors, key informants and service providers. Three different geographical locations were selected as potato producing clusters representing the diversified nature of varieties and yield. The areas were Munshiganj (historically large scale potato producing district), Comilla (agriculturally progressive district producing potato on a moderate scale) and Rangpur (joined recently in large scale potato production). Three FGDs were carried out with potato farmers in these three different areas to capture the overall production scenario. Primary data was collected during the first quarter of 2013. Desk research was continued along with interviews and FGDs throughout the study period to validate field findings with available facts and figures. The overall research applied the following approaches:

1. Mapping the core processes in the value chain,
2. Identifying the actors,
3. Identifying the services that feed into the value chain,
4. Mapping the relationships and linkages,
5. Mapping the flow of products including the geographical flow,
6. Mapping the changes in the value and form of the products,
7. Mapping the information and knowledge flows,
8. Mapping the number of actors and employment, and
9. Identifying the transaction costs and ways to reduce them.

The study begins with a brief description of the Bangladesh potato sector followed by mapping the value chain including the information and knowledge flows at different tiers. It also summarizes the constraints and opportunities and possible solutions to address them.

Potato is a very popular crop for farmers in Bangladesh irrespective of land holding size. The main reasons as found during the FGDs with farmers were its higher profitability, short growth duration, the next crops requiring less fertilizer, scope of intercropping/relay cropping, etc.

Data shows that in 2004 - 2012, the compound annual growth rate was 11.22% for production and 2.76% for yield; for export volume it was 29.12 %. Besides, the growth of the area under cultivation was 8.29%. However, there was an overall setback in 2009. As opined by industry experts, there was a potato glut in 2008 and consequently, farmers were compelled to sell their produce at low prices. In the following year, many farmers did not cultivate potatoes or invested less in cultivation which resulted in lower yields. However, the export volume has steadily increased during the last couple of years. As government provides cash incentives to exporters on the export value it has been working as a catalyst to increase exports.

Till last fiscal year, potato exports were entitled to receive a 20% cash incentive if the shipment was made between February and April. In other months, the incentive was halved to 10% to boost supply in the local market. From the current fiscal year, potato exports are entitled to a 20% cash incentive throughout the year. As a result, exports have jumped to 16,500 tonnes in 2011.

According to DAE, potato is grown in all the districts of Bangladesh. Among them, the highest area of concentration is in Bogra-65,300 Hectares (ha) and 61,667 ha in 2012 and contributing to 10.13% and 13.29% of the national total respectively. This is followed by Rangpur (52,720 ha, Dinajpur (42,430 ha), Joypurhat (38,870 ha), Munshiganj (36,045 Ha), and Rajshahi (35,000 ha).

The lowest area coverage is reported to be in Rajbari (96 ha). The Dhaka region, particularly Munshiganj, which is generally known as the potato production belt of Bangladesh, is gradually losing its importance in terms of area coverage in potato whereas regions like Rajshahi and Rangpur are gaining momentum. According to the DAE's data, the highest area concentrations under potato were in Rangpur and Rajshahi (178,114 and 172,091 ha, respectively), showing a steep rise in area under potato cultivation from 2004-05 to 2011-12. The expansion of the potato cultivation area in the northern districts, namely, Rangpur, Dinajpur, Thakurgaon and Rajshahi is mainly due to the availability of land at a relatively lower lease value leading to lower costs of production.

Yield and Yield Variation

Potato is a short duration crop in Bangladesh and its yield is relatively low mainly owing to climatic limitations. The current national average yield of potato in Bangladesh is about 15 MT/ha, as compared to that of more than 40 MT/ha in many potato growing countries of the temperate region. In the potato growing countries of the temperate region, potatoes are grown during a long growing period in summer with long sunny days and a moderate cool temperature, resulting in high accumulation of photosynthate in the tubers, ultimately leading to high yields.

Potato yields vary widely among the potato growing areas of Bangladesh. Table 5.1 shows the yields in different regions of the country from 2006 to 2012, as reported by the Field Services Wing of DAE.

Table 5.1. Yield of potato in different regions of the country from.

Region	Yield (MT/Ha)						
	2006	2007	2008	2009	2010	2011	2012
Dhaka	23.25	22.77	23.35	23.81	25.55	25.83	25.43
Mymensingh	8.84	9.27	9.35	9.57	10.22	13.83	13.68
Comilla	16.27	12.59	16.26	16.33	16.61	18.80	17.95
Sylhet	9.17	9.34	9.10	8.30	8.90	9.71	9.62
Chittagong	13.60	11.53	10.90	11.80	11.60	14.53	14.03
Chittagong	8.11	8.08	7.92	8.22	9.42	14.82	12.92
Hill Tract							
Rajshahi	7.23	7.69	9.69	11.31	12.79	15.48	12.09
Rangpur	10.38	8.77	13.21	13.96	15.11	17.96	14.21
Jessore	14.47	16.59	16.50	16.93	18.06	17.38	14.56
Barisal	11.19	10.08	10.14	9.97	10.85	20.72	18.04
National (Average)	12.59	11.98	13.75	14.39	15.08	17.75	14.54

Source: Field Services Wing, DAE Interestingly, the yield of potato in Munshiganj district (falling under Dhaka region) is higher than that of a few temperate countries of the world like Belarus, Poland and Iran.

Potato cultivation

Potato is cultivated in the winter season. The first fortnight of November is the right time for plantation. However, in certain north-western areas, farmers even plant potato in October to harvest the crop early. Mulching is frequently done over the rows with water hyacinth, straw, etc. to preserve soil moisture and to prevent the growth of weeds. As the potato plants become mature and the tubers are fully formed, the leaves become gradually yellowish and then brownish and finally the plants die. It is always better to harvest the crop after these signs are evident in the field. Most varieties are harvested in this country during February-March. Collection of the tubers is usually done manually using a spade or other devices.

Potato Varieties and Grades

Diamante is the most widely grown potato variety in most of the potato growing districts followed by Granola, Cardinal, Multa, Binella and Felsina. Other varieties grown in different potato growing zones are Asterix, Patronese, Provento, Ultra, Heera and Dheera. However, among them, mostly the Granola variety is currently being exported because of its appearance, taste and size. There are two different grades for exportable potato (Granola): Grade A: 4-6 tubers/kg and Grade B: 7-10 tubers/kg. The bigger the size of the tubers the higher the price. The average C&F value per MT of potatoes in 2007 was USD 240 and in 2008, it was USD 250 for Singapore and USD 265 for Malaysia. It is important to mention that during peak harvesting season (February-April) the wholesale price of potato in the local market is as low as USD 80 per MT and it rises up to USD 280 per MT during November-December.

State Support

The potato sector receives a considerable amount of state patronage for exports. The export of potato now enjoys 20% cash incentive on export value in order to enable the Bangladeshi potato to become competitive in the global market. However, farmers do not receive the incentive directly but the exporters do. But exporters become more

price-competitive in the global market and can export more due to the cash incentive. With increased volumes of exports, the demand for potato increases in the local market and the farmers usually get a better price.

Product Flow and Value Chain Actors

From production to consumption, export and processing of potato, different actors are involved in the potato sector. Among the public sector organizations, the Tuber Crops Research Centre (TCRC) of the Bangladesh Agricultural Research Institute (BARI) and Bangladesh Agricultural Development Corporation (BADC) are involved in research, technology development, variety development, seed production and promotional activities in potato. Private companies, individuals and NGOs are involved in the production and marketing of potatoes. The following diagram shows the core process involving different actors in the potato value chain. The subsequent sections describe the role of different actors in the process.

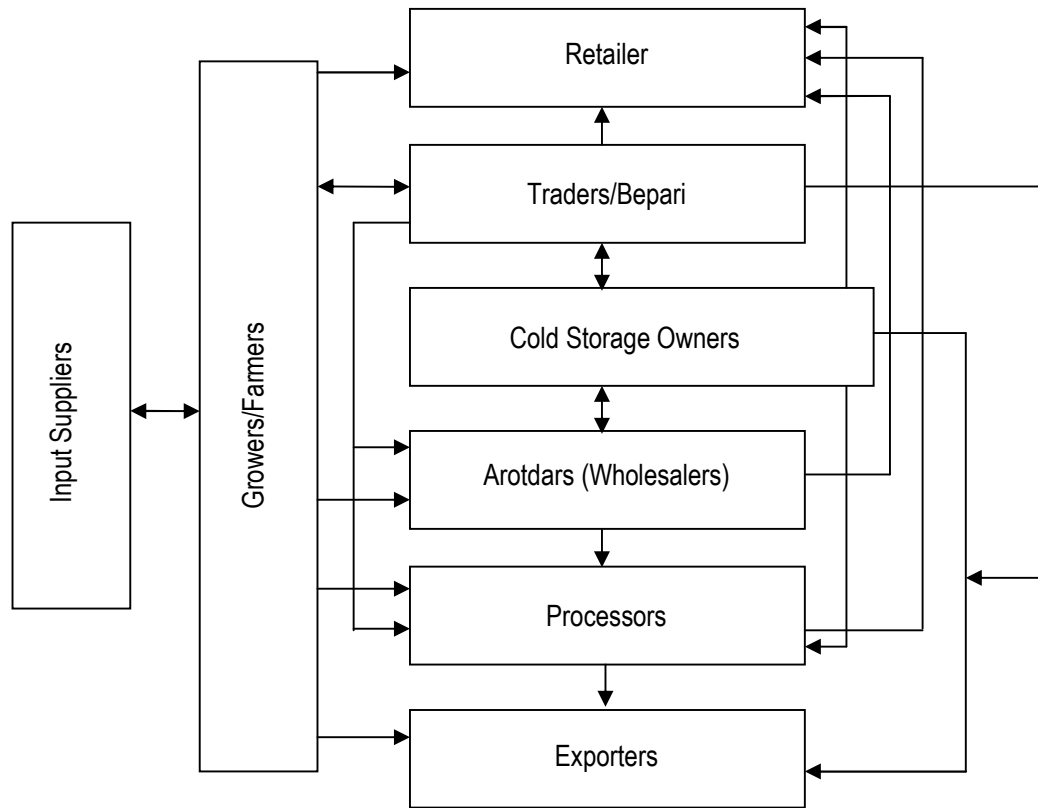


Figure 5.1. Core Process and Value Chain Actors

Input Suppliers

Four major inputs are required in potato cultivation. These are seed, crop protection materials, fertilizers and irrigation. Among them, seed is the most important and vital input. Considering potato production in about 400,000 ha of land and a seed rate of 1.5 MT/Ha, the annual requirement of seed potato in Bangladesh is about 600,000 MT. But, the supply of high quality seed potatoes in the country is only about 6% of the total requirement; of which, BADC's locally produced seed potato is 1 %, private sector's locally produced seed potato is 2% and private sector's imported seed potato is 3%. The balance 94% is farmers' retained seed potatoes which were harvested in the preceding season.

In general, the application of the seed rate is higher than recommended. Farmers have a common perception that a higher seed rate would result in higher yields and also loss through failed germination of seed can be offset this way.

There is no special type of fertilizer as such for potato only. Fertilizer used in other agricultural crops is also used in potato production. Common fertilizers are urea, MOP, TSP, NPK and organic fertilizers. Apart from organic manure, the rest of the fertilizer is sold in input retail shops that are available in all village markets. But adulteration of fertilizer is commonplace and farmers suffer from increased production costs due to over application of them. Use of organic fertilizer is generally lower than the recommended dose of 10 MT/ha. The limited availability of organic manure like cow dung, farm manure and compost is the main reason for the lower dose of organic fertilizer.

Crop protection materials include fungicides, insecticides and bactericides. Application of such materials is very common among potato farmers for curing and also protecting their crops. There are many companies and many brands of such crop protection materials. For example, there are as many as 103 brands of registered fungicides in the country recommended against the late blight disease of potato. Farmers use different types of crop protection materials (fungicides, bactericides,

insecticides) at least 4-5 times during the whole cultivation process. Not all the products are of good quality and farmers very often complain about them. These crop protection materials are marketed by private companies and sold through dealers and retailers in all village markets.

Irrigation is another essential input for potato cultivation. On average, farmers apply irrigation three times in a cultivation period. Well-off farmers have their own irrigation pumps and engines on their land. Small farmers usually buy water from other neighboring farmers who have irrigation facilities.

Potato Growers

Potato growers or farmers usually play a unitary role producing potato and selling them through traders and cold storage owners. However, a small portion of growers play the dual role of producer and trader. Most growers are, however, smallholders. Of the 12 million farm households in Bangladesh, about 80% are small farmers (land holding less than 0.2 ha) and some of these farmers are landless (BBS, 2012). No specific data is available on the number of potato growers as such. Potato is considered a vegetable and according to BBS, the number of vegetable growers in 2012 was 1,260,000.

Traders (Bepari)

Traders, locally called *Bepari*, are non-licensed business people in the production areas. The number of traders varies from 10-15 in each rural aggregation market. They handle a relatively large volume of potato and some amounts of other agricultural commodities. Some of these traders are potato growers as well. They purchase potato from the growers and sell it to cold storage owners, *arotdars* and also retailers.

Arotuars

Arotuar, a Bangla term, is a commission agent who has a fixed establishment in the market place. The number of *arotuars* also varies from 15-25 in rural aggregation markets. Usually, *arotuars* deal in other agricultural commodities as well. Like traders, some *arotuars* also produce potato. They conduct their business in aggregation markets and sometimes in the premises of the cold storage. They let sellers bring their merchandise into their premises where buyers also visit to buy. Thus they offer a physical platform for buyers and sellers to negotiate. They have a few hired laborers or part-time or full-time salaried persons to perform various functions such as weighing, sorting, grading, cleaning, etc. *Arotuars* charge a commission from the buyers if a transaction takes place. Sometimes, they also become buyers of the goods brought to their premises. They are licensed traders with warehouses. In general, *arotuars* distribute commodities in a large geographic area between the points of production and consumption.

Cold Storage Owners

Cold storage owners are entrepreneurs who own one or more cold storage facilities generally for storing potatoes. Cold storage saves potatoes from spoilage and ensures a year round supply of table potatoes in the market. Farmers' seed potatoes are also preserved in cold storage. Most cold store owners are also involved in potato trading. They buy and store potatoes during the potato harvesting season, and sell the stored potatoes mostly to the traders at a later stage.

The number of cold storage plants in Bangladesh was only 77 in 1975, and in 30 years the number increased to 340 due to the increase in potato production in the country. Considering the total cold storage plants and production of potato in the country, at present, nearly 25-30% of the total potatoes produced in the country can be preserved in the cold storage. But still, in some areas of the country and in some

poor production years, a certain portion of the cold storage space remains unutilized. Poor flow of information is another reason for this underutilization.

Table 5.2. Utilization of space in some cold storage plants in different areas of Bangladesh in 2009 (Figures in parenthesis are the number of cold storage plants.)

Area	Utilization of cold storage space (%)
1. Munshiganj (45)	89
2. Chandpur (6)	80
3. Comilla (7)	88
4. Bogra (6)	84
5. Joypurhat (4)	47
6. Rangpur (8)	100
7. Lalmonirhat (2)	79
8. Nilphamari (4)	78
9. Dinajpur (4)	74
10. Thakurgaon (2)	100
11. Rajshahi (8)	99
12. Kushtia (1)	47
13. Jessore (3)	71
14. Khulna (1)	81
15. Chittagong (3)	27
Bangladesh (105)	90

Source: Bangladesh Cold Storage Association

Most of the cold storage space is normally utilized by potato traders, although in some areas, potato growers are the major clients of cold stores such as in the northern part of Bangladesh. In most of these areas (e.g., Rajshahi, Bogra, Rangpur), cold storage owners organize the production of potatoes providing credit support and each of the growers in such organized production takes lease of a large area of land for potato cultivation.

The cold storage facilities are not uniformly distributed throughout the country. The pressure of the clients for the storage of potatoes (traders and growers) is therefore not similar in all areas. As a result, the cold storage charge per bag of potatoes is also not the same in all areas, e.g., the charge is USD 3 per bag in Rangpur and USD 2 per bag in Bogra. Cold stored potatoes start coming out from May and continue till the next harvest. Usually, most of the cold stores become empty by December-January since after May, there are only cold stored potatoes and no fresh harvests. However, the cold storage charge is levied once for the whole season.

Another approach of the cold storage owners in some areas is to appoint agents, who bring the potatoes of the growers or traders to the cold stores for preservation and in return get an amount of, say, USD 0.15 per bag as commission. The potato traders and growers in some areas receive loans from cold storage owners for the storage of their potatoes where stored potatoes work as collateral. The study found that cold storage owners take loans from banks at around 14% interest and disburse them to the potato traders and growers at a relatively higher rate of interest (say 18%).

The supply of non-cold stored potatoes remains high during and immediately after the peak period of harvest (February-May). Normally, cold stores start releasing potatoes in June or July and continue releasing up to November or December depending on the market situation. A part of the potatoes released in October and November is used as seed.

Processors

The present state of potato processing in Bangladesh is not very encouraging, but it can be considered as transitional. A few years back, four potato flake industries were established in the country. But none of them are in operation now, mostly due to lack of operational capital. Constant increases of potato prices in the wholesale market forced them to shut down their plants for indefinite periods. As per the capacity, each factory could utilize about 50,000 MT of fresh potatoes as raw material every year.

A number of processing companies are now making frozen French fries, chips and other snacks using potato as a raw material. Some of these processing companies are Bombay Sweets & Co. Ltd., Ejab Foods Ltd., Ispahani Ltd., Zoha Chips Factory and Crisp Factory of Bhai Bhai Group. As regards the use of potato by different processing companies, there exists a significant domestic market for French fries of around 80-100 thousand MT per year. Moreover, the size of the global market for flakes and starch, growing at a rate of 10% yearly, is over USD 20 billion (The Financial Express, 7 May 2014). As reported, most of the existing potato varieties of Bangladesh, including the widely-grown varieties, are not suitable for industrial use. In most cases, potato processors are handicapped by a lack of processing-type varieties.

The range of quality snacks, frozen food products and ethnic snacks produced by different food companies consists of more than 25 items including potato, corn, cereal-based products, nuts and pulses. Some of these food companies in Bangladesh (such as Bombay Sweets & Co. Ltd., Ejab Foods Ltd.) have sister organizations for the production of raw materials. They mainly cultivate agricultural products either under their own management and/or under the contract growing (system. They provide potato seed to their contract farmers to ensure quality output, monitor and supervise the production and also undertake training programs for the farmers to enhance productivity. Their demand is much more than what they are currently producing under contract arrangements. They meet the rest of the demand by procuring from the open market, either from traders or cold stores.

Exporters

Currently, there are only a few, around 8-10 established private companies that export fresh or processed potatoes, mostly to Singapore, Malaysia and the UAE and very recently to Russia, Vietnam and Sri Lanka. Some of these companies are Agriconcern, Surovi Agro Industries Ltd. (a sister organization of Supreme Seed Co. Ltd.), Alpha Agro, Eusum Agro Ltd., BRAC, Global Agro Resources Incorporation,

etc. All of these exporters have started and are gradually expanding their own contract farming system in order to ensure quality and grade the demanded by buyers.

Retailers

Retailers are the marketing actors between *traders/arotdars* and consumers of potato. They generally buy potatoes from *arotdars*, traders and sometimes from cold store owners and sell directly to consumers. Retailers dealing in potatoes, in general, also sell different types of vegetables and spices and they exist in every agriculture consumer market.

Information Flow in the Value Chain

The on-field inquiry shows that the erratic information flow in the value chain is impeding the growth of the sector. After a review of the general information on the sector, farmers among other players, were asked a variety of questions regarding the flow of information relating to planting, growing, harvesting, post-harvest processes, marketing and different services. The core investigation was the source of their information and how easily available and accessible the information is. The dynamics of this open information flow consisting of financial assistance, inputs, price and technical know-how.

Price Information

Farmers receive price information from a variety of sources. They mostly get their price related information from their immediate buyers such as traders and cold store owners. Fresh or processed potato exporters provide price information to their contract growers. Bigger growers are keen to find more sources for precise price information. Price negotiations by small growers seem to take place at the local primary marketplace, however, large growers negotiate over the phone but the contract is not completed until the buyer materially verifies the potatoes for weight, size, uniformity, and injury status. Most farmers now see the advantage of gathering

the potato market price in the Karwan Bazaar and the Chawk bazaar, Shyam Bazar the major retail and wholesale markets in the capital city, to strengthen their bargaining chip. Besides, wider expansion of cellphone networks in the country and the wider use of mobile phones have enabled the farmers to crosscheck price data and price levels at different key market places throughout the country.

However, mobile operator Banglalink has introduced an Interactive Voice Response (IVR)-based service called 'Banglalink Krishibazaar'. It allows customers to record their own advertisements of farm produce or browse through by listening to other advertisements recorded by other callers to get the necessary information. Callers can also call up the trader instantly by pressing "8" and finalize the deal. Information about the products is available by category, price, location, etc., making the process easier. The Grameen Phone has been facilitating online marketing over the last few years. Anyone with Internet connectivity can visit the website and check the market price of different products. Those who want to upload their merchandize on the site need to have a Grameen Phone subscription number.

Input and Know-how Information

Farmers obtain information regarding seeds from input retailers and also from extension officers. From the same sources, they also receive information regarding crop protection material and fertilizer and their use. Farmers also share information among themselves on different inputs and technical issues. Besides, print and electronic media also provide information occasionally. The growers under contract arrangements receive input-related and technical information from the contracting companies/exporters. Cold store owners provide particularly post-harvest related information to farmers such as sorting, grading, etc. Besides, Grameenphone, the leading mobile operator, has established more than 500 Community Information Centres (CIC) with Internet connectivity in the semi-urban and rural areas of Bangladesh. By visiting the CICs, farmers can access a web portal named www.ruralinfobd.com which is rich in agriculture-related news. On the other hand,

Banglalink offers the 'Krishi Jigyasha 7676' service which provides suggestions and answers to any queries related to agriculture, vegetable and fruit farming, poultry, livestock, fisheries, etc. To avail themselves of this service, Banglalink subscribers need to dial 7676, talk and get expert advice on the problem.

Financial Assistance

Financial assistance flows in four forms:

- Some traders offer loans to their known growers with whom they have a continuous relationship,
- Input suppliers sell on credit to their known farmers,
- Loans are given by commercial banks and NGOs (microfinance),
- Loans are given by cold store owners.

Transaction Costs

In order to simplify the discussion, it is important to go into the transaction costs in detail. In economics and related disciplines, a transaction cost is a cost incurred in making an economic exchange (restated: the cost of participating in a market). Apparently, it is very difficult to estimate the transaction costs as many variables are present. Farmers use various sources to get information and data. Sometimes, they use multiple sources to get information on a particular issue before coming to a decision. Hence, the transaction cost is variable from farmer to farmer and also according to the type of information. For example, a farmer can gather input related information from other farmers, input retailers, government extension offices, private companies doing contract farming, exporters, etc. In certain cases, farmers may use a single source for procurement decisions and in other cases, they may use several sources. If a farmer buys an input from an input retailer, then the involved cost would only be his/her transport cost to the shop in the market, may be around BDT 10 (it may also be different if the farmer makes any other purchases from the market). Conversely, the transaction cost would be higher if a farmer needs to get information

from a government extension officer. In most cases, the transport cost to the office would be around BDT 50-100. However, cell phone communication has reduced transport costs favorably. If the farmer has the cell phone number and can access the extension officer, he/she can talk over the phone which would bring down the transaction cost to less than BDT 10. However, it does not depict the total transaction costs as it shows only the transportation costs or phone call costs and not other variants such as time and effort costs. In a nutshell the cost of transaction for farmers mostly include the cost of procuring information and the effort and time to find the solution provider, in particular, the related cost of transport all of which varies from the nature of each transaction. However, all these transaction costs have decreased significantly now considering carrying cost to be the cost of using cell phones. Once a person is aware of the source of his/her information, he/she can make phone calls and can talk for a few minutes for less than BDT 10. Mobile phones are widely available now in rural areas.

However, as mentioned in the preceding sections, there are a few specific services by a few cell phone operators in Bangladesh where transaction costs for making different decisions or deals are very straight forward. For instance, in ‘Banglalink Krishibazaar’, a farmer can tout his/her product details with a service charge of BDT 1 per minute (excluding VAT). If the farmer is able to tout his complete product profile in two minutes and later someone buys his produce from the seller’s place, then the transaction cost of selling his goods would be only BDT 2. In Banglalink ‘Krishi Jigyasha’, when a farmer talks to an expert and gets answers to his/her queries, he/she has to bear a charge of BDT 2 per minute for a Banglalink subscriber and BDT 5 for other operators’ subscribers. However, this discussion only narrowly tried to pinpoint transaction costs and cannot be concluded as the basis for calculating such costs. A thorough research is essential to measure the associated transaction costs of any economic exchange.

Identified Issues in the Value Chain

The overall field studies identified a series of lacunae besetting the value chain and hampering its growth. Not all the identified shortcomings are discussed in the report as the main focus of the study is to track down the information and the knowledge gaps in the value chain relevant for small holder farmers. Therefore, only the constraints concerning the small holder farmers have been dissected in this section.

Lack of Knowledge of Farmers on Quality Inputs and Their Use

As mentioned earlier, the price of potato has almost doubled during the period 2005-09 with some significant negative consequences. Bangladeshi potato has become expensive or less competitive in the global market; its export volume even after a huge production rise during the last few years cannot be increased because of increased prices, all four potato flakes industries are non-operational when they could have produced huge amounts and inadequate cold storage facilities create a glut of potato after harvest and consequently the price comes down to a very low level with farmers making low profits or even incur losses in a good or bumper production year. Hence, continuous increases in potato prices have made the potato industry vulnerable.

However, a primary cause of increased prices seems to be the lack of knowledge of farmers of identifying quality inputs and their application. It is true that the input cost has increased during this period but the use of excess inputs in all categories (seeds, crop protection and fertilizer) increase production costs several fold. Farmers use poor quality seed and in excess of what is required. They use the same crop protection material repeatedly as they do not know the right product and how to apply it. Because of this lack of knowledge, they very often buy inferior quality products which do not work well and then they hurry to buy a different product. It is not different in the case of fertilizer as adulterated fertilizer is very common in rural markets and farmers buy them as they cannot recognize the difference. As a result, they have to apply more fertilizer to achieve the desired yield.

Hence, this is clearly an extension failure. The limited number of government extension workers can hardly reach all the farmers. Exporting and/or processing companies have started contract farming whereby they provide inputs and also technical know-how. But their outreach is too low to cater to the large number of farmers. In this situation, the use of cell phones could very likely cut down the constraints of physical distance. Banglalink's 'Krishi jigyasha 7676' seems to be a very appropriate solution in this regard. The use of SMS or MMS in communication can also enhance the value. Along with improvising the extension services, it makes some sense to make the farmers better aware of how to identify the best quality inputs and also their use. Quality seed, crop protection and fertilizer companies can resort to promotional campaigns within their marketing plans which would as well promote their own brands. This can be achieved through embarking on road shows, poster-billboards, TVCs and demonstrations apart from mobile phones.

Lack of Knowledge of Farmers on Variety, Grading, Processing and Export Market

Potato should be large, uniform in size, attractive in appearance and free from injuries for export and processing industries. Granola is the most appropriate variety for the purpose. Because of the limited cold storage space, it is unlikely that the price will remain fair after the harvest. Hence, farmers should plan their varieties in such a way so that they could find alternative markets other than the traditional consumer ones. In Rangpur regions, the farmers mostly grow the granola variety. The introduction of contract farming by a number of exporters and/or processing companies in this region has enabled the farmers to know about the demand for the granola variety. On the other hand, Munshiganj, being a very old and one of the leading potato growing regions, is still growing other varieties but not granola.

