

Trade and Poverty Linkages

A Case Study of the Poultry Industry in Bangladesh

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Abstract

The poultry industry in Bangladesh is crucial to agricultural growth and improvement of diet of the people. This sub-sector is particularly important in the sense that it is a significant source for the supply of protein and nutrition in a household's nutritional intake. It is an attractive economic activity as well, especially to women and the poorer sections. Poultry farms in Bangladesh have witnessed a rapid growth in recent times. With a high population and income growth, urbanisation and high-income elasticity of demand, the demand for poultry products is expected to increase appreciably in the future. The poultry sector in Bangladesh is very important for the reduction of poverty and creation of employment opportunities. Many people are directly dependent on this industry for their livelihood.

In order to protect the poultry sector from fierce foreign competition, the government has adopted various measures. For instance, imposing import levy or quantitative restriction to protect domestic producers from the influx of import. Sometimes government imposes high levels of import duty since domestic producers have to pay a higher price for imported inputs. In Bangladesh, a very high level of product price protection together with low level of protection to the imported intermediate inputs provides very large effective protection to poultry meat and egg production. As a result of this high protection, the poultry industry in Bangladesh flourished during the 1990s and has contributed to significant employment and income generation for the poorer sections in the country.

Most of the stakeholders in the industry view the lack of a comprehensive poultry policy guideline as a major constraint to ensure proper implementation of rules and regulations pertaining to the sustenance of the poultry industry in Bangladesh. There is a lack of efficient marketing system particularly in the rural areas. There is also a serious lack of technical know-how among the people involved in this industry. Lack of adequate laboratory testing facility is also considered a major hurdle to inadequate quality and disease control practices. Most importantly, it appears that though the poultry sector received adequate access to credit mainly from NGOs, access to working capital by smaller firms in particular still remains a major hurdle.

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Introduction

Poultry meat is the fastest growing component of global meat production, consumption, and trade, with developing and transition economies playing a leading role in its expansion. In addition to providing opportunities to increased poultry exports, rising poultry production spurs growth in global import demand for feeds and other inputs and in investment opportunities in these sectors. Bangladesh now has a large and rapidly expanding poultry sector. Expansion of poultry industry in Bangladesh is being driven by rising incomes of the consumers and a shift in industry structure towards integrated ownership and coordination of the input, production, and marketing operations involved in poultry production (vertical integration). These factors, in addition to government policies affecting feed supply levels, will help shape future growth in the poultry industry in Bangladesh, as well as in emerging trade and investment opportunities.

The poultry sub-sector is crucial in the context of agricultural growth and improvement of diet for the people in Bangladesh. This sub-sector is particularly important in the sense that it is a significant source of supply of protein and nutrition in a household's nutritional intake. It is an attractive economic activity as well, especially to women and the poorer sections. Poultry farms in Bangladesh are growing fast in recent times. With a high population and income growth, urbanisation and high-income elasticity of demand, the demand for poultry products is expected to increase appreciably in the future. Hence, the number of poultry farms is also expected to expand over time.

Poultry rearing can play a vital role in a country like Bangladesh where most of the people are landless, disadvantaged and devoid of formal education or skill to participate in income generating activities. Poultry can be an important tool to fight poverty not only for this group of people but also for the distressed women as poultry requires minimum land, short capital and skill. In Bangladesh, the poultry sector is also an integral part of the farming system. The number of poultry grew at an annual rate of 6.7 percent over the period 1990-97. The share of poultry in the animal protein of the human diet in Bangladesh increased from 14 percent in 1977 to 23 percent in 1987 (Alam, 1997).

The broad objective of this paper is to analyse the trade poverty linkages in the poultry industry in Bangladesh. This paper has been divided into eight sections. Section one deals with the introductory part of the study which includes motivation and objectives of the study. Section two covers the importance of poultry sector in economic growth and international trade. Section three reviews the implications of the poultry sector in poverty reduction in Bangladesh. Section four examines the implications of trade policy reforms on the poultry sector. Section five analyses other policy issues in the poultry sector development. Section six focuses on the findings from a sample survey in the poultry sector. Section seven deals with the recommendation for the development of poultry sector in Bangladesh, while section eight provides the concluding remarks.

