

**Intellectual Property and Innovation in Least Developed Countries:
Pharmaceuticals, Agro-Processing and Textiles and RMG in Bangladesh¹**

A Study for UNCTAD-ALDC Division,

By

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EXECUTIVE SUMMARY

Statement of purpose

Institutions and incentives that promote learning and innovation-based activities in least developed countries are varied and important. Innovations are generated through both formal and informal learning activities at the firm level rather than R&D, and are promoted extensively through linkages between various agents in the domestic knowledge system. General literature on intellectual property and development acknowledges that certain features of the institutional framework in which learning and knowledge generation is embedded might limit the role of intellectual property rights in inducing innovation. This is one of the first studies of its kind that analyses the process of learning and innovation in three sectors in Bangladesh, in order to generate evidence on this issue.

Innovation from the viewpoint of the firm essentially comprises the practice and production of all product and process technologies that are new to them and their context and not necessarily to the universe (Nelson and Rosenberg, 1993). All activities at the firm level that enhance learning skills, expand the knowledge base and increase competitiveness both locally and globally, are innovative activities. R&D is one form of knowledge production, but such a definition of innovation includes also all other forms of activities through which firms access knowledge and technologies in order to progress along the learning curve. The information and knowledge that form the primary inputs to technological learning and innovative capacity in firms, originate from within the firm and from outside (the knowledge system).

In least developed countries, where innovation is not well developed, intellectual property protection may have very different implications for innovation, domestic knowledge generation and technology learning among local firms (see, for example CIPIH, 2006). Intuitively, it may seem that intellectual property rights may not be advantageous for innovation in such countries, since firms are mainly engaged in incremental innovation, and R&D-based innovative activities are not very common. Despite this, if it can be ascertained that IPRs promote firm-based innovative capabilities through diffusion of knowledge, technology transfer, foreign direct investments (FDI) and licensing, among others, it may still prove to be beneficial for local firms in least developed countries in an indirect sense. A vast amount of theoretical work demonstrates the link between intellectual property rights, trade and foreign direct investment (see for example, Helpman, 1993, Grossman and Helpman, 1993; Currie, Levine et al, 1996, among others). Some studies also exist on the positive impact of IPRs on technology transfer, but how it translates to strengthening innovation at the firm-level behaviour and to what extent this relationship holds true in the case of least developed countries remains unanswered. Mansfield (1994) notes in a firm level survey within the USA, that the type of intellectual property regime has a definite impact on the decision of US firms on whether or not to invest. More recently, Branstetter et al (2006) perform a 16-country analysis of technology transfer in US multinational firms' changes in response to IPR reforms in countries, to show a positive correlation. Popovici (2006) shows similarly a positive correlation of technology flows and IPR reforms from US multinational firms to domestic firms in countries reforming their IPR laws.

These results are seemingly deeply correlated with a range of incentives at the firm-level that set the stage for foreign direct investment and licensing activities of firms in developing and least developed countries. In an LDC context, the domestic knowledge systems may not be capable of extracting such indirect impacts from intellectual property rights protection to foreign firms.

This study seeks to generate empirical evidence on whether IPRs can directly stimulate R&D and innovation in least developed countries, or at least promote firm-based innovative capabilities through diffusion of knowledge, technology transfer, foreign direct investments (FDI) and licensing, among others (hereafter referred to as indirect effects). Bangladesh, the country chosen for this study, is an exception in the LDC category due to its thriving domestic processing sectors, which are actively engaged in exporting textiles and ready made garments (RMGs), processed food products and generic drugs.

The study conducted an in-depth investigation of the pharmaceutical, agro-processing and textiles and RMG sectors in Bangladesh between October 2006 and May 2007, using both quantitative and qualitative techniques. The research process was extensive and consisted of three main stages; in the first stage, a background report and a pilot survey on the state of innovation and the main incentives that play a role in driving innovation in the domestic processing sector in Bangladesh was conducted jointly with a local research team. The second stage consisted of 155 firm-level surveys; guided by data generated through the background report and the pilot survey, a total of 155 questionnaires were administered to firms in all the three sub-sectors. The sample was made up of (i) 50 firms in the agro-processing sector; (ii) 60 firms in the textiles and garments sector; and (iii) 45 firms in the pharmaceutical sector. The third stage consisted of face-to-face interviews conducted with a cross-section of firms, as well as a variety of other actors, such as professional associations and agencies and the concerned government departments. These detailed interviews have been used as case studies to interpret the results of the survey. A total of 116 persons (including CEOs, and top level management) were interviewed for the study.

In keeping with the framework for analysis, the study defined innovation not in the *sensu stricto*, but as the application of new practices and production of all products and process technologies that are new to the firms in question (Nelson and Rosenberg, 1993). Innovation was measured by the number of new product and process development applied by the firms in the past five years. The study attempted to capture a realistic picture of innovation in the three sectors of domestic processing, in order to understand the various factors that promote/hinder innovation in an LDC context. In order to better understand the relative importance of intellectual property rights in promoting innovation, the investigation considered a large range of firm-level factors and institutional variables and their impact on new product/process innovation in the three sub-sectors of domestic processing; such as the contribution of scientific/skilled manpower, the quality of local infrastructure services to new product and/or process development, the financial constraints and availability of venture capital, the collaboration with local universities, local R&D institutes, intellectual property protection (IPP), the participation in local SME development schemes, participation in government-firm-technology transfer coordination councils, and the transfer of personnel between local firms or R&D institutions. It sought to measure both the direct impact of intellectual property rights on promoting R&D and thus enhancing the innovative performance of firms, as well as its indirect impact on promoting mechanisms of capacity building, such as technology transfer, licensing and technology sourcing through foreign subsidiaries.

The survey covered large, medium and small-sized firms equally across all the three sub-sectors. A medium sized firm has between 300-500 employees in the textiles and garments sector (see UNIDO, 2006) and around 200 employees in the pharmaceutical sector. The agro-processing sector has a large number of very small home-based units, (below 10 employees), and is made up of a large, unorganized small-scale sector. In the textiles and garments sector, the survey covered specialized textile mills, ready-made garments firms and also the traditional handloom sector in Bangladesh, which is one of the oldest creative industries in the region. In

the agro-processing sector, the focus was on the general agro-processing industry which uses spices, grains, cereal, flour, among others to produce and market processed food products as opposed to any specialized niche, say shrimp farming or rice products. The pharmaceutical sector survey covered both indigenous pharmaceutical firms and subsidiaries of MNCs operating within the country.

Findings and policy recommendations

This study has conducted an in-depth investigation of innovation and competitiveness in three sectors of domestic processing in Bangladesh: the pharmaceutical, agro-processing and textiles and RMG sectors. The objective was to evaluate the relative importance of IPRs as a firm level incentive for innovation. The findings seek to contribute to the growing literature on intellectual property rights and development, and also make the case for broadening the discourse on the nature of knowledge and learning activities in LDCs beyond IPRs. A summary of the main findings is contained here.

Summary of findings

1. Innovative capacity within local firms is very low across all three sectors and the study finds that the presence of intellectual property rights in the local context does not play a role, either as a direct incentive for innovation or as an indirect incentive enabling knowledge spillovers (through various technology transfer mechanisms such as licensing, imports of equipment, government-firm technology transfer). At the present time, intellectual property rights within the country are benefiting mostly TNCs operating in the local market, as the local firms are not sufficiently specialized to protect their innovations under the current IPR regime. This regime may not, in any case, be appropriate for the types of incremental innovations that most firms engage in. A large number of local firms considered themselves to be involved in new product/process innovations. But there was no observable positive impact of intellectual property rights on licensing, technology transfer, or technology sourcing through foreign subsidiaries. Half of the agro-processing firms, 96 per cent of pharmaceutical firms and 55 per cent of textiles and RMG firms surveyed considered technology transfer from external sources, both public and private to be of very little importance to new product/process innovations at the firm level. Other benefits of IPR protection in the local context such as licensing, technology sourcing through foreign subsidiaries plays hardly any role. Only a small number (4 per cent) of the firms in agro-processing, 2 per cent of the firms in pharmaceuticals and 7 per cent of the firms in textiles and RMG sector considered it to be of any use. The only important sources of innovation at the firm level are the firms' own indigenous innovation efforts, and innovation through imitation/copying.

2. Most firms in the agro-processing sector did not believe that intellectual property rights played a major role, either positively or negatively. They had major concerns about the impact of intellectual property rights on seed availability and seed price. Larger firms tended to view IPRs differently and in a more beneficial light than smaller firms; a tool through which they could protect their products and secure benefits. Others, who ranked it as detrimental to innovation, based their assessment on the indirect impact of IPRs on increasing prices of seeds and other inputs. However, at this stage, it is difficult to assess the impact of rising seed prices on agricultural produce in Bangladesh resulting from application of IPRs with any conclusiveness. In the textiles and RMG sector, most of the firms interviewed were of the view that IPRs did not play any role as an inducement for innovation, since they simply assembled the final output according to precisely given, buyer-determined specifications. Firms also noted

that that since they did not possess any indigenous design-related capabilities, IPRs could not be an inducement to innovation (field interviews). On the question of whether they benefited from IPR protection in terms of increased collaboration from external firms, the consensus view was that the buyer firms did not help them in their efforts at technology upgrading or to enhance innovative capabilities since this would help them to create better backward linkages, especially in knit-wear, and enhance the bargaining power of the local firms (field interviews). Most local firms considered that such knowledge sharing would be inimical to the interests of the buyer firms who benefited from the low prices in the market due to the lack of bargaining power of the local firms (field interviews). The firms in the pharmaceutical sector were very concerned that since foreign firms can obtain patents on their products in the country, this might adversely affect their efforts to venture into reverse engineering of APIs. The patents on pharmaceutical products (approximately 50 per cent of the 182 granted in 2005) are not on local innovations, and point to the presence of other motivations for patenting, such as, such as strategic use and monopoly profits, and prevention of parallel imports. This issue however, needs to be explored further. As regards the indirect impact of IPRs on the firms, most firms interviewed have been in the process of negotiating technology transfer for building up API capacity, reverse engineering skills and other such know-how unsuccessfully. Even those who have been successful in negotiating such agreements with foreign firms considered that IPRs were not a helpful factor in promoting foreign collaborations for access to technology (field interviews).

3. The domestic knowledge system in the country is very weak in Bangladesh, characterized by weak industrial and scientific infrastructure, poor collaboration and sectoral inter-linkages, lack of skills and institutional support for technological upgrading. In this context, the study finds that the relative importance of IPRs for domestic processing sectors of varying technological intensity, as expected, (based on the experience in developed economies, and as indicated by economic literature), thus, may not hold for LDCs. The overall finding is that IPRs are equally unimportant across the three sectors, largely owing to their inability to engage in knowledge intensive activities.

4. In conclusion, the findings based on firm-level evidence indicate that policy matters in reducing the collateral damage of exposing nascent sectors in LDCs to global competition. Coherent national policies that focus strategically on enabling innovation in the three sectors will play a key role in transforming the sectors into more competitive modes and enable local firms to deal with any potential harmful effects of IP protection. Without such deliberate and strategic policy intervention in support of learning and innovation, granting IPRs locally does not induce higher levels of technological learning in the domestic processing firms in Bangladesh.

Policy recommendations

A sectoral lens allows for in-depth investigation of general concepts (Evans, 1995), and the disaggregated sector characteristics spelt out in this study create an important basis for thinking of the relevance of institutional incentives and intellectual property rights in each of the sectors under consideration. Rather than focusing on IPRs as a magic bullet policy incentive, there is a need to address the pre-eminence of learning institutions for creating sustained mid-term or long-term economic growth. These institutions, as laid out in the introduction of this study, can either be formal or informal, coded in terms of unofficial attitudes (Rodrik, 2003) and pre-existing cultural and social arrangements that shape the behaviour of agents in the absence of good formal institutions for exchange.

Modest changes in institutional arrangements and official attitudes towards the economy can often produce large payoffs (Rodrik, 2003, p. 16). But these changes are contextual and flow from the specific needs of the knowledge system in consideration. In the case of Bangladesh, an analysis of the institutional incentives for innovation, as conducted by this study drives home two essential points. Firstly, it endorses the point on weak or ineffective domestic knowledge systems in least developed countries, the disjuncture between public sector research and commercialization of products and stresses the relevance of concerted policy effort to build science, technology and innovation institutions for economic development. Secondly, and more importantly though, it raises a larger question regarding the institutional framework in Bangladesh, which can perhaps be extended to other LDCs as well. This relates to the role of market incentives in the three thriving, export-oriented sectors in the country. Why are competitive pressures of global exports not fostering these linkages locally, despite the obvious gains? Competitive market pressures do not seem to work in the case of Bangladesh due to the institutional setting, where even well-intended policy and market incentives fail to enhance patterns of interaction and learning needed for innovation. For example, all the professional associations in the three sectors are active mainly in political lobbying and not associations for the provision of common industry services, or mid-term sector strategy creation, as one would normally assume.² Firms seem to be more interested in retaining their incumbent advantages by lobbying for static policies, rather than pushing concertedly for dynamic growth-oriented models. Mistrust and lack of representation of consumer and labour force welfare (in key sectors like pharmaceuticals and textiles and RMG, both of which are supposedly role models for other LDCs) are key features of interpersonal interactions and the policy landscape. Most of these factors inhibit even the role of competitive market pressures in fostering welfare-maximizing collaborations, and can be summed up as ‘negative’ institutions (Evans, 1995; North, 1990). The informal and (the few) formal institutions for innovation in the country create ample scope for capture by a few, to the detriment of the larger population. The survey finds numerous instances where firms work around well-intentioned policies to find informal mechanisms that help them to retain their profits, to the detriment of the economy and technological progress at large. This is a key finding for national policy bodies and international agencies trying to build innovation capacity in Bangladesh. This implies, for example, that within the current policy landscape, direct industry support to the pharmaceutical sector will not help to reduce the negative public health impacts, in the absence of other policy interventions that target unfair business models and doctor-pharmacy-industry linkages. Donor agencies and international bodies need to focus on how policy-relevant interventions can minimize the inefficiencies of the informal institutional structures that promote such rent-seeking, to move towards increased production efficiency and consumer welfare. Other important policy-relevant recommendations for each of the three sectors are presented below.

For the pharmaceutical sector:

1. Strategic policy support that targets consumer welfare (in terms of greater access to medicines both locally and globally) is key to enhancing the performance of the pharmaceutical sector.
2. Incremental innovation that will make the local firms competitive even within the global generics sector will require technological upgrading activities and investment in the creation of API skills.

² This finding is confirmed by another World Bank study on the agro processing sector in Bangladesh, World Bank (2007b).

3. Apart from the API park, policy efforts should focus on the creation of common facilities that could function on a 'pay-and-use' basis, such as a central bioequivalence laboratory for firms wanting to branch out their exports to regulated and semi-regulated markets.
4. Policy assistance that seeks to enhance the competitiveness of the sector needs to focus on:
 - a. An integrated innovation approach that promotes human skills development of relevance to the sector, as well as improved coordination between the various components (especially public research and industry) of the domestic knowledge system;
 - b. Reducing the dependencies (which are also the cause for major inefficiencies) between medical practice, research and product commercialization in the pharmaceutical sector (that presently extend well into the performance of the health sector);
 - c. Helping Bangladesh develop concrete innovation incentives for the sector that could work hand-in-hand with IPRs to reduce its potential negative impacts on access to technologies for the sector;
 - d. Help enhance capacity of the local intellectual property office, in order to be able to document data on patent applications and grants transparently and accountably; and lastly,
 - e. Help forge liaisons between local and foreign firms that focus on technological upgrading and innovative capacity of the sector.

For the textiles and RMG and agro-processing sectors:

1. Strategic policy support is required to focus attention beyond cash incentives, to other extension services in order to steer the local sectors into more value added activities. In the case of the textiles and RMG sector, policy support is required to promote complete backward integration in knitwear and also to enhance designing and creative activities which will help the sector to move gradually from a the low-end labour intensive segment, to more niche, knowledge-intensive segments in the export markets. The agro-processing firms require substantial help to cope with extension services, organization of reliable supplied, product commercialization and sanitary and phyto-sanitary measures (imposed by the WTO).
2. Policy assistance that seeks to enhance the competitiveness of the sectors needs to focus on interventions that
 - a. Improve the bargaining power of women in both the sectors, since women comprise of the majority of the work force in textiles and RMG, and also account for the home-based informal sector production in agro-processing;
 - b. Support the RMG and textiles firms to cope with international restrictions on exports that relate to value addition and labour welfare. Closer governmental cooperation will be key to ensuring that the local firms survive the post-MFA period to transition into value-added activities;
 - c. Help re-structure university education syllabus to incorporate courses that produce managerial and technical skills required for both sectors;
 - d. Focus on improved basic infrastructure provision that is a major impediment for both sectors;

- e. Focus on resurrecting the traditional handloom sector, through a focus on creative designing and upgrade of production facilities.