There is another aspect of grading potatoes after harvest. Diamant and Cardinal, two other most popular varieties, can also yield rather bigger size potatoes if graded after harvest. Since the price after harvest remains low because of a glut the farmers can

grade their potatoes, separate the bigger ones of uniform size for export and thus can earn a better margin. Lack of knowledge of the farmers of the requirements of exporters limits their scope to increase income.

Exporters, in this context, can promote the varieties they require and make the farmers aware of the need to grade their harvest. Contract farming has shown positive results as exports have steadily increased in the last few years. Hence, by expanding the contract farming system, exporters and/or processing companies can educate the farmers on varieties and grading. ‘Banglalink krishibazaar’ can also provide a platform for buyers and sellers to get to know about product quality, grade and price.

Lack of Knowledge of Farmers on Post-harvest Techniques

Since potato is harvested manually with a little spade, a few potatoes can always get damaged. Some of the harvest may also be affected by disease. Hence sorting, curing and grading are essential before preserving them in cold storage. Farmers’ lack of knowledge of these matters results in wastage and rotting in the preservation process. As cold storage owners and also farmers stated, approximately 5% preserved potatoes goes bad. This ultimately affects their net return on production.

Cold storage companies can educate farmers on these issues. Before harvesting, they can educate potential customers through an information campaign. In this way, their customers (farmers) will suffer little or no loss and the cold storage operators can create a better image of a win-win service. In addition, CICs of Grameenphone or ‘Krishi jigyasha’ of Banglalink can also provide such information to the farmers.

Lack of Information on Available Space in Cold Storages

As mentioned earlier, only around 25-30% of total production can be stored in around 340 cold storage plants all over Bangladesh. The current export volume is only a meagre portion of the total volume. The result is an obvious glut during and immediately after the harvest when the price sometimes falls even below the production cost. Unfortunately, even in this situation, around 10% of cold storage space remains unfilled in some areas while in other areas, farmers stand in long queues for few days for access to cold storage. A clear information asymmetry prevails here.

In this situation, informing the farmers on unfilled space in the cold stores can help. Then, the farmer can take his/her potatoes to the particular cold store where space is available. Transportation cost is a decisive factor in the distance the farmer can travel. Hence, it is important that the farmers get information regarding the unfilled cold storage space within a convenient distance. Cold store owners can provide such information to the farmers through a variety of means such as announcements through a public address system (a very popular means in rural areas) in production clusters, market places, etc, banners, "word of mouth", and so on. An ICT based solution could be used to register farmers in the surrounding areas on their respective mobile phone numbers. Farmers can register themselves with the cold stores prior to harvesting. After harvests, an unfilled cold store can send SMSs to the registered farmers informing them of the space available to store potatoes.

Conclusion

Potato consumption has increased globally and marks a shift from the developed world to the developing. Bangladesh has also showed significant growth in terms of production, yield and consumption in the last decade. However, the sector is still struggling to become price competitive in the global market and thus export the surplus. Increased production costs have not only made Bangladeshi potato less competitive in the global market but also prevented small farmers from reaping

sufficient profit or even cover their investment costs. Lack of sorting, grading and standard post-harvest practices also lead to economic loss for the farmers. Appropriate post-harvest techniques can reduce wastage and rotting during the preservation period. There are only limited preservation facilities available in Bangladesh for potatoes but still a significant part remains unused. These are all rooted in the poor knowledge of the farmers and also the weak flow of information to them. Increased knowledge of agriculture inputs and their proper application can certainly reduce the farmers' cost of production. This would affect the entire value chain positively as the exporters will also be in a better situation regarding price competitiveness. With knowledge and information regarding post-harvest techniques, farmers can also increase their profit by reducing wastage. If the information is available to a farmer on which cold storage has provisions for preserving potato, he/she can save him/her from losing money in a period of glut. The study anatomized all these aspects from the information and knowledge lacunae perspective and tried to identify the root causes. Addressing the issues can certainly improve the information and knowledge flow scenario and can ultimately lead to a robust vibrant and competitive potato sector in Bangladesh.

Summary

Potato has been cultivated in Bangladesh for more than a century and has recently occupied an important place in the country's list of major food and cash crops. Over the years, the sector has been thriving with new opportunities. The value chain analytics was conducted considering the huge potential of the sector and to identify bottlenecks hindering its growth. The value chain analysis of the study attempts to gauge the systemic points faced within the whole deal from farming to exporting in light of knowledge and information gaps. The study identifies hindrance to progress the sector is facing, kinship and linkages between and among the actors, the flow of produce and the alternatives in prices and in the data and knowledge flow. It is plain from the study that potato production in Bangladesh has marked significant growth over the last few years despite the fact that in peak seasons growers face enormous

difficulties with their surplus production due to cold storage capacity constraints leading to unfavourable pricing. The study addresses some systematic information-related problems faced within the value chain and offers some possible solutions to farmers in the use of inputs and also to cold storage operators and farmer associations to coordinate the uneven use of even the small amount of such available facilities.

Chapter-Six

Status and Economics of Three Fresh Fish Markets in Bangladesh

Introduction

Marketing is of paramount importance to pisciculture and marketing of fish makes important contributions to economic growth through creating employment, providing livelihood support and penury alleviation. Fisheries development depends on augmented productivity and processing technology and also on highly effective marketing system. Therefore, fish marketing is a cardinal aspect for sellers, consumers and the facilitating agencies. Fish marketing is not only confined to selling of fish but also includes all the acting elements which exert considerable impaction on the exploitation, output, distribution, preservation and carrying of fish in addition to veritable sale of fish by putting off the middlemen (Agarwal, 1990).

In Bangladesh about 97 percent of the fish production is marketed for domestic consumption while a paltry part is exported (Rahman, 1997). Though fish farming is deemed as an industry and fish marketing system is well practiced in many countries of the world, and pitiable the fish farmers in Bangladesh hardly get any opportunity to communicate directly with the consumers. However, the serious marketing deficiencies seem to occur in remote communities because of lack of means of carrying, ice for preservation and poor road facilities and where the farmers are particularly in a vulnerable position in relation to intermediaries (DFID, 2012). As fish is highly perishable with uneven supply, examination of fish marketing system is

vital considering the fact that fish is the principle protein source in the diet of Bangladeshi people which supplements 60% of total animal protein (DoF, 2012).

Fish also earns considerable amount of foreign exchange for the country (Ranadhir, 1984). Fish production can be increased through following scientific method but without better marketing mechanism it will ultimately prove fruitless. Making fish available to consumers at affordable prices at right time and place in good condition requires an effective marketing work out. According to Olukosi *et al.*, (2007), marketing work out channel is the path of a commodity from its raw state to finished form. Shrivastata and Randhir (1995), Quddus (1991), Mia (1996) and Rahman (2003) identified several fish marketing courses. Different studies were conducted on fish marketing mechanism in different times in different regions by Ahmed (1983), Quddus (1991), Rokeya *et al.* (1997), Rahman (1997), Flowra *et al.* (2000), and Ahmed (2005). However, those do not appear to diminish the shortcomings and the issues prevailing in fish marketing mechanism in the North-West region of Bangladesh like Parbatipur upazilla. As Parbatipur upazilla has vast swath of water bodies in the form of ponds, *dighis*, canals, floodplain etc., it is important to know at length the existing fish marketing process of this upazilla. In light of the above, this study was conducted to gauge the status of prevalent fish marketing systems and to pinpoint the marketing inefficiency and the economics of marketing fish in Parbatipur upazilla.

Source of Data and Methods

The study was carried out for a period of six months from January 2014 to May 2014 on three different fish markets the Natun bazar, Puratun bazar and Ambari bazar of Parbatipur upazilla in Dinajpur. The data for this study were acquired through questionnaire interviews by simple random sampling method. A total of 45 primary fish traders (15 from each market) and 30 final consumers (10 from each market) were selected randomly for interview. In each market around 20-35 retailers were involved in the interview. For this very study questionnaires were formulated in

line with those of Siddique (2001) and were pretested and moderated for collecting the information. The collected data were analyzed and the working parameters were obtained using the following formula:

- i. Market margin =
Sale price – Purchase price
- ii. Net marketing margin =
Market margin – Marketing cost
- iii. Farmer's share (%) =
$$\frac{\text{Farm price}}{\text{Final retail price}} \times 100$$
- iv. Intermediaries' share (%) =
$$\frac{\text{Intermediaries' margin}}{\text{Final retail price}} \times 100$$
- v. Faria's or Bepari's share (%) =
$$\frac{\text{Faria's or Bepari's margin}}{\text{Final retail price}} \times 100$$
- vi. Paiker's share (%) =
$$\frac{\text{Paiker's margin}}{\text{Final retail price}} \times 100$$
- vii. Wholesaler's share (%) =
$$\frac{\text{Wholesaler's margin}}{\text{Final retail price}} \times 100$$
- viii. Retailer's share (%) =
$$\frac{\text{Retailer's margin}}{\text{Final retail price}} \times 100$$

Results and Discussion

By conducting the examination on Status and economic in-depth analysis of the three fresh fish market, we observed the prevailing situation of Parbatipur upazilla and achieved indispensable results which were synonymous with the earlier studies.

Status of surveyed fish markets in Parbatipur

The status of surveyed fish market in Parbatipur upazilla has presented a real condition in the marketing system of Parbatipur upazilla which is as follows

Structural condition

The marketing activities start at 7.00 A.M. and lasts till 6.00 P.M. but in many cases the duration was observed to change depending on selling and supply of fish as well as consumer's demand. The infrastructure facilities in all the surveyed three markets were found to be in shambles and appeared to be simply inadequate for handling highly perishable commodity like fish. The findings are shown in Table 6.1.

Table 6.1. Comparative study of the infrastructure facilities of the surveyed fish markets

Facilities	Different fish markets		
	Natun bazar	Puratun bazar	Ambari bazar
Floor	Cemented	Cemented	Cemented and Not cemented
Roof	Tin shed	Tin shed	Tin shed and Chatai
Platform	Well developed	Semi developed	semi developed
Electric supply	Present	Present	Present
Sufficient water supply	Absent	Absent	Absent
Water sources	Tube well	Tube well	Tube well and pond
Drainage system	Not well	Not well	Not well
Polythene paper	Used	Used	Used

Source: Authors' calculation, based on Field Study

Marketing channel

The present study indicates that the fish marketing channel starts with the primary fish farmer and passes through a number of intermediaries to end at the ultimate consumer (Fig. 1). Fish farmers carry fish from the remote villages to the bulk handling commission agents for wholesaling and the commission agents have to be paid 3-4% commission from the farmers for the rendered services. The present findings are agreeable with those of Rokeya *et al.* (1997) who revealed that local agents collect fish from farmers on commission basis in the fish distribution network of Rajshahi. With some exceptions, the fish farmers hardly find the chance to communicate directly with the final consumers. Market communication was usually being made through intermediaries. The local paikers transport the fish (about 60%) from fish farmers to the markets on their own or hired transport and sell them to the retailers taking the help of *aratdars*. The fish farmers carried their catch (about 25%) to retailers with the help of *aratdars* (commission agents). The present study also reveals that the fish farmers partially sell their catch to the wholesalers (about 10%) with the help of *aratdars* and the wholesalers in turn sell it to the retailers. In a very exceptional case, farmers carry the fishes (5%) to the markets on their own and sell them to the retailers. All of that involve the active involvement of *aratdars* and *beparies* as a strong link in the existing marketing system. From the survey, it was found that about 10% retailers invested their own money for fish trading while the rest 90% received loans from *aratdars* free of interest.

Sources, availability and amount

The present study reveals that 70% of the fishes come from the local areas (Holdibari, Horirampur, Atrai, Daglaganj, Debiduda, Chirirbandor, Habra, Dangapara, Islampur bazar arot etc.) and only 30 per cent come from as far as India and Myanmar. This more or less conforms to the findings of Ahmed and Rahman (2005) who reported that most of the fish (80%) is supplied from indigenous sources and only 20 per cent is from non-indigenous in Gazipur market. Many fish species such as Indian major

carp (rui, catla, mrigel), exotic fish (silver carp, mirror carp, sarputi, pangus etc.), SIS (mola, batasi, puti, darkina etc.), snake head (taki, shol etc), cat fish (shing, magur, tengra, air, boal etc.), featherback (foli, chital etc.), sard and herrings (*hilsa*) etc. were reported to be available in all the three fish marketing spots.

Flowra *et al.* (2000) also reported the availability of four commercial category fishes and prawn of the North-West region of Bangladesh. On an average, a fish dealer in Puratun bazaar, Natun bazar and Ambari bazar was seen to sell 18-30, 20-45 and 15-35 killogram respectively everyday. The daily traded quantity of fish in Puratun bazar was estimated to be about 0.36 to 0.75 metric ton while that in Natun bazar and Ambari bazaar was estimated as 0.46 to 1.5 metric-ton and 0.2 to 0.63 metric-ton respectively. Ahmed and Rahman (2005) stated that the daily supply of fish in the markets of Gazipur Sadar and Sripur was about 2 to 3 and 1 to 1.5 metric-ton respectively.

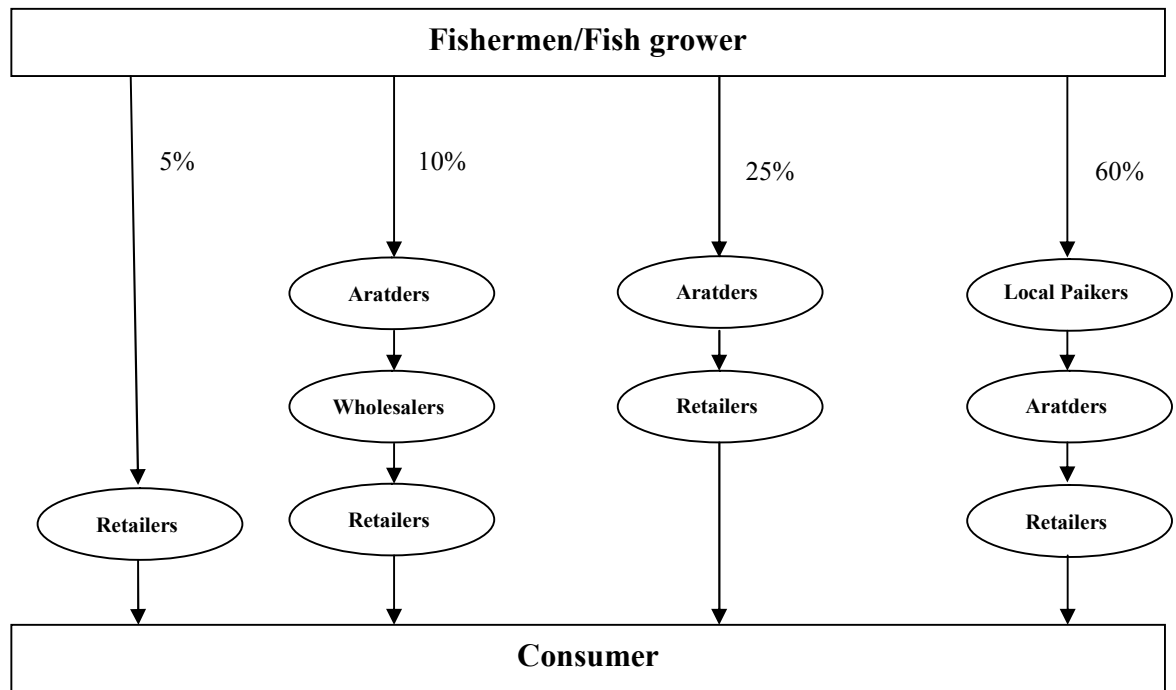


Fig. 6.1. Fish marketing chain from farmers to consumers as observed in the markets under study

Grading, selling and buying

Fishes were subjected to grading based on the species and size, but in some cases smaller sized indigenous fishes were not graded. The price of fishes was determined by open auction process at each intermediate sales point to ensure the maximum prices. In Natun bazaar fish market, many retailers buy different types of fishes with a view to selling those in rural fish retail points. The amount of fishes sold in Natun bazar fish market is more than Ambari and Puratun bazaar fish markets combined together. It appears that the government does not apply regulatory mechanism over the fixation of price of fish for consumers. Price of fish in the retail point was found to be based on the theories of demand and supply, besides this eye estimation was still the common practice for price fixation in some cases. Similar kinds of selling and buying processes were reported by Roy (2008) in Dinajpur district of West Bengal.

Preservation and transportation

Mainly two techniques were visible to be in practice in the surveyed markets viz. live fish in water and iced dead fish. Ice comes from the nearby ice factories. However, in Puratun bazar there is no ice factory. Rahman (1997) advised that all marketing organizations should possess fish freezing and storage facilities as well as localized ice factories to ensure effective fish marketing systems. Different kinds of vehicles were seen to be used for fish transportation and these were mechanized (train, tempo, nosimone, truck, etc.) and non-mechanized vehicles (rickshaw, van, bicycle, etc.). The present findings are nearly similar to those of Siddique (2001) who noted that the middlemen in Mymensingh district used rickshaw, van, train, pushcart etc., Parween *et al.* (1996) and Rokeya *et al.* (1997) who stated that the trucks which carried consignments mostly handled fish distribution in Rajshahi.

Containers and packing

Different categories of containers were found to be in use according to the condition of fish or inherent merits and demerits such as metal containers (Tray, Gamla, Pot, Khancha, Bucket, etc. and non-metal containers (Plastic gamla, Bamboo basket, Plastic basket, etc.). Fishes were seen to be packed with ice and aquatic vegetation and banana leaves or gunny bags in the studied markets. Similar results were found by Parween *et al.* (1996) in Natore and Nawabganj districts and by Rokeya *et al.* (1997) in Rajshahi district.

Constraints

There are some shortcomings which were found in the three fish markets in Parbatipur upazilla namely Natun Bazar, Puratun Bazar and Ambari Bazaar. These shortcomings created some imbalance in the marketing system and hampered normal situation of the market. The constraints found in the market are given in Table 6.2.

Economic analysis

The economic analysis of the three fresh fish markets in Parbatipur upazilla is very indispensable for understanding the pricing system, marketing cost, profit margin etc. which can foster the development of livelihoods of a large number of people linked with the production, distribution and marketing systems.

Pricing

The price of different fish groups is intertwined with the market structure, types of species, quality, size and weight of fish. Traders reported that the price of fish is variable depending on the daily demand and season with the highest in in-season (March to May) and off-season (December to February). Quddus (1991), Siddique (2001) and Rahman (2003)) found identical seasonal variation in fish selling prices, the highest being in summer and the lowest in winter. Shrivastava and Ranadhir

(1995) concluded that fish price was the highest in case of longer than usual marketing channel as it involved high incidental expenses in relation to gross margin in Bhubaneshwar, Orissan, India.

Marketing cost

The marketing cost of a product necessarily indicates the expenses incurred by various sets of intermediaries which entails various marketing actions to reach the product from the producers to the end users. The cost of different components of fish marketing were single out during the study on such heads as transportation, wastages, storage, icing, and miscellaneous expenses. Detailed average marketing costs are shown in Fig. 5. According to Mia (1996), the average marketing cost per quintal of fish incurred by these intermediaries in Muktagachha, Fuljaur and Mymensingh were 555.14, 209.91 and 660.53 Tk./kg. respectively. Gupta (2004) noted that the retailers whose purchase of fish from wholesalers and sale to the consumers accrued a gross margin of Tk 780 per quintal in Fulpur upazila. After subtracting the marketing cost of Tk 78.43 per quintal the net margin stood at Tk 701.57.

Table. 6.2. Different constraints of the surveyed fish markets

Facilities	Different fish markets		
	Natun bazar	Puratun bazar	Ambari bazar
Infrastructure	Not well	Not well	Not well
Poor sanitary conditions	Present	Present	Present
Lengthy marketing channel	Existing	Existing	Existing
Higher transport cost	More	More	More
Unstable production and price	Present	Present	Present
Political disturbance	More	More	More
Drainage system	Not well	Not well	Not well
Packaging facilities	Not well	Not well	Not well

Source: Authors' calculation, based on Field Study

Table 6.3. Net Marketing margin and the intermediaries' share in case of some fish groups in the surveyed fish markets

Fish Groups	Intermediaries	Natun bazar		Puratan bazar		Ambari bazar	
		Net Marketing margin (Tk/kg)	Intermediaries share (%)	Net Marketing margin (Tk/kg)	Intermediaries share (%)	Net Marketing margin (Tk/kg)	Intermediaries share (%)
Indian major carp	Paikar	25	16.04	8.85	9.51	15.1	11.22
	Wholesaler	38.95	23.53	20.73	17.32	13.70	11.22
	Retailer	9.15	6.95	2.22	3.66	13.9	10.27
Exotic carp	Paikar	45	31.25	10.55	9.51	25.1	14.74
	Wholesaler	4.95	6.25	17.06	17.32	19.4	12.61
	Retailer	16.15	12.5	27.93	3.66	13.44	8.79
Cat fishes	Paikar	15	5.15	15.55	3.01	20.1	7.28
	Wholesaler	9.95	3.87	17.06	3.01	20.37	7.77
	Retailer	40.85	11.08	32.22	16.54	32.23	10.68

Source: Authors' calculation, based on Field Study

Net marketing margin

Marketing margin is the difference between the selling price received by the primary producers (Farm-gate price) and the purchase price of the final consumers (Retail price). Net marketing margins include the marketing cost and profit or loss incurred by all actors in the marketing channel. Intermediaries' share (%) in three fish markets under focus is shown in Table 6.3. Ahmed (1983) reported that the primary producers received 50 per cent and the intermediate traders received 65 percent share for rohu and shingi respectively. Ali *et al.* (2008) conducted a study on the cost analysis of fresh fish marketing and found that the marketing margin was 38.38 percent while the producer's share was 61.62 percent. Ara *et al.* (2010) reported that the average marketing margin of return per quintal of fish for fishermen was 305.56 taka and for aratder, paiker and retailer were 334.65, 515.80 and 340.40 taka respectively.

Conclusions and Recommendation

Fish farming is regarded as an industry but the fish farmers hardly get any chance to communicate directly with the consumers. Again, there are also a lot of constraints or limitations in the form of poor sanitary conditions, inadequate infrastructure, lengthy marketing channel, higher transport cost, unstable production and price, political disturbance etc. which hampered the real marketing system. As such, special care should be taken in handling, aging and transportation of fish before placing fresh fish for sale to the consumers. Government and Non Governmental Organizations (NGOs) should therefore take effective steps and programs to develop fish marketing system. If proper steps are taken, it will be fruitful to remove poverty, ensure food safety and satisfy protein demand and to develop the socio-economic condition of the people associated with the fish market in the form of consumer and seller or the both market actors.

Summary

This chapter analyzes the status of fish marketing system in Parbatipur upazilla of Dinajpur district in the northwest region of Bangladesh in March 2014. The marketing chain from farmers to consumers in all the three fish markets was found to pass through a number of intermediaries. Four types of marketing channel were identified. The average marketing cost of retailer was 3.69 Tk/kg. The net marketing margin of the retailers for Indian major carps and Exotic carps were 8.42 and 19.17 Tk/kg respectively. Seasonal variations in prices were observed with the highest in summer (March to May) and the lowest in winter (December to January). A number of constraints were identified. The infrastructure, transportation and packaging facilities were not satisfactory and sufficient in all the three fish markets under survey.

Chapter-Seven

Maize Production and Marketing in Bangladesh

Introduction

Agro-ecologically Bangladesh is a rich country to grow varieties of crops, fresh water and marine fish, poultry, livestock products, cattle feed, forestry, etc. The country has great potential to strengthen her economy through proper and appropriate management of increasing production and marketing. The country has already achieved self sufficiency in food grains. There is, however, a need to achieve food security and supply of nutritious food for the rural and urban people. In that respect the question of high value crop production and marketing is a pertinent issue for the policy makers, researchers, farmers and traders.

Maize is a very important agricultural crop throughout the world. Its production and area coverage in Bangladesh is very little compared to other grain crops. Depending upon the rising demand, area and production of maize have been growing fast in last few years. Hopefully, it will increase faster, if the crop gets proper and faster outlet ensuring the farmers a better price.

Maize can be termed as one of the most versatile crops in the agriculture sector. The whole plant can be used for different purposes. Without having any meaningful importance, maize has been cultivated in Bangladesh from an ancient time in a low scale of production. With the increasing population, the thrust has been given to the intensive cultivation of rice and wheat. From the 1960's and onward vertical and horizontal development strategy has been adopted by public as well as private sector

to boost up food grain production. For the last few years the country has come to realize that maize is a much valued crop in terms of its costs and returns as compared to other crops.

With a view to achieving food security and self-sufficiency in food, maize can be treated as one of the efficient crops with multipurpose uses. Maize is an important cereal crop in many developing and developed countries of the world. The developing countries use it in general as food. But the developed world uses it widely as a major source of carbohydrate in animal feed and as industrial raw material.

World Situation of Maize

In USA uses of maize in 2014 were forecasted to rise in aggregate by 7% compared to the previous year's 2%. One of the main factors likely to give rise to a more rapid increase in ethanol production is the surge in petroleum prices. The expansion in syrup production may be more modest indicating a sluggish prospect in the sugar market.

Table 7.1: World carryover stock of cereals (million tons)

Items	1990	2000	2012
Wheat	260.4	256.9	243.0
Maize	223.4	224.7	204.2
Barley	35.7	28.2	24.9
Sorghum	8.4	8.4	7.5
Others	16.7	14.0	12.6
Rice (Milled)	115.8	161.2	152.9
Total	700.4	693.4	645.0

Source: FAOSTAT-2013

Table 7. 2 : Cereal Export Price (US \$/ton)

Item	2012		2000
	March	January	March
<u>USA</u>			
Wheat	134	134	112
Maize	92	95	95
<u>Argentina</u>			
Wheat	119	120	98
Maize	81	84	85
<u>Thailand</u>			
Rice white	181	187	232
Rice broken	127	137	151

Source: FAOSTAT- 2013

Production Situation in Bangladesh

Maize can grow throughout the year in the sub-tropical climate of Bangladesh. Maize is grown in 3 cropping seasons of the country: (a) Rabi (Nov-Feb), (b) Pre-monsoon (Mar-Jun) and (c) Monsoon (Jul-Oct). Around 84% of the country's maize harvest is in the winter season which requires irrigation, but it requires much less than rice and wheat. Maize can be grown in fallow land and as inter-crop or mixed crop with broadcast aus rice, potato, sweet potato, chilly, groundnut, mung bean, grass pea, sweet gourd, tomato, radish, etc. It is well understood that maize can be an important crop in respects of production and utilization. This can be possible if appropriate technology for maize cultivation and production is adopted. Northern districts are the main maize-producing zone in the country. It is the third major cereal after rice and wheat in Bangladesh.

Although maize is grown almost in all districts in Bangladesh; but its high concentration is found mostly in Rangamati, Dinajpur, Rajshahi, Bandarban and Rangpur. During the last few years, farmers have adopted widely the cultivation of HYVs of maize in their farming systems. It is now extensively used as poultry and animal feed. Roasted and fried maize are also consumed by the people. However, to meet the challenge of maize production in Bangladesh, the farming system research, profitability of maize and its marketing are the key issues to be considered.