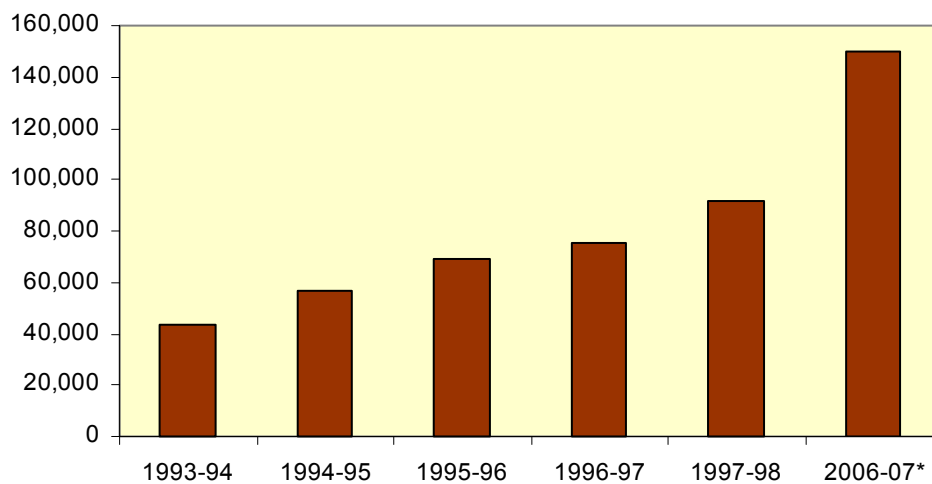
Poultry Industry in Bangladesh: A Silent Revolution

Overview of the Poultry Industry

In Bangladesh, around 89 percent of rural households rear poultry through traditional production systems like “low input-low output”. Local chicken dominates poultry production. Most birds are kept in small flocks under a scavenging system with feed generally available from household waste, homestead pickings, and crop residues. Productivity of the local hens is low and losses due to diseases and predators are high. The constraints to productivity however, are not only related to disease but also to management systems, lack of supplementary feeding, predators, and inappropriate breeds (Saleque, 2001).

Figure 1 shows that in 1993-94 there were only 43,589 poultry firms, which increased substantially to reach a number of 150,000 by the year 2006-07.

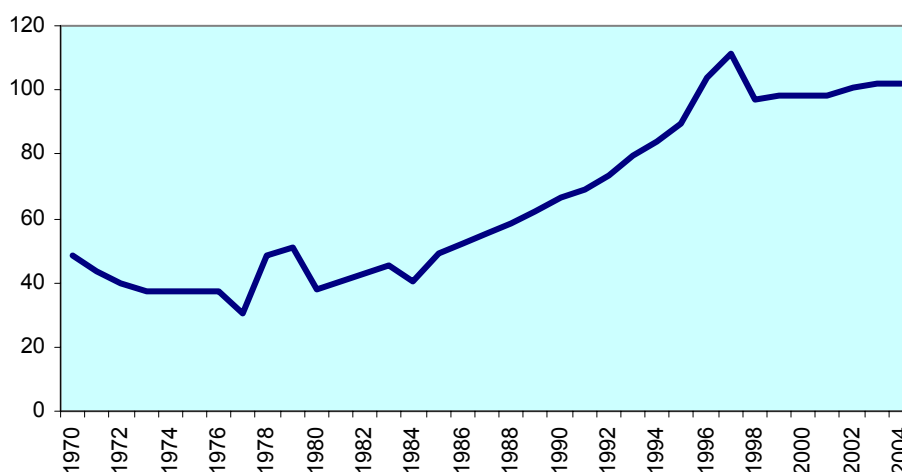
Figure 1: Trend in the Number Poultry Firms in Bangladesh



Source: Fattah (2000) and IFC (2007)

Figure 2 illustrates that the production of chicken meat remained constant at around 40,000 MT up to the mid-eighties. Subsequently, government as well non-governmental organisations initiated different programmes to promote the poultry industry with the view to alleviating poverty. From mid-eighties to late-nineties, there had been a sharp increase in the production of chicken meat due to the boom in the poultry sector. From late-nineties, however, there has been stagnancy in the chicken meat production.