1. INTRODUCTION

Institutions and incentives that promote learning and innovation-based activities in least developed countries are varied and important. Innovations are generated through both formal and informal learning activities at the firm level rather than R&D, and are promoted extensively through linkages between various agents in the domestic knowledge system. General literature on intellectual property and development acknowledges that certain features of the institutional framework in which learning and knowledge generation is embedded might limit the role of intellectual property rights in inducing innovation. This is one of the first studies of its kind that analyses the process of learning and innovation in three sectors in Bangladesh, in order to generate evidence on this issue.

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Firm-level capacity to absorb knowledge and apply it to innovation (Cohen and Levinthal, 1990) is determined primarily by the extensive and complementary relationship between firms and the knowledge system in which they are embedded. How much and how fast firms' in any sector transition to build technological capabilities to compete at the frontier depends on how well the institutional framework is geared towards promoting coordination within the various parts of the domestic knowledge system. Organizations such as universities (for human capital provision), financial institutions (for venture capital and financing of research), industrial infrastructure (for manufacturing products or acquiring information related to production), entrepreneurial associations (for marketing and assessment of market-based conditions), all provide incentives (or disincentives) for firms to tap all knowledge sources, both internal and external.³ Institutional efficiency in such a context can thus be defined as how effectively access to knowledge for local firms can be achieved at minimal transaction costs, and is critical in explaining the process of knowledge sharing that underlines interactive learning and innovative success. The country-specific institutional framework as shaped by social and cultural aspects and level of human skills determines the institutional efficiency of organizational coordination. The relevance of the institutional framework cannot be stressed enough; firms that do not have appropriate institutional support not only fail to transition through various stages of capabilities building to innovate at the frontier, but firms which have the appropriate institutional impetus but lack innovative capabilities sometimes manage to succeed, and often do so, at the cost of innovative firms that lack them (Chesbrough and Teece, 1996).⁴

The global political economy of knowledge production is dominated by firms and

³ Users (both domestic and foreign) as well as competing firms, especially those from outside the economy can also play important roles as providers of knowledge.

⁴ Teece (1986) and Chesbrough and Teece (1996) note the same although applying a different approach to study the process of building innovative capability. In Teece's words, a firm's capability to innovate is influenced by the "appropriability regime" in which it operates.

organizations based in industrialized countries, making distribution or access to knowledge one of the key issues in the catch-up debate. There is a large tacit element involved in the acquisition of knowledge, or also in the conversion of acquired knowledge into industrial activities and outputs (North, 1990). The presence of such tacit capabilities are best measured by variables that promote the creation of human skills and foster their development such as schooling and education (measured at the primary, secondary and tertiary levels), scientific and physical infrastructure, and a wide range of institutional incentives that foster learning in any given context (in terms of express or indirect policy). Within this complex matrix, intellectual property laws have historically figured as an institutional incentive to promote commercialization of knowledge and investment in inventive activities. In addition to intellectual property, one could think of a range of other policy incentives that can reduce costs of transacting for knowledge in any institutional set-up, such as those that reward collaboration and low costs of reaching legal agreements and enforcing them. Different institutional frameworks create different incentive structures for the kinds of knowledge generation and learning that can be observed in agents, and also determine what forms of knowledge are in demand locally. To use the rather drastic example of North (1990), the incentives for learning in a mafia system are different from that in a capitalist set-up. Focusing on intellectual property rights as a magical bullet for innovation ignores this very distinct feature: the kinds of learning and knowledge creation in agents in a system are a direct pay-off of the institutional incentives therein. Merely granting intellectual property rights may not bring about major returns if the other institutional features do not foster knowledge intensive activities.

In least developed countries, where innovation is not well-developed, intellectual property protection may have very different implications for innovation, domestic knowledge generation and technology learning among local firms (see, for example CIPIH, 2006). Intuitively, it may seem that intellectual property rights may not be advantageous for innovation in such countries, since firms are mainly engaged in incremental innovation, and R&D-based innovative activities are not very common. Despite this, if it can be ascertained that IPRs promote firm-based innovative capabilities through diffusion of knowledge, technology transfer, foreign direct investments (FDI) and licensing, among others, it may still prove to be beneficial for local firms in least developed countries in an indirect sense. A vast amount of theoretical work demonstrates the link between intellectual property rights, trade and foreign direct investment (see for example, Helpman, 1993, Grossman and Helpman, 1993; Currie, Levine et al, 1996, among others). Some studies also exist on the positive impact of IPRs on technology transfer, but how it translates to strengthening innovation at the firm-level behaviour and to what extent this relationship holds true in the case of least developed countries remains unanswered. Mansfield (1994) notes in a firm level survey within the USA, that the type of intellectual property regime has a definite impact on the decision of US firms on whether or not to invest. More recently, Branstetter et al (2006) perform a 16-country analysis of technology transfer in US multinational firms' changes in response to IPR reforms in countries, to show a positive correlation. Popovici (2006) shows similarly a positive correlation of technology flows and IPR reforms from US multinational firms to domestic firms in countries reforming their IPR laws.

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and innovation in least developed countries, or at least promote firm-based innovative capabilities through diffusion of knowledge, technology transfer, foreign direct investments (FDI) and licensing, among others (hereafter referred to as indirect effects). Bangladesh, the country chosen for this study, is an exception in the LDC category due to its thriving domestic processing sectors, which are actively engaged in exporting textiles and ready made garments (RMGs), processed food products and generic drugs.

1.1. Choice of sectors and research methodology

The study conducted an in-depth investigation of the pharmaceutical, agro-processing and textiles and RMG sectors in Bangladesh between October 2006 and May 2007, using both quantitative and qualitative techniques. The research process was extensive and consisted of three main stages; in the first stage, a background report and a pilot survey on the state of innovation and the main incentives that play a role in driving innovation in the domestic processing sector in Bangladesh was conducted jointly with a local research team. The second stage consisted of 155 firm-level surveys; guided by data generated through the background report and the pilot survey, a total of 155 questionnaires were administered to firms in all the three sub-sectors. The sample was made up of (i) 50 firms in the agro-processing sector; (ii) 60 firms in the textiles and garments sector; and (iii) 45 firms in the pharmaceutical sector. The third stage consisted of face-to-face interviews conducted with a cross-section of firms, as well as a variety of other actors, such as professional associations and agencies and the concerned government departments. These detailed interviews have been used as case studies to interpret the results of the survey. A total of 116 persons (including CEOs, and top level management) were interviewed for the study.

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handloom sector in Bangladesh, which is one of the oldest creative industries in the region. In the agro-processing sector, the focus was on the general agro-processing industry which uses spices, grains, cereal, flour, among others to produce and market processed food products as opposed to any specialized niche, say shrimp farming or rice products.⁵ The pharmaceutical sector survey covered both indigenous pharmaceutical firms and subsidiaries of MNCs operating within the country.

1.2. Relevance of IPRs for the three sectors

General literature and evidence from developed countries shows that the relative importance of intellectual property rights varies considerably amongst the three sectors that have been chosen for investigation. Both the agro-processing and textiles and garments sectors are low-technology, whereas the pharmaceutical sector is a high technology sector. It is well-acknowledged that the global pharmaceutical sector is patent-intensive, owing to its technological intensity, and IPRs in this sector raise a range of issues, starting from possibilities to reverse engineer and catch-up, to prices of drugs and accessibility as well as access to technologies due to patents on upstream technologies. IPRs are said to be of moderate importance in the case of textiles and ready-made garments, where yarns and designs are trademarks-protected (copyrights are also used for the latter). The machinery required at the firm level for technological upgrading is patent protected in both the textiles and RMG sector, although this is not really relevant for the user of such machinery. Patent protection on seeds and chemicals for agriculture may also have an impact on the agro-processing sector: increased prices of seeds and agricultural inputs have implications for food security, and genetically modified crops may also affect agricultural biodiversity. The differential role played by IPRs in stimulating innovation in the three sectors was a prominent reason for the choosing them as part of the investigation.

Other factors that motivated the choice of sectors included the complexity of the innovation processes, their significance in generating employment and economic growth in Bangladesh. All the three sectors have a traditional base with potential for new technologies integration, which was also considered important. Whereas the growth of capabilities in the pharmaceutical manufacturing sector remains one of great success in an LDC context, Bangladesh has been experiencing several difficulties in modernizing its agriculture-based output and textiles and garments sector. In agriculture, although there has been an effort to promote modern agriculture and agro-processing, the sector has been experiencing a modest growth and a slow transition since the 1970s: it has recorded an average growth of 2.5 per cent average per year with the growth of output barely keeping pace with the population growth of the country (ADB, 2001, p. 9).

1.3. Constraints

A major constraint faced during the study was the lack of basic data amongst government agencies on the state of the sectors under consideration. There is some published information on the textiles/garments sector, but there seems to be a serious shortage of basic data on the agro-processing as well as pharmaceutical sectors. National statistics are mainly related to production of primary food products: cereal crops, fish, meat, milk, horticulture, among others. There is also data on value addition in terms of cost of production of crops deducted from the market price. However, there is a general paucity of data on specific value addition by crop and food processing in small-scale production units or household levels (which comprises 50 per

⁵ See for example, World Bank (2007b) for a case study of shrimp farming in Bangladesh.

cent of the sector approximately). Up until the national labour force survey of 1996-97, popular small-scale economic activities at household levels, which comprises agro-processing, poultry and livestock rearing and other agro-processing activities were completely unaccounted for. Hence, the significant portion of home-based small-scale units in this sector may not be accounted for appropriately.

2. BANGLADESH: INNOVATION AND INTELLECTUAL PROPERTY RIGHTS IN DOMESTIC PROCESSING

The domestic economy of Bangladesh is characterized largely by low technology endowments, dominance of trading and services in the absence of significant natural resource assets. In the 1970s and 1980s most of the economy relied on the agricultural sector for job creation due to lack of human resources and scientific and technological infrastructure and resulting low levels of industrial development. During the 1990s, liberal economic policies that emphasized labour intensive manufacturing and agro-based industrial production have gradually focused attention on non-farm activities in the country (World Bank, 2005a). Policy reform was initiated through Structural Adjustment Programs and Enhanced Structural Adjustment Programs that were initiated in 1982, 1985-1986 and then again in 1991-1992 (see Hossain and Karunaratne, 2002), which resulted in a unilateral trade liberalization of Bangladesh's economy (Dowlah, 2003).

2.1. Knowledge infrastructure

Bangladesh has very weak knowledge infrastructure gauged by conventional indicators such as R&D investments as percentage of GDP, centres of excellence for basic and applied research in both the public and private sectors of the economy, and scientists and researchers per million of the population. Table 2.1 shows available education information for Bangladesh for the years 2000-2005, and table 2.2 contains information on R&D investments as percentage of GDP and researchers per million, among others. As table 2.1 shows, Bangladesh' success in terms of near-universal primary school enrolment (World Bank, 2005b), does not extend to secondary and tertiary education. There is a drastic drop in enrolment rates from primary to secondary and tertiary education, which draws a bleak picture of the human skills available in the country with severe repercussions for innovative capacity, a result that was corroborated by data collected in the survey.

Table 2.1: Education Indicators Bangladesh 2000-2005

	2000	2001	2002	2003	2004	2005
Education						
School enrollment, primary (% gross)	109	108	107	106	109	-
School enrollment, primary (% net)	89	90	91	93	94	-
School enrollment, secondary (% gross)	50	51	52	51	-	-
School enrollment, secondary (% net)	47	48	49	48	-	-
School enrollment, tertiary (% gross)	6	7	6	7	-	-
Pupil-teacher ratio, primary	57	55	56	54	-	-

Source: World Development Indicators database, World Bank, 2007.

There is no data available on researchers involved in R&D and data on R&D expenditure for the country is also not available since 2003. However, findings of several earlier investigations on LDCs help to gauge the situation. As UNCTAD (2006) notes, the gross expenditure on R&D in 2003 was 0.2 per cent of GDP in LDCs (about ten times less than in developed

countries) and the number of researchers and scientists engaged in R&D activities per million population in 2003 were 2 per cent of the level observed in developed countries.

Table 2.2: Investment and R&D in Bangladesh 2000-2005

	2000	2001	2002	2003	2004	2005
Investment and R&D						
Foreign direct investment, net inflows (% of GDP)	1	0	0	1	1	-
Merchandise imports (current US\$)*	8,883	9,018	8,592	10,434	12,023	13,868
Research and development expenditure (% of GDP)	1	1	1	-	-	-
Researchers in R&D (per million people)	-	-	-	-	-	-
Financial Support						
Domestic credit to private sector (% of GDP)	26	27	29	29	30	32
Interest rate spread (lending rate minus deposit rate)	7	7	8	8	8	6
Market capitalization of listed companies (% of GDP)	3	2	3	3	6	5

* Amounts in 100,000

Source: World Development Indicators database, World Bank 2007.

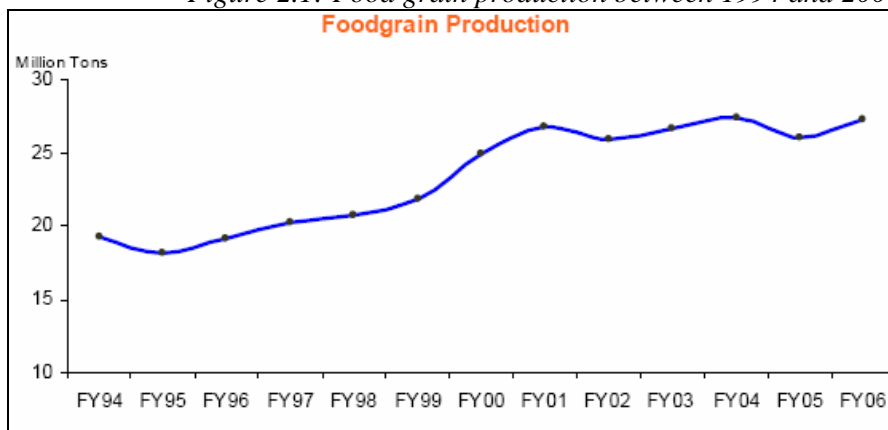
2.2. Growth in the textiles and garments, agro-processing and pharmaceutical sectors

Both the local agro-processing and the textiles sector have been the focal points of the economic reform policies over the past two decades in the country. This emphasis seems to have been justified given the historically important role both sectors have played in economic growth and the abundant labour supply available in the country. The textiles sector in Bangladesh can be traced back to several hundred years, when it was famous for its unique patterns and dyes. Similarly, as a predominantly agrarian economy, production and processing activities based on agriculture have always played a major role. During the colonial period (mid 18th to mid 20th century) the region produced and exported various processed and semi processed agricultural products like, rice, jute, tea, indigo, sugar apart from spices.

The Industrial Development Policy of 1999 has been credited with laying the basis for the growth of the agro processing and textiles and RMG sectors, augmented by the developments in the pharmaceutical sector, which is the other main sub-sector that builds on local manufacturing capabilities. The policy targeted export-oriented industrialization by providing incentives and facilities of various kinds to fully ‘export-oriented’ industries. It defines an export oriented industry as an industry exporting at least 80 per cent of its manufactured goods or contributing at least 80 per cent of its products as an input to finished exportable products; and similarly, a business entity exporting at least 80 per cent of services including information technology related products qualifies to be called export-oriented. The policy envisages several facilities to fully export oriented industries, such as duty free import of capital machinery, special facilities and venture capital support to “thrust sectors” (to be understood as leading sectors).

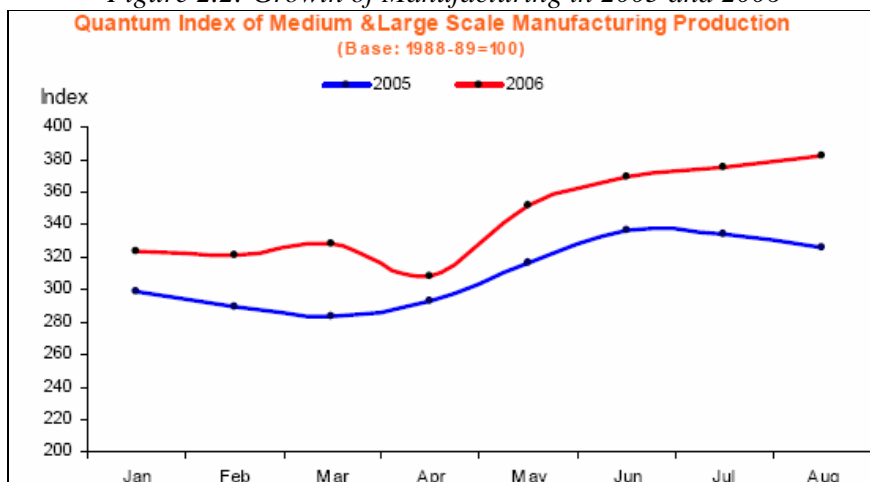
This policy is largely credited with Bangladesh’s economic growth which has been an average of 4.75 per cent per year throughout the 1990s, owing to the performance of these key sectors. The textiles sector is often cited as a success case on how appropriate policy incentives for the processing industry can result in channeling the abundant labour force to secure economic growth. The agro-processing sector ranks next only to textiles, as the second largest sub-sector within domestic processing both in terms of value of output and employment generation capacity (see for example, Salim and Kalirajan, 1999). Figures 2.1 and 2.2 below show the country’s performance in production of food grains and manufacturing. The pharmaceutical sector, however, has not received a concomitant policy support, such as cash incentives or other sector-specific export promotion programmes.