Table 7.3 : Production of maize in Bangladesh (1990 to 2012)

Period	Production (metric tons)
1990-91	3,040
1991-92	3,000
1992-93	7,000
1993-94	15,000
1994-95	29,075
1995-96	32,000
2001-2003	88,690
2005-2006	122,279
2008-2009	135,518
2011-2012	200,000

Source:DAE-2014

Considering the importance of the crop the Ministry of Agriculture implemented a project named as Integrated Maize Production Program in the country to disseminate production knowledge and promote seed supplies and use of maize. Besides this, some NGOs e.g., BRAC, Grameen Krishi Foundation are also involved in promoting maize production through contract farming.

Importance of Maize

In the last few years with the development of poultry, dairy and fisheries, especially shrimp industry, the demand of animal feed has been increasing and maize is one of the most important ingredients of poultry, animal and fish feed. Now, rice bran, rice polish, wheat bran and flour have been used as energy source for all these farms. Maize is an energy rich feed ingredient and is comparatively cheaper than wheat and rice.

The rapid expansion of poultry and livestock production strongly indicates that the livestock and poultry feed industries will face feed crisis in the near future. The highly valued product (shrimp) through which the country has earned a lot of foreign currency, integration of maize flour, bran, etc. with fish feed industry may fulfill the increasing demand for energy rich fish feed, which ultimately will help in developing low cost shrimp/fish feeds.

Establish Backward Linkages

Bangladesh is facing acute problem of not having backward linkage of its industries. After 2004 as a signatory of WTO if the country cannot establish backward linkages for the readymade garments there will be the question of sustainability of the industry. Similarly for the rapidly growing poultry, livestock and fisheries industry in the country it is the prime time to establish backward linkages of the feed industry. Dependence on the import of machineries, raw materials, feed, etc. has been enhancing the price of final products. At the same time under the free market economy the international prices and tariff measures also influences the industrial production. In this case every stage of production and marketing should be given priority immediately. In nutritional view-point maize is highly acceptable for human consumption as well as raw materials of livestock, poultry and fish meal industries because of higher content of nutrients.

Table 7. 4 : Comparative nutrition in maize, wheat and rice (per 100 gm. of grain)

	Maize	Wheat	Rice
Wheat Rice Energy (K Calorie)	342	346	346
Protein (gm)	11.2	11.8	7.3
Minerals (gm)	1.5	1.6	0.7
Fibre (gm)	2.7	1.2	0.2
Carbohydrate	66.2	71.2	77.8
Calcium (gm)	10.0	41.0	10.0
Iron (gm)	2.0	4.1	3.2
Riboflavin (gm)	0.1	0.09	0.1

Source: Institute of Nutrition and Food Science, Dhaka University, 2008

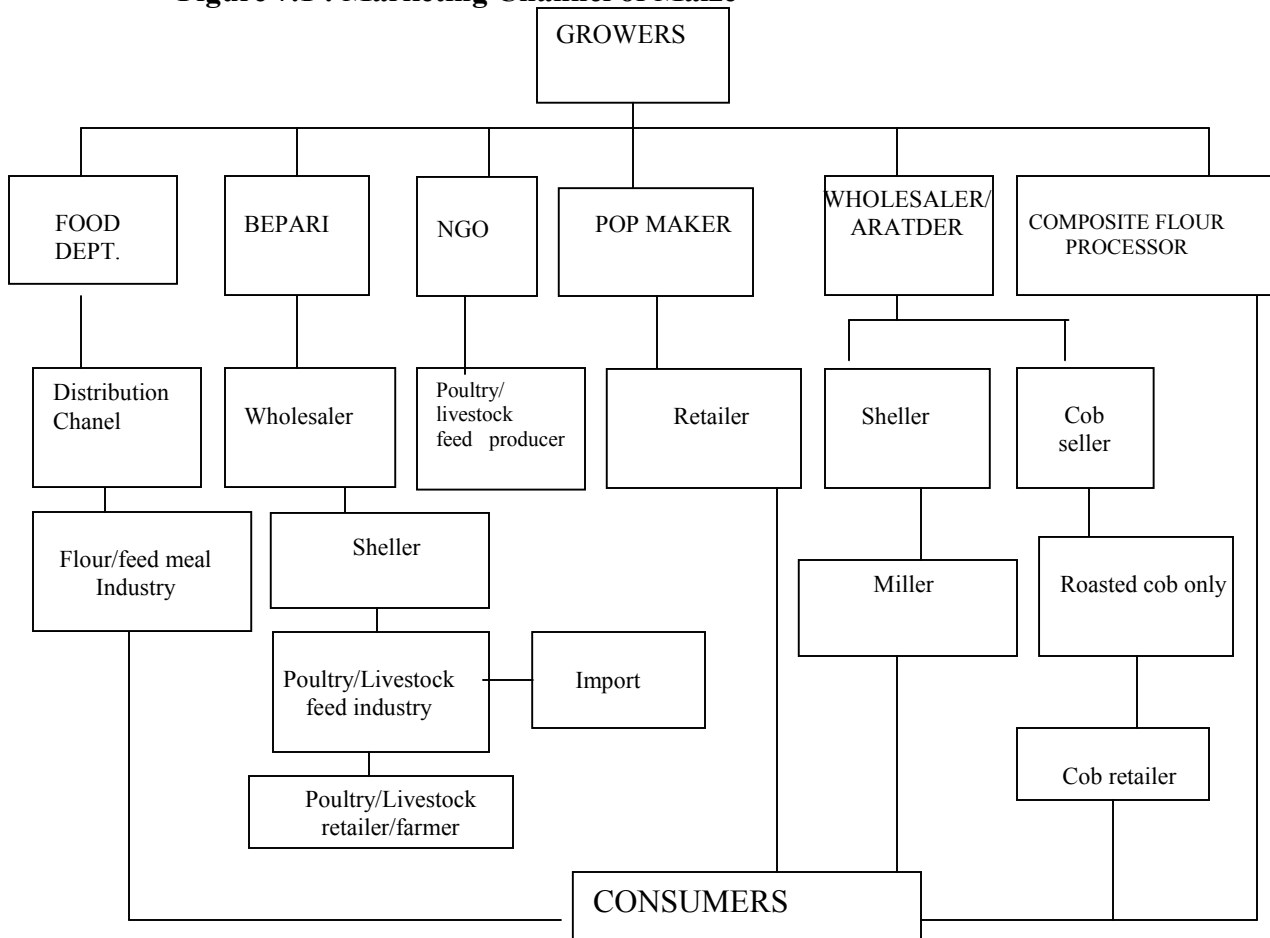
The comparative cost advantage is reasonably higher for maize than other crops. Per KG. cost of maize is Tk. 5-6 where aman paddy around Tk. 7.50, boro paddy around Tk. 7.00 and wheat Tk. 7.22. In this case there is a good rationale for investing in maize cultivation. Most of the livestock, poultry, fish and shrimp farms are importing feed at high costs. The growing feed meal industries are also importing maize at a higher price from outside. There is, however, a good opportunity to invest in and use maize within the country. There is further scope of increasing consumption in future.

Maize is used as green cob in roasted form, farmers' home consumption, snacks products, flour mills, poultry feed, cattle feed, cattle fodder, starch factory and also home use for fuel, etc. Recently, maize is being used in relief and rehabilitation program. There is another grand prospect, hitherto untapped, of producing corn oil which is universally acclaimed as human heart-friendly.

MARKETING OF MAIZE

With increased production the efficient and integrated marketing automatically becomes a vital issue. If the farmers are not getting price incentive the production will not be sustainable. Thus the whole production effort will be jeopardized. Immediately after harvesting the marketing function starts with sorting, grading, threshing, cleaning, loading, packaging, storage, transportation and finally selling for better price, at least, 10-15% more than the cost of production.

Figure 7.1 : Marketing Channel of Maize



Through different chains maize is being disposed off to the consumers and users.

- Beparis purchase maize and sell it to wholesalers who sell to the poultry/livestock feed industry and also to poultry farms (some poultry farms are producing their own required feed by indigenous technology).
- Poultry/livestock feed industry directly purchase maize and sell it to the farmers.
- Wholesalers purchase cobs and sell it to the roasted cob-sellers and also directly to the retailers and consumers.
- NGOs that have contact growers buy produce and sell it to the feed industry who then sells it to the farms.
- Pop makers buy maize from growers and sell it to retailers and consumers. Pop makers directly sell to consumers.
- Green cobs are available at market near to high income residential areas.
- Importers buy maize from international markets and sell it to the industry which then goes to farms.
- After shelling grain the cob is also sold to the consumers as fuel.
- The green plants and leaves are purchased by cattle owners and sometimes village families use their own maize plants and leaves for feeding cattle.
- The roots and stems are used and sometimes sold to village consumers as fuel.
- Pop corn goes to departmental stores through wholesalers and is then sold to the consumers.
- A new channel can be evolved from growers to fish/shrimp feed industry and then the farm.
- Government Food Department purchases maize from growers and through mills makes flour mixed with wheat which is then sold through distribution channels.

Some other components of marketing of maize Drying and storage

In the post harvest time drying and storage is important. As maize seed is very sensitive to fungal attack than paddy and wheat it needs more care at the stage of storage. This Fungus is harmful for food and feed. Its moisture content should be below 13%. Farmers mostly sun-dry grains for storage and keep in traditional

containers. It should be kept in the gunny bags, lined with polythene, tin containers made of MS sheet sealed with lids or earthen containers with polythene will be more hygienic. If the farmers or traders wanted to store for long time then they should sundry at certain intervals to evaporate the absorbed moisture.

Maize Sheller

Farmers are traditionally separating grains from cobs by hand which is not possible when there is a need for shelling large volume of grains. Now- a- day's BARI introduced power sheller for separating grains. But it is essential to introduce low-cost power sheller for the farmers and traders, (1) As far as this study concerns the maize sheller introduced by BARI costs Tk. 15,000-20,000/- per machine. (2) One private entrepreneur in Khustia introduced maize sheller which costs Tk. 5000-6000/- per machine. The threshing capacity of this machine is 30-50 kg per hour (3) Most of the small traders already introduced one wheeler thresher for maize which costs Tk. 300-400/- per machine. The threshing capacity of the machine is 20-35 kg per hour.

Patenting under the WTO Regulation

The country should make the people aware of having the patent rights of their produced machine and products under the agreement on Trade Related International Property Rights. Otherwise the products will not be registered by the LDC, developing countries.

Prices of Maize

The price varies in different seasons. The price is also influenced by the price of imported maize. Sometime smuggled maize grain is coming into the country from India which created the problem of low price of the local maize. In our country almost 60% maize grain are imported. Local production can cater around 30% of the requirement. Round the year supply in the market is mixed up with locally produced and imported grain.

It is noticeable that in the peak season the farmers are selling maize cob at Tk. 0.50-1.00 apiece, on the other hand at the Dhaka retail market the same is sold at Tk. 3.00-4.00 apiece. The Government has included maize in the procurement program. The target of procurement has been set at 5000 mt with the floor price of Tk.7.00 per Kg.

OPPORTUNITIES OF USES AND MARKETING OF MAIZE

Maize as Food

According to the information of FAO, the annual per capita consumption of maize of the populations of Mexico, Chile, Latin America, Caribbean, Cuba, Guatemala, and many other countries is around 81 kilograms and 69% of the calorie intake in food grains is met up by maize. In our country, there is a significant demand of roasted green maize cob, popcorn, flour, fried flour, etc, taken in a traditional way. The following diversified processed foods made from maize can be marketed and consumed.

- Composite flour
- Bread from composite flour
- Maize powder mixed with wheat, rice, soybean, potato flour
- Paratha with composite flour
- Luchee with composite flour
- Dalpuree with composite flour
- Bread with maize and potato
- Piss-pass with maize
- Rice mixed with maize and different types of pulses and spices
- Maize porridge
- Maize chicken soup
- Maize salad
- Hot soup with maize
- Boiled maize

- Maize curry
- Confectionery maize
- Maize polau
- Popcorn
- Some local processed foods with popcorn like: mua, murki.

Problems in the use of Maize as Food

- People are not well informed about the different uses of maize as food.
- Many people do not know the recipes of food made from maize.
- Even a lot of educated people are not aware that maize can be one of the main staple foods. As a result, they bear a negative attitude towards maize in mind,
- Flour or coarse flour of maize is never imported or distributed to the common people. The sale of maize grains or maize flour in local markets has not been started. Hence, the availability of maize as food or other uses is poor.

Measures to be taken to promote maize as food

(a) Since unripe maize cob are already somewhat popular, it is necessary to take some steps to make it more popular:

- Maize should be grown in villages near urban areas or in suburban homesteads.
- Supply of good quality seeds should be ensured.
- Exhibitions should be organized in schools and other community places.
- Common people should be educated about the qualities of maize as food.

(b) The following steps should be taken to make the other known and unknown foods of maize

- Common people should be made aware of the nutritional qualities of maize and recipes of its foods. Small leaflets/folders should be distributed to the appropriate people.

- Food, that common people consume, should be prepared and shown in exhibitions.
- Posters containing attractive pictures should be made and presented in markets, schools, colleges, bus stands, rail stations, community places etc.
- Maize grains or flour made from ungerminated maize should be distributed in relief work or food-for-work programs.
- Market procedure should be initiated by fixing price and controlling procurement of maize.
- Machines to separate maize embryo should be distributed locally or imported from abroad.

(c) Measures to promote popcorn

- Cultivation should be arranged at small-scales in homesteads.
- Supply of good quality seeds should be ensured.
- People should be informed about the process of making popcorn.
- Popcorn should be made instantly and supplied in stalls at urban supermarkets, cinema halls, schools, etc.
- Exhibitions should be arranged to present foods apart from popcorn: e.g. mua, murki, etc.
- Popcorn-making machines, which are cheap and easily portable, should be imported and distributed for industrial purposes.

Cattle Feed Industry

There is a significant lack of cattle/animal feed in Bangladesh. In our country wheat bran is used as the main ingredient of cattle feed. The nutritional value of wheat bran is low; 60% of it consists of fiber. Besides, wheat bran contains a substance called ocrulet salt which, in large quantities harms the health of cattle. Maize can play an important part as the substitute or supplement to wheat bran. The green leaves, stems and grains of maize can be used as good quality cattle feed in the same way that maize grains are nutritional as human food. Maize grains have a high calorie and a

low fiber content. In the protein-rich variety of maize, the nutritional qualities of proteins are also good.

Different parts of the maize plant can be used as feed for domestic animals. Silage made from its plant can also be fed to cattle. Grass preserved in airtight conditions is called silage. In this process, grass is stored in underground holes or trenches. This grass can be fed to cattle in seasons when there is a shortage of grass. Since this contains a lot of starch, there is no need to add molasses.

Poultry Feed Industry

In agrarian economy of Bangladesh poultry farming is one of the important industries which can play a great role in economic development: Almost 85% of the rural population is involved in keeping poultry. Poultry plays an important role as an economical food of superior quality in the daily lives of agricultural people. Poultry and eggs form the main source of animal proteins for rural people. In the socio-economic context of Bangladesh small, landless farmers cannot earn their livelihoods from the production of crops alone. Hence, animal resources and poultry constitute a major source of income for these people.

At present in Bangladesh only wheat is used as the source of grains needed to produce balanced poultry feed. However, in many other countries of the world, maize is used as the major source for this purpose. Apart from maize, the other sources of grains for poultry feed in Bangladesh include linseed oil cake, powder of dried fish, rice husk, fine wheat husk, small amounts of nut oil cake and mustard-oil cake, coconut-oil cake, fish oil or soybean oil, shell powder, salt, mixed vitamins and minerals, maize and soybean-oil cake. Despite availability of better food constituents to produce poultry feed, there is no sufficient supply of these in Bangladesh. In recent times, farmers in the poultry industry are procuring maize and soybean meals from different areas in the country or from India to produce balanced poultry feed.

Among different grain feed constituents, maize is considered to be of superior quality; in addition, maize used singly in mixed poultry feed does not pose any problem. It is a tasty feed for poultry and is digested easily. About 50% of poultry feed needs to be composed of grains. Maize grains have the highest amount of calorie content among all the grains. In addition, maize has a high content of vitamin B 1. Due to high carotene content of yellow maize, the yolk of eggs of poultry turns yellow. There will be no problems with the color of the egg-yolk if 25% of poultry feed is composed of maize. In our country, wheat is the main grain used in poultry feed; as a result, the egg-yolks are white in color. It should be mentioned that the nutritional value of eggs is not related to the color of the yolk. However, buyers generally prefer eggs with yellow yolks.

With the increase in the number of commercial poultry farms, the demand for grain feed also rises. Wheat, the only grain used in poultry feed, cannot keep pace with the rising demand of this industry. Hence, the demand for maize is rising every day.

Fish and Shrimp Feed Industry

Maize is a cereal grain which is mainly used as livestock feed. Maize has also been fed successfully to fish and shrimp. It is palatable and suitable for fish and shrimp. The nutritive value of maize is high and almost equal to wheat and rice but maize is comparatively cheaper than wheat and rice which can be successfully utilized in place of rice (rice bran, rice polish) and wheat (wheat bran, wheat flour) in fish feed formulation. Maize can be used as fish feed in the form of maize flour, maize meal, maize gluten meal, maize bran, maize germ oil meal and maize starch.

Fish and shrimp farmers mostly don't know that maize is a good source of raw materials for feed and they can produce it in their own area. If maize becomes available and remain cheaper than the imported feed then it is obvious that it can play a vital role for fish industry as well.

Maize as an Industrial Input

In addition to the use of maize in preparing different types of food it can also be used as industrial raw material. Maize-based industries have not developed in our country probably due to the limited cultivation of maize. However, every year this country imports 15-20 thousand tons of starch. Production of the same quantity of starch requires 30-40 thousand tons of maize. A huge amount of foreign currency can be saved if starch and other industrial materials can be produced in the country using home-grown maize.

Maize grains are used as industrial raw material to produce starch. The dried grains of maize contain about 66% starch. At present, raw material of starch in Bangladesh includes mainly cassava, sweet potato and seeds of *tetul*. Starch production from these materials is costly.

Starch is also used in various other industries. These include textile mills, herbal medicine industry, paper mills, mines, asbestos board making, different types of cosmetics, plastic, tablet making in medicine, toy packaging, making of moulds of different machines and machine-parts and drycell batteries. Different grades of starch are used in these industries in different ways.

Maize Oil

Corn oil is produced as a by-product in starch-based industries. Maize grains (embryo) contain 7-12% oil. Corn oil is colorless, odorless and contains many essential fatty acids. Thus, it is considered to be a food-oil of superior quality. In addition, corn oil is used in manufacturing industries of gunpowder, chemicals, paint, varnish, artificial rubber, soap, bakery products, mayonnaise, rust-resistant materials, liquid oil, etc.

Corn Flake Industry

Cornflake is one of the important items of break fast and snacks throughout the world. It is a very good product for the children, old people and the patients. Cornflakes can be fortified with iron and/or vitamin which will give added nutritional value. Its market has been created in the country. The imported flakes from India, Pakistan, USA, etc. are now meeting the demand. Imported flake is costly for the middle and lower middle class families. In the context of rapid urbanization and involvement of women in service/job the demand of this type of product is increasing. Maize is the main raw material of corn flake industry.

Fuel for Household Use

It has a great demand as fuel substitute of firewood and kerosene in the country. Every year significant number of trees is destroyed as firewood which has been creating environmental imbalance. As there are a lot of diversified uses and the demand for increased marketing of maize will not be a problem, if production increases. These industries can also diversify products with the same or a little more capital investment.

Maize-Based Cropping Patterns

Farmers are found to follow many cropping patterns in their farms some of which are maize-based patterns. Bangladesh Agricultural Research Institute (BARI) has developed some maizebased cropping patterns which are given below:

- i. Maize-T. Aman-Potato
- ii. Maize-Mungbean-Mustard
- iii. Maize-Fallow-Wheat
- iv. Maize-T. Aman-Chickpea/Mustard/Linseed
- v. Maize-Fallow-Rabi crops
- vi. Maize-Fallow-Vegetables

- vii. Maize-Groundnut
- viii. Aus/T. Aman-Fallow-Maize
- ix. Vegetable-Fallow-Maize
- x. Vegetable-T. Aman-Maize
- xi. Aus/Jute-T. Aman-Maize
- xii. Groundnut-Maize
- xiii. Hybrid maize-T. Aman

Benefits from Maize-Based Cropping Patterns

- i. Total annual income from the maize-based cropping patterns is much higher.
- ii. The quantity of by-product at the rate of 5 ton/ha can be available in addition to main product.
- iii. Green plant and leaves can be used as cattle feed.
- iv. Maize has deep root zone. So it has drought tolerant capacity and can be used safely in the drought conditions.
- v. It can be harvested 10 days earlier than broadcasted aus and for this reason the next crop can be planted timely.
- vi. There is a pulse crop in the Maize-Mungbean-Mustard cropping pattern which is leguminous crop. It increases soil fertility as well as it adds additional food for human consumption.
- vii. The benefit-cost ratios from the maize-based cropping patterns are much higher and must be quantitative than many other cropping patterns.

Maize as Intercropping

BARI has developed some maize-based intercropping practices which are found economic to the farmers. These are as follows:

- i. Maize+Groundnut
- ii. Maize+Mungbean
- iii. Maize+Blackgram
- iv. Maize+Soyabean

- v. Maize+Radish
- vi. Maize+Red ammaranthus
- vii. Chilli+Maize
- viii. Sweet potato+Maize
- ix. Sweetgourd+Maize
- x. Khesari/Mator+Maize(no tillage)
- xi. Potato+Maize
- xii. Tomato+Maize

Benefits from Intercropping

- i. More production from the same land
- ii. More income but less cost
- iii. Less risk of production
- iv. More crops can be produced in the limited land according to the demand of the family
- v. Production and income can be assured at least for a reasonable time
- vi. Less infestation of disease, insects and weeds
- vii. Increases soil fertility

Cost and Returns of Maize

Farmers cultivate maize for different reasons. This study found that the farmers cultivated maize mostly due to easiness to produce, higher yield and for livestock and poultry feeding. Farmers cultivate crops only when they find it profitable to them. This study found that the average cost of open-pollinated maize production was Tk 28,137/ha on full cost basis and Tk 20,873/ha on cash cost basis. Only the variable costs were considered for the analysis. The cost of maize production was higher in Dhaka (Tk 30,849/ha) than in Rangpur (Tk 25,421/ha). The higher cost in Dhaka was mainly due to higher cost of human labor.

Returns from Maize

The average gross return from open-pollinated maize was Tk 45,714/ha and it was higher in Dhaka (Tk 47,709/ha) than Rangpur (Tk 43,719/ha). The gross margin (Tk 18,298/ha) and the benefit cost ratio (1.72) were found higher in Rangpur on full cost basis due to lower costs. The return to irrigation per Taka invested was little higher in Dhaka (Tk 10) than Rangpur (Tk 9). This higher return was due to lower irrigation cost. The average return to human labor was found to be Tk 179/day against the wage rate of Tk 80/day.

Marketing System of Maize

There is a bright prospect of maize in Bangladesh due to its better yield, food value, diversified uses and environmental suitability. Maize can be cultivated at least in 18 lakh hectares of land. This crop can be cultivated in most of the areas in the country with normal tillage, little tillage or no tillage and with and without irrigation. In comparison to many other crops, it has higher yields, it has drought tolerant capacity and it has less disease and insect infestation. Yet, its cultivated area is not very large mainly due to its marketing problems.

For any crop, its marketing greatly depends on its demand. At present, the demand of maize for eating is limited to roasted and fried cobs. BARI study (2013) found that 72 percent of the farmers sold maize in the form of cobs and 28 percent in the form of grain. It is again confined in and around the cities and towns. Therefore, the purchase and sale of maize is not sustained due to its irregular supply. The following reasons can be mentioned under these circumstances:

- i. Still maize is not considered as an important food
- ii. Maize-based industry has not yet developed
- iii. Food habits on maize has not yet developed
- iv. Knowledge on the storage system of maize is very limited
- v. Procurement of maize is absent at the government level
- vi. No attempt has been made on the export promotion of maize.

Marketing Costs and Profits of Maize

Marketing Cost of Maize

The important cost items of maize marketing are found to be transport, loading and unloading. This cost was calculated on the basis of the actual expenses. The total marketing cost varied from Tk 200/ton (NGO) to Tk 585/ton (bepari). The cost of local bepari was higher due to higher transport cost. The other costs included storage cost and personal expenses.

Marketing Margins and Profits

The higher margin was found for NGO (Tk 1500/ton) due to higher sale price followed by bepari (Tk 1200/ton). The profit was also found higher for NGO (Tk1300/ton) due to lower cost and higher margin. Although the profit of the wholesalers were found to be the lowest (Tk 20/ton) but their volume of transactions were much higher than other groups of intermediaries.

CONSTRAINTS OF MAIZE MARKETING

As maize production trend is positive and is expected to increase in future the most crucial problems for marketing are:

Market Information

- Lack of information of internal and international prices of maize, import volume, tariff measures in the country and importing countries, volume of consumption and requirement of different industries and timely dissemination of these information to the users, traders, growers and consumers.

Appropriate marketing technologies

- Proper marketing technologies like cheaper machines for shelling, grading, packaging, storing etc.
- No provision of marketing credit
- Lack of contract marketing
- Lack of farmers' associations for group marketing
- Lack of proper knowledge of procuring technologies
- Non-availability of homestead processing as pilot project etc

CONCLUSIONS

Export Market: The demand of maize is increasing due to its international demand as well as for home consumption. So, the increased production of maize can meet the local demand as well as the excess amount can be exported to other countries to earn foreign exchange. Export market should be explored for maize grains or its processed products like animal feed and other processed products.

Development of Maize-Based Industry: Recently huge production of maize is found in different parts of the country. But these are not properly utilized due to its limited use. Therefore, maize-based industry is an urgent need in the country due to the production of animal feed, fish feed and human food such as starch, flakes, chemicals, corn oil, fuels, etc.

Demonstration of Maize Foods and Other Uses: There is still a very limited use of maize mainly as fried and roasted cob. So, to popularize the crop and increase its demand, field demonstrations of different food items of maize and other uses should be organized from time to time in different maize growing areas of the country. For this purpose, mass media and different leaflets can be utilized for its campaign and advertisement.

Supply of Funds: Different maize programs should be taken by the researchers as well as by the extension personnel for the improvement of the crop. Necessary funds should be provided to them for research and extension work. Farmers should also be encouraged through credit support. Government intervention is necessary for these purposes.

Technical Knowledge: Many farmers still are not aware of the improved methods of maize cultivation. They should be provided technical knowledge through short-term training programs especially in the intensive maize growing areas. The benefits from maize cultivation should be communicated to them. The knowledge of shelling system with the shelling machine should be available to the farmers timely. The researchers, extension people and NGOs can play an important role in this regards.

Seed Production Program: Non-availability of good and quality seeds is an important problem in the farmers' fields. So for its availability, seed production programs can be taken up with the selected contract growers in different areas. BADC, DAE and NGOs can take up this program in different maize growing areas.

Demonstration Plots: There are still many farmers who are not aware of the cultivation of maize. For this purpose, strong extension program should be taken in the farmers' fields through its demonstration of a package of improved technologies. On-farm trials are very important in this regard.