Figure 2: Trend in Chicken Meat Production in Bangladesh (000 MT)



Source: FAOSTAT

Table 1 reports that the poultry sector was growing at 4.5 percent throughout the decade of eighties, while the growth rate was 3.7 percent throughout nineties. While the growth rate of total livestock was 1.9 percent and 1.3 percent during the eighties and nineties respectively, such growth of poultry firms was remarkable. However, during the nineties, poultry sector attracted the attention of policymakers and development organisations as an important tool for poverty reduction.

Table 1: Livestock Population in Bangladesh

Species	Year				Annual Growth Rate	
	1980	1990	2000	2002	1980-1990	1990-2000
Cattle and Buffalos	22031	24016	24730	25150	0.9	0.3
Sheep and Goats	9796	21904	35232	38094	8.4	4.9
Poultry	67656	105078	150600	151500	4.5	3.7
Total livestock	12672	15249	17394	17899	1.9	1.3

Source: FAOSTAT

Note: LU= livestock Unit Conversion Ratio: Cattle and Buffalo (0.50), Sheep and Goats (0.10), Pig (0.20) and Poultry (0.10)

Table 2 presents the trend in annual meat production in Bangladesh. Average annual growth rate of poultry production was 4.3 percent and 3.4 percent during the eighties and nineties respectively, while average annual growth of meat production was 3.9 percent and 3.4 percent during the eighties and nineties respectively. Poultry sector contribution to the country's overall meat production has been remained unchanged to one-fourth.

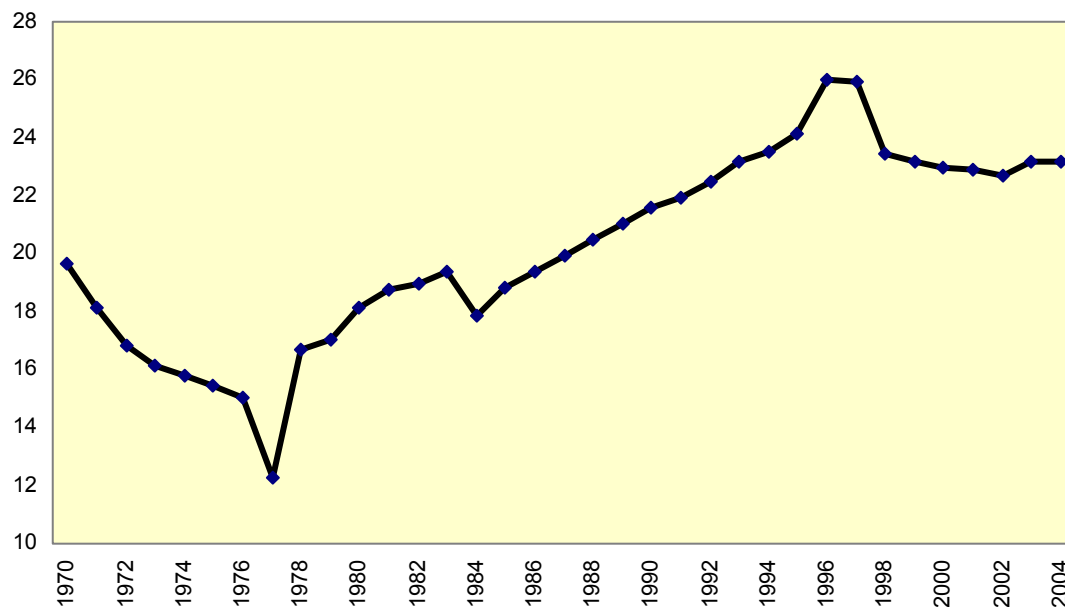
Table 2: Trend in Annual Production of Meat (000 MT)