Figure 2.1: Food grain production between 1994 and 2006



Source: Bangladesh Quarterly Economic Update, ADB 2006.

Figure 2.2: Growth of Manufacturing in 2005 and 2006



Source: Bangladesh Quarterly Economic Update, ADB 2006.

2.3. Regime for intellectual property protection

As a least developed country, Bangladesh is exempt from implementing the general provisions of the TRIPS agreement until 2013, and has an extension until 2016 to implement its provisions on pharmaceutical patents (in accordance with the Doha Declaration). However, the country is presently working towards gradual compliance with the TRIPS Agreement pursuant to a bilateral treaty with the EU that requires Bangladesh to amend its national IP regime to conform to the TRIPS Agreement. The EU-Bangladesh Commission is currently negotiating the U.S-Bangladesh Bilateral Investment Treaty where the definition of investment includes the protection of intellectual property. Article 1(c) of the agreement defines investment to include intellectual property protection.⁶ Bangladesh's Parliament is expected to amend the country's trademark, patent, and copyright legislations, following a lengthy inter-agency approval and clearance process, in order to make the country's IP regime TRIPS-compliant.

⁶ Article 1 (c) of the treaty specifies that intellectual property rights includes rights with respect to copyrights, and related patents, trade marks, trade names, industrial designs, trade secrets and know-how, and good will.

As part of these obligations, the Law Commission of Bangladesh has formulated a new Trade Marks Law that makes Bangladesh TRIPS-compliant, in consultation with the WIPO, expected to be placed before the Advisory Committee of the Cabinet for approval in May 2007.⁷ Similarly, new legislations for Patents and Designs (provisionally called the Patent Law 2007, and the Designs Law, 2007) have been formulated by the Ministry of Industries, which are presently with the Ministry of Law and Parliamentary Affairs for legal vetting, and are expected to be enacted next year.⁸ The Draft Patent Law of 2007 grants an exemption to the pharmaceutical sector, and provides that “It shall come into force at once except the provisions relating to examination, sealing, grant and post-grant matters of the patents relating to pharmaceutical and agricultural chemical products, but excluding the grant of exclusive marketing rights therefore and mailbox filings which shall come into force on and from the first day of January, 2016” (Section 1). Until these laws come into force in Bangladesh, its present policy framework for intellectual property protection, which consists of the Patents and Designs Act of 1911, the Trade Marks Act of 1940, the Copy Right Act of 2000 and the Merchandise Marks Act of 1889 are in force.

Status of patent protection

The present patent protection regime comprises the Patents and Designs Act of 1911 (last amended in 2003) and the Patent and Design Rules of 1933. The Act deems patents to be valid for a total of sixteen years (Section 14), calculated from the date of application (Section 7), and allows a further extension of ten years (Section 15(a)(1)).⁹ Section 8 contains provisions for opposition to grant of patent (within four months from the date of advertisement of acceptance of application). The law grants both process and product patents on pharmaceuticals.

Section 22 of the Act deals with the grant of compulsory licenses and revocation of patents. According to this section, any person can present a petition to the government of Bangladesh that the demand for a patented article is not being met. Under such circumstances, the government or the high court division may order the patentee to grant licenses on terms they see fit. A revocation can also be made within grant of four years of the patent, in case the patentee fails to give adequate reasons for his default (Section 22 (4)).

The Department of Patents, Designs and Trademarks, which was created by merging the former Patent Office and the Trademark Registry Office, is the apex intellectual property agency in the country. The office has a total manpower of 112, with 44 officers and 68 administrative staff. Patent statistics between 2000 and 2005 are contained in Table 2.3 below.

⁷ Pers. Comm., Mesbah Uddin, Registrar, Department of Patents, Designs and Trademarks, 17 April 2007.

⁸ Pers. Comm., Mesbah Uddin, Registrar, Department of Patents, Designs and Trademarks, 17 April 2007.

⁹ Section 7 reads: “After the acceptance of an application and until the date of sealing a patent in respect thereof, or the expiration of the time for sealing, the applicant shall have the like privileges and rights as if a patent for the invention has been sealed on the date of the acceptance of the application.” Section 15(a)(1) on ‘Patents of Addition’ provides that “Where a patent for an invention has been applied for or granted, and the applicant or the patentee, as the case may be, applies for a further patent in respect of any improvement in or modification of the invention, he may in his application for the further patent request that the term limited in the original patent or so much of that as is unexpired, and if he does so, a patent (herein after, referred to as a patent of addition) may be granted for such term as aforesaid.”

Table 2.3: Patents Granted in Bangladesh between 2001 and 2006

Year	Applications Filed			Applications Accepted		
	Local	Foreign	Total	Local	Foreign	Total
2001	56	239	295	21	185	206
2002	43	246	289	24	233	257
2003	58	260	318	16	206	222
2004	48	268	316	28	202	230
2005	50	294	344	21	161	182
2006	23	287	310	16	146	162

Source: Department of Patents, Design and Trademarks, Bangladesh

Status of copyright protection

Copyright and related right activities in Bangladesh are governed by the Copyright Act 2000 (in force since 01 November 2000), which is consistent with the Berne Convention and TRIPS Agreement.¹⁰ The protection covers all literary, musical, dramatic or artistic works, cinematographic works, sound recordings, broadcast, computer software, video-films and performances (computer programs come within the definition of literary works and video-films come within the definition of cinematograph films), and published editions of literary or artistic works. Under the Act, copyright protection subsists for the life time of the author who creates the work plus 60 years after his death. In the case of government works, musical records, cinematograph, films, photographs, and works of international or local organizations, the term is 60 years after first publication. The term of protection for broadcasting right is 25 years. The term for the protection of performer's rights is 50 years.

Other rights

Other rights such as trademarks and industrial designs are presently also being granted under the existing regime. Protection of a new and original design can be secured through registration of the design for 5 years and protection is extendable for another 2 terms of 5 year each. As of 2006, 850 designs were registered and 2,753 trademark applications were approved by the office.

3. INNOVATION IN THE PHARMACEUTICAL SECTOR: SURVEY RESULTS¹¹

Bangladesh now exports a wide range of pharmaceutical products (therapeutic class and dosage forms) to 67 countries.¹² The Drug Control Ordinance of 1982 placed a ceiling on selling imported drugs in the local market promoted self-reliance in its pharmaceutical sector, prior to which the local manufacturing catered to only 20 per cent of the total needs. Local exports have risen from USD 0.04 million in 1985 to USD 27.54 million in 2006 (Export Promotion Bureau). As opposed to relying on foreign companies for 75 per cent of their drug supply prior to the Ordinance, local firms now cater to 82 per cent of the markets, whereas subsidiaries of MNCs supply 13 per cent of the market and 5 per cent of the drugs are imported (Ibid.). Square Pharmaceuticals is the largest firm in the market for many years now, and is

¹⁰ Pers. Comm., Mohmudul Hasan, Registrar, Copyrights Office, 17 April 2007.

¹¹ This section is based on Gehl Sampath, "Innovation and Health in Developing Countries: Can Bangladesh's Pharmaceutical Sector Help Promote Access to Medicines?" A UNU-MERIT Study, 2007. This is a broader study on the pharmaceutical sector in Bangladesh, that looks at all other components in the domestic knowledge system (such as universities, public research institutes, hospitals and clinics), in addition to firms.

¹² Pers. Comm., Dr. Habibur Rahman, Director, Drugs Administration, 11 April 2007.

followed closely by Beximco, Incepta, ACME and Eskayef (IMS, 2006). Other firms in the top ten bracket include Aristopharma, General, Healthcare Pharma, Novartis and Drug International (Ibid.). The market is extremely concentrated: the top ten firms cater to about 70 per cent of the market and only two companies, Beximco and Square hold 25 per cent of the entire market (Chowdhury et al, 2006).

3.1. Sector characteristics

Pharmaceutical manufacturing consists of two steps: production of active pharmaceutical ingredients (APIs), which requires chemical synthesis skills and is commonly referred to as 'reverse-engineering' capabilities, and final formulations, which is a manufacturing activity and involves the mixing of active pharmaceutical ingredients with other non-active ingredients into pill, tablets, or other forms of administration (Bumpas, 2007). Pharmaceutical firms in Bangladesh are mainly engaged in formulation of APIs requiring manufacturing skills only, and are presently struggling to build capacity in the more knowledge-intensive processes of reverse engineering active pharmaceutical ingredients (APIs). Formulation activities are carried out in most indigenous firms and a small percentage of subsidiaries of international firms that operate in the market, and both groups were captured by the survey.

Product range: Approximately 450 generic drugs, in 5,300 registered brands having 8,300 different presentations of dosage forms and strengths are manufactured by 237 registered companies (including 5 multinationals) in the sector. The local companies produce a wide range of products that include antiulcerants, flouroquinolones, antirheumatic non-steroid drugs, non-narcotic analgesics, antihistamines, and oral antidiabetic drugs. The survey shows that many of the bigger firms are now venturing into the production of anti-cancer drugs, anti retroviral drugs for the treatment of HIV/AIDS¹³ and anti Bird Flu drugs.

Firm size: The companies include specialized multinational companies, local large companies with international links and smaller local companies. Out of the 237 registered companies, only around 150 are estimated to be in a functional state.¹⁴ The Bangladesh Association of Pharmaceutical industries (BAPI) is the main professional association for the sector, and has 150 member companies that lobby the government for policy changes, among other activities.

Technologies used: Firms mainly use process development technologies to manufacture generic formulations. The survey shows that the firms import between 75 to 100 per cent of their machinery and 50 to 100 per cent of all production inputs are imported from foreign sources. Active pharmaceutical ingredients are sourced from a range of countries including India, China, Italy, Spain, Germany, United Kingdom, France and the USA.¹⁵

Intellectual property rights: The global pharmaceutical sector is extremely patent intensive, and firms rely on product, process and formulation patents to protect their innovations. Pharmaceutical IPRs raise a range of issues for firms in developing countries and LDCs, the

¹³ Square Pharmaceuticals is currently engaged in manufacturing eight drugs that are part of several ARV combinations that are expected to be available in the market later this year. Pers. Comm. Parvez Hashim, Executive Director Operations, Muhammadul Haque, Director Marketing and Md. Nawabur Rahman, Assistant General Manager, Square Pharmaceuticals, 9 April 2007.

¹⁴ Pers. Comm., Dr. Habibur Rahman, Director, Drugs Administration, 11 April 2007.

¹⁵ Pers. Comm., Parvez Hashim, Executive Director Operations, Muhammadul Haque, Director Marketing and Md. Nawabur Rahman, Assistant General Manager, Square Pharmaceuticals, 9 April 2007; Joint meeting with the members of the Bangladeshi Association of Pharmaceutical Industries (BAPI), 11 April 2007; Amanullah Chowdhury, Executive Vice President and Habibur Rahman, Vice-President and Director, Rangs Pharma, 16 April 2007.

most important ones being the restriction of reverse engineering possibilities and its implications for catch-up in this sector, higher prices of drugs and access to medicines as well as access to technologies due to patents on upstream technologies. Under the present patent regime in Bangladesh (the Patent Law of 1911), patents are available for a period of sixteen years, and extendable for another ten years. The present patent regime grants both product and process patents to pharmaceuticals.¹⁶ According to the local patent office, of the 182 patents granted in 2005, over 50 per cent are pharmaceutical patents.¹⁷ The draft Patent Act of 2007 contains exceptions for pharmaceutical products in accordance with the TRIPS Agreement and the Doha Declaration on the TRIPS Agreement and Public Health, but may not be enacted soon due to the political situation in the country.

3.2. Innovation and competitiveness in the pharmaceutical sector

The pharmaceutical sector in Bangladesh has received a lot of attention in the context of access to medicines and the TRIPS Agreement in recent times. With India becoming TRIPS-compliant in 2005, the sector in Bangladesh could potentially fill the vacuum created by Indian firms, if the local firms are able to produce generic versions of important medicines at globally competitive rates. There are however, many reasons discussed in this section that may not work in favour of indigenous pharmaceutical firms in Bangladesh that are seeking to capitalize on the Doha extension until 2016.

The survey, most importantly, points out to the link between incentives for learning and competitiveness of the sector as a whole. As the analysis in this section shows, a protective local policy regime that was initially intended to boost local manufacture of drugs and enhance access to medicines in the local market, seems to be creating disincentives for the local firms to technologically upgrade their production and enhance competitiveness. The local pharmaceutical sector is presently focusing extensively on retaining the gains that accrue from their dominant position in the domestic market. This narrow focus, attenuated by the policy environment, fails to create appropriate incentives for firms to strategically invest in acquiring reverse engineering skills required for production of APIs. Apart from protecting local firms from extensive foreign competition, there is a lack of scientific and physical infrastructure support, which can also be traced to insufficient policy emphasis, and the relatively small domestic market does not provide the requisite economies of scale, which are all important factors for API skills development. If the local firms are to transition gradually into a competitive sector even within the highly competitive global generics market, their acquisition of such skills is essential. Industrial policy for the sector will need to resolve this paradox of creating appropriate incentives for technological upgrading within firms, failing which merely extending the TRIPS deadline will not help realize the potential of the sector.

Innovative capacity

Local pharmaceutical firms in Bangladesh are struggling to master the process of manufacturing APIs from scratch. The few firms in Bangladesh that are presently producing APIs locally are only able to perform the last few steps in the process with help from technologies bought from Indian firms.¹⁸ The lack of capacity to locally produce APIs reduces

¹⁶ Pers. Comm, Mesbah Uddin, Registrar; Farhad Hossain Khan, Assistant Registrar (Patents) and Azim Uddin, Assistant Registrar (Copyrights), Department of Patents, Designs and Trademarks, 17 April 2007.

¹⁷ Pers. Comm, Mesbah Uddin, Registrar; Farhad Hossain Khan, Assistant Registrar (Patents), 17 April 2007.

¹⁸ Pers. Comm., Parvez Hashim, Executive Director Operations, Muhammadul Haque, Director Marketing and Md. Nawabur Rahman, Assistant General Manager, Square Pharmaceuticals, 9 April 2007; Amanullah

the competitiveness of the firms enormously, since between 30 and 50 per cent of the production price of the drugs is taken over by the expenses of securing APIs from external sources (Bumpas, 2007). The top local firms (around six in total) are trying to secure skills and scientific infrastructure in order to venture into API production and reverse engineering.¹⁹ However, they are stifled by lack of adequate scientific and physical infrastructure. Lacking scientific infrastructure includes missing human resources as well as the incapacity of domestic research and development institutes, (RDIs) and universities in assisting the firms in developing these chemical synthesis skills due to under-funding of research, disillusion of scientists and researchers and lack of a cogent focus amongst core university faculties that do work on medical sciences (see Gehl Sampath, 2007). This disarticulation between various components of the domestic knowledge systems illustrates a prevailing phenomenon that prevents effective learning and absorption by the enterprise sector in most LDCs. The lack of API production capabilities reduces their competitiveness substantially even for the manufacture of generics. Most exporting firms in the survey pointed out cheap labour costs as their main advantage in the international markets, but even the biggest firms like Square Pharmaceuticals were skeptical about whether they could capture markets in other African and Asian countries on the basis of just cheap labour when they did not possess the economies of scale and reverse engineering skills on par with their Indian counterparts.²⁰ The top Bangladesh firms are keen on diversifying exports between regulated and unregulated markets, since sales from regulated markets can be huge once the initial hurdles of market entry are countered. Square Pharmaceuticals, for example, has invested huge sums in setting up production facilities that meet exporting requirements to the UK (and planning to expand to the USA too) just outside of Dhaka. The absence of infrastructure support to conduct bioequivalence tests and the lack of biotechnological capabilities pose big barriers to such firms seeking to branch out into emerging options such as bio generics or focus on exporting to regulated markets.

The lack of reverse engineering capabilities amongst the pharmaceutical firms was confirmed through observed R&D investments over 2000-2005 as captured by the survey. The survey shows that there was not much difference in the amounts invested in R&D between the pharmaceutical firms, and those in agro-processing and textiles and garments (about 1 per cent). At a first glance, this seems to be a surprising result, since it implies that R&D and innovations are not (statistically and significantly) correlated with one another in the pharmaceutical sector in Bangladesh, although generally speaking the pharmaceutical sector is very technological intensive and far more innovative in terms of new product/process innovations than the other two sectors under consideration. But in the context of LDCs, it confirms the extensive relationship between firms and the knowledge systems they are entrenched in. The difficult state of the domestic knowledge system in the country (see UNCTAD 2006, Chapter 6), forces firms operating in what is normally a high-technology sector to focus on manufacturing and excludes the more knowledge-intensive activities from their reach.