Linkage between Farmers and Poultry Farms: There are many farmers who are not producing maize due to selling problem. This is simply the communication gap. There is sufficient demand of maize in the poultry farms. If the linkages between the farmers and the poultry farm owners (or other purchasers) are created the farmers will be interested to produce more maize. The extension people and the personnel involved in the program can help the farmers in this regard.

Procurement of Maize Grain: If the farmers get fair prices of the crop and get assurance of selling the crop timely, they will be interested to bring more areas under cultivation which will result in more production of the crop. The government intervention is necessary for the matter.

Necessary Tables

Table-7.5 : Farm level maize area in different locations

Location	Maize Area (ha/farm)
Rangpur	0.44
Rajshahi	0.47
Dinajpur	0.22
Nilphamari	0.53
Jessor	0.47
Dhaka	0.44
Narayongonj	0.08
Rangamati	0.25
All Areas	0.36

Source: BARC 2014

Table-7.6 : Cost of production of maize

Cost Item	Open-Pollinated		
	Rangpur	Savar	All Areas
1. Human labour:			
Family	3000	4320	3660
Hired	2640	8080	5360
Total	5640	12400	9020
2. Animal Power:			
Family	720	300	510
Hired	600	500	550
Total	1320	800	1060
3. Power tiller (hired)	600	741	671
4. Seed (purchased)	2090	2200	2145
5. Cowdung (owned)	1220	1498	1359
6. Fertilizers:			
Urea	3156	2689	2923
TSP	3878	3430	3654
MP	2210	1930	2070
Gypsum	740	380	560
Borax	360		180
Zinc sulphate	272	510	391
Total	10616	8939	9778
7. Insecticides	-	592	296
8. Irrigation	2367	1778	2072
9. Interest on op. cap.	1568	1901	1734
10. Total cost:			
Full cost basis	25421	30849	28137
Cash cost basis	18913	22830	20873

Source: BARC 2014

Table-7.7 : Returns from maize

Items	Open-Pollinated Maize		
	Rangpur	Dhaka	All Areas
1. Total cost (Tk/ha):			
Full cost basis	25421	30849	28137
Cash cost basis	18913	22830	20873
5. Gross returns (Tk/ha)	43719	47709	45714
6. Gross margin (Tk/ha):			
Full cost basis	18298	16860	17577
Cash cost basis	24806	24879	24841
7. Benefit cost ratio:			
Full cost basis	1.72	1.55	1.62
Cash cost basis	2.31	2.09	2.19
8. Return to labour (Tk/day)	170	189	179
9. Return to irrigation per Taka invested	9	10	9

Source: BARC 2014

Table-7.8 : Returns from traditional and improved cropping patterns

Items	Cropping Pattern							
	Traditional				Improved			
	Aus	T.Aman	Potato	Total	Maize	T.Aman	Potato	Total
Yield (t/ha)	1.69	2.75	8.62	-	4.87	4.45	26.98	-
Cost (Tk/ha)	5366	7784	14559	27709	7610	8296	28635	44541
Gross Return (Tk/ha)	8076	14403	26314	48793	22177	22171	63295	107643
Gross Margin (Tk/ha)	2710	6619	11755	21084	14567	13875	34660	63102
Additional Cost (Tk/ha)	-	-	-	-	2244	512	14076	16832
Additional Gross Return (Tk/ha)	-	-	-	-	14101	7768	36981	58850 (121)

Source: BARC 2014

Bracketed figure represents the percentage of the additional gross return.

Table-7.9 : Returns from traditional and improved cropping patterns

Items	Cropping Pattern					
	Traditional			Improved		
	Aus	Mustard	Total	Maize	Wheat	Total
Yield (t/ha)	1.31	0.47	-	5.60	1.78	-
Cost (Tk/ha)	3624	2477	6101	5055	4489	9544
Gross Return (Tk/ha)	11600	5280	16880	40167	7887	48054
Gross Margin (Tk/ha)	7976	2803	10479	35112	3398	38510
Additional Cost (Tk/ha)	-	-	-	1431	2012	3443
Additional Gross Return (Tk/ha)	-	-	-	28567	2607	31174 (185)

Source: BARC 2014

Bracketed figure represents the percentage of the additional gross return.

Table-7.10 : Comparative cost and returns of maize and other crops

Crop	Total Cost (Tk/ha)	Yield (kg/ha)	Gross Return (Tk/ha)	Gross Margin (Tk/ha)	Benefit Cost Ratio	Crop Duration (day)
Boro Rice	15474	3988	21738	6264	1.40	150-180
Chickpea	2540	900	5598	3058	2.18	115-130
Cotton	6897	676	9464	2567	1.37	180-240
Lentil	5774	710	7182	1408	1.71	100-115
Mustard	2756	550	4594	1838	1.67	90-105
Onion	14906	4722	23232	8326	1.56	130-135
Pineapple	19815	4140	32398	12583	1.64	590-610
Potato	18969	20350	27383	8414	1.44	90-95
Maize (kharif)	5859	29208*	12399	6540	2.12	90-110
Maize (rabi)	6831	32848*	16511	9680	2.42	125-145
Wheat	9,576	2,325	14,466	4,890	1.51	100-120

* No. of cobs per hectare

Source: BARC 2014

Table-7.11 : Marketing cost of maize of different intermediaries

Intermediaries	Marketing Cost (Tk/ton)			
	Transport	Loading and Unloading	Others	Total
Bepari	475	20	90	585
Wholesaler	100	50	80	230
NGO	100	20	80	200

Source: BARC 2014

Table-7.12: Marketing margin and profit of maize of different intermediaries

Intermediaries	Purchase Price (Tk/ton)	Sale Price (Tk/ton)	Marketing Margin (Tk/ton)	Marketing Cost (Tk/ton)	Profit (Tk/ton)
Bepari	7550	8750	1200	585	615
Wholesaler	8500	8750	250	230	20
NGO	8500	10000	1500	200	1300

Source: BARC 2014.

Chapter-Eight

Marketing of Poultry and Dairy Products

Poultry

Introduction

Bangladesh has experienced dramatic growth in the poultry industry with the emergence of successful commercial operations over the past 10-15 years. Although the outbreak of highly pathogenic avian influenza (HPAI) since 2007 has been a setback, by all accounts, demand for poultry products is likely to keep growing in the near future as long as the outbreak is controlled and proper measures instituted to regulate the industry, ensure food safety, and restore consumer confidence. Large-scale commercial operations are well established, but the development of more small and medium enterprises (SMEs) would generate employment and potentially serve as an important avenue for poverty reduction in rural areas. This chapter focuses on the opportunities and constraints for SMEs in commercial poultry and dairy production, marketing and processing.

Demand and Market Size

Demand for poultry products (eggs and meat) have been growing rapidly. According to the 2010 HIES, rural residents consumed an average of 26 eggs per person per year and 2.2 kilograms of poultry meat. Consumption levels are much higher in urban areas where per capita consumption of eggs was about 44 eggs and average poultry meat consumption was 3.8 kilograms. Estimates based on HIES data from 1995/96 and 2010 indicate that the production of eggs increased by around 3 percent per year between the period while production of poultry meat

increased by just over 10 percent. According to official production data, Bangladesh produced 0.3 million tons of poultry meat and about 5,625 million eggs in 2010 which translates into a supply of 2.6 kilograms of poultry meat and about 41 eggs per capita per year. The production figures for poultry meat match extremely closely with the HIES estimates although they seem to overestimate egg production by 34 percent.

The market share of the commercial poultry industry has increased rapidly over the past decade. Today around 43 percent of meat sold in urban areas is broiler meat produced commercially. Local chickens are still preferred to broilers in rural areas. Commercial operations supply almost 80 percent of the eggs sold on the market. In 2010 the size of the commercial poultry industry was estimated at US\$ 600 million; the broiler meat segment was valued at US\$ 368 million and the egg industry at US\$ 253 million (World Bank, 2013). The same study estimated the value of the input and service industry catering to the poultry industry at US\$ 197 million of which the day-old chick (DOC) segment was valued at US\$ 115 million and the feed industry at US\$ 66 million.

The poultry meat market is dominated by live birds sold in the open markets. The market for dressed or processed poultry is very limited with demand coming largely from richer consumers and emerging fast-food chains. Two large producers have started processing on a very small scale and others are ready to invest as soon as they find the consumer market ready for intake.

H5N1 is a significant challenge for the poultry industry. Avian influenza was first detected in February, 2007; as of June, the virus had spread to 16 of 64 districts. So far, 238,777 birds have been culled from 73 farms, of which 51 had birds that tested positive for H5N1, the strain of influenza virus that is of particular concern. The reported outbreaks have occurred mostly in layer farms. The impact of the H5N1 virus is likely to be particularly serious for the industry and for the welfare of many poor rural households that depend on poultry farming as an important

source of income and employment. The high density and close interaction between human and poultry populations imply that the risk of transmitting the virus from poultry to humans is potentially high.

In the week following confirmation of the outbreak, broiler prices (both farmgate and retail) fell by about 50 percent; egg prices declined slightly less by about 30 percent. Prices recovered slightly in the ensuing weeks. Current retail prices for broilers are about 9 percent lower than before March 22, 2007 and farmgate prices are 6 percent lower. Current retail prices for eggs are about 11 percent lower than before March 22, 2007 and farmgate prices are about 6 percent lower.

In the short term, it is likely that HPAI will cause the consumption of poultry products to fall substantially. In the long term, however, consumption of poultry products is expected to recover particularly because of the high demand for cheap protein as fish and beef are becoming more expensive. In Vietnam, where 45 million birds were culled during the first HPAI outbreak in 2004, GDP fell by an estimated 0.12 percent in 2004 as a result. In addition to the birds that had to be culled, egg production declined. Yet the 2004 outbreak in Vietnam led to very important substitution effects, especially the production of other types of meat (in this case pork). The growth in substitute livestock production softened the economic impact at the macro level (World Bank 2005).

Early identification of HPAI and the immediate culling of diseased or suspected animals are critical steps for reducing the risk that the disease will spread. The cooperation of farmers in complying with disease reporting and culling requirements is most frequently achieved by compensating them for the losses incurred. An effective compensation scheme for farmers encourages early reporting and reduces the time between the discovery of an outbreak and containment actions.

Small and Medium Commercial Poultry Enterprises

The introduction of commercially produced broilers and eggs over the past 10-15 years has taken most of the urban market for these products away from traditional smallholder and backyard producers. Presently almost 60 percent of poultry is commercially produced. An estimated 130,000 small and medium commercial farmers are involved in the industry, each with an average of about 1,000 birds. In addition to these SMEs around a dozen large integrated poultry operations have more than 10,000 broilers and 6,000 layer birds. Most large integrated poultry farms have contractual growing arrangements with SMEs. Estimates indicate that 80 percent of broilers are produced by SMEs and only 20 percent by large integrated companies (World Bank 2013).

Table 8.1: The poultry industry in Bangladesh (numbers in millions)

	2006	2007	2008	2009	2010
Fowls	142.68	152.24	162.44	172.63	183.45
Backyard	57.07	60.9	64.98	69.06	73.38
Commercial	85.61	91.34	97.46	103.57	110.07
Ducks	33.83	34.67	35.54	36.4	37.28
Backyard	33.83	34.67	35.54	36.4	37.28
Commercial	0	0	0	0	0
Total	176.51	186.91	197.98	209.03	220.73
Annual growth					
Backyard fowls		6.7%	6.7%	6.3%	6.3%
Commercial fowls		6.7%	6.7%	6.3%	6.3%
Backyard ducks		2.5%	2.5%	2.4%	2.4%

Source: Researcher's Personal communication with the poultry association

Almost 60 percent of households in Bangladesh report owning poultry (HIES 2010). Research has shown that smallholder poultry farming can play an important role in poverty alleviation, especially for women, partly because barriers to entering the business are low and partly because poultry rearing is a familiar

activity (DANIDA 2005). The growth of the commercial poultry industry has also generated direct and indirect employment opportunities. It is estimated that almost 2 million workers are employed in poultry farms and that additional employment is created in feed mills, hatcheries, and the input supply and service industry catering to poultry producers.

Growth of the commercial poultry industry has led to rapid growth in the input supply and service industry. There are now 8 grandparent stock farms and 123 parent stock farms in Bangladesh. While a number of farms import DOCs as parent stock, the share of locally produced parent stock has grown rapidly from 2.5 percent in 2003 to 47 percent in 2010. The feed industry has also grown apace. Currently about 54 medium and large mills produce about 4,000 tons of feed per day. An expanding machinery and equipment industry caters to poultry producers. A number of local and multinational pharmaceutical companies have started to manufacture medicines to support poultry production although most important medicines and vaccines (almost all antibiotics, vitamins, and growth hormones) are still imported. Diagnostic services are provided by 10 private laboratories in addition to government laboratories. Veterinary services are provided by the private sector as well as government veterinarians.

With the exception of the feed industry, the input supply and service industries have not yet developed as individual industries, and the major players are still the large integrated companies.

When the commercial poultry industry started, related input supply and service industries were not very developed. The first commercial producers experienced significant difficulty in getting the right quality and quantity of inputs on a timely basis. Consequently, most large-scale commercial farmers developed an integrated system in which inputs such as DOCs, feed, and animal health services were supplied from within the company. This pattern has spread to the SMEs and it is common for suppliers of DOCs to provide other inputs and services including

feed, medicine, production technology, advisory services, marketing, and even financial services. The downside of this trend is that most small and medium producers of broilers or eggs rarely benefit from competition between suppliers and tend to be bound to one supplier through a variety of arrangements.

Contract farming is prevalent in the large-scale commercial poultry enterprises in Bangladesh and has contributed to its growth. In India, contract farming has been shown to be an important institutional arrangement for supplying credit, insurance, and technology to poultry farms (Ramaswami, Birthal, and Joshi 2006). Developing strong SME poultry producer associations would facilitate sustainable contract farming systems.

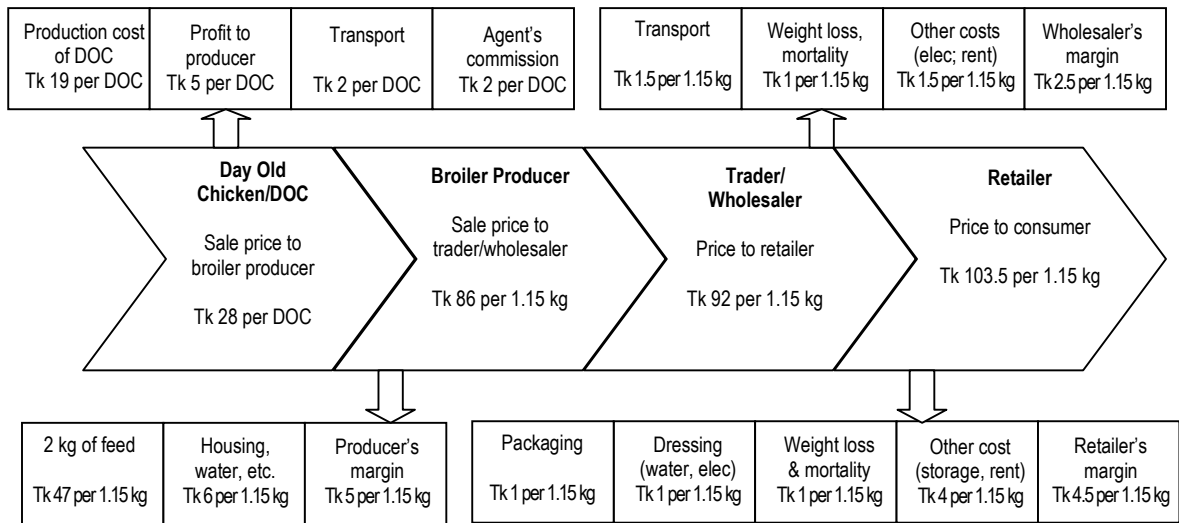
Value Chain for Commercial Broilers and Layers

Profit margins are quite low for small and medium producers of commercial broilers and eggs; these producers also tend to bear a greater share of risk than all other stakeholders, at least, among the noncontract producers. Obtaining accurate data on costs and prices is difficult for the poultry industry in Bangladesh, particularly, because most inputs are delivered by one company making it difficult to separate cost components. The value chains in figure 8.1 and figure 8.2 provide some indicative estimates, however. Input prices (particularly the price of DOCs) as well as producer prices are highly variable resulting in wide fluctuations in producer margins. Major costs for small and medium producers of broilers are the costs of DOCs and feed. In 2013 costs for DOCs and feed accounted for about 33 percent and 55 percent of the total cost of production for SME producers respectively (figure 8.1). It is reported that DOC production in Bangladesh is often below market demand contributing to high prices.

Feed costs are also higher in Bangladesh than in India, so Bangladeshi poultry producers are at a cost disadvantage compared to Indian producers. The main ingredients in commercial broiler feed are maize (50 percent), soybean cake (23

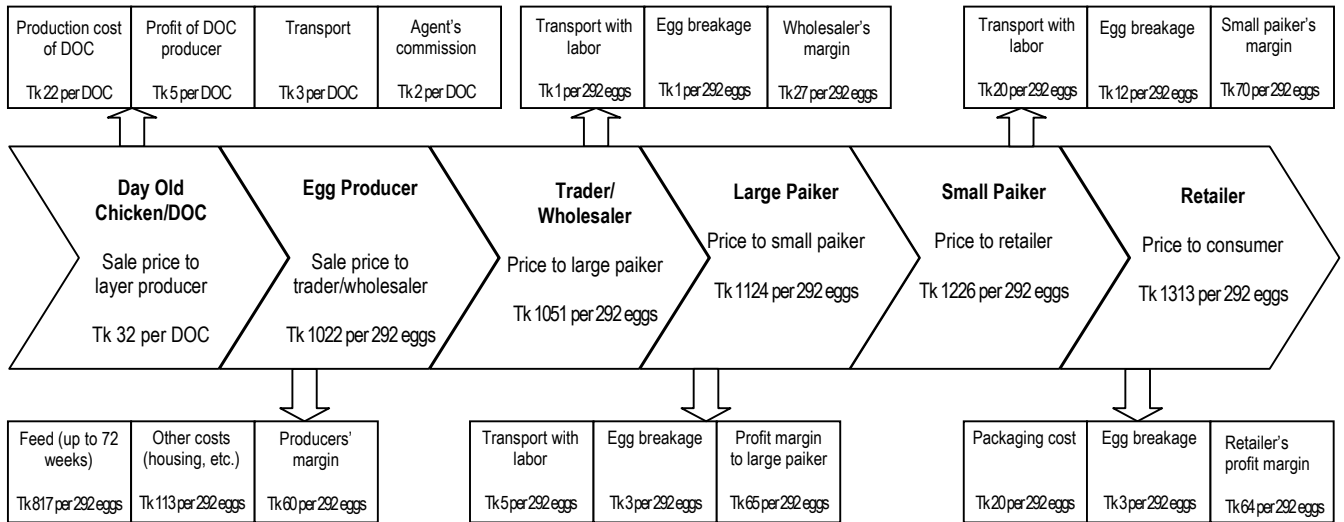
percent), and rice polish (12 percent). The same major ingredients feature in commercial layer feed in slightly different proportions: maize (50 percent), soybean cake (16 percent), and rice polish (15 percent). Increased demand for maize by the poultry industry has sparked phenomenal growth in maize production which has grown by an average of 101 percent annually since 1997/98. Production increased from only 2.65 thousand tons in 1997/98 to 356 thousand tons in 2005/06 (FAOSTAT). Even so, domestically produced maize suffices to meet only 20 percent of the poultry feed industry’s requirements. Storage and drying capacity has been a problem for domestically produced maize compromising quality and shelf-life. With the HPAI outbreak, most SME broiler producers are likely to be incurring losses. Farmgate prices are only Tk 75 per bird and feed costs have probably increased in tandem with world maize prices.

Figure 8.1: Value chains for commercial broilers from small and medium producers, 2013



Source: Authors' analysis

Figure 8.2: Value chains for commercial layers from small and medium producers, 2013



Source: Authors' analysis

The lack of processing facilities to balance the periods of higher production and demand, poor planning of production and insufficient knowledge of the demand structure all contribute to huge fluctuations in prices of broiler meat. While there are large fluctuations in prices to farmers consumer prices at the retail level appear surprisingly stable. When the market for dressed and processed poultry meat develops, a more stable price is to be expected. For the time being, the market for processed and frozen meat is very limited, however, as the majority of customers definitely prefer to buy a live chicken.

Constraints and Opportunities

Upgrading Technical Knowledge

Poor technical knowledge of intensive poultry production is a major constraint that must be addressed to improve efficiency in the industry, particularly in the SMEs. The value chain analysis revealed that technical knowledge of poultry production and management including production technology and methods,

nutrition, water quality, and biosecurity was deficient on farms of all sizes leading to inefficiencies and higher costs. Research and statistical data on technical performance in different production systems are also quite scarce.

The lack of qualified personnel is a major problem and an effective advisory service needs to be developed for poultry farmers. The only form of technical assistance available for most SME producers is the “customer service teams” that input suppliers commonly provide when producers have problems. It is impossible for an individual farmer to hire specialist personnel and there are no independent technical advisory services. The lack of specialist advice is very problematic for a number of reasons. For example, if a farmer encounters a problem such as a poor growth rate, the service provider will investigate the problem and identify failures in management that caused the problem. The farmer has no recourse to a second opinion about the quality of the feed as a cause of slow growth and must accept all the blame for the problem. In many cases, the farmer also has to sell the product through the input supplier because of credit or other nontransparent arrangements. These formal and informal linkages between the many intermediaries are a serious weakness of the poultry industry. The lack of veterinary practitioners in the field postpones diagnosis and treatment of sick birds which increases costs and bird losses.

To develop an effective advisory service, a close partnership has to be created between public agencies and the farming community, in which the public sector provides a major share of the financial resources and guidance while farmers and their associations contribute an agreed share of the costs and take responsibility for managing the advisory services. Support to farmers in the form of advisory services and capacity building in the farming community is often seen as a government responsibility which in many countries translates into free public extension services for farmers. Bangladesh has no specific livestock extension service, however, and the general agricultural extension program cannot reach out to all farmers. This situation is common in most developing countries. A great

deal of evidence has now shown that a government officer is not the most efficient agent for advising farmers and alternative approaches for providing technical advisory services have been developed.

Investments in farmers' training systems, including formal education, are also needed. The Savar Youth Training Centre has a formal training module for young farmers. A certificate from the Centre entitles the farmer to obtain a first loan from a government bank to establish poultry production with a government guarantee and a reduced interest rate. The concept behind this training program appears to be very good, but its capacity is far too low and the training too general. In a three-month course, farmers have to accommodate training in dairy, poultry, fisheries and crop production. There is room to further improve the program and prepare more specialized courses (for example, a course specific to poultry). The general opinion in the poultry industry is that the university curricula need to be updated and focus more closely on the emerging industry in Bangladesh. Similarly, the industry is demanding more research on production methodologies and technologies, nutrition, processing, and biosecurity. A partnership between public research institutions and the private sector would yield mutual benefits. The industry could take some responsibility for undertaking and funding research on various aspects of production of interest to all stakeholders.

Improving Quality Control for Inputs

The absence of quality control for all inputs, including DOCs, feed, and medicine is a major impediment. Bangladesh is almost self-sufficient in parent stocks of broilers and layers, but there are still no institutional arrangements for testing and ensuring the quality of breeding stock. The Directorate of Livestock Services (DLS) and the industry have an agreement for DLS to ensure the quality of DOCs and for DLS to oversee an agreed price for DOCs from producer to farmer. Although DLS has been hosting and chairing a "Chick Quality Control Committee" with industry members the committee's performance at the time of

this study was questionable. Reliance on government for quality control remains common in Bangladesh, yet a better strategy may be undertaken for the industry stakeholders to organize and finance a trustworthy system to ensure quality control and transparency in decisions and enforcement which would benefit the entire industry.

Similarly, there are no animal feed regulations, no standards for feed quality and no trustworthy and independent system for ensuring the quality of domestically manufactured or imported feed. No commercial laboratories test feed quality; in the public sector only DLS has the facilities to test feed quality in Dhaka. Readymade feed for broilers and layers is sold on the market, but there are no standards for its composition or nutrient content. Poor packaging of feed and lack of critical information on the packaging, such as the manufacturing data, batch number, and expiration date, are other major problems.

No regulations are enforced for handling veterinary drugs although drug sellers are supposed to have a license. It is reportedly very difficult to get licenses to manufacture veterinary medicines. DLS appears to have a monopoly for producing animal medicine. Licenses generally have to be renewed every year. The process is costly and, more important, time consuming leading to great uncertainty over the time it will take for renewal. About 40 percent of the cost of licenses is reportedly for payments to accelerate bureaucratic procedures (“speed money”). It is difficult to think of any reason based on quality control or assurance for why licenses would have to be renewed every year, especially as no quality control seems to be involved. It is recommended that the policy be changed to allow either unlimited time for a license (unless misuse is proven under prevailing rules and regulations) or 5-10 years.

Poor availability of vaccines has been a significant problem. The most crucial input for improving SME poultry production is vaccines which are supposedly supplied by DLS. However, supplies from DLS have been inadequate and the

private sector is restricted in providing vaccines partly because DLS vaccines are heavily subsidized. All the large companies import medicine from abroad whereas SMEs have to rely on vaccines produced locally (mainly by DLS) which the large companies consider to be of inferior quality. Drugs also appear to be very expensive in Bangladesh and were reported to be double the price of the same medicine in Thailand and India. There is a need to clarify public and private sector roles in the provision of services for poultry development to ensure that the public sector does not crowd out private initiatives (table 8.2).

Assuring Food Safety and Biosecurity

Scanty attention is given to food safety and quality. The public authorities officially have a role in assuring quality and food safety. These authorities are supposed to undertake food safety checks in retail shops and markets. The general opinion is, however, that the control is not systematic, not objective, not done by qualified staff and fines are imposed on the spot with no means of complaining. It is not unusual for retail shops to view food safety authorities more as a means of harassment other than assistance and the impression is that the system has no palpable impact on food safety.

Most poultry is sold in open markets and a visit to the biggest market in Dhaka is a most convincing argument for not attributing any value to the public food safety control. Live birds are kept in overcrowded and hot baskets close to fresh meat, fish, and vegetables. Customers have their birds slaughtered and dressed on the spot making the environment extremely unhygienic. The industry is aware that something has to be done for consumers to believe that processed poultry is safe to consume and of good quality. In fact, such intervention is recognized as a prerequisite for the widespread marketing of processed poultry in Bangladesh. Mistrust in the quality of processed meat is seen as the biggest obstacle to the wide-scale introduction of processed meat. At the same time, the processing of poultry meat is seen as a precondition for the industry to develop further. The

marketing of processed meat is deemed necessary to balance the huge price fluctuations experienced in the industry.

Table 8.2: Public and private sector responsibilities for service provision in poultry development

	Responsibility	Funding	Oversight	Comment
Breeding services	Private	Private	Public-private	Initial support might be justified.
Clinical veterinary services	Private	Private	private	
Preventive veterinary services	Public	Public-private	partnership	Only for main contagious diseases.
			Veterinary associations	This could be implemented through contracting private veterinarians.
			Public	Based on detailed risk analysis of threats of zoonosis .
Food safety requirements	Public	Public		Public cost sharing to enable the smallholder to get access.
Advisory Services	Private-public	Mainly public	Public	
	Private	Private		
Egg/broiler collection and marketing	Private	Mainly private	Private-public	Initial public investment and promotion might be justified.
Processing and marketing of poultry meat products			Private	Initially public funding.
	Mainly public	Mainly public		Initially public funding.
Research	Public	Mainly public	Private	
Education			Public-private	
			Public-private	

Source: Author's observation

There are no regulations or enforcement of regulations for building poultry houses providing a protective environment, handling manure, ensuring biosecurity in handling large numbers of poultry and handling dead birds. This lack of regulation is unsustainable for the industry, as the risk of HPAI has demonstrated very clearly to all stakeholders.