Product	Year				Annual Growth Rate	
	1980	1990	2000	2002	1980-1990	1990-2000
Total Meat	209	308	429	446	3.9	3.4
Beef, Buffalo	123	143	176	182	1.5	2.1
Mutton, Goat	24	75	132	140	11.9	5.8
Poultry	53	80	112	115	4.3	3.4

Source: FAOSTAT

While there was a declining trend in the share of poultry in the country's total meat production in the seventies, share of poultry in the country's total meat production had shown a continuous growth over the eighties and nineties (Figure 3). However, from the end of the nineties, it has remained almost stagnant.

Figure 3: Share of Poultry in the Country's Total Meat Production



Source: FAOSTAT

The current state of poultry sector with respect to its contribution to the country's external trade is difficult to measure due to the unavailability of data. Therefore, the assessment of poultry sector's contribution to trade should consider the indirect effects. Poultry sector is a sub-sector of the livestock sector and the export and import figures of livestock sector in Table 3 helps us draw conclusions that Bangladesh is an almost self-sufficient with respect to trade in livestock products. If import figures are considered, it is found that these figures are mainly for the cattle imports from India, especially during the occasion of Eid-ul-Azha. In case of the poultry sector though, Bangladesh can't export egg and meat, the production is sufficient to meet the domestic demand.

Table 3: Trade in Livestock Products (Value in million US\$ Current)

Product	Exports				Imports			
	1980	1990	2000	2002	1980	1990	2000	2002
Livestock	3.1	5.0	0.1	0.7	30.9	90.7	90.8	73.5
Share of livestock trade in total trade	0.3	0.3	0.0	0.0	1.0	2.2	1.0	0.8

Source: FAO (2005)

Evolution of Development Projects in the Poultry Industry in Bangladesh

Like many developing countries, poultry is a common enterprise in rural Bangladesh. Poultry is sometimes used as the first investment for a livestock ladder (in the sense that one can move from poultry to goat/sheep to cattle etc.) to increase income and get out of poverty. Therefore, government, as well as the NGO sector in Bangladesh has pursued poultry production as a tool for poverty alleviation. Bangladesh Rural Advancement Committee (BRAC), the leading NGO has played the important role in the development and execution of the model in Bangladesh with support from various donors including IFAD, FAO, DANIDA, Asian Development Bank (ADB). Between 1978 and 1982, BRAC poultry programme did not have any model or design; it was being implemented on an ad hoc basis. Later a pilot project was carried out in Manikgonj. Based on the experiences of the Manikgonj project, BRAC and DLS together replicated the model during 1985-87 on a pilot scale in 32 thanas mainly in the northwestern part of the country through 54 area offices of BRAC with assistance from FAO/UNDP. The outcome of the extended pilot project appeared to be positive. Based on these experiences, the model was further modified and replicated through three large projects during 1992-2003 with the assistance of DANIDA, IFAD, ADB and the Government of Bangladesh (Table 4).

Table 4: Targeted Thanas and Beneficiaries in Various Smallholder Livestock Development Projects in Bangladesh

Period	Project	Donor	Thanas covered	Target beneficiaries
1992-1998	SLDP I: Smallholder Livestock Development Project	Danida, IFAD, GOB (DLS), 3 NGOs (BRAC, Proshika and Swanirvar Bangladesh)	80	4,00,000
1998-2002	PLDP: Participatory Livestock Development Project	Danida, ADB	89	3,64,000
1999-2003	SLDP II: Smallholder Livestock Development Project	Danida	26	1,09,000
2004-2010	PLDP II: Participatory Livestock Development Project	ADB	157	6,66,000