Chowdhury, Executive Vice President and Habibur Rahman, Vice-President and Director, Rangs Pharma, 16 April 2007.

¹⁹ Pers. Comm., Joint meeting with the members of the Bangladeshi Association of Pharmaceutical Industries (BAPI), 11 April 2007.

²⁰ Pers. Comm., Parvez Hashim, Executive Director Operations, Muhammadul Haque, Director Marketing and Md. Nawabur Rahman, Assistant General Manager, Square Pharmaceuticals, 9 April 2007; Amanullah Chowdhury, Executive Vice President and Habibur Rahman, Vice-President and Director, Rangs Pharma, 16 April 2007.

Inadequacy of the present regulatory framework

The pharmaceutical sector in Bangladesh suffers from a lack of coherent policy regime. The Drug Control Ordinance of 1982 was in several ways, very similar to India's policy initiative of a similar kind that triggered self-reliance in its pharmaceutical sector, but this policy has not been supported by complementary industrial policy measures to support the sector.²¹ Thus, although it promoted the growth of the sector, its present deficiencies can be traced back to the absence of a consistent, strategic policy framework that could steer it into a profitable and competitive trajectory. Even if the New Patent Law of 2007 that incorporates the Doha flexibilities for pharmaceutical patents in Bangladesh until 2016 is enacted, strategic policy support is required to promote API and reverse engineering skills amongst local firms, in order for them to effectively supply low cost generic versions of patented drugs to other LDCs.

The pharmaceutical sector falls under the Ministry of Health and Family Welfare (MHFW) in Bangladesh, rather than the Ministry of Industry and Commerce (or Ministry of Science and Technology), which is generally the case in other countries. The sector has not been a leading sector in the most recent economic policies that seek to provide a variety of incentives for exports, although the government has enacted a New Drug Policy (2005) and a National Biotechnology Policy (2005), and is in the process of establishing an API park. The New Drug Policy (2005) contains provisions for technology transfer and some other incentives to MNCs to set up production facilities in the country both on a joint venture or independent basis, although it is not clear how this alone will help in the absence of other institutional incentives that promote knowledge intensive activities, such as human skills. The Directorate of Drug Administration is the key department in charge of the sector, and is supported by the Institute of Public Health, which has the mandate of supporting public health activities, quality control, and production of biomedical, training and research. Both organizations are severely under-equipped and under-funded.²² One of the few services offered by the Directorate is the Bangladesh National Formulary, produced by the Directorate of Drugs Administration which contains a list of all drugs available in the country, with manufacturing details and price.

Another peculiar problem with the Ministry of Health is that most government officials (except those that specifically occupy technical positions) that work for the ministry are medical doctors, who are forced to undertake tasks without necessary specialized skills. Doctors are assigned the task of planning and strategy, overseeing functions of the various departments, and even handle financial management responsibilities (field interviews). This seriously affects performance of the various organizations under the ministry. The survey found that within specialized institutions like the Institute of Public Health, production specialist occupations (for production of vaccines) are occupied by medical doctors. The civil service system is also based on regular two-year transfers for many of these positions. Those who invest the time to learn to perform the tasks that they are assigned to are transferred soon thereafter. Hence, most officials interviewed for the study thus expressed their frustration to invest in on-the-job learning (field interviews).

²¹ See Gehl Sampath (2007) for a comparison of the incentives for the pharmaceutical sector in the two countries.

²² The Directorate of Drug Administration has only two laboratory facilities (in Dhaka and Chittagong) that can test about 3,500 samples of medicines a year. About 12,000 samples of different brands of medicines remain without test every year, although the regulations require that medicines are tested for quality and efficacy twice every year (Bumpas, 2007).

Human skills creation and allocation

University and research in RDIs is grossly under-funded. The government allots only 12 crore takas (equivalent to USD 1.75 million) for public sector research for the entire country which are to be shared amongst universities, RDIs, NGOs and all other public sector institutions.²³ The status of research even under the premier university departments and RDIs is not sufficiently supportive towards developing local API skills.²⁴ Laboratory facilities for both pharmaceutical sciences and biotechnology research are also not enough to create human skills that can be directly deployed by the industry.²⁵ Most firms complained that they had to train graduates in aspects of clinical pharmacy for a year after they are employed (field interviews). There is a relatively large mismatch amongst the qualifications of personnel as well as facilities available to enable them to perform in the various organizations in the local pharmaceutical innovation system. The country produces a large number of qualified pharmacists who are absorbed by the pharmaceutical firms, and employed for quality assurance and quality control activities for the manufacture of drugs. As a result, most pharmacies in the country are run by pharmacy owners, or personnel who have very little professional training. Similarly, most researchers with a PhD or other research-related qualifications in pharmaceutical sciences end up working for universities and RDIs, who do not have the requisite facilities and funding to encourage pharmaceutical R&D (Gehl Sampath, 2007). Amongst the university faculties, Dhaka University has very old and established departments that deal with pharmaceutical sciences, but lack of funding and focus are major handicaps.²⁶

Intellectual property rights and potential limitations of technology transfer

Closer scrutiny of the patents that have already been granted within the country shows that many of the patents are presently disregarded in the local market. A major explanation for this lies in the technological intensity of the local firms; their inability to reverse engineer offers the best form of protection for the foreign firms who sell their products in the local market. Given this, one is forced to question the motives of foreign firms to patent in the local market. One explanation is that the patent holder firms may wish to prevent competition from companies in other countries, such as India, who may still be keen on generic versions of patented drugs that they

Firms in Bangladesh require substantial help in developing local API skills, which could be promoted through south-south cooperation with the pharmaceutical sector in India. Amongst the firms that were surveyed, several large firms are in negotiation (or had failed to negotiate) transfer of skills and know-how from successful Indian firms. The government has allotted land and finances to building an API park that will also contain common effluent and waste management as well as water treatment facilities, and this may really help to speed up the process. Previous experience shows that technology transfer and collaboration helped to develop formulations capacity in the sector. Good examples are Square Pharmaceuticals which collaborated with Janson and Vicsenco that received help from Pfizer. But in the case of API skills, this may not be so easy, since the firms require access to know-how in addition to codified technology in order to build capacity.

²³ Joint meeting, Department of Clinical Pharmacology, Department of Pharmaceutical Chemistry and Department of Pharmaceutical technology, Dhaka University, 10 April 2007.

²⁴ Pers. Comm., Parvez Hashim, Executive Director Operations, Muhammadul HAque, Director Marketing and Md. Nawabur Rahman, Assistant General Manager, Square Pharmaceuticals, 9 April 2007; Amanullah Chowdhury, Executive Vice President and Habibur Rahman, Vice-President and Director, Rangs Pharma, 16 April 2007.

²⁵ Joint meeting, Department of Clinical Pharmacology, Department of Pharmaceutical Chemistry and Department of Pharmaceutical technology, Dhaka University, 10 April 2007; Joint Meeting, Department of Pharmacy and Department of Microbiology, Jehangir Nagar University, 12 April 2007. The Biotechnology Policy of 2005 has created five national executive committees on biotechnology, and development of pharmaceutical biotechnology falls under the National technical committee on medical biotechnology.

²⁶ See Gehl Sampath (2007), for a detailed discussion of the university of Dhaka facilities for pharmaceutical sciences research as well as a 'Policy Support Vision' Statement drafted by the professors of the various faculties for the study.

can no longer sell in the Indian market for exports to Bangladesh. The survey clearly shows that technology licensing to local firms is marginal and not a contributor to innovative efforts presently (see analysis in Section 6). Efficient technology transfer for the future, especially in the case of a knowledge-intensive sector like pharmaceuticals, will hinge upon transfer of know-how (Arora, 1995, p. 41). Successful transfer of know-how, which is uncodified and costly to transfer will in turn depend on the technology absorption capacities of the recipient, and not just the willingness of the licensor (see box above).

Narrow focus on the domestic market

Most of the sales for even the largest firms accrue from the local market,²⁷ but the size of the local market is quite small.²⁸ The policy framework protects the local firms from imports of drugs that can be locally manufactured and the present marketing and sales incentives for firms (see next paragraph) are such that there seems to be very little incentive to enhance competitiveness (field interviews). The few firms that are in the process of expanding their range of activities to include API and reverse engineering skills are focusing on the export markets, and will need a lot of institutional support to achieve efficient results.²⁹

Lack of GMP standards

Presently, there is no law prescribing GMP standards for the pharmaceutical drugs that are sold in the local market. Around 8 drug firms have WHO-pre-qualified facilities for manufacturing, and another 6 are presently in the process of acquiring WHO prequalification.³⁰ The New Drug Policy of 2005 states in its objectives that the sector requires the enactment of good manufacturing standards in order to promote safety and efficacy of drugs for the local market. There is a need to enact rules that promote this objective in order to boost the export of pharmaceutical products, as well as to ensure safe and efficacious access to medicines in the local market.³¹

Drug procurement and sales

Several aspects of the health sector in the country, especially those related to drug procurement and sales contribute to low competitiveness of the Bangladeshi firms. The internal market is characterized by branded competition: each product essentially a generic, competing on the basis of brand names. In the absence of control mechanisms that check for bioequivalence of drugs marketed locally, a drug distribution system that is organized around pharmacies and doctors, offers ample scope for the sale of low quality drugs at high prices. Drug supplies through both institutional and private pharmacies proceed through suppliers and retailers in a market that is not well regulated, and offers ample scope for price-fixing and other anti-competitive practices (World Bank, 2007a). Drugs sold in local pharmacies very often do not contain information leaflets thus lacking indication of composition and dosage and are sold by personnel who are not qualified pharmacists (field interviews). The extent and percentage of spurious drugs in the market is presently also unclear. It also offers a basis to conclude that the present protected environment for the local firms, is perhaps running at odds with the aim of

²⁷ The first largest firm in the market, Square Pharmaceuticals is reported to be exporting only 3 per cent of its total production, and Beximco, another firm in the top five, exports only 2.7 per cent.

²⁸ According to World Bank Statistics (2007), Bangladesh reported a population of 141.8 million in 2005.

²⁹ For a discussion of problems of acquiring technologies from foreign firms, see box in Section 6 of this study.

³⁰ Pers. Comm., Dr. Habibur Rahman, Director, Drugs Administration, 11 April 2007.

³¹ Several factors prevent cheap access to medicines in the local market within Bangladesh, especially in the public sector health institutions. For a detailed analysis see Gehl Sampath (2007).

safe and accessible drug supplies, since drugs are consistently over-priced in the local market (Bumpas, 2007).³² Some of the over-pricing seems to be related to the inefficiency of the production process shielding the local firms from price competition in an undesirable way.

4. INNOVATION IN THE TEXTILES AND RMG SECTOR IN BANGLADESH: SURVEY RESULTS

The textiles and ready made garments (RMG) sector in Bangladesh broadly comprises dyeing and printing factories, and spinning and weaving mills that produce both knit and woven fabrics. Rural textiles (handloom factories), which are traditionally focused on processing yarn and produce both clothes and fabrics, also form an essential part of the sector. As of 2004, Bangladesh had 142 spinning firms, 109 weaving firms and 104 dyeing, printing and finishing firms (Nazneen, 2007 cited in Rasiah, 2007). This sector has experienced exponential growth over the past few years in Bangladesh, growing from USD 1 million in 1978 to USD 4.1 billion in 2002 (UNCTAD, 2005, p. 42). Much of this growth is home-driven, in the sense that most producers are local and the sector has attracted less than 5 per cent of the total FDI in recent years (Ibid.).

Although ready made garments only contribute to about 5 per cent of the country's GDP, it is the largest creator of jobs in the country. The RMG business employed 2.2 million people as of 2006, thereby accounting for 40 per cent of all industrial employment in the country (BGMEA, 2007; World Bank, 2005c).³³ The textiles and RMG sector has continued to perform well even after abolition of the quota-based trading system under the Multi-Fibre Agreement, 1974 that was largely responsible for the rise of the sector initially. There are presently around 4,200 RMG firms in the country and trade in RMGs continues to be the largest foreign exchange earner for the country.³⁴ Traditional textile products, also known as handloom (or *Khadi*) meet about forty per cent of the total clothing needs of the country; and some of its products are also exported (Bangladesh Handloom Board, 2007). This survey of the textiles and RMG sector also covered handloom production equally, although this is not generally the case amongst other studies of this nature.³⁵

4.1. Sector Characteristics

The textiles and RMG sector in Bangladesh exhibits three main characteristics reminiscent of traditional "sweat shops". It comprises a high concentration of low value-added products; demonstrates a heavy dependence on imported intermediate inputs and has a high regional concentration of exports (mainly USA and EU), an offshoot of its MFA practices.

Product Range: The main products include ready-made garments, yarn and fabrics produced by modern textile mills, which are also largely export-oriented, and handloom textiles that cater largely to the needs of the local people. The textile firms focus largely on knitwear and not woven fabrics. For a variety of reasons, Bangladesh has been unable to produce cotton, making it an importer of woven fabric. Knitwear manufacturing has the advantage that several

³² According to Bumpas (2007), when the prices of drugs between India and Bangladesh are compared, generic versions of the same molecules are often available at a fraction of the price in India.

³³ The BGMEA is the Bangladesh Garments Manufacturers and Exporters Association, a professional body that seeks to establish a health business environment for its 3,500 members. See Table V.5, Annex 5 for more detailed figures on the growth of the sector.

³⁴ See Annex 5.

³⁵ See for example, World Bank (2005c), UNIDO (2006), which both deal with modern textiles and RMG production in Bangladesh.

of the raw materials are synthetic in nature, thus making it easier for the local firms to manufacture it. According to estimates, around 85 per cent of woven garments rely on imported fabrics, whereas in the case of knitwear only 25 per cent of the inputs are imported by the knitted garment manufacturers (World Bank, 2005c).³⁶ The RMG products include both knit and woven wear, where the share of knitwear in the total production of garment in Bangladesh is increasing steadily, since the sector has been able to achieve backward integration in knitwear to its advantage. In 2006, the sector exported USD 4,544.79 million worth of woven garments and USD 4,388.72 million worth of knit garments (BGMEA, 2007). Apart from regular clothing, the two most promising products of Bangladesh Handloom are the Jamdani and Benarasi textiles, both of which are used to make saris.

Firms in Bangladesh can range from those which only sew garments from imported woven fabrics/local or imported knitted fabrics, those that use imported woven fabrics, but produce their own knitted fabrics (and have the capacity for spinning, dyeing, weaving and knitting) and sew garments, and firms that knit, weave and produce garments using imported yarn (see World Bank, 2005c). There are three different professional associations in the sector, the Bangladesh Textile Mills Association (BTMA), the Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) and the Bangladesh Garments Manufacturers and Exporters Association (BGMEA), which represent the textile producers, knit wear manufacturers and the garment firms respectively. Several large firms are members of two or more associations (for example, Purbani), given the diversity of their activities.

Technologies used: The sector remains largely dependent on imported fabrics, accessories and machinery. Of the sixty firms surveyed, 54.2 per cent of the firms sourced over 50 per cent of their production inputs from outside the country (18 per cent of the firms sourced all their production inputs externally) and 54 per cent of the firms sourced over 80 per cent of their machinery for production from foreign sources.³⁷ Thus the major value addition in the RMG industry is domestic labour. The cheap labour force, almost entirely women, is the backbone of the RMG industry in Bangladesh, and its key comparative advantage. In handloom production, improved technologies have contributed immensely to increased production over the past decades. Traditional throw-shuttle and/or fly-shuttle looms have been displaced by the more productive Chittaranjan/semi-automatic looms (Latif, 1997).

Intellectual property rights: In Bangladesh, both yarns and designs that are intermediary inputs to the production process are trademarks-protected (copyrights are also used for the latter) and machinery required at the firm level for technological upgrading is patent protected. Local firms do not engage in any patenting/design protection, due to the lack of novel products.

4.2. Innovation and Competitiveness in the Textiles and RMG Sector in Bangladesh

Until recently, the sector mainly focused on RMGs due to the market advantages in the USA and EU under the Multifibre Agreement. Following the abolition of MFA in 2005, the sector has managed to create backward linkages to include textiles production for knitwear and the sector output has increased because Bangladesh has moved into the lower end of the global textiles and garments market. Most of the production, for both woven and knit wear, is entirely demand-driven and therefore also determined by buyer specifications (field interviews). The scale of the operations and the country's historical expertise in textiles are reasons for the steady development of the sector (also see, UNIDO, 2006).

³⁶ The woven fabric is usually imported using back-to-back letter of credit arrangements.

³⁷ This is a very high number of firms, since the 60 firms in the survey included 15 handloom firms, which mainly source both their production and machinery inputs from within the country.

4.2.1. Textiles and ready-made garments³⁸

Firms in the survey attributed their inability to compete efficiently and upgrade to four main factors: (a) inability to create backward linkages in woven fabrics (the country produces less than 10 per cent of cotton that the sector needs); (b) delays in lead time caused by raw material imports (weak physical infrastructure at ports and for transportation) and use of not-so-modern production technologies especially in weaving and dyeing; (c) lack of skills creation that is required to branch out into innovative activities, such as design; (d) lack of interest amongst international buyers to transfer technology, both tacit (through skills training) and codified (machinery and equipment) (field interviews).