Improving Coordination in the Industry

Developing strong partnerships among the various stakeholders and establishing an umbrella organization are necessary to overcome the low levels of organization among stakeholders. Bangladesh has five national poultry associations-the World Poultry Society Association, Poultry Breeders Association, Poultry Industry Association, Egg Producer Association, and Animal Health Care Association dominated by the large-scale producers. Many localised associations exist as well. These associations are not very active on behalf of their members, however; their main activity is to secure government and donor support for members and the industry. Except for collective interventions to avoid and mitigate HPAI no proactive work for the benefit of members was identified despite many obvious interventions that could benefit all participants in the input and marketing chains.

The establishment of a National Poultry Coordination Committee could create an umbrella organization for policy research, product development, marketing, public awareness and other interventions of interest to all stakeholders. The committee could be a private umbrella organization representing all stakeholders in the poultry industry. It could be responsible for initiatives to promote industry-wide activities based on financial resources created by the poultry industry, such as, a National Poultry Development Fund (for example, access on DOCs of Tk 0.01 would generate around Tk 26 million per year). The umbrella organization could represent the industry in all communication with the government, delegate members to boards of directors in public institutions dealing with poultry and provide a platform for dialogue between the private sector and government authorities, institutions and organizations with a stake in the poultry industry.

Finalizing an Industry Policy

The government also urgently needs to finalize a comprehensive policy for the poultry industry, in close partnership with private stakeholder associations. The Poultry Policy Committee finished its work three years ago. Together with DLS

and the Ministry, the Food and Agriculture Organization of the United Nations (FAO) has prepared a new and updated policy (GoB 2005), but it is yet to be approved by the government. An appropriate policy is needed for the domestic manufacture of inputs such as medicines, vaccines, machinery, and tools. The licensing of companies manufacturing, importing, and selling equipments has to be streamlined and made less-time consuming for the industry.

Improving Access to Credit for SMEs

Improving the quality of financial and production plans and budgets would help in securing financing for SMEs involved in the poultry industry. It appears almost impossible for SMEs to finance their initial investment through a private bank. The industry has a reputation of frequent defaults followed by costly and complicated procedures to collect repayment from the defaulters. The industry is improving on this image crisis and banks are regaining interest. Credit programs that facilitate access to finance for poultry SMEs that have participated in a formal training program and that have prepared proper financial and production plans and budgets could be piloted. For small-scale producers, it is a disadvantage that large-scale producers receive government subsidies (they pay lower prices for fuel and electricity and income from the livestock industry is exempted from tax until 2010). These subsidies benefit few SMEs which are not categorized as an industry.

Poor access to formal credit makes SMEs excessively reliant on agents and middlemen for finance which constrains further development of the industry. Farmers appear obligated to sell through a middleman who has supplied the financial resources to initiate production by purchasing DOCs and feed. This relationship, unlike a transparent contract farming system, gives the farmer no bargaining power in deciding the price at the time of marketing, no options for changing feed company and no options to complain about deficiencies in the input supplied. Prices are set by the buyer at the time of marketing.

Summary and Recommendations

Upgrade farmers' knowledge

1. **Curriculum development:** A curriculum should be developed for formal, qualified short-term training (six to eight weeks) in specialized poultry production with an emphasis on the economic aspects and cost-benefit analysis. Training should include information on farmer associations, the benefits of collective action, and opportunities for obtaining inputs and marketing services through the associations. The training could be implemented at the existing youth training centers and should be linked with the new Chittagong Veterinary University which has specialized activities in poultry.

However, the implementation through the many poultry farmer associations around the country could also be tested. Large private companies interested in contract farming and/or in providing market outlets for SMEs could qualify as implementing agents as well as NGOs involved in the poultry industry.

2. **Training of trainers:** The youth training centers under the Ministry of Youth could be the focal point.
3. **New and more targeted training programs:** Information to serve as the basis for developing new training programs could be obtained through a comprehensive review of the three-month course currently on offer from the youth training centers and from feedback from former trainees. Particular attention should be given to providing an option for specializing in poultry production, offering a follow-up course after 6-12 months, and providing the option to develop tailor-made courses for industry personnel.
4. **Additional interventions to support a producer association:** The training programs should include additional interventions for strengthening, assisting,

and promoting the establishment and activities of poultry producer associations-locally, at the district level, and nationally.

Strengthen small-scale poultry production

The following activities should be developed and implemented by interdisciplinary and action research teams in close cooperation with poultry producers and their associations:

1. **Contract farming:** Develop and test a framework and models for contract farming.
2. **Producer associations:** Develop and test a framework and models for proactive poultry producer associations enabling them to become involved in improving input supply, services, and marketing on behalf of the members.
3. **Small-scale feed production:** Develop and test a framework and models for small commercial feed mills managed by poultry associations.
4. **Advisory service:** Develop and test a framework and models for a technical advisory service managed by producer associations.

Improve productivity and efficiency along the value chain

1. **At the farm level:** Train farmers in poultry production and management, strengthen and upgrade farmer associations so that they can become active players in the industry and improve the quality of inputs and services.
2. **At the intermediate level of input suppliers, service providers, and marketing agents:** Upgrade professional knowledge and responsibility, facilitate a higher degree of coordination to limit the number of segments involved and improve the quality of inputs and services.

3. **In the marketing of poultry products:** Implement arrangements for transparent price setting, product development and marketing and for initiatives that promote and ensure food safety.

4. **In providing credit:** Develop products that can satisfy the needs and demands of different stakeholders, especially, the small- and medium-scale producers.

Dairy Production and Marketing

Introduction

Milk production is an important economic activity providing about 3.6 million Bangladeshi households with supplementary income, employment, and nutrition. Per capita milk consumption has not increased as rapidly as consumption of other high-value agricultural products, but domestic production is still insufficient to meet the demand. Costs of fresh milk production are high because of yields are low and expensive feed. Processing costs are also higher than in the neighboring countries. Failure to address the productivity issues will make it difficult to compete with imports.

Demand and Market Size

Average annual per capita milk consumption in Bangladesh rose over the last decade (from 10.45 liters in 1995/96 to 11.2 liters in 2010) but remains very low compared with regional levels (for example, 85 liters per capita in India). According to HIES data, total milk consumption grew by about 3 percent per year between 1995/96 and 2010, but national milk production grew at an average rate of only 1.2 percent per year from 1995 to 2010 (FAOSTAT). Growth in milk production remains far behind that of other Asian countries over the same period (3.8 percent in India, 3.6 percent in Pakistan, and 13.2 percent in China).

To compensate for the deficits in supply, Bangladesh has relied heavily on imports of powdered milk. Bangladesh imported 51,545 tons of skim milk powder (SMP), valued at US\$ 87.81 million, in 2010. This quantity of SMP is equivalent to 0.64 million tons of liquid milk or about 28 percent of domestic milk production. The cost of recombined milk (imported milk powder and butter oil) works out to about US\$ 14 per 100 liters which is lower than producer prices in Bangladesh. Bangladesh imposes a very high tariffs on imported milk powder, however. The total

protection rate-estimated at 86.7 percent for FY 2010)-translates into a retail price of about US\$ 26 per 100 liters for milk converted from imported milk powder.

In cities, powdered milk is cheaper than processed, packaged fresh milk transported from rural areas (GoB 2012). Many urban consumers reportedly prefer imported powdered milk, regardless of the price, for reasons of convenience and safety. Unhygienic production of milk and dairy products, adulteration, and short shelf-life all partly explain the urban preference for milk powder.

Profile of the Dairy Industry

Bangladesh had 24.5 million cattle and 0.9 million buffaloes and produced 2.26 million tons of milk in 2012. Of the 64 districts in the country, 20 are considered suitable for milk production, but the five main milksheds are Tangail, Manikganj, Tekerhat (Madaripur), Satkhira (Jessore), and Baghabarighat (Sirajganj). The Baghabarighat milkshed accounts for a major share of production and about 38 percent of primary milk cooperative societies are located in this milk shed (Khan 2005, as cited in Knips 2005). Milk production primarily takes place in two seasons-the lean season from July to October and the flush season spanning November through June. During the monsoon season (July to October), nearly one-third of the country is flooded which drastically reduces access to grazing areas, damages green and dry fodder, and causes milk production to fall. As a result, the lean production is about 30 percent less than the flush output.

Bangladesh has three categories of milk

producers: The landless and smallholders who keep 1-3 cows (local/crossbred) and sell milk directly to consumers or vendors; smallholders who own 1-5 crossbred cows and sell milk to the organized sector including cooperatives, NGOs, and private processors (sometime referred to as “pocket dairies”) and small to

medium producers who own 10-20 or more crossbred cows in peri-urban areas and sell milk directly to consumers, vendors, or the organized sector. About one-fourth of all milk producers are landless households.

Less than 4 percent of the national milk production enters into the formal market (the so-called “organized” sector). The bulk of milk produced domestically (81 percent) is processed by the traditional “unorganized” sector and about 15 percent is consumed by producer households. Locally produced liquid milk accounts for 12.8 percent of the formal market. The rest (87.2 percent) consists of imported milk powder.

Ten organizations are involved in processing liquid milk, making milk products and marketing them. Bangladesh Milk Producers’ Cooperative Milk Union Ltd. (BMPCU) which sells dairy products under the brand name Milk Vita is the largest organized dairy enterprise in the country and produces about 66 percent of processed liquid milk.

BMPCU Ltd. is a two-tier milk producers’ cooperative, consisting of the primary milk producers’ cooperatives at the village level and the Milk Union as the apex cooperative at the country level. The Milk Union collects some 200,000 liters of milk per day and most of it is sold as pasteurized milk. More than 1,000 primary dairy cooperative societies (DCSs) are affiliated with BMPCU Ltd. Private and nongovernmental dairy enterprises include BRAC (Aarong), Grameen Matsho and Pashu Sampad Foundation (GMPF), and PRAN. The nongovernmental and private organizations procure milk from farmers through commission agents.

Table 8.3: Liquid pasteurized milk sales by the format sector, 2012

Organization	Milk sold (L/day)	Share (%)
Milk Vita	160,000	65.8
Aarong	40,000	16.5
Amu Milk	5,000	2.1
Silaidah	4,000	1.6
Bicrampur	3,000	1.2
Savar Dairy	3,000	1.2
Aftab Dairy	5,000	2.1
Safa Dairy	3,000	1.2
Tulip	5,000	2.1
Pran	15,000	6.2
Total	243,000	100

Source: BBS, 2012

In the unorganized sector which handles 81 per cent of the milk produced in Bangladesh, about 20 percent of production is consumed as liquid milk. The remaining 80 percent is converted into traditional sweets made from dairy products. All major cities and towns in Bangladesh have “milk markets” where milk is traded. Producers and vendors bring milk to the designated milk markets where the *halwais* (sweet manufacturers) and household consumers obtain their milk.

Value Chain in the Organized Milk Processing Sector

Fresh Milk Production

The cost of producing fresh milk in Bangladesh is high. Shamsuddin et al. (2006) calculate the cost of production of 100 liters of milk under different management conditions in four regions of Bangladesh drawing on data from 1,440 dairy farms. The production cost averaged from US\$ 31.5 to US\$ 35.1 per 100 liters for producers who were not members of BMPCU cooperatives. The production cost for BMPCU members in Sirajganj and Pabna was considerably lower at US\$ 18.9 per 100 liters (table 8.2). Although milk production costs in the organized sector in Sirajganj and Pabna were almost half of those in the unorganized sector, they still

slightly surpass costs on large farms in India and Pakistan which are reportedly below US\$ 15 per 100 liters (Hemme et al. 2004). Production costs on the most competitive dairy farms in Western Europe, North America, and Australia are around US\$ 32, 26, and 14 per 100 liters, respectively (IFCN 2005).

Table 8.4: Average costs of producing 100 liters of milk in four regions of Bangladesh, 2002

	Mymensing	Khulna- Satkhira	Sirajganj- Pabna	Chittagong
Share of cost going to:				
Health care (%)	0	1	1	1
Feed (%)	60	70	73	58
Labor (%)	38	26	23	38
Housing (%)	1	2	3	2
Milk production (US\$ per 100 L)	35.1	31.5	18.9	34.6
Yield (L /cow/day)	3.5	4.8	7.2	5.1

Note: Data from a survey of 1,440 dairy farms

Source: Shamsuddin et al. 2006

The high costs of fresh milk production can be attributed to low yields and high feed costs. Average yields are only 2.0 liters per cow per day although there is some regional variation. Among commercial dairy farmers, average milk production ranges from 3.5 litres per day in Mymensingh to a high of 7.2 liters per day in Sirajganj (Shamsuddin et al. 2006). Average milk yields per cow in Bangladesh are equivalent to about 0.7 tons per year, which is very low when compared to average yields in India (1.2 tons per cow per year) or Pakistan (1.1 tons per cow per year). Yields in Australia, New Zealand, and Denmark are around 5.2, 3.7, and 7.8 tons per cow per year respectively. Yields must increase significantly to reduce production costs. As outlined later in this chapter, producers obtain only about US\$ 0.22 per liter, although production costs on many small farms are much higher. Provided that feed costs do not increase further, Shamsuddin et al. (2006) estimate that farmers must consistently produce an average of 7 liters per cow per day to have reasonably lower production costs.

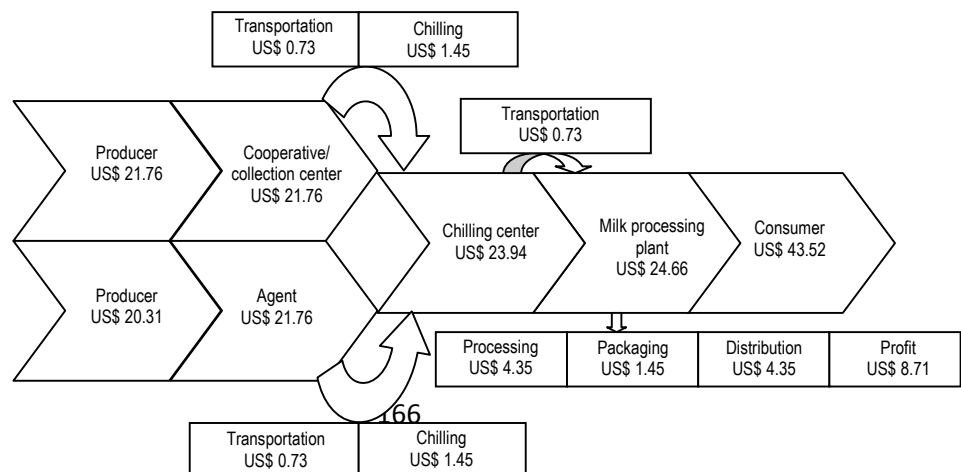
The branded feed available in Bangladesh is of unknown quality and extremely expensive. Several very small animal feed milling plants are operated by DLS, BMPCU, NGOs and the private sector. Most of these mills have a capacity ranging from 7 to 10 tons per day. BRAC owns one large plant with a capacity of 200 tons per day, but at the time of this study the plant produced only about 200 tons of animal feed per *month*. BMPCU Ltd. sells feed at Tk 9,500 per ton; BRAC sells ordinary feed at Tk 13,000 per ton and special feed at Tk 17,000 per ton. The best animal feed (bypass protein pellets) in India costs Rs 5,400 per ton (Tk 8,100). Bangladesh imports around 24 million tons of concentrate feed a year.

Value Chain for Processed Milk

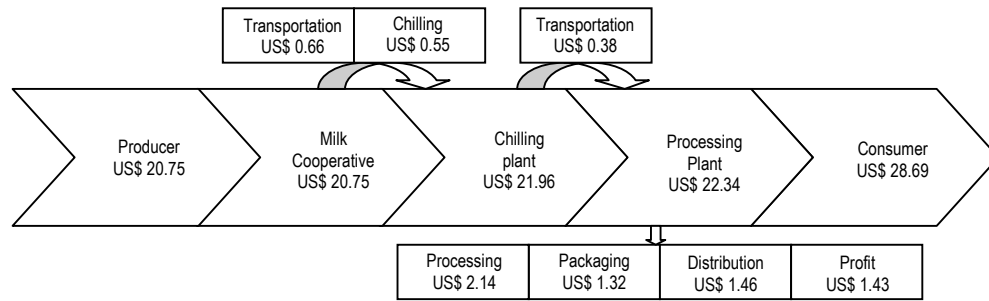
The overhead costs in milk processing appear to be quite high in Bangladesh dairies, particularly when benchmarked against processing costs in Indian dairies. Figure 8.1 presents value chains for milk processing in the organized sector in Bangladesh and India. In Bangladesh, dairies sell milk at Tk 30 per liter (US\$ 0.44) after reducing the fat content to 3.5 percent. In India, processed pouched milk of similar quality is sold at US\$ 0.29-0.31 per liter. The higher costs in Bangladesh appear to arise from the lower volumes of milk being processed and the higher overhead costs. Introduction of bulk vending for milk distribution will bring down the overheads in packaging and distribution. The milk sold through bulk vending can be priced lower.

Figure 8.3: Value chains for processed milk in Bangladesh and India, 2006

Indicative value chain from Bangladesh (costs are per 100 L)



Indicative value chain from India (costs are per 100 L)

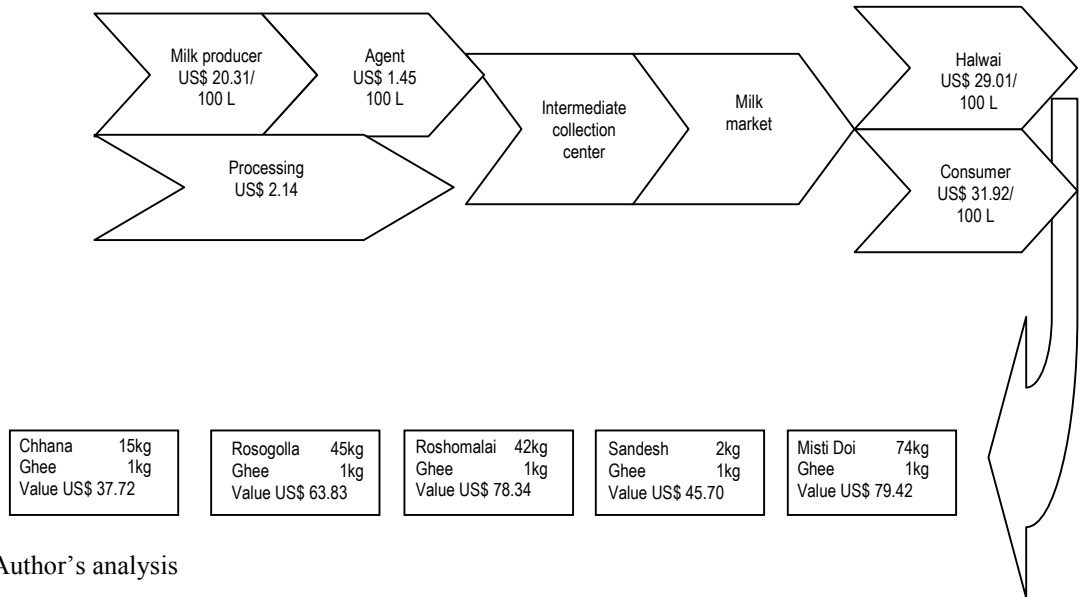


Source: Author's analysis

Value Chain in the Traditional Sector

As mentioned, most milk produced in Bangladesh (81 percent) passes through the unorganized sector, where about 20 percent of the milk sold in the milk markets is consumed directly and 80 percent is used to make a variety of milk-based sweets, predominantly sweets based on *chhana* (acid-coagulated milk). In terms of volume, about 1.5 million tons of milk is consumed annually as milk-based sweets produced by thousands of halwais. The amount of milk processed by a halwai may vary between 10 and 1,500 liters, but the average is in the range of about 20 liters per halwai. Based on these estimates, it appears that there are around 200,000 halwai shops in Bangladesh that produce a variety of milk-based sweets and generate about 500,000 jobs per year. The value addition in the production of these sweets is extremely high (figure 8.2). It can be four times the farmgate price with additional input of sugar the value of which is less than the value of milk solids. These products provide a unique opportunity to increase local milk production. Bengali milk-based sweets traditionally are high margin products that can pay for increasing the efficiencies in milk production, procurement, processing and marketing. Improved technologies can improve the quality of these products, help to produce them on a relatively large scale, substantially increase their shelf-life and generally help the unorganized sector grow by providing better returns to milk producers.

Figure 8.4: Value chains in the traditional sector



Source: Author's analysis

Constraints and Opportunities for the Dairy Industry

Breeding Strategies

Indigenous cows have very low productivity and a breeding policy to promote the replacement of indigenous cows with highly productive crossbred cows is required. Most cows in Bangladesh are local (*deshi*) cows which have short lactation periods (180 days) and long calving intervals (2.5 years) (Jahan and Rahman 2003). Only about 3 million cows are high yielding (giving 6 liters of milk per day on average) (Jahan and Rahman 2003). The slow replacement of local cows with genetically improved crossbreds is one factor behind the low milk production levels in Bangladesh.

Animal Health Strategies

Veterinary and breeding services have limited reach and scope. The DLS provides veterinary services through 567 veterinary hospitals. Each district headquarters has a veterinary hospital, and the remaining hospitals are distributed in

the upazillas (subdistricts). Veterinary services are institution-based and not delivered to the farmer's doorstep: farmers must bring their animals to the hospitals. Veterinary service delivery by stationary institutions severely compromises the reach of these institutions which ultimately serve only a few livestock owners in the vicinity. The hospitals also lack adequate facilities and stocks of medicines. Because artificial insemination (AI) services provided by DLS are also institution-based, AI coverage and conception rates have suffered as cows are placed under great stress by walking long distances to AI facilities.

The DLS has emphasized curative veterinary care while preventive care has been grossly neglected. Consequently epidemics often kill animals and incur huge losses for farmers. The climate and the poor nutritional status of cattle foster high levels of such diseases as anthrax, haemorrhagic septicaemia, black quarter, foot and mouth disease, and parasitic and protozoan diseases. Restructuring is necessary to make DLS more functional and effective. The DLS should concentrate on control, containment and eradication of animal diseases. Veterinary care and AI services should be converted into mobile practices by the government-employed veterinarians and para-vets. There are very few private veterinary practitioners although many dairy organizations such as BMPCU Ltd., BRAC, GMPF, and PRAN have employed professionals and do provide veterinary and AI services on the farm.

Animal Nutrition Strategies

Measures for optimizing the use of dry fodder and enhancing its nutritive output would improve the efficiency of present feeding practices and substantially enhance ruminant production. Nearly 40 percent of the total dry matter intake of all ruminants in Bangladesh comes from dry fodder making it the staple on which all ruminant production is based. Dry fodder in Bangladesh consists of all kinds of straws, stovers, and stalks available throughout the year. The traditional system of handling and feeding dry fodder involves considerable inefficiencies and waste,

however. It can be improved by: (1) using chaff cutters, mangers, and properly designed shelters to avoid waste and (2) regular feeding of urea molasses mineral block (UMMB) licks. UMMB is a low-cost feed supplement that greatly improves the availability of nutrients from dry fodder. The mineral mixtures in UMMB are an enormous help to ruminants in Bangladesh where high rainfall leaches minerals from the soil and thus limits their presence in fodder. UMMB licks can be manufactured by setting up UMMB plants alongside feed plants. The local availability of molasses is an advantage. The treatment of straw with urea would also help to enhance nutrient availability.

On the green fodder front, Bangladesh has enormous potential to substantially enhance its green fodder supply by growing hybrid varieties of Napier grass (*Pennisetum purpureum*) with low oxalate content. Hybrid Napier is a perennial tropical grass with deep root systems that enable it to establish well in one year. To maintain high grass yields, it is advisable to replant with root slips from existing plants every fourth year. Hybrid Napier is also an excellent crop for plot or crop borders in agricultural fields near villages. The ideal practice is to plant Napier grass at the beginning of the monsoon season in rows at one-meter intervals in crop/plot borders, alternating with hedge lucerne (*Desmanthus virgatus*, an excellent leguminous shrub). A mix of equal quantities of hybrid Napier grass and hedge lucerne constitutes an excellent green fodder rich in energy and protein which will reduce or even eliminate the need for farmers to feed expensive concentrates.

Large quantities of natural or cultivated grasses (leguminous and nonleguminous) are available during the wet season from June to November and can be preserved by ensiling. The Bangladesh Livestock Research Institute (BLRI) and BAU-Mymensingh have developed ensiling techniques that can be used at the village level.

Aside from these efforts, a broad, decentralized effort should be made in fodder development at the village level in the country's milk sheds. Such an effort could

include fodder minikits, campaigns for on-farm fodder production, crop border plantations, field border plantations of fodder trees and the development of common lands as captive fodder sources for villages that have such lands.

Strategies to Improve Quality in Milk and Milk Products

The dairy industry suffers from inadequate food legislation, low standards, and poor laboratory and control services. Throughout the supply chain, milk quality is given little importance except at the time of sale in the organized dairy sector. At every stage in the supply chain there is scope for adulterating milk (usually by adding water) with the result that at the end of the chain milk solids need to be added to adhere to BSTI standards. This of course adds to the processing costs. The standard prescribed for milk is already liberal-3.5 percent fat and 8 percent solids-not-fat (SNF) which is frequently not met. Individual milk samples are not tested in cooperatives or private milk collection centers. There is no incentive for farmers to supply quality milk, because all suppliers receive the same price regardless of quality.

Poor milk quality has only served to reinforce consumers' perceptions that imported milk powder is of higher quality than the fresh pasteurized milk. One incentive to improve milk quality would be for primary cooperatives to test the fat and SNF percentages in milk supplied by each producer and to set the milk price on the basis of these percentages. Another means of improving quality is to transfer the responsibility for collecting and chilling milk to communities of producers who would own the chilling plant collectively, thus individual quality control would be enhanced by community social control. Cooling the milk within one hour of milking, instead of three to four hours (the current practice), would also improve quality. To ensure the quality of milk and milk products, establishment of an industry-driven in-house mechanism for quality assurance is recommended.

Strategies to Improve Processing and Value Addition

Significant scope exists for expanding the milk processing and value addition infrastructure in Bangladesh. Currently there are several successful milk procurement systems in the organized sector where 10 organizations handle liquid milk processing, make milk products and market them. BMPCU Ltd. has successfully organized cooperative societies, but its activities have been limited primarily to one milk shed (Baghabarighat) and additional BMPCU Ltd. cooperatives have been very slow to organize and expand coverage for reasons that are somewhat unclear. Supporting the formation of dairy producer associations that would collect and chill milk before selling it to processors could serve as an effective alternative for improving milk marketing. Milk producer associations could be registered under the Companies Act and linked through a nationwide federation. The associations could contract with a milk processing and marketing company to collect their milk year-round. Such an arrangement would also help in implementing milk testing and quality control measures. The associations would work as counterparts to service providers and milk buyers (processors).