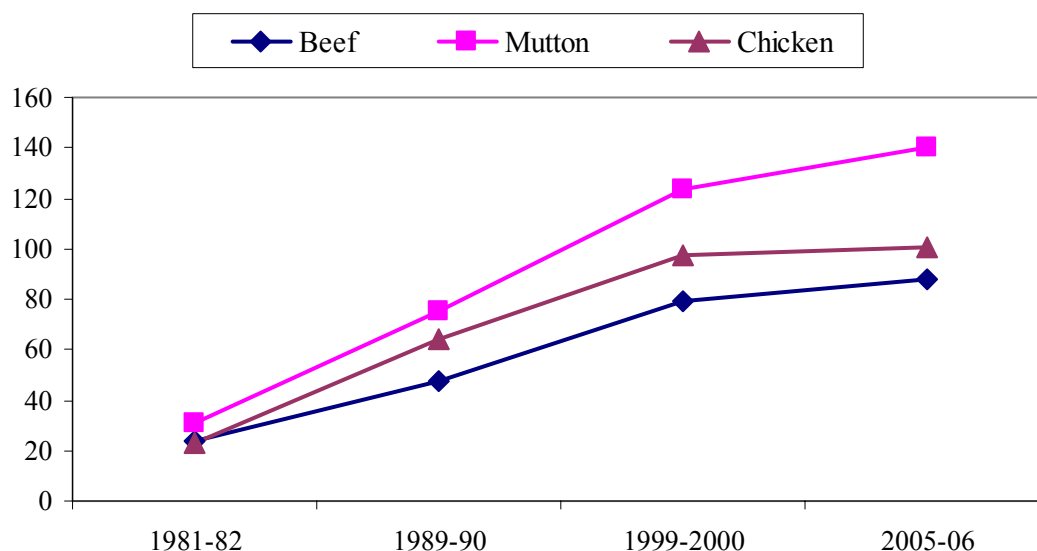
Source: Fattah (2000)

According to Alam (1997), the aforementioned projects generated substantial positive impacts on poultry production, employment and income generation in rural areas. The beneficiaries of the project had been the poor women. The generation of income and employment opportunities through these projects enhanced the status of those women in their families and societies. Also, as the income of beneficiary households increased, they were able to consume more chicken and eggs produced by them.

Price of Chicken Meat and Egg

Over the past two and half decades, price of meat and egg have increased four times. However, huge supply of poultry meat and egg helped keep the price at a relatively low level. During 1999-2000 and 2005-06, the price of broiler chicken had been stable at around Tk100 per kg, while the price of beef and mutton increased steadily which resulted in low relative price of chicken.

Figure 4: Trend in the Prices of Different Kinds of Meat



Source: Different Issues of Statistical Pocket Book, Bangladesh Bureau of Statistics

Meat and Egg Consumption

Table 5 shows that per capita consumption of meat has been doubled over the past two decades, while per capita egg consumption has increased by five times over the same time period. The annual per capita consumption of meat was 4.8 kg in 1985-86, which increased to 8.5 kg in 2004-05. On the other hand, in 1985-86, the per capita consumption was 12 eggs annually, while this increased to 59 eggs annually in 2004-05. This mammoth increase in the meat and egg consumption was possible only for the exploration of poultry sector in Bangladesh.