Skills creation and innovation

Lack of technical education is a major impediment to specialization and value addition in the sector. Firms complained of a lack of both managerial and technical expertise. There is a shortage of institutes to train skilled labour required for the sector. None of the institutes in the country has an industry-specific skill-based programme, and the few institutes that do exist operate with antiquated syllabus dating from colonial times that need urgent revision.³⁹ In the absence of professional training, on-job training in this sector takes up to four years.⁴⁰ Firms however, do not benefit long enough from the workers they train since workers are paid meagerly, dismissed without notice, and not treated well in the workplace. The main emphasis for most firms is on securing cheap labour and workers are not in a position to demand good and stable working conditions due to very lax enforcement of labour laws in the country. Despite being on par with countries like China in terms of sector competitiveness, workers are treated much worse than those in other LDCs with a textiles and RMG sector, like Kenya (UNIDO, 2006). There is also a gender-based dimension that deserves attention here – most of the workforce in this sector comprises of women, who are vulnerable to exploitation (see Box below). The wages in the garment sector are still higher than other forms of employment in the informal sector, as a result of which workers continue to work despite adverse circumstances (UNIDO, 2006).⁴¹

Women in Bangladesh are typically engaged in the informal sector, which is more than 3 quarters of the total labour force (74.2 million) of the country. An estimated 65 per cent of the informal sector labour is comprised of women. In the RMG sector however, women comprise 70 to 90 per cent of the total labour force. This is the only sector where women can engage in formal occupation. There have been allegations of poor working conditions for women, lack of security in the work place, irregular pay and long working hours for them etc. Yet, compared to complete lack of any institutional benefits in the informal sector employment, formal sector employment still has its advantages. According to UNIDO (2006), although the RMG sector is performing better than that in Kenya, the payment of workers is much lower in Bangladesh.

Low technological capabilities

Technological learning and constant upgrading is required if local firms are to remain competitive even within the low-end global market for textiles and RMGs. The level of technological capabilities in the

³⁸ The analysis in this section benefited greatly from a joint meeting with the board members of the BGMEA and the President of the BTMA (Abdul Hai Sarkar), 17 April 2007. Those interviewed included: Anwar-Ul-Amal Chowdhury (President), M. Fasihur Rahman (Secretary), and other directors of the board, Abdullah Al Mahmud, Iqbal Hamid Quraishi, Osama Taseer, 17 April 2007, and detailed discussions with Abdul Hai Sarkar, president of the Bangladesh Textile Mills Association, 17 April 2007.

³⁹ In order to partially fill in the lacuna, the BGMEA has a management centre in Uttara that offers courses on managerial skills for the textiles and garments sector.

⁴⁰ Pers. Comm. Protima Paul-Majumdar, Senior Research Fellow and Sector Specialist, Bangladesh Institute for Development Studies, 15 April 2007.

⁴¹ According to UNIDO (2006), for the poor in Bangladesh the average earning in alternate forms of employment is much lesser than that of a helper in the first year of employment in the garment industry (p. 37).

sector is very low and skewed. Although most of the technological inputs are sourced from external sources, their quality is not very high and workers end up spending over four times the amount of time to accomplish spinning/dyeing and other tasks, when compared to other countries like Sri Lanka.⁴² The firms have better technologies for spinning and weaving woven fabrics, which is paradoxical and calls for improved technologies for knit fabrics, since the sector has achieved backward linkages in knitwear.⁴³ Dyeing is another area where firms reported a large wastage, and there is a need for better dyeing expertise and technologies.⁴⁴ The survey data reveals that local firms have a lead time of 90 to 120 days in delivering RMG products, which is much more than other countries such as India (50 to 70 days) and China (40 to 60 days) (Rasiah, 2007). Apart from lack of appropriate technologies, the survey leads to the conclusion that the lag in lead times is attributable to two other factors, poor transportation facilities and dependence on imported inputs.

Compliance issues

Reports of rights violations of workers in the RMG factories have resulted in the gradual incorporation of specific export demands⁴⁵ as well as other requirements by international buyers such as adherence to legally specified working hours, childcare facilities, and sick leave among others. Most firms complained that since their main advantage is cheap labour, if they are to adhere to these requirements without increase in buying prices, they will have to incur losses (field interviews). Most firms surveyed have expanded scale of production in response to the end of the MFA agreement, and reported to be under pressure to compete and survive (field interviews). This points to a very serious issue in the sector: Are firms so hard-pressed to compete on the basis of cheap prices in the absence of other major value additions? Is the sector's main competitive advantage, namely cheap labour, leading to exploitation of poor workers in the economy? These issues need to be explored further through targeted research.

Lack of coherent policy vision

There is a lack of coherent policy vision for the sector. Survey data reveals that in addition to a lack of trained technical and managerial labour, there are no industrial zones, and no common infrastructure provided by the government to encourage innovation activities that could lead to sustained value addition. The government has also reduced the export incentives for the RMG sector to 5 per cent (from a previous 25 per cent) and has enacted rules mandating value addition of exported goods, which puts immense pressure on local firms to compete in the international market. This, once again, in the absence of equally forceful enforcement of labour laws, seems to be adding to on-going mistreatment of workers in the sector.

4.2.2. Traditional Textiles: Handloom Production

The traditional handloom production is based on ancient craftsmanship in textiles in the region and remains a family occupation for most weavers. The traditional handloom production is characterized by a lack of institutional support from the early 1960s, which has been further weakened by the recent overt emphasis on promotion of the textiles and RMG component of the sector, with little or no institutional support for its activities. The domestic market has been flooded by RMGs in the past few years forcing the indigenous handloom sector into an uneven

⁴² Pers. Comm., Protima Paul-Majumdar, Senior Research Fellow and Sector Specialist, Bangladesh Institute for Development Studies, 15 April 2007.

⁴³ Pers. Comm., Abdul Hai Sarkar, President, Bangladesh Textile Mills Association, 17 April 2007.

⁴⁴ Pers. Comm., Abdul Hai Sarkar, President, Bangladesh Textile Mills Association, 17 April 2007.

⁴⁵ The USA has a requirement now on the presence of trade unions that cater to worker welfare.

competition.⁴⁶ The main reasons for the low performance of the handloom sector are summarized here.

Lack of policy and institutional support

There is a lack of a strategic vision to protect and promote traditional craftsmanship. Over a thousand weavers societies existed at the time of independence, almost all of which are dormant today (Latif, 1997, p. 165). The Bangladesh Small and Cottage Industries Corporation, supposed to encourage small-scale cottage industry and the Bangladesh Handloom Board, that has the mandate of catering to the welfare of handloom producers, are the two state-run organizations responsible for providing policy support.⁴⁷ Lack of finances and manpower as well as the lack of a coherent policy framework for the development of the handloom production render the work of the agencies untenable.⁴⁸

Physical infrastructure

Presently, more than fifty per cent of the handloom producers are living below the poverty line with fewer than two looms. Handloom production is conducted on a cottage scale, with over 50 per cent of the weavers belonging to landless or near landless households (see Latif, 1997, p 51). The physical infrastructure is extremely weak, since most of these cottage units are based in very underprivileged areas of the city and work environment is extremely challenging (field interviews, Mirpur).

Skills creation and innovation

Over 60 per cent of the weavers have no formal education, and another 30 per cent have only finished their primary education (Ibid.). Training facilities for weavers in skills of designing, use of looms and other techniques required to enhance production efficiency is therefore key for the sector's performance. However, of the seven 'Textile Facility Centres' initially established by the Handloom Board, only two are functional.⁴⁹ Most weavers are not skilled and trained in designs. Most of those interviewed reported the need to buy designs from Indian designers, especially for weaving Benarasi saris. This reduces their competitiveness; and increases the costs of production many fold (field interviews, Mirpur).

Other market imperfections

As in the case of agro-processing, intermediaries play a very big role between the weavers and the buyers of the products, taking away a large share of the profits. Usually, the intermediaries are common agents liaising between the weavers and wholesalers/retailers of the handloom products who then sell it to the customers. Although several studies have reported competitive price setting in a majority of the instances (see Latif, 1997), the survey indicates that the impact of unregulated intermediary activities needs a closer look. Almost all weavers interviewed

⁴⁶ Interview, Azim Jahangir, Chief, Planning and Implementation, Bangladesh Handloom Board.

⁴⁷ The Bangladesh Handloom Board is the main organization for the promotion of the handloom industry through (a) study and evaluation of constraints; (b) training, research and development; (c) establishment of maintenance and sales depots through weavers' co-ops; (d) arrangement of internal marketing through co-ops; (e) supply of yarn, dyes, chemicals and implements and accessories; and, (f) technological development, marketing promotion, and product development.

⁴⁸ Interview, Azim Jahangir, Chief, Planning and Implementation, Bangladesh Handloom Board.

⁴⁹ These centres were equipped with improved looms and other ancillary plant and equipment to demonstrate techniques and provide necessary services to weavers. The two functional textile facility centres are located at Narsingi and Papna, and focus on training Benarasi and Jamdani weavers.

during the survey complained of exploitative practices of intermediaries (field interviews).⁵⁰ Lack of stable financing measures reduces bargaining power of weavers (Latif, 1997).

5. INNOVATION AND TECHNOLOGICAL CAPACITY IN THE AGRO-PROCESSING SECTOR: SURVEY RESULTS

The agro-processing sector in Bangladesh includes both cereal and non-cereal commodities, such as fruits, vegetables, fisheries and livestock products in addition to horticultural products and shrimp production (World Bank, 2005b). The gradual shift of emphasis from agriculture to agro-processing in the local economy is attributable to several factors; geographical, cultural and economic. Geographically, farm-based activities cannot be pursued for 4 to 5 months per year due to annual flooding. In contrast, agro-processing has the relative advantage of year-round demand and provides an important non-farm activity to augment income. Economically, export opportunities to foreign countries with prominent Bengali communities, growing urbanization and the rise of employment in sectors such as ready-made garments have led to rising income levels and contributed to the demand for processed food.

The RMG sector, which was the single most important source of foreign exchange earning in the 1990s, and has gradually induced two main changes in local consumption habits. Employment in the RMG sector became an important means of livelihood for a large section of poor households, and the search for better life standards in such factories caused re-location of a large section of the labour force (mainly women) to urban centres. This, coupled with growing spending, has been responsible for an overall change in the life-style of many people. An increased number of women going out to work for income earning purposes, and busy urban life-style for about two million low-income households, gave rise to a niche which the country's small-scale food processing sector was quick to exploit.

5.1. Sector characteristics

The agro-processing sector is relatively nascent; emerging in the latter part of the 1990s. The sector has been growing at an annual rate of 6 per cent, making a significant contribution of 10 per cent to the country's GDP. It is also projected to attain a growth rate of 15 per cent in the coming years (World Bank, 2005b; Huq and Shahjahan in BARI, 2005).

Product range: The sector manufactures a range of products such as pickles, jams and jellies, spices, tea, rice, Bengali specialty sweets and savories, nuts, chips, coconut oil and potato flakes (BAPA statistics, 2007). The total value of processed foods exported by the country has risen from USD 1.6 million (in 2003-2004), to USD 5.6 million (in 2004-2005) (BAPA Statistics, 2007).⁵¹ Besides the emergence of export oriented modern agro-processing in the recent years, there has been a large growth of small to medium sized agro-industries, such as small-scale commercial poultry and fish firms.

Firm Size: Small-scale, home-based units have dominated the agro-processing sector since its inception. As of 2001, approximately eighty per cent of the total production of the domestic agro-processing sector was being carried out in small scale and home based units, while 10 per cent each was contributed by the urban industrial units and imported food products (Taher, 2001). Over the past five years however, the contribution of the large-scale industrial units has substantially increased. Their share of the market has risen from 10 to over 30 per cent of the total production, with a number of major industrial houses and groups of companies expanding

⁵⁰ Around fifteen handloom weavers were interviewed from the Mirpur area for this study.

⁵¹ The final figure for 2005-2006 is not yet available with the BAPA office. The interim figure with the data available until April 2006 was USD 2.6 million for 2005-2006, but BAPA expected the total exports to be far greater than the total for 2004-2005.

into the agro-processing business. The Bangladesh Agro Processor's Association (BAPA) estimates that around 50 per cent of the total agro-processing is presently being carried out by small-scale enterprises.⁵²

Technologies used: The large firms are relatively well equipped in processing and packaging technologies, whereas the smaller firms, especially household, small-scale units, choose products that are not technologically intensive to manufacture (field interviews). Apart from frozen products, pickles, spices, rice, tea and Chanachur (a Bengali savoury) dominated the export earnings for 2005-2006 (BAPA statistics, 2006). Choice of these products is dependent on availability of raw materials and processing equipment as well as year round market demand (Taher, 2001). Value addition correlates with the nature of technologies and the scale of production amongst firms; the value addition by home-based units is smaller when compared to bigger firms. Larger firms, like Square Products produce a wide range of products in the sector. At the same time, survey results indicate that the larger firms display a high degree of unrealized productive capacity in the agro-processing sector and there is a large potential to improve output efficiency without enhancing inputs in this sector.

Intellectual property rights: IPRs in the agro-processing sector cover technologies required to upgrade techniques required for sophisticated processing, which are protected through patents or industrial designs. Apart from this, patent protection on seeds and chemicals for agriculture may also have an impact on the availability and quality of agricultural produce required for agro-processing activities.

5.2. Innovation and competitiveness in the agro processing sector in Bangladesh

The agro-processing sector suffers from severe inefficiencies that result from the absence of appropriate linkages between production, processing and marketing of agricultural produce. A range of factors are responsible for this disjuncture, including lack of policy support, and non-availability of reliable data for the design of interventions.

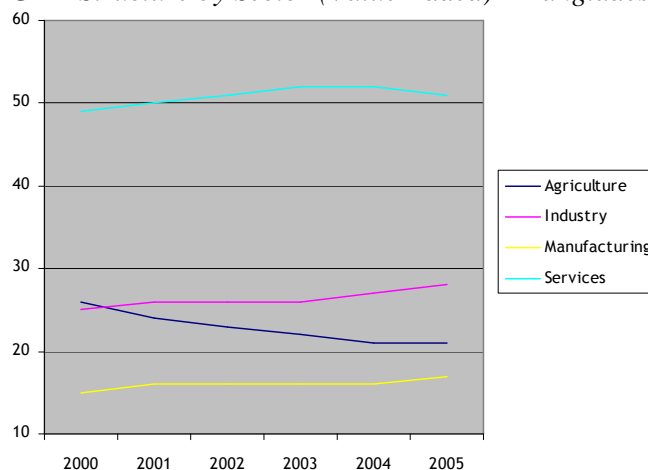
Dependence on local agriculture

The agro-processing sector is intricately connected to the local agriculture, which has been experiencing a declining rate of contribution to GDP from 29 per cent in the early 1990s to about 23 per cent in 2006. The lack of locally adapted varieties and production technologies, poor post-harvest management techniques (including handling, grading, packaging and transportation), inadequate market access, lack of crop insurance, poor infrastructure and limited private sector investment all affect the productivity of agro-processing (field interviews; World Bank, 2005b). The Bangladesh Agricultural Development Corporation (BADC) is a semi-government organization that is responsible for the development of seeds and its distribution to cultivators, but has not been able to perform its mandate effectively over the past few years owing to reasons of corruption, managerial capacity and lack of skilled scientists. Bangladesh also has several other public sector organizations focused on agricultural research, but the present agricultural research and extension system in Bangladesh is unable to generate, transfer and promote the use of such technologies to enhance both agricultural productivity and the productivity of the agro-processing sector (see World Bank, 2005b). Most of the research is focused on enhancing agricultural productivity for cereal crops, and ensuring availability of other non-cereal agricultural products that are necessary for a thriving agro-processing sector assumes secondary importance. Likewise, issues of loss of agricultural

⁵² Pers. Comm., Mohammadul Haq, Advisor, Bangladesh Agro-processors Association, 15 April 2007.

produce due to poor harvest and post-harvest management techniques do not seem to receive the attention they deserve (field interviews).

Figure 5.1: GDP Structure by Sector (Value Added) – Bangladesh 2000-2005



Source: Created from World Development Indicators database, World Bank, 2007.

Lack of systemic inter-linkages and extension services

The most acute problems in agro-processing relate to organizing reliable supplies of agricultural produce for products and their marketing. Several missing linkages between production, processing and marketing of agricultural produce impact upon the efficiency of agro-processing. Only the large firms like BRAC, PRAN and Square organize the supply of agricultural produce through contractual arrangements with growers (field interviews, World Bank, 2005b). Most producers of processed food are not involved in agricultural production, and this emphasizes the need for smooth channels of collaboration between buyers and sellers of agricultural produce. Producers, especially small and medium sized firms, are unable to cope with fluctuating supplies, which also influences their production decisions. Ensuring good quality products at stable prices is perhaps the biggest problem for most agro-processing firms.⁵³ Marketing of agricultural produce is presently dominated by inefficient intermediary structures, and affirmative policy support is required to eliminate these inefficiencies and enhance collaboration between buyers and suppliers.