Bangladesh has no nationally instituted entity to promote development of the dairy industry. There would be strong benefits from establishing a National Dairy Coordination Committee as a private organization representing all stakeholders. In other countries, dairy development boards have played a vital role in promoting the industry and assisting with policy formulation, product development, quality assurance, and industry research. Bangladesh faces enormous challenges in each of these areas. Data related to all aspects of the dairy industry are virtually lacking, so very little information exists to assist policy formulation.

Milk procurement systems in the organized sector

Milk Vita: Bangladesh Milk Producers' Cooperative Union Ltd. (Milk Vita) was registered in 1965. There are 1,050 primary milk producers' cooperative societies

affiliated to the Union which covers the entire country. The Union has three dairy plants with a capacity of 297,000 liters (Baghabari, Tekerhat, and Dhaka) manufacturing facilities and 16 chilling centers with a total capacity of 150,000 liters. Eight new chilling centers are under development. The Union collects about 200,000 liters of milk daily of which 90 percent comes from the Baghabarighat area and 10 percent from other areas; 160,000 liters are sold as liquid milk and the balance converted to various products, such as milk powder, butter, ghee, cream, yogurt, ice cream and other sweetened products.

Milk is procured through the primary milk producers' cooperative societies. It is collected in the morning and evening. The societies do not test the milk supplied by each producer and pay a flat rate that provides no incentive to ensure the quality of the milk supplied. Adulteration is common. Skim milk powder must be added to milk to compensate for the resulting low fat and solids-failing-fat levels and to meet the legal standard for pasteurized liquid milk. Sets for measuring less than 500 milliliters of milk are not supplied though supplies below 500 milliliters are accepted and recorded.

The Union has a feed mill which produces about 6 tons of feed per day. The Union also provides veterinary and artificial insemination (AI) services on the farm; it maintains a station where frozen semen is produced for the AI program. The Union's training center conducts programs for AI workers and awareness programs for farmers. The Union also distributes seed of fodder crops and planting materials to farmers.

Bangladesh Rural Advancement Committee (BRAC): BRAC, a nongovernmental organization (NGO), has been involved in dairying since 1998, when it set up a dairy plant at Gazipur. The dairy receives 60,000 liters per day from 57 chilling centers owned by BRAC; 40,000 liters are sold as liquid milk and the balance converted into such products as skim milk powder, butter, yogurt milk, chocolate milk, and ghee. Milk is procured through collection centers operated by commission agents who

deliver the milk to the BRAC chilling centers. BRAC also provides veterinary and AI services. Some 40,000 para-vets have been trained at BRAC's training center and placed all over Bangladesh. BRAC has its own semen preservation station. It supplies semen and AI equipment to over 1,000 inseminators trained at Bangladesh Agricultural University, Mymensingh and insemination is done on the farm. The BRAC feed mill can produce 10 tons of palette feed per hour although it currently produces only 200 tons each month.

Grameen Matsho and Pashu Sampad Foundation (GMPF): GMPF is another NGO involved in dairying. It has set up seven chilling centers that handle about 4,000 liters of milk daily and sell it to Milk Vita and a private dairy. Milk collection centers have been set up in the villages and commission agents deliver milk from these centers to the chilling centers for which they are paid Tk 1,000-2,000 per month. No testing is done at the collection centers. Producers are paid every seven days and on average receive about Tk 15 per liter. GMPF provides veterinary and AI services through its staff which include 3 Veterinarians, 8 Livestock Field Assistants, and 15 Livestock Field Workers.

PRAN Dairy Ltd.: Pran Dairy Ltd. is an enterprise of the PRAN-RFL Group. This company started its dairy business three years ago and now has a plant at Ghoshal (capacity: 50,000 liters), a chilling center at Bera (capacity: 50,000 liters), and nine farm coolers. Milk is collected from the company's contract farmers by vendors who deliver it to the farm coolers. Milk supplied by individual producers is not tested. Presently the dairy handles 30,000 liters daily; 15,000 are sold as liquid milk and the balance converted into ultra-high temperature milk. Upcoming plans include expanding the dairy's capacity to 100,000 liters, operating a feed mill (under installation), and operating a model dairy farm, AI program, and breeding farm.

Like the poultry industry, the dairy industry urgently requires the government to finalize a comprehensive policy. A livestock policy and action plan have been formulated but not yet approved by the Government and Parliament of Bangladesh.

The recommendations from this study support the main areas for action outlined in the livestock policy and action plan which include: improving collection and processing facilities; removing input constraints (feed enhancement, veterinary services, and diagnostic facilities); creating and facilitating establishment of a management information system in the private sector to provide market information; establishing a regulatory body to monitor milk prices, prevent collusion, and monitor quality control of dairy products; formulating a national livestock breeding policy; upgrading technical skills in the industry; controlling the quality of animals used in breeding programs; and conserving indigenous livestock.

Summary and Recommendations

- a. **Develop an appropriate livestock breeding policy:** Formulate a livestock breeding policy that provides farmers with options for upgrading breeds where economically viable.
- b. **Promote private sector delivery of veterinary and AI services:** Veterinary and AI services provided by DLS need to be transformed into mobile rather than primarily institution-based services. While preventive veterinary services should remain in the domain of the public sector clinical veterinary services are to be provided by the private sector with oversight from veterinary associations. Subsidized public sector delivery of clinical veterinary services undermines the development of private services.
- c. **Increase emphasis on preventive care:** DLS needs to place greater emphasis on preventive care.
- d. **Improve animal nutrition:** Measures for optimizing the use of dry fodder and enhancing its nutritive output are needed including: (1) using chaff cutters, mangers, and properly designed shelters to avoid waste and (2) regular feeding of UMMB licks.

- e. **Boost fodder production:** Decentralized efforts are needed for fodder development including campaigns for on-farm fodder production, crop border plantations, field border plantations of fodder trees, and the development of common lands as captive fodder sources for villages that have such lands.

- f. **Support the formation of dairy producer associations.** Supporting the formation of dairy producer associations that would collect and chill milk before selling it to processors could provide an effective alternative arrangement for improving milk marketing.

- g. **Strengthen food safety legislation, enforcement mechanisms, and laboratory and control services.**

- h. **Finalize and adopt a comprehensive dairy policy.**

- i. **Develop a National Dairy Coordination Committee** as a private organization representing all stakeholders. The committee would play a key role in promoting the industry and assisting with policy formulation, product development, quality assurance and industry research. The committee would also serve as a repository of information on the industry which would help inform policy formulation surrounding the whole gamut of the highly prospective dairy industry.

Chapter-Nine

Summary, Conclusion and Policy Options

During the last four decades Bangladesh has witnessed a great many changes in the patterns of production, consumption and trade in agriculture. One is the shift in the pattern of production and consumption from granular and other starchy staple crops to higher value agricultural produce such as meat, milk, eggs, fish, fruits and vegetables. Another is the burgeoning modern agricultural marketing outlets including the expansion of processing, large-scale retail outlets (e.g. supermarkets), and food services industries (e.g. restaurants), all of which create a need for multiple forms of vertical coordination.

It is imperative to understand the implications of these changes on poverty in order to formulate appropriate policies, but tracking the manifold effects of these drifts on households is not a simple task. Both the trends offer new opportunities as well as challenges for farmers and trade bodies, but the real impact on poverty hinges on many other details. Are poor farmers able to respond to these fast-growing markets? How can one quantify the employment generated in agricultural production and processing? How labor-intensive are contemporary marketing outlets compared to traditional ones? And how much is the impact of retail consolidation on conventional traders and consumers?

The debate on these issues has been hindered by the lack of a comprehensive conceptual chain of events that describes the various processes by which these trends affect the poor households. Most of the studies of the effect of high-value agriculture and the modernization of food marketing chains in the developing countries have been descriptive or have emphasized on the impact on one type of household. For

example, studies of high-value agriculture often centers round on the effect on households as agricultural producers with less emphasis on the impact on households as wage-earners or consumers. Similarly, some studies of retail consolidation have explored the one-sided impact on small-scale retailers excluding the impact on consumers.

This study aims at developing a conceptual structure for understanding and evaluating the impact of high-value agriculture, the modernization of food marketing and the enhancing value addition to the commodities in the off-farm part of supply chain on poverty in developing countries. In particular, the study has three objectives:

- To identify production status and scope of high valued agricultural products.
- To assess the prevalent market access and vertical linkages with agro-based industries; assess the marketing costs and margins by assessing the price differential within the chain and
- To identify the constraints and opportunities and hence suggest ways for intervention/support in improving market admittance and vertical linkages in the value chain.

What are the types and dimension of the shift in agricultural production and food consumption toward high-value agriculture? In what ways are food trading outlets in developing countries becoming more “modern”? And what is the proof to date regarding the effect on poverty? The address of these questions are the objects of this study.

The primary driving force behind the shift toward high-value agriculture is the rising income although changes in lifestyle with speedy urbanization and changes in the demographic structure have also contributed notably. As incomes rise the share of the budget earmarked for food tends to decline, but the composition of the food budget also changes commensurably. Households allocate a smaller share of the food budget to cereal and other starchy staples and a greater share to meat, milk, fish, fruits,

vegetables, processed and prepared foods. Thus, income growth leads to palatable substitution away from grains and lentils toward high-value agricultural produce.

Since 1992, the global per capita income growth had been 1.85% per year, higher than in any decade since the 1960s. However, per capita income rise has differed substantially over time and across the regions. Since 1992, per capita income had grown at an average rate of over 5% per annum in East and Southeast Asia and at over 3% per annum in South Asia. The per capita income growth over the same period in sub-Saharan Africa, Latin America and the Caribbean, the Middle East and North Africa has been markedly slower (0.4% to 0.8% per year), but admirably faster than in the 1980s.

Alongside the economic growth, there has been a continuous momentum on urbanization as well particularly in the developing countries. Urbanization alters diets simply because the urban consumers purchase a greater share of their food (rather than growing it), also urban consumers face have a broad range of foods to choose from and because urbanization has integrated women's participation in the workforce reducing the time available for cooking food . Globally, the number of the population living in urban areas has jumped from about one-third (33%) in 1960 to almost half (49%) in 2014. In the developing countries, the urban stake is smaller but growing more quicker than in the industrialized countries.

Economic growth, demographic changes and urbanization have together stimulated diversification in food consumption menus. The changing pattern is corroborated by the higher growth in per capita consumption of high-value foods relative to grains and pulses in most developing countries.

The agricultural production patterns have favorably responded to the shift in food consumption that has surfaced over the past few decades. An increasing swath of the arable and permanent land is being used for vegetable and fruit production.

Furthermore, most of this increase is taking shape in developing countries. The proportion of the arable land used for vegetable and fruit cultivation has remained static in the developed countries, but has augmented markedly in most developing countries including Bangladesh.

Since 1971, global export of agri-products have grown at an annual rate of 3.0% in real terms, on average, whereas agricultural production has grown at 0.7% per annum. The resultant share of agricultural production that is exported has notably doubled rising from 19% in 1971 to 40% in 2013. The composition of agricultural exports has accordingly changed as well. The surge in processed agricultural exports relative to primary products points to two trends. First, as mentioned above, as incomes rise the share of food budgets spent on processed food products rises increasingly. Second, some processing jobs are being entrusted with the exporters in developing countries to take the benefit of lower wages.

The steady growth in the share of agricultural exports encompasses almost all commodity categories. The exceptions to this pattern are fruits and vegetables: both primary and processed fruits and vegetables have increased their share of world agricultural exports over this period, but growth in fresh fruit and vegetable exports picking up higher stake. This reflects both consumer inclination to pay more for fresh produce as well as improvements in transportation and logistics.

Another trend is the shift in the composition of agricultural commodities for exports. Not surprisingly, export of grain and cereals have fallen drastically as a proportion of the total value of agricultural trade declining from 15% in the 1960s to a paltry 8% in the 1990s. During the corresponding time, exports of higher-value agricultural products such as fruits and vegetables, meat, dairy products, eggs, fish and seafood have strengthened from 29% to 42% of the total over the same period. The share of fish and seafood, in particular, has more than doubled from less than 5% to over 13% of world agricultural trade.

Livestock and livestock products represent about one-seventh of the total agricultural trade, but the share is progressively growing over time. Developed nations continue to account for the bulk of world trade. Import of livestock and livestock products by developing countries is increasing with the rise being more prominent for dairy products and meat. World dairy trade is small relative to the production, mainly due to highly perishable nature of the products. Exports of dairy products are dominated by processed items like cheese and milk powder. Even though India is one of the biggest milk producers in the world international trade in dairy products is dominated by middle- and high-income countries.

Worldwide export of fisheries meant for human consumption has grown more than six folds since the mid 1970s to approximately US\$ 60 billion by 2012. China has recently emerged as the world's top exporter of fish overtaking Thailand. The main impetus to this faster increase resulted from local and foreign investment in fish processing and attaining the ability to meet quality and food safety standards in high profile developed countries.

With the ongoing trend of faster urbanization and higher income surge in the developing countries expected to continue there will be even more shift in food consumption towards high value products. IFPRI's IMPACT model⁴ depicts that milk and meat consumption will continue to grow at a faster pace in developing countries than in the developed countries. For the period between early 1990s and 2020, milk consumption is forecasted to grow 3.3% per annum in the developing countries in contrast to 0.2% per annum' in the developed countries. Similarly, meat consumption is estimated to grow 2.8% per annum in the developing regions compared to just 0.6% per annum in the developed countries. The demand in developing countries will spur domestic production so that by the year 2020 the presently developing nations will account for 60% of the world's meat production (with China being the top producer) and 52% of world's milk production (with India becoming the biggest producer).

The IMPACT projections for fisheries laid down that the consumption of both high-value and low-value food fish will augment in the developing world whereas the intake will remain static in the developed world. On the output side, the developing countries are projected to increase their share in the world production from 73% in 1997 to 79% in 2020 as global food fish production is estimated to grow by 40% between 1997 and 2020. The share of pisciculture in overall fish supply is projected to increase from 31 % in 1997 to 41 % by 2020.

Alongside the shift in food consumption toward higher-value products there are broad-based changes in the food marketing channels. These changes are emanated in three ways: the changeover and solidifying the retail food sector, the expansion of the food processing sector and the growth of the food service industry. The likely driving force behind these trends include snowballing income (which brings about ever increasing demand for convenience, quality and food safety), urbanization, improvement in mobility and life-style changes with ever increasing number of women working outside the home, greater ownership of refrigerators and micro-wave ovens and liberal foreign investment regulations. For example, the rising demand for food safety means that processors and producers in exporting countries are being subjected to change production methods, update processing facilities, strictly implement testing procedures and document the various measures employed to minimize the risk of hazardous contamination and spoilage.

One aspect of the modernization of food marketing channels is the setup of large-scale retail outlets which include supermarkets and hypermarkets. It is obvious, however, that supermarkets and other modern retailing outlets are growing rapidly in most developing countries. Among the developing countries, the share of the retail food market is the highest in middle-income countries such as Brazil, Argentina and Thailand and the lowest in low-income Asian countries such as Bangladesh and Vietnam. Finally, these supermarket chains- are also gradually spreading their presence beyond bigger urban centers.

The Supermarkets have the quality to handle processed foods and fresh products with a longer shelf life, but they have to face difficulties in handling leafy vegetables and other perishable produce. In Bangladesh, the supermarkets appear to have a small share of the market in the fresh fruit and vegetable segment but have been able to consolidate their market share in the processed food items.

Despite the rapid expansion of the supermarkets many consumers continue to frequent traditional wet markets particularly for fresh fruits and vegetables. ACNielsen reports that in Bangladesh, between 80 and 90 percent of the urban dwellers use wet markets on regular basis. Only in Japan and the Republic of Korea, less than 50 percent of urban buyers use them on a regular basis. In Malaysia, the trend is the most dominant and advanced. Supermarkets and hypermarkets there are on record for 60 percent of fruit sales and 35 percent of vegetables sales in 2010. Not falling far behind is Thailand where 40 percent of fruits and 30 percent of vegetables were sold through supermarkets and hypermarkets in the greater Bangkok area. In the Philippines, mere 15 percent of the vegetables are accounted to be sold through supermarkets in Metro Manila.

The consolidation of retail mega shops has manifold implications for the rest of the food supply chain. The most obvious effect is the displacement of small-scale vendors. Depending on the dimension and pace of growth of the supermarket outlets this may mean slow down in growth or actual shrinking of the traditional poor retailers. Second, the larger supermarket chains often entrench dedicated distribution outlets bypassing the food wholesalers. Third, for uninterrupted and a steady supply of high-quality and safer agricultural products particularly the perishable ones the supermarket chains often establish preferential supplier relationships with the selected farmers or traders. These trade relationships involve a passage from spot markets to more vertically coordinated markets.

There is a widespread apprehension that small farmers will be debarred from these channels because of the high-transaction costs of monitoring and collecting produce

from many small growers. Finally, the multinational supermarket chains resort to international sourcing exposing local farmers to crippling competition from the suppliers and from other origins but also providing a passage by which local farmers may supply stores in other countries.

Multiple institutional arrangements have been work out to link the farmers with the emerging modern marketing channels in Bangladesh. The supermarkets and the processors operating at lofty scale and often catering to high-pitched markets need to secure their supply lines by maintaining quality and quantity of inputs or supplies. This pressing need has made the link-up with the farmers an imperative. Contract farming, for example, between the downstream firm and the local suppliers are becoming increasingly a common phenomenon. Our study found that, in the newly formed linkages between the supermarkets and the farmers, there is positive indication that small producers can fruitfully join the supply chains to the supermarkets in a manner that boosts their livelihood.

In addition, there has been a marked shift in the consumption trend towards more value-added products. The heightened value addition has occurred on two counts. First, there is more sorting, processing and packaging to cater to the need for year-round supply and consumption of seasonal products, ready-to-cook and ready-to-eat products with reassured quality and food safety. Furthermore, there is more value addition in the retail and food service industries to create a more convenient and catchy experience for the consumer. Supermarkets, for example, have transited from a food store to a place where one can purchase a multiple services under one roof, thereby multiplying the convenience of one-stop shopping.

As mentioned earlier, rising income has integrated with a shift in food consumption habits toward high-value agricultural products such as meat, fish, dairy, fruits and vegetables as well as an inclination for more processed foods. Processed food is simply defined broadly to include a range of value-added acts including cutting, packaging, drying, canning and freezing. Some of these activities, such as cutting and

packaging meat and vegetables, may be handy and carried out at the retail level by supermarkets or smaller shops. Others, such jobs as drying, preserving, canning and freezing, are done by specialized processors. The main urge for the consumers to shift to processed foods is their frequently acquired higher income to go for processed foods which generally is a time saver in food preparation. In addition, processed foods are generally the least perishable (which cuts shopping frequency) and consumers repose more confidence in the quality and food safety of packaged and branded food.

The composition of food in demand strongly influences the dimension of the food processing sector in relation to the size of the agricultural sector. As per capita GDP rises, the contribution of the agricultural sector has a downward slide, while the contribution of food processing is relatively sound. The trend lines points to a two-pronged falls of per capita contribution of agriculture toward GDP from 23 percent to 5 percent while the contribution of food processing to GDP declining from 7 percent to 4 percent. An obvious implication of these two trends is that the contribution of the food processing sector to the combined agri-food GDP grows as with rising income. More specifically, the contribution of food processing to the combined agri-food value addition rises from less than one-quarter.

One study assessed that processed food exports grew 4.2% per year over 1980-1994, twice as fast as primary product exports (World Bank 2010). The study used a cross-country regression analysis to show that growth in processed food exports is higher among countries with more export-oriented trade regime.

On the other hand, the basket of processed food exports in total food exports has shrunk. Furthermore, the share of exported processed food is actually smaller than the share of primary agricultural commodities that are exported. This is partly due to the fact that processed foods are often victimized by much higher tariff protection than unprocessed agricultural produce. In addition, processed food must meet stringent

local standards in terms of labeling and language as well as meeting custom-made preferences in terms of product characteristics.

Rising per capita income and the ever increasing share of the population living in urban areas are altering the composition of food demand. The families are bringing variety to their diets away from grains and other staple foods into meat, dairy products, fish, fruits and vegetables. In addition, the share of processed food and food eaten outside the house is on the rise. These shifts in demand are manifested in the growing emphasis on high-value agriculture in production and international trade. For example, the value of fruit and vegetable exports from developing countries now outstrip the combined export value of coffee, tea, cocoa, tobacco and cotton.

In parallel to the changes in the composition of agricultural production and consumption is a transfiguration of agricultural marketing outlets. First, the importance of supermarkets is on the faster growth track and they now poised for a large share of food bought in lower-middle and upper-middle income developing regions. This trend is powered by rising incomes, urbanization and external investment in the retail sector. Second, the food services industry including restaurants and fast-food outlets is growing quickly in response to many of the similar trends. Third, the food processing industry is responding to the surging demand for processed food. We have shown that the contribution of food processing to the agri-food system grows from less than one-quarter when per capita GDP is US\$ 900 to about one-half when it is US\$ 10,000.

The mounting importance of high-value agricultural produce (most of which are perishable) and these trends in marketing channels indicate a greater need for vertical coordination among participants in the marketing channels as well as the greater importance of safer and quality food. One most common form of vertical coordination between big buyers (such as supermarkets, processors, and exporters) and farmers is farming on contract basis. These changes bear important implications for the down trodden in developing countries like Bangladesh.

The preceding eight chapters have reviewed the opportunities and growth prospects for selected commodities and industries culminating with a set of recommendations to address constraints specific to each. Finally, we take a broader perspective and examine cross-cutting issues that emerge as priorities for promoting high-value agriculture and concomitant agro-business development throughout Bangladesh.

As highlighted in each of the chapter, urgent and due attention is a pressing need for strengthening legislation on food safety through enactment of relevant laws and regulations for quality control for all types of agricultural inputs including feed, agro-chemicals and medicine. Many existing regulations are simply outmoded (such as those concerned to food safety) and others are not present (especially in key areas, such as consumer and protection, and ensuring the quality of animal feed and related inputs). These deficiencies are detrimental to consumer welfare, inspire the private sector to indulge in unscrupulous practices which will negatively impact the agro-business and as a result there will be an undesirable slowdown in the growth of high value agriculture.

Many forms of subsidies, export incentives and tax benefits formulated to promote the growth of high-value agriculture and related agro-business are in fact stultifying growth thereby distorting the production environment while disregarding underlying problems contrary to 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. Some of the specific incentives identified in the case 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 inclination against market development in destinations not under Biman service. By eliminating the freight advantage that unfairly favors Biman, the exporters would be at liberty to choose from more conventional road ways for acquiring competitive benefits.

- Incentives extended to processing plants. Seafood processors may import machinery and equipment duty-free, benefit from a tax holiday and obtain loans from state agricultural banks at two-thirds of 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 utilized.

Further reform in regulations that put hurdles against the ease of doing business in Bangladesh will be a harbinger of 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 2007). 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). 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 (World Bank 2007).

Agro-food processing firms (and manufacturing firms in general) in Bangladesh have consistently rated electricity outages as their most serious constraint in Investment Climate Surveys conducted between 2002 and 2005. The unreliable provision of electricity is a national problem and not restricted to only agriculture or agro-business, yet it severely compromises prospects for growth in these sectors which would greatly benefit from its resolution. The decision for plantation made by farmers and investment and business operation decisions made by the processors are unjustifiably affected by worries over the likelihood of rising electricity costs or service disruptions.

Improvements in market infrastructure are also desirable. The development of efficient and competitive markets is a catalyst for promoting growth in high-value

agriculture. While Bangladesh has quite a high density of markets-of its 16,476 markets 2,050 are marked out as growth centers and 392 are "notified" markets -many markets need significant improvements in infrastructure to grapple with highly perishable fruit, vegetable, fish, and animal produce. 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 individual entities.

Generally, there is no connection between fees collected from a market and services provided to traders. As of 2004, there were at least two markets in every Union Parishad. The Department of Agricultural Marketing (DAM) is responsible for market regulation, inspection, registration of traders and fixing of market charges in all notified markets. Each notified market has a District Market Advisory Committee (DMAC). The DMAC has control over the markets in its respective district. The Local Government Engineering Department is responsible for improving market infrastructure in larger notified markets. Infrastructure development in small primary markets is the responsibility of the Union Councils. Market revenue collection is under the control of the lessees (on behalf of Upazilla Councils and the City Corporations). Each individual market is managed by a Market Management Committee. Each Upazilla has a Market Management Committee headed by the Upazilla Nirbahi Officer that is supposed to review management, operation, and maintenance of all the markets in the Upazilla. In the notified markets, private collectors collect market fees from traders not operating in permanent structures while the officers from DAM collect monthly rents from shop owners in permanent structures.

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. 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”. There is a very lax oversight of how much is actually collected and charges are rarely posted clearly at the market entrance.

The 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. 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 the areas for reform. A well-thought-out strategy for market development and operation is needed.

The technical skills and knowledge required to produce and manage high-value agricultural products need to be improved. University curricula needs upgrading and training programs should be developed to improve the pool of skilled technicians and extension agents available to farmers and enterprises. As discussed in chapter-6, the bagda and galda hatcheries seem excessively reliant on foreign experts. Training Bangladeshi technicians will be critical for the sustainability of this industry. Similarly the lack of qualified technicians in the poultry sector is a major drawback in terms of delivering effective advisory services to SMEs. Investments in farmers' training systems are also needed in the greater interest of highly productive agriculture.

Farmers require continued assistance to reduce the informal subjection to extortion and tolls against fresh produce while it is being transported from farm to market. The enhanced costs that such tolls impose are ultimately shared by the final consumers as well as the farmers and they disadvantage both the parties. A continued effort should also be made to reduce informal tolls for routine handling of export consignment through the Port of Chittagong and Hazrat Shahjalal International Airport. Like informal road extortions these illicit payments serve as a hurdle on export growth; they reduce farmers' incomes and consumers' welfare.

A generous investment is required to build the knowledge base that will further enable the private sector to join the endeavor and compete in high-value agriculture and relevant agro-business. Agricultural research, in general, in Bangladesh has been under funded (World Bank 2005). Between 1997/98 and 2004/05, allocation for agricultural research and development as a share of total agricultural GDP runs from 0.20 percent to 0.34 percent. This level of expenditure is a trifling amount and lower than that in the developing nations as a whole which averaged 0.62 percent of agricultural GDP and significantly scanty than earmarked on agricultural research in the 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 2005). The Horticulture Research Center carries out limited research on fruit and vegetables and the Post Harvest Technology Division of Bangladesh Agriculture Research Institute examines issues concerning fruit and vegetable processing (World Bank 2005). 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 pisciculture and livestock sectors has not produced any better result. BFRI has conducted some work on breeding and genetics, feed and nutrition, integrated fish farming, disease and health care management and socio-

economic aspects of pisciculture and BLRI is entrusted with livestock research to boost 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 relevant agro-business. We identified several areas where such research would be commendably beneficial:

- Fruit and vegetable processing where research is needed to usher in beneficial processing techniques, operation of equipment and manufacture and innovation of new product.
- Aquaculture where intensive research is required to reduce genetic degradation in carp stocks. The DoF and BFRI have extensive facilities; the universities (including BAU) and BFRI have strengths in genetics and technical know-how; and the private sector would inject a catalytic element of entrepreneurial drive to the program and possibly underwrite partial financing.
- The poultry industry where there is a cry for more research on production methodology and technologies, nutrition, processing and biosecurity. A partnership between public research institutions and the private sector in tandem would yield mutual and lasting benefits.
- The high-value rice industry where closer coordination between those involved in plant breeding and the traders is required to develop improved varieties of traditional fine rice with such characteristics as palatability, aroma, higher milling output and lower cost of production.