Table 5: Annual Per Capita Consumption of Meat and Egg

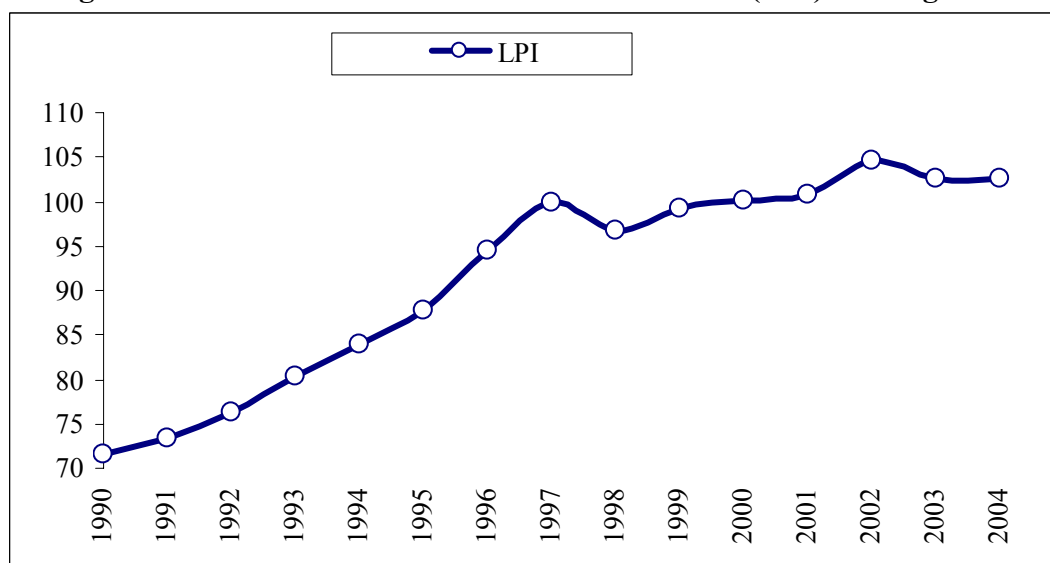
	1985-86	1989-90	1999-2000	2004-05
Meat (Kg)	4.8	3.3	5.2	8.5
Egg (number)	12	14	32	59

Source: Different Issues of Statistical Pocket Book, Bangladesh Bureau of Statistics

Contribution of Poultry to GDP

The Livestock Production Index shows that Bangladesh has been able to register growth in livestock since 1990. In recent years, the rate of growth seems to be little down as reflected in the flatter slope of the LPI since 2002 (Figure 5). However, the importance of livestock can be understood by observing its contribution to GDP over the years (Table 6). Livestock sector's contribution to GDP was 2.80 percent in 1990-91, which increased to 2.92 percent in 2005-06. However, the livestock sub-sector grew at a rate higher than the annual growth rate of the overall agricultural sector.

Figure 5: Trend in the Livestock Production Index (LPI) in Bangladesh



Source: World Development Indicators 2007

Table 6: Contribution of the Livestock Sector to GDP

	Year		
	1990-91	2000-01	2005-06
Share of Livestock Sector to GDP (%)	2.80	2.95	2.92
Annual Growth Rate of the Livestock Sector	2.2	2.81	6.15
Annual Growth Rate of the Agricultural Sector			

Source: Different Issues of Statistical Pocket Book, Bangladesh Bureau of Statistics

The poultry sector happens to be one of the prime components of the total livestock population. Poultry constitutes 14 percent of the total value of livestock output. During 1983 and 1996, the chicken population increased substantially with an annual growth rate of 3.6 percent (Alam, 2002). According to the South Asia Enterprise Development Facility (SEDF), the current market size of the poultry industry is \$1 billion and is supporting nearly 5 million people directly or indirectly through 0.15 million poultry farms. Poultry constitutes 1.6 percent of Bangladesh GDP currently (The Poultry Site.com).

Poverty Implications of the Poultry Sector in Bangladesh

There is a clear correlation between level of income and consumption of livestock products in urban as well as rural areas. Many reports have established this, but also provided evidence that an increase in livestock production based on smallholder systems not only increase cash income but also household consumption of livestock products (LID, 1999; Kurup, 2001). It is also documented that the increased rural income impact on the local purchasing power and general economic activity (Milk Vita, 2001).