Marketing of processed foods, especially in newer and more technology intensive products, such as those in the dairy business, also involve extensive investments into marketing (field interviews). Due to poor law enforcement of food regulations in the country and problems of corruption, gaining consumer trust is an uphill task.

Lack of an effective system to ensure food quality

The regulation of quality of processed food falls under the Pure Food Ordinance, 1959. Section 2 of the Act defines adulterated food products, and also deems the regulation of food products to be under the local municipality of each city. The municipality has the responsibility under the Act to appoint “public analysts” who are qualified personnel to inspect and regulate quality of food (Section 4), and also to prohibit the sale or manufacture of food that is not of proper

⁵³ Pers. Comm., Mohammadul Haq, Advisor, Bangladesh Agro-Processors Association, 15 April 2007.

standard or quality (Sections 6 and 7). Additionally, the Act has provisions against use of false labels and advertisements (Sections 18 and 19). Quality assurance is based on certificates issued by public analysts stating that the product in question meets standards of safety (Section 31 on duty of food analysts to issue certificates). However, the Ordinance suffers from poor implementation due to lack of qualified personnel and funding available to the city municipalities (field interviews). Implementation is also very selective due to rampant corruption amongst municipality officials (field interviews). There have been many recent food scandals locally (including the use of formalin to preserve fish) and the governmental infrastructure does not seem to be adequately equipped to cope with it (field interviews).

Lack of policy incentives

The agro-processing sector has very limited policy support, which impinges upon its capacity to tap into emerging opportunities and adapt and thrive in a well-organized way (see also World Bank, 2007c). Amongst the policies that are in place, the new agricultural policy 1999 has a focus on agro-processing and agro-based industries. The policy projects the enhancement of the annual share of this sector to total GDP earnings in the coming years to 25 per cent from its estimated present rate of 10 per cent per annum (Khan, 1999). Encouragement of increased export of agro-processing products through cash incentives has been important for the sector. The Government of Bangladesh offers 20 per cent cash incentive for all agro-products exported using over 70 per cent domestic agricultural raw material. The association of agro-entrepreneurs, BAPA, has been accorded the responsibility of certifying entrepreneurs entitled to receive such benefits from the central bank.

The national budget for 2006-2007 has allocated Tk.150 crore (Tk.1.5 billion, roughly equivalent to USD 21.8 million) to support building agro-based farm and industries, under the Agro based Industries Assistance Programme. Another Tk.200 crore (Tk.2 billion, roughly equivalent to USD 29.1 million) was allocated for the same period to an Equity Development Fund to support agro-product processing and software industries. To encourage different financial institutions and banks to provide credit to SMEs in general, a government re-financing scheme has been approved for Tk.100 crore through the central bank. Additionally, Tk.244 crore has been allocated for agricultural research during the fiscal year 2006-07.⁵⁴ Although these seem to be positive developments, they may not be relevant to promote the performance of the sector in the absence of sustained interventions over the next decade.

Predominance of the informal sector

Small enterprises and home-based units mainly operating in the informal sector comprise over fifty per cent of the agro-processing activities in the country (BAPA, 2007). This exacerbates the issues of enforcement of food safety regulations, grant of policy incentives and organization of reliable agricultural supplies for the processing sector enormously. One of the primary problems in assessing constraints and planning appropriate interventions for the sector is the absence of appropriate data. The BAPA also admits that the lack of data makes it very difficult to assess the performance of the sector and plan effective interventions.⁵⁵ Most national statistics focus on the production of primary food products: cereal crops, fish, meat, milk, and horticulture. Data on value addition is limited to simple calculations in terms of cost

⁵⁴ These budget figures are taken from the budget speech of the Finance Minister in the National Parliament on June 8, 2006 as reported in the Daily Star, 9 June 2006 p. 12-15.

⁵⁵ BAPA has recently taken steps to improve this situation by undertaking different studies and assessments. For example, they are presently collaborating with Bangladesh Agricultural Research Council (BARC) to study and document the entire value chain of agricultural products and the main steps involved in agro-processing.

of production of crops deducted from the market price, but data on specific value addition by crop and food item processing at small scale production units or household levels is not available.

Lack of data also hinders prospects of promoting linkages between different actors like input providers, farmers, traders, processors and service providers as discussed in the previous subsection (see Haque and Shahjahan in BARI, 2005).

Lack of standard setting and certification organizations

The Bangladesh Agro-processors Association (BAPA) is the main sectoral body overseeing the activities and addressing problems of producers and comprises 150 members. The member organizations represent mainly medium to large agro-processing companies, thus once again leaving out the majority of the sector, which comprises home-based units. BAPA's role is policy advocacy and not the provision of professional services, which constrains the capacity of the association to address the needs of its members in an effective way.⁵⁶ All the firms interviewed expressed the need for improved testing, grading and packaging services, improved technologies, improved access to information on international markets (field interviews), which could be provided through an agency such as the BAPA if its mandate is expanded and strengthened through policy efforts.

5.3. Agro-processing exports and sanitary and phyto-sanitary measures

Bangladesh did not require much reform to conform to the Uruguay Round of Trade Negotiations in the Agricultural sector because the country had liberalized beyond what was required by the WTO, much before the on-set of the WTO in 1995 (Dowlah, 2003, p. 69). These measures might have implications for the export of local products such as jute, tea, frozen foods, vegetables and other traditional products from the country (Ibid.). Most firms that participated in the survey were very concerned about the imposition of sanitary and phyto-sanitary (SPS) measures by OECD countries under WTO regulations (field interviews). Specifically, their concern related to the lack of adequate scientific and technological capabilities to enforce the SPS measures such as trade labour and eco-labeling (field interviews). There is no expertise for testing and labeling within the country that could help firms to meet such measures (field interviews). Moreover, since most agro-processing firms do not produce the agricultural ingredients required for their products either in-house or through contractual arrangements, they are not in a position to control the amount of fertilizers and other farm-level inputs that are need to be declared during registration and labeling procedures.

6. INNOVATION INCENTIVES AND THE ROLE OF INTELLECTUAL PROPERTY RIGHTS

Innovative capacity within local firms is very low across all three sectors for reasons analyzed in sections 3, 4 and 5 and the study finds that the presence of intellectual property rights in the local context does not play a role, either as a direct incentive for innovation or as an indirect incentive enabling knowledge spillovers (through various technology transfer mechanisms such as licensing, imports of equipment and government-firm technology transfer). Presently, intellectual property rights within the country are benefiting mostly TNCs operating in the local market, as the local firms are not sufficiently specialized to protect their innovations

⁵⁶Group meeting, members of Bangladesh Agro-Processors Association, 15 April 2007.

under the current IPR regime, which in any case, may not be appropriate for the types of incremental innovations that most firms engage in.

Table 6.1 below contains descriptive statistics on innovation, contribution of technology transfer to new product/process innovations, and other potential indirect impact of intellectual property rights on knowledge spillovers (through various technology transfer mechanisms such as licensing, imports of equipment and government-firm technology transfer). The table shows that a large number of local firms considered themselves to be involved in new product/process innovations. There was no observable positive impact of intellectual property rights on licensing, technology transfer, or technology sourcing through foreign subsidiaries. Half of the agro-processing firms, 96 per cent of pharmaceutical firms and 55 per cent of textiles and RMG firms surveyed considered technology transfer from external sources, both public and private to be of very little importance to new product/process innovations at the firm level. Other benefits of IPR protection in the local context that are usually referred to in general literature on the topic, such as licensing, technology sourcing through foreign subsidiaries hardly play any role. Four per cent of the firms in agro-processing, 2 per cent of the firms in pharmaceuticals and 7 per cent of the firms in textiles and RMG sector considered it to be of any use. The only important source of innovation at the firm level is attributable to firms' own indigenous innovation efforts, and imitation and copying from others (the "other sources" category in the table).

Table 6.1: Innovation, technology transfer and indirect effect of IPRs

	<i>Agro-processing</i>		<i>Pharmaceuticals</i>		<i>Textiles</i>	
	Number	% of firms	Number	% of firms	Number	% of firms
New product development						
No	9	18.0	2	4.4	11	18.3
Yes	41	82.0	43	95.6	49	81.7
New process development						
No	10	20.0	31	68.9	6	10.0
Yes	40	80.0	14	31.1	54	90.0
Impact of various sources of knowledge on new product/process innovation						
Tech licensing*	1	2.0	1	2.2	2	3.3
Tech sourcing from foreign subsidiaries	1	2.0	0	0.0	2	3.3
Firm's own innovation efforts	18	36.0	7	15.6	25	41.7
Other sources**	30	60.0	37	82.2	31	51.7
Number of firms	50		45		60	

Source: Field survey by author, 2006-2007.

* Including through IP protection.

**"Other sources" was elaborated upon by the firms to be mainly imitation and copying.

6.1. Sector-specific results

Sector specific inquiry aimed at identifying the main drivers for innovation at the firm level and whether IPRs played a direct or indirect role for innovation, substantiated the results of the analysis in the previous sections of the study. Table 6.2 below contains descriptive statistics on several variables, such as government incentives and skilled manpower to new product/process development at the firm level across the three sectors. The values are the mean between 1 (very weak) and 5 (very strong), hence any rating above 2.5 indicates that the variable is important for new product/process development at the firm level. The table shows that skilled manpower and good local infrastructure play a very important role for new product/process innovations. This validates the analysis of the previous sections of this study. Government incentives play

an important role in the case of the textiles and RMG and agro-processing sectors, since the two sectors receive cash incentives for export performance. The table also shows that intellectual property protection does not play an important role as far as new product/process development is concerned.

Table 6.2: Contribution to New Product/Process Development

Contribution to product development:	Pharma Biotech	Textiles & RMG	Agro-Processing
Government incentives	1.066	2.754	2.980
Skilled manpower	2.493	3.100	3.540
Collaboration with univs.	1.177	2.435	2.520
Collaboration with DRIs	1.087	2.364	2.400
Intellectual property protection	1.219	2.000	2.280
Good local infrastructure	1.980	2.799	2.860
Venture capital	1.581	2.017	2.240
Local SMIs	1.131	2.029	2.200
Mobility of staff bet. public and private sector	1.444	2.137	2.420
Loom & dye tech. contrib.	-	2.398	-
<i>Number of firms</i>	<i>45</i>	<i>60</i>	<i>50</i>

Source: Field survey by Author, 2006-2007.

Figures in table represent the mean of rankings between 1 (very weak) to 5 (very strong)

These explanatory variables were considered along with several other quantitative variables, such as employment and R&D investments to estimate a bivariate probit model on a firm's incentives to engage both in new product/process innovations. The dependent variable is a dummy variable, which distinguishes innovative from non-innovative firms, on the basis of new product and process development efforts carried out over the past five years. For an independent variable to be included in the set of regressors, it had to be present in the three data sets, so that its effect across the three sectors can be compared and its effect in the pooled model can be assessed.⁵⁷

Apart from separate models for each sector, a pooled model was also estimated. The poolability of the slope coefficients, that is, those associated with the exogenous explanatory variables, was tested using a Chow-type likelihood ratio test, and the null hypothesis was not rejected. The results are contained in Table 6.3 below, and the pooled model with different sector intercepts is thus the more preferred model. The first three pairs of columns form the general model with different slope parameters, and the last pair of columns shows the more preferred restricted model (pooled data). The general model reported in the first three pair of columns was first tested against an even broader general model where all the potential incentives for new product/process innovations at the firm level were considered, and the set of regressors included IPRs, intensity of collaboration, areas of government/other institution support, education of staff and level and training, and financial support constraint variables. It was found that those variables do not play a role at all in the likelihood of being involved in new product/process development in the three sectors in Bangladesh, and they were thus excluded from the model.

⁵⁷ The main technology source variables were included when estimating the model for agro-processing only and pharmaceuticals only. None of them is significant and they are jointly insignificant in both sectors.

Table 6.3: Bivariate probit ML estimation results: New product/process development

Variable		Coefficient	(Std. Error)	Coefficient	(Std. Error)	Coefficient	(Std. Error)	Coefficient	(Std. Error)
		Agro-processing		Pharmaceuticals		Textiles		Pooled data	
New product development									
R&D intensity 2001-2005 (in log)		-0.169	(0.114)	0.072	(0.195)	-0.152*	(0.064)	-0.174**	(0.052)
Employment (FTEs in log) 2001-2005		-0.570*	(0.252)	0.000	(0.412)	-0.191	(0.121)	-0.294**	(0.099)
Collaboration with industry association		0.934	(0.793)	0.000 (assumed)		0.417	(0.446)	0.874**	(0.337)
Agro-processing		-	-	-	-	-	-	-2.414**	(0.548)
Textiles		-	-	-	-	-	-	-1.643**	(0.456)
Intercept		2.180	(1.588)	2.150	(3.005)	1.141	(0.974)	3.600**	(0.894)
New process development									
R&D intensity 2001-2005 (in log)		-0.219*	(0.089)	0.072	(0.195)	0.019	(0.108)	-0.115*	(0.053)
Employment (FTEs in log) 2001-2005		-0.336 [†]	(0.180)	0.000	(0.412)	-0.703	(0.459)	-0.353**	(0.114)
Agro-processing		-	-	-	-	-	-	-2.317**	(0.521)
Textiles		-	-	-	-	-	-	-0.895*	(0.454)
Intercept		0.247	(1.191)	2.150	(3.005)	6.025	(3.944)	3.443**	(0.944)
Number of firms		50		45		60		155	
Log-likelihood		-17.095		-9.221		-26.947		-58.519	

Significance levels: [†] :10% * : 5% ** :1%

Source: Field survey by author, 2006-2007.

The results of the model can be interpreted as follows. Firstly, results of the study indicate that R&D expenditures, expressed as a percentage of total sales, play a negative role in both new product and new process development, as all three sectors mainly engage in very low value-added activities, which are labour intensive, rather than R&D intensive. The limited R&D that is being carried out is relatively removed from the needs of local production in all three sectors (see also UNCTAD 2006, chapter 6). The current policies of the government may even exacerbate this situation, as they are too narrowly focused on limited areas (promotion of exports and macro-economic stabilization) and mainly favour urban, large and middle-sized private entrepreneurs. Consequently, public policies should be expanded to promote learning at the firm level that would assist firms in their efforts to engage more in knowledge-intensive, value-added production and processing activities.

Secondly, larger firms (in terms of full time employment) are less often involved in new product and new process development. That result can be explained by the fact that the data set consists of a large number of small and medium sized firms, owing to the composition of the sectors (agro-processing and handloom production is largely small scale). The smaller the firm is, the larger its absolute R&D expenditure and hence the result.

Thirdly, intellectual property rights do not contribute to new product/process development in any of the three sectors. Most firms in the agro-processing sector did not believe that intellectual property rights played a major role, either positively or negatively. They had major concerns about the impact of intellectual property rights on seed availability and seed price. Larger firms tended to view IPRs differently and in a more beneficial light than smaller firms; a tool through which they could protect their products and secure benefits. Others, who ranked it as detrimental to innovation, based their assessment on the indirect impact of IPRs on increasing prices of seeds and other inputs. However, at this stage, it is difficult to assess the impact of rising seed prices on agricultural produce in Bangladesh resulting from application of IPRs with any conclusiveness. Most agro-processing firms do not produce the agricultural

inputs in-house, and the inefficiencies in post-harvest techniques and lack of organized sale of agricultural produce within the country does not allow for a rigorous assessment of the impact of increased seed prices on agricultural produce.

In the textiles and RMG sector, most of the firms interviewed were of the view that IPRs did not play any role as an inducement for innovation, since they simply assembled the final output according to precisely given, buyer-determined specifications. Firms also noted that since they did not possess any indigenous design-related capabilities, IPRs could not be an inducement to innovation (field interviews). On the question of whether they benefited from IPR protection in terms of increased collaboration from external firms, the general view was that the buyer firms did not help them in their efforts at technology upgrading or to enhance innovative capabilities since this would help them to create better backward linkages, especially in knit-wear, and enhance the bargaining power of the local firms (field interviews). Most local firms considered that such knowledge sharing would be inimical to the interests of the buyer firms who benefited from the low prices in the market due to the local firms' lack of bargaining power (field interviews).

The firms in the pharmaceutical sector were very concerned that since foreign firms can obtain patents on their products in the country, this might adversely affect their efforts to venture into more knowledge-intensive, reverse engineering of APIs. The patents on pharmaceutical products (approximately 50 per cent of the 182 granted in 2006) are not on local innovations, and point to the presence of other motivations for patenting, such as strategic use and monopoly profits, and prevention of parallel imports. This issue however, needs to be explored further. As regards the indirect impact of IPRs on the firms, most firms interviewed have been in the process of negotiating technology transfer for building up API capacity, reverse engineering skills and other such know-how unsuccessfully. Even those who have been successful in negotiating such agreements with foreign firms considered that IPRs were not a helpful factor in promoting foreign collaborations for access to technology (field interviews).