The extension system also needs to be reoriented to better develop and disseminate technology related to high-value agricultural commodities and in assisting farmers identify market opportunities.

There is a lack of reliable agricultural and industry data on most high-value agricultural commodities which 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.

The 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, but knowledge of successful interventions is not widely disseminated and therefore rarely scaled up.

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 offshore buyers and consumers concerning the health and safety traits of the food products on their buying list and 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.

Putting in place appropriate food safety regulations and ensuring compliance with the regulations is of crucial importance for consumer welfare as well as boosting up 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 to agro-food trade and the growth of agro-business in general. The problems arise from the 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 including hazardous chemicals in fish and fish products; (3) heavy metal contamination, particularly the high levels of arsenic, lead and cadmium in vegetables as well as 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 had reviewed the food control methods in Bangladesh. The recommendations included: (1) formulating an all-inclusive food safety policy; (2) streamlining and improvised 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 framework on GAP and GMP for all foods, including fruit and vegetables; and (6) evolving and enacting a comprehensive labeling law with appropriate provisions for labeling local and imported packaged food commensurate 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 the responsibilities are spread across 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.

Like Bangladesh, India had to confront the challenges posed by outdated food laws and by enforcement responsibilities scattered among a myriad of government agencies. India recently revised its food laws and passed an integrated food law, “The

Food Safety and Standards Bill, 2005” in August 2006. The bill unites diverse legislation under a single umbrella law and creates a Food Safety and Standards Authority of India. This process of legal and institutional reform took considerable time dating from the formation of a Task Force on Food and Agro-Industries Management Policy in 1998.

The key provisions of the bill: (1) repeal a number of Acts and Orders (including the Prevention of Food Adulteration Act); (2) establish a Food Safety and Standards Authority; (3) define standards for food additives, contaminants, genetically modified and organic foods, packaging, labeling, and food imports; (3) require accreditation of laboratories, research institutions, and food safety auditors; (4) require licensing and registration of food businesses and set penalties for offenses; and (5) establish a Food Safety Adjudication Tribunal. (World Bank 2007)

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 2005). Growing evidence indicates that for well-prepared developed countries and suppliers, upgrading 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 keeping 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 the trading partners. Good reputations gained through demonstrated compliance yield lower transaction costs for farmers and exporters. As pointed out earlier, 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 damaging reputation for poor quality.

The past studies emphasize that future competitiveness in prolific export markets depends on making urgently needed betterment in laboratory and testing facilities. For example, BSTI is not fully equipped to perform many of the tests and certifications required for export markets or to ensure that fruit, vegetables, or products derived from them are free of contamination from chemical residues, dyes, or heavy metals. While this deficiency may not pose an immediate threat to the capacity of national distributors and exporters to service today's customers in ethnic markets the time is drawing closer when most, if not all, markets of interest will insist that imported products must accompany test results confirming compliance with plant health and food safety standards. It is imperative that the official institutions be upgraded or that competent private companies be inducted into the country to provide such certifications credibly, readily, and affordably.

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 the government. In a variety of circumstances, importing countries require certain functions to be performed by a designated “competent authority” in the public sector. Past studies showed that 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).

Contract farming is on rapid pervasion in Bangladesh which now has set many examples of well-accomplished contract farming arrangements. Contract farming-in which producers enter into forward agreements, sometimes at a predetermined price,

to produce and supply agricultural commodities in return for production support (such as technical advice, inputs, or finance) from the purchaser (processors, retailers, or exporters)-is an increasingly important institutional catalyst for the growth of high-value agriculture and relevant agro-business. The vertical coordination between growers and purchasers becomes indispensably valuable for high-value agricultural products as it may ward off the high transaction costs and the accompanying risks. In a production process where quality control is particularly important contract farming enables processors, exporters, and retailers to supply quality inputs, ensure adherence to codes of practice, and ultimately procure either raw materials for production or finished product for export/domestic retail that conform to specific requirements.

Contract farming also offers small-scale producers an opportunity to remain glued to high-value agriculture. Contract farming can cut short the number of intermediaries, wastage, transaction costs, and unnecessary market risks. Contract farming schemes are associated with significant improvements in farmer productivity, less fluctuation in returns (in comparison with those received by noncontract farmers), and credit for smallholders. Gulati et al. reported that contract farmers attain higher net returns than noncontract farmers because both production and marketing costs are lower. The share of marketing cost in total cost for noncontract farmers was 20 percent for milk and 21 percent for vegetables, but only 2 percent in both cases for contract farmers.

Despite contract farming's numerous advantages the enforcement capability of contracts poses a challenge in Bangladesh where breach of contract is liberally common among producers and purchasers alike. Other countries have set in place legal and regulatory mechanisms to address contract enforcement related issues and it would be useful to conduct a careful review of contract farming arrangements in Bangladesh to better understand how contracts currently safeguard the interests of the parties and to minimize the scope for anticompetitive and abusive practices. Ultimately, the best way of improving contract enforcement is to build trust, although this may take time. Innovative contract specifications and self-enforcing contracts that include flexible conditions to anticipate market changes could mitigate the

problem (World Bank 2007). The public sector can help by building capacity in contract design and developing a contract design knowledge base that draws public lessons from the individual experiences of firms. Strengthening producer organizations may also help enforce contracts on the farmers' side, and alternative dispute resolution institutions (such as industry associations) can also play an important role.

Building capacity for market research, developing market information systems and strengthening market-related know-how is vital for farmers, traders, processors and exporters involved in high-value agriculture and related agro-business. There is a need to incorporate appropriate technology (such as radio broadcasts and SMS messages via cell phones) to provide farmers and their marketing agents with real-time information on market prices and volumes for the range of domestic markets where high-value agricultural products are sold.

Exporters have been unable to explore new market opportunities because they lack market information and because institutions have failed to assist them in identifying new opportunities. Exporters need better market research and greater capacity in meeting market access requirements. For example, in order to access promising markets for horticultural exports in East Asia the Ministry of Agriculture would need to develop the ability to conduct pest risk analyses and to negotiate and implement work plans as part of the process of gaining access to these markets. For fruit and vegetables from new origins to enter the markets of Japan and China (as well as India, Australia, the United States, and others), an exacting array of studies must be completed to prevent the introduction of pests, diseases, or weeds into the importing country. Further steps in gaining access to such markets include the establishment of protocols to ensure that product is treated and handled to remain free of pathogens and that programs are in place to guarantee compliance with these protocols. Now there is no capacity to conduct such studies, negotiate such protocols, or guarantee such compliance in Bangladesh.

Strong commodity, industry, and profession-based associations are essential for agro-business to grow in Bangladesh. Many existing associations focus on lobbying and are less effective in fostering collective action to provide services to their members. The capacity building required within these associations could be supported through matching grants and similar arrangements (World Bank 2003).

Long-term technical support through NGOs and other agencies would help to build and strengthen producer organizations. The need for effective producer organizations is discussed more specifically in the dairy, poultry and aquaculture chapters. Such organizations give small-scale farmers a platform to conduct business with large input suppliers, traders, processors and retailers. As a group, small-scale producers can achieve economies of scale in buying the inputs and selling the products. They can pool resources to undertake activities that would not be feasible to pursue individually and they can provide easier contact points for support services, share risks, facilitate learning and provide social support in times of crisis (FAO 2007).

Considerable experience in Bangladesh and throughout the world demonstrates that producer groups can be vital for small-scale farmers' participation in high-value agriculture and for developing mutually beneficial partnerships with private industry. A wide number of producer groups in different shapes and forms exist in Bangladesh, but continued effort is needed to scale up, build management capacity and ensure the autonomy, independence and financial viability of current and future groups. In other countries, the public sector has supported the formation of productive partnerships between agro-business and producer organizations.

Currently, no single entity has an institutional mandate for promoting the growth of agro-business in Bangladesh. As a result, support for high-value agriculture and related agro-business has been piecemeal and uncoordinated. The Ministry of Agriculture and the Ministry of Fisheries and Livestock need to strengthen their ability to formulate policy and provide services related to high-value agricultural commodities, focusing on post-harvest management and marketing. Closer collaboration between the public sector, nongovernmental organizations and the

private sector, possibly through the industry task forces, would be extremely beneficial.

The private sector will continue to take the lead in developing high-value agriculture and related agro-business, but the government has important complementary roles to play. The government is central to creating the enabling environment for market-led development through stable and undistorted economic incentives and the provision of essential public goods and services. The government's regulatory role is also very important in this regard. In addition, the public sector has a responsibility to ensure that the growth of high-value agriculture and agro-business does not exacerbate poverty, accentuate prevailing inequities or damage the environment. The importance of closer collaboration between the public sector, NGOs, and private sector in promoting the growth of high-value agriculture and related agro-business can hardly be overemphasized. There is an adage that says that nobody can shake hand with a clenched fist. A similar situation of clenched fist will supervene if all the role players from the public and private sectors fail to put their hands together, go hand in hand collectively for the upliftment of all precious agricultural sector in Bangladesh. If all concerned come forward, shed their differences, put their endeavours in a tandem then one may become sure that the golden bells will be ringing for the Gargantuan agricultural wheel of Bangladesh in a not so distant future.

BIBLIOGRAPHY

- Ali, M. M (2013) Bangladesh Journal of Political Economy, Vol. 29, No. 1.
- Ali et al (2008) Price Spread in Fish Marketing, Mimeo, BARC, Dhaka.
- Amin, M. R. (2013) Bangladesh Journal of Political Economy, Vol. 29, No. 1.
- Agrico Ltd. (2004). Agribusiness Development Project. (ADB TA No. 4139-BAN).
- Ahmed, R. (2001). Retrospect and Prospects of the Rice Economy of Bangladesh. Dhaka: University Press.
- Ahmed, R. (1983). Fish Marketing in Selected Districts of Bangladesh, Mimeo, BAU.
- Ahmed, R. (2005). Fish Marketing in Selected Districts of Bangladesh, Mimeo, BAU.
- Ahmed, R and Rahman H.. (2005). Fish Marketing in Selected Districts of Bangladesh, Mimeo, BAU.
- Aksoy, M.A., and J.C. Beghin (eds.). 2005. Global Agricultural Trade and Developing Countries. Washington, DC: World Bank.
- Al-Rmalli, S.W., P.I. Haris, C.F. Harrington, and M. Ayub. 2005. "A Survey of Arsenic in Foodstuffs on Sale in the United Kingdom and Imported from Bangladesh." *Science of the Total Environment* 337(1-3): 23-30.
- Arndt, C., P. Dorosh, M. Fontana, and S. Zohir, with M. El-Said and C. Lungren. 2002. "Opportunities and Challenges in Agriculture and Garments: A General Equilibrium Analysis of the Bangladesh Economy." Trade and Macroeconomics Division Discussion Paper No. 107. International Food Policy Research Institute (IFPRI), Washington, DC.
- Ara et al (2010) Price Spread in Fish Marketing, Mimeo, BARC, Dhaka.

- Ashraf, A. 2004. Market Management Study: Northwest Crop Diversification Project (NCDP). Dhaka.
- Ahmed, J, S.M. Elias et al. 1990. Farm Level Processing, Storage and Utilization of Maize in Bangladesh. Economic Affairs, Vol. XXXV, Qtr-1. BC144, Sector 1, Salt Lake City, Calcutta, India.
- Ahmed, Rafiq. 1993. Prospect and Problems of Maize Extension. Published in the Book "Maize Production and Utilization". On-Farm Research Division, BARI, Joydebpur, Gazipur.
- ATDP (Agro-based Industries and Technology Development Project). 2005. "Shrimp Industry Study: Problems, Prospects, and Intervention Agenda," United States Agency for International Development (USAID), Dhaka.
- ACNielsen (2003). Asia-Pacific Retail and Shopper Trends 2003. ACNielsen, Hong Kong. Available at <http://www.acnielsen.de/pubs/documents/RetailandShopperTrendsAsia2005.pdf>
- Ahmadi-Esfahani, F.Z and Stanmore, R.G. (1997). "Export Demand for Attributes of Australian Wheat in Asia and the Middle East". Food Policy, 22(2):145-154.
- Alderman, H. (1987). "Cooperative Dairy Development in Karnataka, India: An Assessment". Research Report 64. International Food Policy Research Institute. Washington, D.C.
- Agawal (1990). "Fish Marketing in India: An Assessment". Research Report 64. International Food Policy Research Institute. Washington, D.C.
- Ali, M. and Abedullah, M. (2002). "Economic and Nutritional Benefits from Enhanced Vegetable Production and Consumption in Developing Countries" Journal of Crop Production, Vol. 6, No. 1(2), 145-76.
- Athukorala, P. and Sen, D. (1998). "Processed food exports from developing countries: patterns and determinants". Food Policy 23 (1): 41-54.
- Baker, J. L. (2000). "Evaluating the Impact of Development Projects on Poverty: A Handbook for Practitioners." The World Bank, Washington, D.C.

- Balsevich, F. Berdegue, J. A., Flores, L., Mainville, D. and Reardon, T. (2003). "Supermarkets and Produce Quality and Safety in Latin America." *American Journal of Agricultural Economics* 85 (5): 1147-1154.
- Barron, M. A. and Rello, F. (2000). "The impact of the tomato agro industry on the rural poor in Mexico", *Agricultural Economics*, 23(3): 289-297.
- BARI (2013), Annual Report on Maize, Gajipur.
- BARC (2014), Maize Area in Different Locations of Bangladesh, Monograph.
- Baumann, P. (2000). "Equity and Efficiency in Contract Farming Schemes: The Experience of Agricultural tree Crops". Working Paper 139. Overseas Development Institute, London.
- BBS. 2004. Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics, Ministry of Planning.
- BBS. 2012. Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics, Ministry of Planning.
- Bangladesh Bureau of Statistics (BBS), Ministry of Planning, Statistical Year Books, Various Issues.
- Bangladesh Bureau of Statistics (BBS), Ministry of Planning, Economic Census, Various Issues.
- Bautista, R. and Thomas, M. (1998). "Agricultural growth linkages in Zimbabwe: Income and equity effects." Discussion Paper No. 31. Trade and Macroeconomics Division. International Food Policy Research Institute. Washington, D.C.
- Birthal, P.S., Joshi, P. K. and Gulati, A. (2005). "Vertical Coordination in High Value Commodities: Implications for the Smallholders." MTID Discussion Paper No. 85. International Food Policy Research Institute. Washington, D.C.
- Bougs, H. E. and G. Scott (1996). Demand for High Value Secondary Corps in Developing Countries. The case of Potatoes in Bangladesh and Pakistan, IFPRI, Discussion Paper No. 14, Washington, USA.

- Boselie, D., Henson, S. and Weatherspoon, D. (2003). "Supermarket Procurement Practices in Developing Countries: Redefining the Roles of the Public and Private Sectors." *American Journal of Agricultural Economics*. 85 (5), 1155-1161.
- BBS (Bangladesh Bureau of Statistics). Various years. *Statistical Yearbook of Bangladesh*. Dhaka: BBS, Planning Division, Ministry of Planning.
- BFFEA (Bangladesh Frozen Foods Exporters Association). 2004. "Vision 2008: Achievable Target for Bangladesh Seafood Export, BFFEA, Dhaka.
- Bogetof, P., and H. Olesen. 2002, "Ten Rules of Thumb in Contract Design: Lessons from Danish Agriculture." *European Review of Agricultural Economics* 29(2): 185-204.
- Cadilhon, Moustier, J. P., Poole, N. D., Tam, P.T.G. and Fearne, A. P. (2006). "Traditional vs. Modern Food Systems? Insights from Vegetable Supply Chains to Ho Chi Minh City (Vietnam)." *Development Policy Review*, 24 (1): 31-49.
- Chen, K.Z., Shepherd, A.W. and da Silva, C. (2005). "Changes in food retailing in Asia: fruit and vegetable supply chain developments and implications for farmers and traditional marketing systems", FAO, Rome.
- Chauhan, H.R.S., R.B.S. Tomar and A. K. Gupta. 1994. *Economic Performance of Paddy*
- Chengappa, P.G., Achoth L., Mukherjee A., Reddy B.M. and Ravi P.C. (Forthcoming). "Evolution of Food Retail Chains in India". *International Food Policy Research Institute*, Washington, D.C.
- Chowdhury, S., Gulati, A. and Gumbira-Sa'id, E. (2005). "High Value Products, Supermarkets and Vertical Arrangements in Indonesia". *MTID Discussion Paper No. 83*. *International Food Policy Research Institute*. Washington, D.C.
- Chawdhury, M.Kanti. 1993. *Maize Cultivation in Inter-Cropping*. Published in the Book "Maize Production and Utilization". On-Farm Research Division, BARI, Joydebpur, Gazipur.

- Chowdhury, S. (2005). Value Chain Analysis: Concepts and Methods. Powerpoint presentation made at Programa del Taller de Planificación, Proyecto CAFTA (IFPRI-CEPAL), IICA, Coronado, San Jose, Costa Rica, 2-3 de June 2005.
- Chowdhury, N., and S. Haggblade. 2000. "Evolving Rice and Wheat Markets." In R. Ahmed, S. Haggblade, and T.E.Chowdhury (eds.), *Out of the Shadow of Famine: Evolving Food Markets and Food Policy in Bangladesh*. Baltimore: Johns Hopkins, for the International Food Policy Research Institute (IFPRI), pp. 73-100.
- Dev, B. K. (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- Directorate of Agricultural Extension (DAE), Annual Reports, Various Years.
- DANIDA (Danish International Development Agency). 2005. "Study on DANIDA Support to the Livestock Sector-Smallholder Poultry Sub-sector in Bangladesh from 1993 to 2005," Network for Smallholder Poultry Development, Copenhagen.
- de Wilde, A., T. Islam, and Z.-U. Zaman. 2003. "Niche Markets for Agrobusiness in Bangladesh." Seminar presented at Agri-Invest 2003 Bangladesh, Dhaka, December.
- Dorosh, P. 2001. "Trade Liberalization and National Food Security: Rice Trade between Bangladesh and India." *World Development* 29(4): 673-689.
- . 2006. *Accelerating Income Growth in Rural Bangladesh*. Background paper prepared for Bangladesh Strategy for Sustained Growth, World Bank.
- Dorosh, P., C. del Ninno, and Q. Shahabuddin (eds.). 2004. *The 1998 Floods and Beyond: Towards Comprehensive Food Security in Bangladesh*. Dhaka: University Press Ltd.

- Draaijer, J. 2002. Milk Producer Group Resource Book: A Practical Guide to Assist Milk Producer Groups. Rome: Food and Agriculture Organization (FAO).
- Datt, G. and Ravallion, M. (1998). “Why Have Some Indian States Done Better than Others at Reducing Rural Poverty?”. *Economica*, 65 pp. 17-38.
- Deaton, A. (1997). *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*, Baltimore, Johns Hopkins University Press for the World Bank, 1997. (479 pp.)
- Delgado, C.L., Hopkins, J., Kelly, V., Hazell, P., McKenna, A., Gruhn, P., Hojjati, B., Sil, J. and Courbois, C. (1998). “Agricultural Growth Linkages in Sub-Saharan Africa”. Research Report 107. International Food Policy Research Institute. Washington, D.C.
- Delgado, C.L., Minot, N., and Tiongco, M. (2005). “Evidence and implications of non-tradability of food staples in Tanzania 1983-1998”. *Journal of Development Studies* 41(3): 376-393.
- Delgado, C. L., Wada, N., Rosegrant, M.W., Meijer, S., and Ahmed, M. (2003) *Fish to 2020: supply and demand in changing global markets*. Washington, D.C. International Food Policy Research Institute (IFPRI) / WorldFishCenter, Penang. <http://www.ifpri.org/pubs/books/fish2020book.htm>
- Digal, L.N. and Concepcion, S.B. (2004). “Securing small producer participation in restructured national and regional agri-food systems - The case of Philippines.” Accessed at http://regoverningmarkets.org/docs/Philippines_Report%20_6Nov2004.pdf.
- Dolan, C. and Humphrey, J. (2001). “Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry.” *Journal of Development Studies*, 37(2), pp. 147-176.
- DFID (2012). *Efficiency of Fish Markets in Bangladesh*, Research Report, Dhaka.
- Directorate of Fisheries (DoF), Annual Bulletin, various issues.

- DANIDA (Danish International Development Agency). 2005. "Study on DANIDA Support to the Livestock Sector-Smallholder Poultry Sub-sector in Bangladesh from 1993 to 2005," Network for Smallholder Poultry Development, Copenhagen.
- de Wilde, A., T. Islam, and Z.-U. Zaman. 2003. "Niche Markets for Agrobusiness in Bangladesh." Seminar presented at Agri-Invest 2003 Bangladesh, Dhaka, December.
- Dorosh, P. 2001. "Trade Liberalization and National Food Security: Rice Trade between Bangladesh and India." *World Development* 29(4): 673-689.
- 2006. Accelerating Income Growth in Rural Bangladesh. Background paper prepared for Bangladesh Strategy for Sustained Growth, World Bank.
- Dorosh, P., C. del Ninno, and Q. Shahabuddin (eds.). 2004. *The 1998 Floods and Beyond: Towards Comprehensive Food Security in Bangladesh*. Dhaka: University Press Ltd.
- Draaijer, J. 2002. *Milk Producer Group Resource Book: A Practical Guide to Assist Milk Producer Groups*. Rome: Food and Agriculture Organization (FAO).
- Eaton, C. and Shephard, A.W. (2001). *Contract farming: Partnerships for growth*. FAO Rome. Available at www.fao.org/ag/ags/agism/contract.htm
- Elias, S.M, F.S.Sikder, et al. 1985. *A Perspective of Summer Maize in Bangladesh: An Agro Economic Analysis*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Elias, S.M, J. Ahmed, et al. 1985. *A Perspective of Winter Maize in Bangladesh: An AgroEconomic Analysis*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Elias, S.M., J.Ahmed, et al. 1988. *Farm Level Processing, Storage and Utilization of Maize in Bangladesh*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.

- EPB (2010), Annual Report, Ministry of Commerce, Government of Bangladesh.
- Faiguenbaum, S., Berdegue, J.A. and Reardon, T. (2002). “The rapid rise of supermarkets in Chile: Effects on dairy, vegetables and beef chains”, *Development Policy Review*, 20(4): 459-471.
- Fafchamps et al (1998), cited from Faiguenbaum et al (2002).
- Farina, E.M.M. Q. (2002). “Consolidation, Multinationalization and Competition in Brazil: Impact on Horticulture and Dairy Products Systems.” *Development Policy Review*, 20(4). 441-457.
- Florkowski, W.J. (1999). “Effects of product attributes and consumer characteristics on attitude and behavior: The Case of Peanuts in a Transition Economy”. *Agribusiness* 15(3):411-425.
- Flowra et al (2000). *Fish Marketing in North-West Region of Bangladesh*, Mimeo, BAU.
- Food and Agriculture Organization (FAO). (2004). *The state of the agriculture commodity markets*, Publishing Management Services, Rome: Food and Agriculture Organization of the United Nations, Rome.
- Food and Agriculture Organization (FAO). (2004). *The state of world fisheries and aquaculture*, Publication Management Services, Rome: Food and Agriculture Organization of the United Nations, Rome.
- Food and Agriculture Organization (FAO). (2005). *FAOStat. Food and Agriculture Organization of the United Nations*. Rome.
- Food and Agriculture Organization (FAO). (2006). *FAOStat. Food and Agriculture Organization of the United Nations*. Rome.
- Food and Agriculture Organization (FAO). (2007). *FAOStat. Food and Agriculture Organization of the United Nations*. Rome.
- Food and Agriculture Organization (FAO). (2008). *FAOStat. Food and Agriculture Organization of the United Nations*. Rome.
- Food and Agriculture Organization (FAO). (2009). *FAOStat. Food and Agriculture Organization of the United Nations*. Rome.

- Food and Agriculture Organization (FAO). (2010). FAOStat. Food and Agriculture Organization of the United Nations. Rome.
- Food and Agriculture Organization (FAO). (2011). FAOStat. Food and Agriculture Organization of the United Nations. Rome.
- Food and Agriculture Organization (FAO). (2012). FAOStat. Food and Agriculture Organization of the United Nations. Rome.
- Food and Agriculture Organization (FAO). (2013). FAOStat. Food and Agriculture Organization of the United Nations. Rome.
- Foster, J., Greer, J. and Thorbecke, E. (1984). "A class of decomposable poverty measures." *Econometrica*, 52 (1984), 761-765.
- FAO (Food and Agriculture Organization of the United Nations). 2007. Committee on Agriculture, Twentieth Session: Challenges of Agribusiness and Agro-Industries Development. Rome.
- FAOSTAT. Database of the Food and Agriculture Organization of the United Nations. Available at <http://faostat.fao.org>. various Issues: 2000-2013.
- GOB (Government of Bangladesh) 2005, Industrial Policy of Bangladesh.
- GOB (Government of Bangladesh) 2012, Dairy Production of Bangladesh.
- GOB (Government of Bangladesh), Department of Fisheries (DoF). 2005a. Fishery Statistical Yearbook of Bangladesh 2004-05. Dhaka: Department of Fisheries, Ministry of Fisheries and Livestock.
- . 2005. Livestock Policy and Action Plan. Dhaka: Department of Livestock Services, Ministry of Fisheries and Livestock.
- , Bangladesh Bureau of Statistics. 2004. Household Income and Expenditure Survey. Dhaka: Bangladesh Bureau of Statistics.
- , Department of Fisheries (DoF). 2004. Ecological Studies on Wild Shrimp Larvae: Results of an Intensive Study. Dhaka: Fourth Fisheries Project-Aquatic Resources Development, Management, and Conservation Studies.
- , Bangladesh Bureau of Statistics. Various Years. Statistical Yearbook of Bangladesh. Dhaka: Bangladesh Bureau of Statistics.

- Gulati, A., N. Minot, C. Delgado, and S. Bora. 2007. "Growth in High-value Agriculture in Asia and the Emergence of Vertical Links with Farmers." In J.F.M. Swinnen and K.U. Leuven (eds.), *Global Supply Chains, Standards, and the Poor: How the Globalization of Food Systems and Standards Affects Rural Development and Poverty*. Wallingford: CABI.
- Gupta S (2004) Price Spread in Fish Marketing, Unpublished Report, BARC.
- Ghezan, G., Mateos, M. and Viteri, L. (2002). "Impact of supermarkets and fast-food chains on horticulture supply chains in Argentina." *Development Policy Review*, 20(4): 389-408.
- Gilmour, B. and F. Gale. (2002). "A mature retail sector: Wider channels for food imports?" In Fred Gale, Francis Tuan, Bryan Lohmar, Hsin-Hui Hsu, Brad Gilmour (eds.). *China's Food and Agriculture: Issues for the 21st Century*. Agriculture Information Bulletin No. 775. Economic Research Service, U.S. Department of Agriculture, Washington, D.C.
- Global Insights. (2005). "The Economic Impact of Wal-Mart. Business Planning Solutions," Global Insight Advisory Service Division, available at http://www.globalinsight.com/publicDownload/genericContent/11-03-05_walmart.pdf.
- Glover, D. (1984). "Contract farming and smallholder out grower schemes in less-developed countries", *World Development*, 12 (11/12): 1143-1157.
- Glover, D. and Kusterer, K. (eds.) (1990). *Small farmers, big business: contract farming and rural development*, London, Macmillan.
- Gelhar, M. and Regmi, A. (2005). "Factors shaping global food markets." In Regmi, A. and M. Gehlhar (eds.) *New Directions in Global Food Markets* Agriculture Information Bulletin, Number 794, Washington, D.C.
- Greene, W.H. (1997). *Econometric Analysis*. Third Edition. Prentice Hall, New Jersey.
- Guo, H., Jolly, R. W. and Zhu, J. (2005). "Contract farming in China: Supply Chain or Ball and Chain?" Paper Presented at IAMA Symposium in Chicag,2005.Availableatwww.ifama.org/conferences/2005Conference/Symp_Presentations/Session4Ambassador/Chicago%20Conference_Zhu.ppt

- Gutman G. E. (2002). "Impact of the Rapid Rise of Supermarkets on Dairy Products Systems in Argentina", *Development Policy Review* Volume 20, Number 4, September, pp. 409-427(19).
- HIES, Bangladesh Bureau of Statistics, Ministry of Planning, GoB 1996
- HIES, Bangladesh Bureau of Statistics, Ministry of Planning, GoB 2010.
- HIES, Bangladesh Bureau of Statistics, Ministry of Planning, GoB 2011.
- HIES, Bangladesh Bureau of Statistics, Ministry of Planning, GoB 2012.
- HIES, Bangladesh Bureau of Statistics, Ministry of Planning, GoB 2013.
- Hasan, S. et al (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- Hasan, M. R. (2005). *An Economic Analysis of Contract Farming for Production and Export of HV Vegetables in Bangladesh*, Unpublished MS Thesis, Dept. of Agricultural Economics, BAU, Mymensing.
- Hemme, T., O. Garcia, and A. R. Khan. 2004. "A Review of Milk Production in Bangladesh with Particular Emphasis on Small-Scale Producers," *Pro-poor Livestock Policy Initiative Working Paper No. 7*, PPLPI, Rome.
- Hussain, S., and F. Ara. 2004. *Bangladesh Food Retail Sector Report*. Global Agriculture Information Network (GAIN) Report No. BG4001. Dhaka: United States Department of Agriculture, Foreign Agricultural Service (USDA-FAS).
- Hussain, M.S., M.N. Islam, et al. 1995. *Comparative Study on Hybrid and Composite Variety of Maize in Selected Areas of Bangladesh*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Hussain, M.S, C.G. Swenson, et al. 1980. *Agro-Economic Study of On-farm Maize Trials in Bangladesh*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Harris, M.J. (1997). "The impact of food product characteristics on Consumer Purchasing Behavior: The Case of Frankfurters." *Journal of Food Distribution Research*, 28(1): 92-97.

- Hsu, Hsin-Hui, Chern, W. S., and Gale, F. (2002). "How will rising income affect the structure of food demand?" In Fred Gale, Francis Tuan, Bryan Lohmar, Hsin-Hui Hsu, Brad Gilmour (eds.). *China's Food and Agriculture: Issues for the 21st Century*. Agriculture Information Bulletin No. 775. Economic Research Service, U.S. Department of Agriculture, Washington, D.C.
- Hu, Dinghuan, Fuller, Frank, and Reardon, Thomas. (2004b). "The Impact of the Rapid Development of Supermarkets on the Dairy Industry in China." (In Chinese) *Chinese Rural Economy*, 7 (Serial No. 235), 2004:12-18.
- Hu, D., Reardon, T., Rozelle, S., Timmer, P. and Wang, H. (2004a). "The emergence of supermarkets with Chinese characteristics: Challenges and opportunities for China's agricultural development," *Development Policy Review* Vol. 22, No. 4, September: 55786.
- Hortex Foundation (2013), *A Quarterly Publication of the Horticulture Export Development Foundation*, Dhaka.
- Hoq, M.S., S. K. Raha and N. Sultana (2012).m *Value Addition in Vegetables Production, Packaging and Export from Bangladesh*. *Bangladesh Journal of Agricultural Research* (37) 3, September.
- Humphrey, J. (2005). "Shaping Value Chains for Development: Global Value Chains in Agribusiness", study commissioned by the Federal Ministry of Economic Cooperation and Development, Germany.
- IFCN (2005) *Global Dairy Situation*.
- Gslam, M. M. (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- Islam, M.A. et al. 1993. *Maize-Based Improved Cropping Patterns*. Published in the Book "Maize Production and Utilization". On-Farm Research Division, BARI, Joydebpur, Gazipur.
- Islam, M.N., M.M.Anwar, et al. 1995. *Economics of Hybrid and Composite Variety of Maize in Selected Areas of Bangladesh*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Islam, M.N., M.M.Anwar, et al. 1996. *Marketing of Maize Grain in Bangladesh*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.

- Islam, M.N., M.M. Anwar, et al. 1995. Status of Maize Seed Used by Farmers and Constraints to Use of Better Seeds. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- INFS (2008), Unpublished Report, Dhaka University.
- Igbal, Javed, 2000. A National Maize Development Program: Needs and Approaches. Presented in the Maize Seminar, DAE, Khamarbari, Dhaka.
- IFCN. 2005. IFCN Dairy Report 2005, International Farm Comparison Network, Global Farm GbR, Braunschweig
- Jaffee, S., and M. Sewadeh. 2005. The Changing Composition of Developing Country Agro-food Exports and the Changing Standards Landscape. Mimeo.
- Jahan, N., and H. Rahman, 2003. "Livestock Services and the Poor in Bangladesh-A Case Study." Available at http://www.globallivestock.org/NR/rdonlyres/77C2493C-B7D2-4586-BB4C-E6C3A1521967/0/Bangladesh_case_study.pdf.
- Johansson, L. 2003. Strengthening Food Control in Bangladesh. Rome: Food and Agriculture Organization (FAO).
- Jaffee, S. 2003. "From challenge to opportunity: The transformation of the Kenyan fresh vegetable trade in the context of emerging food safety and other standards." PREM Trade Unit. Washington, D.C.: World Bank.
- Jansen, H. G. P. (1994). Improving Horticulture Export Performance of Developing Countries in Asia. Review of Marketing and Agricultural Economics, 62.
- Jarvis, L. S. and Vera-Toscano, E. (2004). "The Impact of Chilean Fruit Sector Development on Female Employment and Household Income." Working Paper No. 04-002, Department of Agricultural and Resource Economics, University of California, Davis.
- Kohis, R.L. and J. N. Uhl. 1980. Marketing of Agricultural Product Fifth Edition: Macmillan Publishing Co., INC.
- Knips, V. 2005. "Developing Countries and the Global Dairy Sector." Pro-poor Livestock Policy Initiative Working Paper 31, Food and Agriculture Organization (FAO), Rome.

- Kimenye, L. (2002). "Promoting farm/non-farm linkages: a case study of French bean processing in Kenya" In Davis, B., T. Reardon, K. Stamoulis, and P. Winters (eds.) Promoting farm/non-farm linkages for rural development: Case studies from Africa and Latin America. Food and Agriculture Organization, Rome.
- Kirsten, J. and Sartorius, K. (2002). "Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming?". *Development Southern Africa* Vol. 19, No. 4, pp. 503-529.
- Ladd, G.W., and Zober, M. (1977). Model of Consumer Reaction to Product Characteristics. *Journal of Consumer Research* 4:89-101.
- Lancaster, K. (1991). *Modern Consumer Theory*. USA: Edward Elgar.
- Little, P. (1994). "Contract farming and the development question." In Little, P. and M. Watts (eds.). *Living under contract: Contract farming and agrarian transformation in SubSaharan Africa*, Madison, Wisconsin: University of Wisconsin Press.
- Little, P. and Watts, M. (eds.) (1994). *Living under contract: Contract farming and agrarian transformation in Sub-Saharan Africa*, ed. Madison, Wisconsin: University of Wisconsin Press.
- Mandal, M. A. S. and Dutta, S. C. (1993), *Irrigation for Crop Diversification in Rice-based Systems in Bangladesh*. *Bangladesh Development Studies*, Vol. XXI, No. 3.
- Metzel, J. and Benson, A. (1993) *Constraints to Diversification in Bangladesh*. *Bangladesh Development Studies*, Vol. XXI, No. 3.
- Mian, M. R. U. (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- McCulloch, N. and Ota, M. (2002). "Export horticulture and poverty in Kenya", Working Paper, No. 174. Institute for Development Studies. Sussex, U.K.
- Minot, N. (1986). "Contract farming and its effect on small farmers in less developed countries", Working Paper, No. 31, Michigan State University, East Lansing, Michigan.

- Minot, N., and Baulch, B. (2003). "Spatial distribution of poverty in Vietnam and the potential for targeting." in Glewwe, P. and D. Dollar (eds.) *Economic Growth and Household Welfare: Policy Lessons from Vietnam*. World Bank. Washington D.C.
- Minot, N. and Goletti, F. (2000). "Rice market liberalization and poverty in Vietnam." Research Report, No. 114, International Food Policy Research Institute. Washington, D.C.
- Minot, N. and Ngigi, M. (2004). "Are horticultural exports a replicable success story? Evidence from Kenya and Cote d'Ivoire" EPTD Discussion Paper No. 120 and MTID Discussion Paper No. 73, International Food Policy Research Institute. Washington, D.C.
- Minot, N. and Goletti, F. (2006). "Rice market liberalization and poverty in Vietnam." Research Report, No. 114, International Food Policy Research Institute. Washington, D.C.
- Minten, B., L. Randrianarison and Johan F.M. Swinnen. 2005. "Global Retail Chains and Poor Farmers: Evidence from Madagascar." Processed.
- Mullens, G., L., Wahome, P., Tsangari, and Maarse, L., (1996). "Impacts of intensive dairy production on smallholder farm women in coastal Kenya". *Human Ecology* 24 (2): 231-253.
- McCulloch et al (2002). "Impacts of intensive dairy production on smallholder farm women in coastal Kenya". *Human Ecology* 24 (2): 231-253.
- McCulloch and Ota (2002). "Impacts of intensive dairy production on smallholder farm women in Kenya". *Human Ecology* 24 (2): 231-253.
- Moazzem and Fuzita (2004). Potato Consumption in Bangladesh, *Journal of Agricultural Economics*, Bangladesh Agricultural University, Mymensingh. Marketing Channels. A Case Study of Banda District of Uttar Pradesh. *Journal of Agricultural Marketing* 37(2): 6-10.
- Minot, N. et al. (2003). "Rice market liberalization and poverty in Vietnam." Research Report, No. 114, International Food Policy Research Institute. Washington, D.C.

- Mia and Rahman (1996). *Fish Marketing Channels in Bangladesh*, Mimo, BAU.
- Mallorie, E., and A. Ashraf. 2005. "Rural Markets in the Coastal Char Region," International Fund for Agricultural Development (IFAD), Rome 2005.
- Muir, J.E. (ed.). 2003. *The Future for Fisheries: Findings and Recommendations from the Fisheries Sector Review and Future Development Study*. Dhaka: World Bank, Danish International Development Agency (DANIDA), United States Agency for International Development (USAID), Food and Agriculture Organization (FAO), Department for International Development (DfID), Ministry of Fisheries and Livestock (MoFL), and Department of Fisheries (DoF).
- Neven, D., Reardon, T., Chege, J. and Wang, H. (2005). "Supermarkets and Consumers in Africa. The Case of Nairobi, Kenya" *Journal of International Food and Agribusiness Marketing* 18 (1/2), pp. 103-123.
- Ngigi, M. (2003). "Successes in African Agriculture: The Case of Smallholder Dairying in Eastern Africa." Discussion Paper 118. Environment and Production Technology Division, International Food Policy Research Institute, Washington, D.C.
- Nerlove, M.L. (1995). "Hedonic Price Functions and the Measurement of Preferences: The Case of Swedish Wine Consumers". *The European Economic Review*, 39:1697-1716.
- Orden, D., Torero, M. and Gulati, A. (2004). "Agricultural Markets and the Rural Poor". Draft paper for Poverty Reduction Network (POVNET) workshop, March 5, 2004. 35p.
- Olukosi et al (2007), *Fish Marketing in Bangladesh*. JIDS, Dhaka.
- Palmer, H. G. P. (1994). "An error Coprrected? What the Figure really Show." *Journal of Development Studies*. 31.
- Parween et al (1996). *Fish Distribution System in Rajshahi Division*, Unpublish Research Report, BARC, Dhaka.
- Porter, G., and Phillips-Howard, K. (1997). "Comparing Contracts: An Evaluation of Contract Farming Schemes in Africa." *World Development*, 25(2): 227-238.

- Rahman, M. 1992. Problems and Prospects of Rice Processing Technology in Bangladesh. Dhaka: Bangladesh University of Engineering and Technology (BUET).
- . 2004. “Foodgrain Quality, Grades, and Standards in the Bangladesh Foodgrain Trade.” In P. Dorosh, C. del Ninno, and Q. Shahabuddin (eds.), *The 1998 Floods and Beyond: Towards Comprehensive Food Security in Bangladesh*. Dhaka: University Press Ltd.
- . 2006. “High Value Fine and Aromatic Rice Varieties of Bangladesh: Prospects for Enhanced Production, Domestic Marketing and Exports.” Dhaka.
- Quddus A (1991). *Fish Marketing; Opportunities and Constraints*, Mimeo, BAU.
- Rajts, F. 2004. “Genetic Erosion of Silver Carp (*Hypophthalmichthys molitrix Valenciennes*) Is Threatening Food Security in Bangladesh.” Dhaka: Fourth Fisheries Project, Department of Fisheries.
- Ranadhir (1984). *Fish production and Export from Bangladesh*, Mimeo, BAU.
- Ramaswami, B., P.S. BIRTHAL, and P.K. JOSHI. 2006. “Efficiency and Distribution in Contract Farming: The Case of Indian Poultry Growers,” MTID Discussion Paper No.91, International Food Policy Research Institute, Washington, DC.
- Rashid, M.A. et al. 2000. *Input-Out Relationships of Major Fruits*. Agricultural Economics Division, BARI, Joydebpur, Gazipur.
- Ramaswami B., BIRTHAL, P.S. and JOSHI, P. K. (2006). “Efficiency and Distribution in Contract Farming: The Case of Poultry Growers.” MTID Discussion Paper 91. International Food Policy Research Institute. Washington D.C.
- Ravallion, M. (2005). “Evaluating anti-poverty programs.” Prepared for the *Handbook of Agricultural Economics Volume 4*, North-Holland, edited by Robert E. Evenson and T. Paul Schultz (available at http://siteresources.worldbank.org/INTISPMA/Resources/3837041130267506458/Evaluating_Antipoverty_Programs.pdf)

- Ravallion, M., and Shaohua, C. (2004). "China's (Uneven) Progress Against Poverty." Development Research Group. The World Bank, Washington, D.C.
- Rajagopal. 1986. Economic Efficiency of Paddy Marketing System in Madhya Pradesh: A Case Study. *Indian Journal of Agricultural Economics* 41(4): 583-589.
- Reza, S. (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- Reardon, T, Timmer, C.P. and Berdegue, J.A. (2003). "The rise of supermarkets in Latin America and Asia: Implications for international markets for fruits and vegetables", In Anita Regmi and Mark Gehlhar (eds.). *Global Markets for High Value Food Products*, Agriculture Information Bulletin, Washington, D.C., The United States Department of Agriculture, Economics Research Services.
- Reardon, T., Timmer, C.P., Barrett, C.B. and Berdegue, J. (2003). "The rise of supermarkets in Africa, Asia, and Latin America." *American Journal of Agricultural Economics*, 85 (5), (December): 1140-1146.
- Reardon, T. and Berdegue, J.A. (2002). "The rapid rise of supermarkets in Latin America: Challenges and opportunities for development", *Development Policy Review*, 20(4): 371-388.
- Reardon, et al (1992). Cited from Reardon, T., Timmer, C.P., Barrett, C.B. and Berdegue, J. (2003)
- Rosegrant, M.W., Paisner, M.S., Meijer, S. and Witcover, J. (2001). "Global food projections to 2020: Emerging trends and alternative futures", Washington, D.C., International Food Policy Research Institute (August).
- Rokeya et al (1997). *Fish Marketing Channels in Bangladesh*, Mimeo, BAU.
- Roy S (2008). *Price Spread in Fish Marketing in West Bangal*, Jadavpur University.
- Runsten, D. and Key, N. (1996). "Contract Farming in Developing Countries: Theoretical Aspects and Analysis of Some Mexican Case Studies." Report LC/L. 989. Economic Commission for Latin America and the Caribbean.

- Reardon, T and C P Timmer. 2005. "Transformation of Markets for Agricultural Output in Developing Countries Since 1950: How Has Thinking Changed? In R E Evenson, P Pingali and T P Schultz (ed) Handbook of Agricultural Economics (Vol.3): Agricultural Development: Farmers, Farm Production and Farm Markets.
- Rahman. S (1997). Fish Production and Marketing in Some Selected Areas of Bangladesh, Mimeo, BAU, Mymensingh.
- Sarker, R. (2013) Bangladesh Journal of Political Economy, Vol. 29, No. 1.
- SEDF (South Asia Enterprise Development Facility). 2005. "Identification of Agri-business SMEs and Poultry Sub-Sector Supply and Value Chain Analysis." SEDF and International Finance Corporation (IFC), Dhaka.
- Shahabuddin, Q., and P. Dorosh. 2002. "Comparative Advantage in Bangladesh Crop Production." MTID Discussion Paper 47, International Food Policy Research Institute (IFPRI), Washington, D.C.
- Shamsuddin, M., W.J. Goodger, M.S. Hossein, Azizunnesa, T. Bennett, and K. Nordlund. 2006. "A Survey to Identify Economic Opportunities for Smallholder Dairy Farms in Bangladesh." Tropical Animal Health and Production 36(2):1573-7438.
- Shrimp News International. 2006. "Free News." Available at <http://www.shrimpnews.com/>
- Satter, M.A. 1993. Maize Cultivation with Little or No Tillage. Published in the Book "Maize Production and Utilization". On-Farm Research Division, BARI, Joydebpur, Gazipur.
- Swaminathan, M.S., E.W.Sprague and Joginder Singh. 1982. Processing, Utilization and Marketing of Maize. Indian Council of Agricultural Research, New Delhi, India.
- Samikwa, D. and Brorsen, W. (1998). "Hedonic Prices of Malawi Burley Tobacco". International Food and Agribusiness Management Review, 1(1): 107-117

- Scott, G. J. (1988), *Marketing Bangladesh's Potatoes: Present Patterns and Future Prospect*, Dhaka: Int. Potato Centre.
- SDPI (Sustainable Development Policy Institute) (2004). "Regoverning Markets: Securing small holder producer participation in restructured national and agri-food systems. Pakistan" Accessed from www.regoverningmarkets.org, February 15, 2005.
- Sharma, V.P. and A. Gulati. (2003). "Trade Liberalization, Market Reforms and Competitiveness of Indian Dairy Sector." Discussion Paper No. 61. Markets, Trade, and Institutions Division. International Food Policy Research Institute. Washington, D.C.
- Shepherd, A.W. (2005). "The implications of supermarket development for horticultural farmers and traditional marketing systems in Asia". Agricultural management, Marketing and Finance Service, FAO, Rome.
- Simmons, P., Winters P., and Patrick I. (2005). "An analysis of contract farming in East Java, Bali, and Lombok, Indonesia". *Agricultural Economics*, 33 (2005) supplement 513-525.
- Srivastava and Ranadhir (1995). *Marketing Channel of Fish*. *Indian Journal of Marketing*.
- Singh, S. (2002). "Contracting out solutions: political economy of contract farming in the Indian Punjab", *World Development*, Vol.30(9), pp. 1621-1638.
- Siddique A (2001). *Fish Marketing System in some Selected Areas of Bangladesh*.
- Stanley, L.R. and Tschirhart., J. (1991). "Hedonic Prices for a non-durable goods: The case of breakfast cereals". *The Review of Economics and Statistics* 73:537-541.
- Tam, P. (2004). "Regoverning Markets: Securing small holder producer participation in restructured national and agri-food systems, The case of Vietnam." Accessed from www.regoverningmarkets.org, February 15, 2005.
- Timmer, C.P. (2005). "Agriculture and Pro-Poor Growth: An Asian Perspective." Working Paper 63, Global Center for Development. Washington, D.C.

- Torero, M., Gulati, A. (2004). Connecting Small Holders to Markets: Role of Infrastructure and Institutions. Policy Brief. International Food Policy Research Institute.
- Tschirley, D. and Milton, A. (2005). “Changing Horticultural Supply Chains in Africa: Implications for Government and Donor Investments; Evidence from Kenya and Implications for Africa.” Presentation at the World Bank, Washington, D.C. on April 6, 2005.
- U.S. Department of Agriculture (USDA) (2002). “Thailand Retail Food Sector Report” GAIN Report. Foreign Agricultural Service, U.S. Department of Agriculture. Washington, D.C.
- UN (United Nations 2008). UN Statistics Division. Commodity Trade Statistics Database (Comtrade). US Division. Available at <http://unstats.un.org/unsd/comtrade/default.aspx>.
- UN (United Nations 2008). UN Statistics Division. Commodity Trade Statistics Database (Comtrade). Various Issues 2001-2013. Available at <http://unstats.un.org/unsd/comtrade/default.aspx>.
- U.S. Department of Agriculture (USDA) (2003). “Indonesia Retail Food Sector Report” GAIN Report, Foreign Agricultural Service, U.S. Department of Agriculture. Washington, D.C.
- U.S. Department of Agriculture (USDA) (2004a). HRI Food Service Sector Thailand. Foreign Agricultural Service GAIN Report TH4030. Washington, D.C. (Accessed) at <http://www.fas.usda.gov/gainfiles/200403/146105693.pdf>.
- U.S. Department of Agriculture (USDA) (2004b). Vegetables and melons: Situation and outlook yearbook. Washington, D.C., United States Department of Agriculture, Economics Research Service (July).
- U.S. Department of Agriculture (USDA) (2005a). HRI Food Service Sector Mainland China Foreign Agricultural Service GAIN Report CH5407. Washington, D.C. (Accessed) at <http://www.fas.usda.gov/gainfiles/200506/146130105.pdf>

- U.S. Department of Agriculture (USDA) (2005b). HRI Food Service Sector Brazil. Foreign Agricultural Service GAIN Report BR5024. Washington, D.C. (Accessed at www.fas.usda.gov/gainfiles/200510/146131361.doc).
- Valdes and Foster (2003). High Yield Variety of Fruits in Chile, Document no. 12, National Planning Board.
- Van der Meer (2006), Rising Demand for Food Safety, Document no. 12, National Planning Board, Belgium.
- von Braun, J. and Immink, M. (1994). “Nontraditional vegetable crops and food security among smallholder farmers in Guatemala”, In Joachim von Braun and Eileen Kennedy (eds.) *Agricultural commercialization, economic development, and nutrition*. Baltimore, MD, Published for the International Food Policy Research Institute by the Johns Hopkins University Press.
- von Braun, J., Hotchkiss, D.R. and Immink, M. (1994). “New export crops in traditional smallholder agriculture: Effects on production, consumption, and nutrition in Guatemala”, International Food Policy Research Institute, Research Report, No. 73, Washington, D.C.
- von Braun, J., Haen, H. de, and Blanken, J. (1991). *Commercialization of agriculture under population pressure: Effects on production, consumption, and nutrition in Rwanda*. Washington, D.C.: International Food Policy Research Institute.
- Wadud, M. A. (2013) *Bangladesh Journal of Political Economy*, Vol. 29, No. 1.
- Warning, M. and Key, N. (2002). “The Social Performance and Distributional Consequences of Contract Farming: An Equilibrium Analysis of the Arachide de Bouche Program in Senegal.” *World Development*, 30(2), 255-263.
- Warr, P. (2001). “Poverty Reduction and Sectoral Growth: Evidence from Southeast Asia” *World Development Research Institute*. Working Paper. <http://www.wider.unu.edu/conference/conference-2001-1/warr.pdf>

- Weatherspoon, D., and Reardon, T. (2002). "The Rapid Rise of Supermarkets in Eastern and Southern Africa: Implications for Agrifood Systems and the Rural Poor." Paper presented at the 2002 Conference on The Challenge of Global Chains: Integrating Developing Countries into International Chains, a Potential Risk or an Opportunity, Wageningen University, November 11.
- Weatherspoon, D. and Reardon, T. (2003). "The rise of supermarkets in Africa: Implications for agri-food systems and the rural poor", *Development Policy Review*, 2003, 21 (3): 333-355.
- Weinberger, K. and Lumpkin, T.A. (2005). "Horticulture for Poverty Alleviation: The Unfunded Revolution". AVRDC Working Paper no. 15. AVRDC. The World Vegetable Center.
- Weinberger, K., and C. A. Genova. 2005. "Vegetable Production in Bangladesh: Commercialization and Rural Livelihoods." *Technical Bulletin No. 33*, Asian Vegetable Research and Development Center (AVRDC), Tainan (Taiwan).
- World Bank (2003). *World Development Indicators*. CD-ROM database. The World Bank. Washington, D.C.
- World Bank (2004). *World Development Indicators*. CD-ROM database. The World Bank. Washington, D.C.
- World Bank. (2005). *Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports*. Report No. 31207 Poverty Reduction & Economic Management Trade Unit and Agriculture and Rural Development Department. The World Bank. Washington, D.C.
- World Bank (2006). *World Development Indicators*. CD-ROM database. The World Bank. Washington, D.C.
- World Bank. (2007). *China's Compliance with Food Safety Requirements for Fruits and Vegetables: Promoting Food Safety, Competitiveness and Poverty Reduction*. Published for the World Bank. Beijing.

- . (2007). *Access to Rural Finance*. Washington, DC: World Bank.
- . (2007). *Bangladesh Strategy for Sustained Growth*. Washington, DC: World Bank.
- . (2007). *Doing Business in South Asia 2007*. Washington, DC: World Bank.
- . (2007). “India’s Emergent Horticultural Exports: Addressing Sanitary and Phytosanitary Standards and Other Challenges.” *South Asia Sustainable Development Unit Report No. 36178-IN*, World Bank, Washington, DC.
- . (2007). “India: Taking Agriculture to Market.” *South Asia Sustainable Development Unit Report No. 35953-IN*, World Bank, Washington, DC.
- World Bank. (2008). “Promoting Agro-enterprise and Agro-food Systems Development in Developing and Transition Countries.” *Agriculture and Rural Development Report No. 26032*, World Bank, Washington, DC.
- . (2009). “Colombia: Productive Agribusiness/Farmer Partnerships.” In *Agriculture Investment Sourcebook*. Washington, DC: World Bank. Pp. 299-300.
- . (2010). *Economic Impact of Avian Flu*. Washington, DC: The World Bank.
- . (2010). “Revitalizing the Agricultural Technology System in Bangladesh.” *Bangladesh Development Series Paper No. 7*, World Bank, Dhaka.
- . (2011). “Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports.” *Poverty Reduction and Economic Management Trade Unit and Agriculture and Rural Development Department Report No. 21307*, World Bank, Washington, DC.
- . (2012). *Enhancing Control of Highly Pathogenic Avian Influenza in Developing Countries through Compensation: Issues and Good Practice*. Washington, DC: World Bank.

- 2012. "Revitalizing the Agricultural Technology System in Bangladesh."
Bangladesh Development Series Paper No. 7, World Bank, Dhaka.
- World Bank (2013). World Development Indicators. CD-ROM database. The
World Bank. Washington, D.C.
- Zohir, S. (1993), Problems and Prospects of Crop Diversification. .
Bangladesh Development Studies, Vol. XXI, No. 3.