Fourthly, firms that collaborate closely with industry associations are more likely to engage in *new product development*; although the variable "collaboration with industry associations" plays no role in new process development. This result is consistent with the analytical sections of the study, that show that firms mainly seek support and lobby for policy change through professional associations, to make up for the absence of an institutional and policy framework that could stimulate and support innovation. Finally, *ceteris paribus*, firms in the agro-processing and textiles sectors are less often involved in new product and new process development than those in the pharmaceutical sector. Presently, maximum value addition activities are going on in the pharmaceutical sector, despite the imports of its raw materials. The textiles and RMG sector, although is a high foreign exchange earner has relatively less value addition.

As already mentioned, the broader general model where all the potential incentives for new product/process innovations at the firm level were considered, including IPRs, intensity of collaboration, areas of government/other institution support, education of staff and level and training, and financial support constraint variables showed that such variables do not play a role at all in the likelihood of being involved in new product/process development in the three sectors in Bangladesh. This points out to one of the most critical issues confronting all three sectors equally: the status of the domestic knowledge system and the absorptive capacity of firms. The domestic knowledge system in the country is very weak, characterized by weak industrial and scientific infrastructure, poor collaboration and inter-linkages, lack of skills and institutional support for technological upgrading. Strategic policy support that strengthens the

absorptive capacity of firms, and enables them to move from labour-intensive to knowledge-intensive activities, is urgently needed to remedy that constraint on enhanced sectoral competitiveness.

In the agricultural sector, much more research that meets the needs of the agro-processing sector needs to be conducted. This includes research on enhancing variety and ensuring the availability of fruits and vegetables all year round, livestock research, among others (field interviews). The New Agriculture Extension Policy that focuses mainly on extension services for cereal crops needs to broaden its reach to benefit the agro-processing sector. Reliable intermediary structures need to be created, in order to foster good matches between supply and demand of food products. Most importantly, inclusive policy action is called for that also caters to the needs of the majority of the home-based, small-scale agro-processing firms. Similarly, the survey indicates that more concerted policy effort is required to promote API capacity in Bangladesh. Such policy response extends beyond the issue of IPRs. Strategic policy action is required to improve the impact and conduct of public sector research in universities and public research institutes in particular, so as to upgrade technologically, as required in the globally competitive pharmaceutical sector. Similarly, low-value addition capacity in the textiles and RMG sector emphasizes the need for policy support institutions. For all the three sectors, the lack of government support to subsidize learning should be addressed in the near future. Creation of human resources at the secondary and tertiary levels should be targeted adequately. Institutional Incentives are required to translate individual capabilities into organizational capabilities so that human resources that are presently available in the three sectors can be harnessed appropriately.

Table 6.4 contains the survey firms' rankings in critical areas of support for engaging in more knowledge-intensive activities. The figures in the table present the mean of rankings between 1 (least important) and 5 (most important). As the table shows, firms across all three sectors consider policy support to be critical in several areas including science and technology support institutions, testing and quality evaluation facilities, and financial support.

Table 6.4: Firms' future ability to compete

Areas of policy support for innovative performance	Pharma Biotech	Textiles & RMG	Agro-Processing
Science and technology support institutions	3.734	3.651	3.940
Testing and quality evaluation facilities	4.179	3.785	3.620
Professional associations	-	4.584	3.500
Market research and intelligence	4.023	4.232	3.400
Overseas market promotion	4.178	3.685	3.280
Export credit program	2.890	3.284	3.420
Financial incentives	4.176	3.850	3.320
SME support	1.419	2.931	2.960
<i>Number of firms</i>	<i>45</i>	<i>60</i>	<i>50</i>

Source: Field survey by Author, 2006-2007.

Figures in table represent the mean of rankings between 1 (very weak) to 5 (very strong)

7. FINDINGS AND POLICY RECOMMENDATIONS

This study has conducted an in-depth investigation of innovation and competitiveness in three sectors of domestic processing in Bangladesh: the pharmaceutical, agro-processing and textiles and RMG sectors. The objective was to evaluate the relative importance of IPRs as a firm level incentive for innovation. The findings seek to contribute to the growing literature on intellectual property rights and development, and also make the case for broadening the

discourse on the nature of knowledge and learning activities in LDCs beyond IPRs. A summary of the main findings is contained here.

7.1. Summary of findings

1. Innovative capacity within local firms is very low across all three sectors and the study finds that the presence of intellectual property rights in the local context does not play a role, either as a direct incentive for innovation or as an indirect incentive enabling knowledge spillovers (through various technology transfer mechanisms such as licensing, imports of equipment, government-firm technology transfer). At the present time, intellectual property rights within the country are benefiting mostly TNCs operating in the local market, as the local firms are not sufficiently specialized to protect their innovations under the current IPR regime. This regime may not, in any case, be appropriate for the types of incremental innovations that most firms engage in. A large number of local firms considered themselves to be involved in new product/process innovations. But there was no observable positive impact of intellectual property rights on licensing, technology transfer, or technology sourcing through foreign subsidiaries. Half of the agro-processing firms, 96 per cent of pharmaceutical firms and 55 per cent of textiles and RMG firms surveyed considered technology transfer from external sources, both public and private to be of very little importance to new product/process innovations at the firm level. Other benefits of IPR protection in the local context such as licensing or technology sourcing through foreign subsidiaries hardly play any role. Only a small number (4 per cent) of the firms in agro-processing, 2 per cent of the firms in pharmaceuticals and 7 per cent of the firms in textiles and RMG sector considered it to be of any use. The only important sources of innovation at the firm level are the firms' own indigenous innovation efforts, and innovation through imitation/copying.

2. Most firms in the agro-processing sector did not believe that intellectual property rights played a major role, either positively or negatively. They had major concerns about the impact of intellectual property rights on seed availability and seed price. Larger firms tended to view IPRs differently and in a more beneficial light than smaller firms; a tool through which they could protect their products and secure benefits. Others, who ranked it as detrimental to innovation, based their assessment on the indirect impact of IPRs on increasing prices of seeds and other inputs. However, at this stage, it is difficult to assess the impact of rising seed prices on agricultural produce in Bangladesh resulting from application of IPRs with any conclusiveness. In the textiles and RMG sector, most of the firms interviewed were of the view that IPRs did not play any role as an inducement for innovation, since they simply assembled the final output according to precisely given, buyer-determined specifications. Firms also noted that since they did not possess any indigenous design-related capabilities, IPRs could not be an inducement to innovation (field interviews). On the question of whether they benefited from IPR protection in terms of increased collaboration from external firms, the consensus view was that the buyer firms did not help them in their efforts at technology

The Baby Zinc tablet that is now being produced and marketed by Acme Pharmaceuticals makes an interesting case. This product that was developed by the Centre for Health and Population Research (ICDDR,B) is the only zinc product that meets pharmaceutical GMP standards as prescribed by the WHO, and is used for the prevention of diarrhea in children. Nutricet, a French firm holds the formulation patent that was needed to produce the drug. Square Pharmaceuticals, which first attempted to formulate the medicine for the local Bangladesh market on a commercial basis, withdrew its interest due to the high price it would have to pay to purchase the license for the formulation patent from the French company. ICDDR, B intervened and negotiated the license with Nutricet on its own in 2005, and has entered into an agreement with Healthcare Pharmaceuticals to produce the tablets.*

*Pers. Comm., David Sack, Executive Director, ICDDR, B, 10 April 2007; Pers. Comm., Mohammadul haque, Director Marketing, Square Pharmaceuticals, 11 April 2007. According to Square, they were asked to pay a royalty of 200,000 Euros for the license by the French firm.

upgrading or to enhance innovative capabilities since this would help them to create better backward linkages, especially in knit-wear, and enhance the bargaining power of the local firms (field interviews). Most local firms considered that such knowledge sharing would be inimical to the interests of the buyer firms who benefited from the low prices in the market due to the lack of bargaining power of the local firms (field interviews). The firms in the pharmaceutical sector were very concerned that since foreign firms can obtain patents on their products in the country, this might adversely affect their efforts to venture into reverse engineering of APIs. The patents on pharmaceutical products (approximately 50 per cent of the 182 granted in 2005) are not on local innovations, and point to the presence of other motivations for patenting, such as strategic use and monopoly profits, and prevention of parallel imports. This issue however, needs to be explored further. As regards the indirect impact of IPRs on the firms, most firms interviewed have been in the process of negotiating technology transfer for building up API capacity, reverse engineering skills and other such know-how unsuccessfully. Even those who have been successful in negotiating such agreements with foreign firms considered that IPRs were not a helpful factor in promoting foreign collaborations for access to technology (field interviews).

3. The domestic knowledge system in the country is very weak in Bangladesh, characterized by weak industrial and scientific infrastructure, poor collaboration and sectoral inter-linkages, lack of skills and institutional support for technological upgrading. In this context, the study finds that the relative importance of IPRs for domestic processing sectors of varying technological intensity, as expected, (based on the experience in developed economies, and as indicated by economic literature), may not hold for LDCs. The overall finding is that IPRs are equally unimportant across the three sectors, largely owing to their inability to engage in knowledge intensive activities.

4. In conclusion, the findings based on firm-level evidence indicate that policy matters in reducing the collateral damage of exposing nascent sectors in LDCs to global competition. Coherent national policies that focus strategically on enabling innovation in the three sectors will play a key role in transforming the sectors into more competitive modes and enable local firms to deal with any potential harmful effects of IP protection. Without such deliberate and strategic policy intervention in support of learning and innovation, granting IPRs locally does not induce higher levels of technological learning in the domestic processing firms in Bangladesh.

7.2. Policy recommendations

A sectoral lens allows for in-depth investigation of general concepts (Evans, 1995), and the disaggregated sector characteristics elaborated in this study create an important basis for thinking about the relevance of institutional incentives and intellectual property rights in each of the sectors under consideration. Rather than focusing on IPRs as a magic bullet policy incentive, there is a need to address the pre-eminence of learning institutions for creating sustained mid-term or long-term economic growth. These institutions, as laid out in the introduction of this study, can either be formal or informal, coded in terms of unofficial attitudes (Rodrik, 2003) and pre-existing cultural and social arrangements that shape the behavior of agents in the absence of good formal institutions for exchange.

Modest changes in institutional arrangements and official attitudes towards the economy can often produce large payoffs (Rodrik, 2003, p. 16). But these changes are contextual and flow from the specific needs of the knowledge system in consideration. In the case of Bangladesh, an analysis of the institutional incentives for innovation, as conducted by this study drives

home two essential points. Firstly, it endorses the point on weak or ineffective domestic knowledge systems in least developed countries, the disjuncture between public sector research and commercialization of products and stresses the relevance of concerted policy effort to build science, technology and innovation institutions for economic development. Secondly, and more importantly though, it raises a larger question regarding the institutional framework in Bangladesh, which can perhaps be extended to other LDCs as well. This relates to the role of market incentives in the three thriving, export-oriented sectors in the country. Why are competitive pressures of global exports not fostering these linkages locally, despite the obvious gains? Competitive market pressures do not seem to work in the case of Bangladesh due to the institutional setting, where even well-intended policy and market incentives fail to enhance patterns of interaction and learning needed for innovation. For example, all the professional associations in the three sectors are active mainly in political lobbying and not for the provision of common industry services, or mid-term sector strategy creation, as one would normally assume.⁵⁸ Firms seem to be more interested in retaining their incumbent advantages by lobbying for static policies, rather than pushing concertedly for dynamic growth-oriented models. Mistrust and lack of representation of consumer and labour force welfare (in key sectors like pharmaceuticals and textiles and RMG, both of which are supposedly role models for other LDCs) are key features of interpersonal interactions and the policy landscape. Most of these factors inhibit even the role of competitive market pressures in fostering welfare-maximizing collaborations, and can be summed up as ‘negative’ institutions (Evans, 1995; North, 1990). The informal and (the few) formal institutions for innovation in the country create ample scope for capture by a few, to the detriment of the larger population. The survey found numerous instances where firms work around well-intentioned policies to find informal mechanisms that help them to retain their profits, to the detriment of the economy and technological progress at large. This is a key finding for national policy bodies and international agencies trying to build innovation capacity in Bangladesh. This implies, for example, that within the current policy landscape, direct industry support to the pharmaceutical sector will not help to reduce the negative public health impacts, in the absence of other policy interventions that target unfair business models and doctor-pharmacy-industry linkages. Donor agencies and international bodies need to focus on how policy-relevant interventions can minimize the inefficiencies of the informal institutional structures that promote such rent-seeking, to move towards increased production efficiency and consumer welfare. Other important policy-relevant recommendations for each of the three sectors are presented below.

For the pharmaceutical sector:

1. Strategic policy support that targets consumer welfare (in terms of greater access to medicines both locally and globally) is key to enhancing the performance of the pharmaceutical sector.
2. Incremental innovation that will make the local firms competitive within the global generics sector will require technological upgrading activities and investment in the creation of API skills.
3. Apart from the API park, policy efforts should focus on the creation of common facilities that could function on a ‘pay-and-use’ basis, such as a central bioequivalence laboratory for firms wanting to branch out their exports to regulated and semi-regulated markets.

⁵⁸ This finding is confirmed by another World Bank study on the agro processing sector in Bangladesh, see World Bank (2007b); pers. Comm.. Andy Hall, 19 July 2007.

4. Policy assistance that seeks to enhance the competitiveness of the sector needs to focus on:
 - a. An integrated innovation approach that promotes human skills development of relevance to the sector, as well as improved coordination between the various components (especially public research and industry) of the domestic knowledge system;
 - b. Reducing the dependencies (which are also the cause for major inefficiencies) between medical practice, research and product commercialization in the pharmaceutical sector (that presently extend well into the performance of the health sector);
 - c. Helping Bangladesh develop concrete innovation incentives for the sector that could work hand-in-hand with IPRs to reduce its potential negative impacts on access to technologies for the sector;
 - d. Help enhance capacity of the local intellectual property office, in order to be able to document data on patent applications and grants transparently and accountably; and lastly,
 - e. Help forge liaisons between local and foreign firms that focus on technological upgrading and innovative capacity of the sector.

For the textiles and RMG and agro-processing sectors:

1. Strategic policy support is required to focus attention beyond cash incentives, to other extension services in order to steer the local sectors into more value added activities. In the case of the textiles and RMG sector, policy support is required to promote complete backward integration in knitwear and also to enhance designing and creative activities which will help the sector to move gradually from a low-end labour intensive segment, to more niche, knowledge-intensive segments in the export markets. The agro-processing firms require substantial help to cope with extension services, organization of reliable supplied, product commercialization and sanitary and phyto-sanitary measures (imposed by the WTO).
2. Policy assistance that seeks to enhance the competitiveness of the sectors needs to focus on interventions that:
 - a. Improve the bargaining power of women in both the sectors, since women comprise of the majority of the work force in textiles and RMG, and also account for the home-based informal sector production in agro-processing;
 - b. Support the RMG and textiles firms to cope with international restrictions on exports that relate to value addition and labour welfare. Closer governmental cooperation will be key to ensuring that the local firms survive the post-MFA period to transition into value-added activities;
 - c. Help re-structure university education syllabus to incorporate courses that produce managerial and technical skills required for both sectors;
 - d. Focus on improved basic infrastructure provision that is a major impediment for both sectors;
 - e. Focus on reviving the traditional handloom sector, through a focus on creative designing and upgrade of production facilities.

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ANNEX I. Pharmaceutical Biotechnology: Firms Surveyed

Bangladeshi Pharmaceutical Firms Surveyed	
1. ACI Ltd	26. Rangs Pharmaceuticals Ltd
2. Ambee Pharmaceuticals Ltd	27. Pharmdesh Laboratories Ltd
3. Orion Infusion Ltd	28. Rephco Pharmaceuticals Ltd
4. Somatec Pharmaceuticals Ltd	29. Apex Pharma Ltd
5. Square Pharmaceuticals Ltd	30. Aristo Pharma Ltd
6. Beximco Pharmaceuticals Ltd	31. Seema Pharmaceuticals Ltd
7. Incepta Pharmaceuticals Ltd	32. Sky Lab Ltd
8. Oponin Pharma Limited	33. Medimet Pharmaceuticals Ltd
9. The ACME Laboratories Ltd	34. Popular Pharma Ltd
10. Sanofi Aventis	35. Edruc Ltd
11. Eskayef Ltd	36. Tropical Pharmaceuticals Ltd
12. General Pharmaceutical Ltd	37. Peoples Pharma Ltd
13. Healthcare Pharmaceutical Ltd	38. Ethical Drugs Ltd
14. Globe Pharmaceuticals Ltd	39. APC Pharmaceuticals Ltd
15. Pacific Pharmaceuticals Ltd	40. Supreme Pharmaceutical Ltd
16. Delta Pharma Ltd	41. Marks Man Pharmaceuticals
17. Biopharma Laboratories Ltd	42. Orion Infusion Ltd
18. Navana Pharmaceuticals Ltd	43. Amico Laboratories Ltd
19. The Ibn Sina Pharmaceuticals Ltd	44. Renata Limited
20. Jayson Pharmaceuticals Ltd	45. Chemist Laboratories
21. Ziska Pharmaceuticals Ltd	
22. Chemico Laboratories Ltd	
23. Nipa Pharmaceuticals Ltd	
24. Proteety Pharmaceuticals Ltd	
25. Doctor's Chemical Works Ltd	

ANNEX II. Agro-processing: Firms Surveyed

Bangladesh Agro-Processing Firms Surveyed	
1. Najat Bakery Ltd.	31. BRAC Dairy & Food Project
2. Babli Bakery Ltd.	32. Bombay Sweets & Com. Ltd.
3. Modern Bread & Biscuit Factory	33. Agricultural Marketing Company, Ltd.
4. Porichoi Bread & Biscuit Factory	34. Practical Action Bangladesh
5. Rupali Bread & Biscuit Factory	35. M/S Engineers 2000
6. M/s. Chira Muri moa Ghur	36. ABCO Corporation Ltd.
7. Kofiluddin Ahmed & Co.	37. Mrs Masha Enterprise
8. Rajdhani Enterprise	38. Magreb Oil Mills & Com.
9. Aline Food Store	39. Azad Rahman Bread & Biscuit Factory
10. Padma Oil Mills Ltd.	40. Mohammad Alamgir
11. Mrs. Asha Rice, Flour & Dent Mills	41. Sunlight Hotel & Restaurant
12. Sopto Borna Biscuit Factory	42. Nashir Sweet
13. M/A Zinnah Enterprise	43. M/S Monsur General Trading Com.
14. M.S. Enterprise	44. M/S Goni & Brother
15. Karnafuly Foods	45. Mahabub Enterprise Rice Mills
16. Monsoor Trading Company	46. Pabna Bread & Biscuit Factory
17. Ahmed Food Products (Pvt.) Ltd.	47. Hsahem Foods Ltd.
18. Premium Sweets	48. M/S. Motiur Rhaman Rice Mills Ltd.
19. Ayurvedia Pharmacy (Dacca) Ltd.	49. Rahamot Pop Corn
20. Zaman Brothers & Sons	50. Ayurvedia Pharmacy
21. ABCO Overseas Corporation Ltd.	
22. Savar Shemai Mills Ltd.	
23. Shah Ali Foods Ltd.	
24. Savar Co-operative Poultry Feeds Ltd.	
25. Mashroom Bazar	
26. Nur Bread & Biscuit Factory	
27. Halima Pitha Ghar	
28. M/S S&F Trading	
29. Maxim Corporation	
30. Square Consumer Products Ltd.	

ANNEX III. Textile and Garments: Firms Surveyed

Bangladesh Textiles and Garments Firms Surveyed	
1. Ali Akbar Tath Kuthi	36. Ridoy Textile Ltd.
2. Mrs. Abdullah Tath	37. Shahparan Dying & Printing Ind.
3. Sakil Bakul Banaroshi House	38. Knittex Industries Ltd.
4. Hasibul Handloom Tath	39. Zahintex Industries Ltd.
5. Alamgir Tath	40. The Overseas Apparels & Embroidery Ltd.
6. Rashid Tath	41. R.T.M. Fashion Wear Ltd.
7. Sarwar Ahmed Handloom	42. Liberty Knitwear Ltd.
8. Vakmal Weaving and Dying Factory/Handloom	43. Star Dyeing Industries Ltd.
9. Badsha Weaving Factory Ltd.	44. Star Fabrics Ltd.
10. Vdnawar Textile Ltd.	45. Mavis Garments Ltd.
11. Mobarok Weaving Factory	46. Giant Knit Fashions Ltd.
12. Shahid Weaving Factory Ltd.	47. Blossom Textile Ltd.
13. Salam Weaving Factory/Handloom	48. Ms. Panaroma Apparels
14. Shomo Weaving Factory	49. JS Knitting and Garments Ltd.
15. Lopa Garments Ltd.	50. Shafi Processing Ind. Ltd.
16. Chamok Textile Mill Ltd.	51. Sinha Style Wear Ltd.
17. Evana Textile Mill Ltd. & Dying ltd.	52. Sajib Knitwear & Garments Ltd.
18. AKH Knitting & Dyeing Ltd.	53. A G Textile Mills Ltd.
19. Sarware Fashions	54. Mars Apparels Limited
20. Bishas Weaving Factory	55. Norp Knit Industries
21. Shamad Mondol Weaving Factory	56. YKK Ltd.
22. Kamal Weaving Factory	57. Araf Apparels
23. Sohrab Weaving Factory	58. M.T.M Textiles
24. Continental Apparels Ltd.	59. LSI Industries Ltd.
25. Newage Group	60. MIM Garment Sweaters Ltd.
26. Habibur Rahman Textile Mills Ltd.	
27. Knittex Industries Ltd.	
28. Sharmin Textile Mill Ltd.	
29. Nur-E-Modina Dying & Printing Industries	
30. Mitu Textile Mill Ltd.	
31. Shonali Textile Mill Ltd.	
32. Hota Para Garments Ltd.	
33. Shapla Textile Mill Ltd.	
34. Interfab Shirt Mfg. Ltd.	
35. Moonlight Garments Ltd.	

ANNEX IV. Field Research Interviewees

Category and Company/Institution Name	Department/Faculty
INDUSTRY	
- Chemical	
- Advanced Chemical Industries Ltd.	- M. Mohibuz Zaman, <i>Chief Operating Officer, Pharma</i>
- BASF	- Masudur Rashid, <i>Manager</i>
- <i>Fine & Intermediate Chemicals</i>	- Saria Sadique, <i>Chairman & Managing Director</i>
- Pharmaceutical	
- Aristopharma, Ltd.	- M. A. Hassan, <i>Chairman & Managing Director</i>
- Delta Pharma, Ltd.	- Dr. M. Omar Faruque, <i>Managing Director</i>
- Eskayef Bangladesh Ltd.	- Mohammad Mostafa Hassan, <i>Business Planning & Procurement Manager</i>
- Healthcare Pharmaceuticals Ltd.	- Md. Halimuzzaman, <i>Executive Director</i>
- Jayson Pharmaceuticals Ltd.	- Md. Salimullah, <i>Managing Director</i>
- Rangs Pharmaceuticals Ltd.	- A. S. M. Habibur Rahman, <i>Vice President & Director</i>
- <i>Production Operations</i>	- Amanullah Chowdhury, <i>Executive Vice President</i>
- Square Pharmaceuticals Ltd.	- Md. Nawabur Rahman, <i>Assistant General Manager</i>
- <i>Quality Operations</i>	- Parvez Hashim, <i>Executive Director Operations</i>
	- Jayanta Datta Gupta, <i>Manager</i>
	- Muhammadul Haque, <i>Director Marketing</i>
	- Mir Mijanur Rahman, <i>Senior Executive Pesticide</i>
- The ACME Laboratories Ltd.	- Md. Lutf-e-Khoda, <i>Assistant Sales Manager</i>
- Agro-Processing	
- Square Consumer Products	- Khurshid Ahmad Farhad, <i>Manager Export</i>
- <i>AgroVet Division</i>	- A. B. Imtiaz Ahmed Khilji, <i>Assistant General Manager</i>
- Rajshahi Mango Products Ltd.	- Raju Ahamed, <i>Managing Director</i>
- Olympic Industries Limited	- Altaf Hamid, <i>General Manager (Adm.)</i>
- Potato Flakes	- Sk. Tarikul Islam, <i>Project Engineer</i>
- MAA Enterprise	- Mohamed Akhtaruzzaman, <i>Proprietor</i>
- Premium Sweets By Central	- H. M. Iqbal, <i>Managing Director</i>
- BRAC Dairy & Food Project	- Mohammad Ali, <i>General Manager</i>

	- Abdullah Faruque, <i>Associate Professor and Chairman</i>
	- Dr. Md. Sohel Rana, <i>Associate Professor & Chairman</i>
	- Dr. Pijus Saha
	- Md. Ehsanul Hoque Mazumder
- <i>Department of Microbiology</i>	- Md. Salequl Islam, <i>Lecturer</i>
	- Dr. Ali Azam Talukder
- <i>Department of Zoology</i>	- Abu Faiz Md. Aslam
- <i>Faculty of Biological Sciences</i>	- Prof. M. Shahabuddin K Choudhuri, <i>Dean</i>
- State University of Bangladesh	- Prof. Dr. Ilyas Dhama, <i>Vice Chancellor (Designate)</i>
- University of Dhaka	
- Faculty of Pharmacy	- Dr. Mohammad Abdur Rashid, <i>Dean</i>
	- Ilyas Dhama
- <i>Dept. of Clinical Pharmacy & Pharmacology</i>	- Bilkis Begum, <i>Associate Professor</i>
	- Dr. Abul Hasnat, <i>Associate Professor & Chairman</i>
	- Dr. Seheli Parveen
	- Bilkin Begun
	- Farida Begun
- <i>Dept. of Pharmaceutical Chemistry</i>	- Dr. Muhammad Amjad Hossain, <i>Professor & Chairman</i>
	- Dr. Mohammad Mehedi Masud, <i>Associate Professor</i>
	- Dr. Shaila Kabir, <i>Assistant Professor</i>
	- Dr. Md. Khalid Hossain, <i>Assistant Professor</i>
	- Dr. Md. Aslam Hossain
	- Dr. Md. Shah Amran, <i>Assistant Professor</i>
	- Md. Gias Uddin, <i>Lecturer</i>
	- Mohhamad Rashdul Haque, <i>Lecturer</i>
	- Dr. M. A. Mazid, <i>Assistant Professor</i>
- <i>Dept. of Pharmaceutical Technology</i>	- Dr. Sitesh C. Bachar, <i>Professor</i>
	- Eva R. Kabir, <i>Assistant Professor</i>
	- Dr. Md. Selim Reza, <i>Professor</i>
	- Prof. A. B. M. Faroque, <i>Chairman</i>
	- Muhammad Rashedul Islam, <i>Lecturer</i>
	- Mohammad Abul Kalam Azad, <i>Lecturer</i>
- <i>Dept. of Genetic Engineering & Biotechnology</i>	- Mohammed Nazmul Ahsan, <i>Lecturer</i>

NON-GOVERNMENTAL ORGANIZATIONS (NGOS)	
- Health, Education & Economic Development (HEED Bangladesh)	- M. D. Faruque Sikder, <i>Director Finance</i>
- Practical Action Bangladesh	- M. G. Dostogir Harun, <i>Program Coordinator (Government Program)</i>
	- Engr. Anayet Husain Topader, <i>Agro-processing Specialist</i>
THINK TANKS	
- Bangladesh Institute of Development Studies	- Dr. Pratima Paul-Majumbder, <i>Senior Research Fellow</i>
GOVERNMENT OF BANGLADESH	
- Ministry of Industries	
- Dept. of Patents, Designs & Trademarks	- Mesbah Uddin, <i>Registrar</i>
- Office of Copyrights	- Mr. Mohmadul Hasan, <i>Registrar Copyrights</i>
- Directorate of Drug Administration	- Prof. Dr. Md. Habibur Rahman, <i>Director</i>
- Institute of Public Health	- Dr. Md. Moyez Uddin, <i>Director</i>
- Antisera Section	- Momena Shirin, <i>Specialist in Preventive & Social Medicine</i>
- Public Health Institute	- Mokabir U. Ahmed, <i>Drug Testing Laboratory</i>
OTHERS	
	- Brig. Gen. M. Mohsin
	- C. S. Narasimhan
	- Muhammad Taher, <i>Management and Social Development Consultant</i>
- Metropolitan Medical Centre Ltd.	- Prof. M.A. Zaman, <i>Professor & Head of Cardiology BM Medical College</i>
- Multipurpose Co-operative Society Ltd.	- Momtaz Bhuiyan, <i>Chairman</i>
- World Intellectual Property Organisation (WIPO)	- Kifle Shenkuru
- Least Developed Countries Division	- Md. Daniul Islam
- Traditional Knowledge Division & Life Sciences Programme	- Antony Taubman, <i>Director & Head Global IP Issues Division</i>

ANNEX V: Bangladesh Garment Exports: Facts and Figures

Table V.1: Value and Quantity of Total Apparel Export - Fiscal Year Basis

Year	Total Apparel Exports in MN. US\$			Total Apparel Exports in MN. DZ		
	Woven	Knit	Total	Woven	Knit	Total
1992-93	1,240.48	204.54	1,445.02	36.05	10.66	46.71
1993-94	1,291.65	264.14	1,555.79	34.35	10.81	45.16
1994-95	1,835.09	393.26	2,228.35	47.21	15.30	62.51
1995-96	1,948.81	598.32	2,547.13	48.82	23.18	72.00
1996-97	2,237.95	763.30	3,001.25	53.45	27.54	80.99
1997-98	2,844.43	937.51	3,781.94	65.59	32.60	98.19
1998-99	2,984.96	1,035.02	4,019.98	64.79	36.66	101.45
1999-2000	3,081.19	1,268.22	4,349.41	66.63	45.27	111.90
2000-2001	3,364.32	1,495.51	4,859.83	71.48	52.54	124.02
2001-2002	3,124.82	1,458.93	4,583.75	77.05	63.39	140.44
2002-2003	3,258.27	1,653.82	4,912.09	82.83	69.18	152.01
2003-2004	3,538.07	2,148.02	5,686.09	90.48	91.60	182.08
2004-2005	3,598.20	2,819.47	6,417.67	92.26	120.13	212.39
2005-2006	4,083.82	3,816.98	7,900.80	108.82	165.02	273.84
2006-2007 (Dec)	2,368.07	2,362.29	4,730.36	67.65	103.38	171.03

Source: BGMEA, 2007.

Table V.2: Value and Quantity of Total Apparel Export - Calendar Year Basis

Year	Total Apparel Exports in MN. US\$			Total Apparel Exports in '000 DZ		
	Woven	Knit	Total	Woven	Knit	Total
1994	1,544.89	341.53	1,886.42	41,642.49	13,768.85	55,411.34
1995	1,976.40	512.18	2,488.58	49,377.11	19,828.10	69,205.21
1996	1,942.37	686.27	2,628.64	47,536.84	26,107.21	73,644.05
1997	2,621.33	810.49	3,431.82	60,560.49	27,997.84	88,558.33
1998	2,871.06	976.29	3,847.35	64,229.77	34,587.54	98,817.31
1999	2,987.73	1,169.90	4,157.63	64,938.82	41,303.64	106,242.46
2000	3,376.49	1,448.22	4,824.71	71,634.03	51,588.27	123,222.30
2001	3,162.28	1,432.72	4,595.00	67,724.50	50,180.09	117,904.59
2002	3,076.28	1,573.40	4,649.68	83,443.78	70,714.60	154,158.38
2003	3,398.84	1,850.36	5,249.20	85,829.29	80,503.80	166,333.09
2004	3,686.78	2,532.62	6,219.40	94,223.23	104,904.34	199,127.57
2005	3,689.60	3,210.48	6,900.08	96,387.06	138,190.49	234,577.55
2006 (Dec)	4,544.79	4,388.72	8,933.51	125,648.96	190,595.40	316,244.36

Source: BGMEA, 2007.

Table V.3: Main Apparel Items Exported from Bangladesh - Value in MN. US\$

Year	Shirts	Trousers	Jackets	T-shirt	Sweater
1993-94	805.34	80.56	126.85	225.90	-
1994-95	791.20	101.23	146.83	232.24	-
1995-96	807.66	112.02	171.73	366.36	70.41
1996-97	759.57	230.98	309.21	391.21	196.60
1997-98	961.13	333.28	467.19	388.50	296.29
1998-99	1,043.11	394.85	393.44	471.88	271.70
1999-2000	1,021.17	484.06	439.77	563.58	325.07
2000-2001	1,073.59	656.33	573.74	597.42	476.87
2001-2002	871.21	636.61	412.34	546.28	517.83
2002-2003	1,019.87	643.66	464.51	642.62	578.37
2003-2004	1,116.57	1,334.85	364.77	1,062.10	616.31
2004-2005	1,053.34	1,667.72	430.28	1,349.71	893.12
2005-2006	1,056.69	2,165.25	389.52	1,781.51	1,044.01

Source: BGMEA, 2007.

Table V.4: Growth of BGMEA Members

Year	Number of Garment Factory
1983-84	134
1986-87	629
1989-90	759
1992-93	1,537
1996-97	2,503
1999-2000	3,200
2000-2001	3,480
2001-2002	3,618
2002-2003	3,760
2003-2004	3,957
2004-2005	4,107
2005-2006	4,220

Source: BGMEA, 2007.

Table V.5: Growth of RMG Employment

<i>Year</i>	<i>Employment in MN workers</i>
1999-2000	1,600
2000-2001	1,800
2001-2002	1,800
2002-2003	2,000
2003-2004	2,000
2004-2005	2,100
2005-2006	2,200

Source: BGMEA, 2007.