The poultry sector in Bangladesh is very important for the reduction of poverty and creation of employment opportunities. The livelihoods of a substantial section depend directly on this industry. Creation of employment, poverty alleviation and improved nutrition are all potential benefits which should be considered for continued support and encouragement to poultry development in Bangladesh. During the mid-eighties, considering the condition of the landless, especially of distressed women and their socio-economic condition, the Bangladesh government initiated activities with the aim of improving the livelihoods of the poor sections by involving them in livestock and poultry rearing. The smallholder livestock development programme involving this group of people began in Bangladesh in 1984-85. To this end, the World Food Programme (WFP) played a vital role by providing assistance in the form of food aid, training and other logistical support. Still the government is trying to protect the poultry sector from any hazards and is also promoting this sector through the motivation of village people and youth, training of rural women and landless farmers, small credit, and input supply etc with the aim of poverty reduction.

Moreover, the development of family poultry production has become an important element in the social and economic development strategies. It is particularly used in the struggle against poverty and food shortage and in policies that aim at empowering rural women. A large number of micro-finance institutions (MFI) like ASA, BRAC, Grameen Bank are directly participating in the development of this sector through their micro-finance programmes. Specially, ASA's micro-finance programme in this industry is remarkable.

In 2007, this industry faced losses following the outbreak of the Avian Flu. This turned out to be a huge disaster for a poor country like Bangladesh. The government has tried to provide some succour through bank loans but often the amount was not enough. However, the MFIs came forward with their micro-finance programme to aid the sufferers.

Trade Policy Reform and the Poultry Sector in Bangladesh

The poultry trade policy of Bangladesh includes quantitative restriction on import of poultry meat and products. Along with these policies, poultry trade policy also incorporates stringent phyto-sanitary regulations and clearance procedures as the threat of Avian-flu is very much prevalent. Poultry sector remained one of the most protected sectors in Bangladesh even though the country moved from an inward looking towards an outward-oriented economy since the 1980s. However, there is a worldwide trend on the part of almost every country to adopt rapid trade liberalisation. Under conditions of a global liberalised market, countries should contemplate raising the level of competitiveness of their poultry sector to international standards sooner rather than later. Removal of trade barriers will increase the welfare of consumers, decrease the welfare of producers, and decrease net government revenue since the opportunity to import poultry meat and egg from around the world will increase. It also follows that domestic production will decrease, while domestic consumption and imports will increase as a result of a lower domestic price.

In order to protect the poultry sector from fierce foreign competition, the government adopted various measure of intervention. Imposing import levy or quantitative restriction to prevent domestic producers from the influx of import is often practiced. Sometimes government imposes high level of import duty as the domestic producers have to pay a higher price for the imported inputs. Exchange rate distortions, export subsidy and marketing controls are other policy instruments. Government also lowers the tariff rate on the intermediate input, birds and feed or extend credit facility to poultry farmers. In Bangladesh a very high level of product price protection together with low level of protection to the imported intermediate inputs provides very large effective protection to poultry meat and egg production.

What is more important is to devise a conceptual framework to analyse the impact of such high level of protection on the competitiveness of the sector and on the welfare impact of such intervention. Bangladesh is supposed to incur significant deadweight loss from inefficient resource allocation in the poultry industry. The loss in consumer surplus in poultry consumption is also significant. Part of the loss in consumer surplus is gained by income transfers to the poultry producers. If the protection were removed, production of both products would have fallen. Consumers who are now paying more than the world price will be benefited. Even Bangladesh could turn into a net importing country for poultry products if the protective elements were removed.

Findings from a Sample Survey of the Poultry Sector in Bangladesh

To assess the current state of the poultry sector, a survey was conducted in two villages in Gazipur district. There was a structured questionnaire, and the survey covered 100 samples from these two villages. The questionnaire covered over time changes in poultry firm's employment situation, wage rate of the workers, years of schooling of the employees involved in the poultry sector, production costs and profit margin. This survey provides a clear picture of the industry. Random sampling strategy was followed during the survey to make the result representative.

Table 7 presents the average number of households or permanent workers involved in the poultry industry over time. It appears that over time, average permanent worker involvement per firm has been increased. Before ten years, average number of permanent workers was 1.86; while at present it is 2.52. Also, the average number of households increased during the last ten years.

Table 7: Average Number of Workers in the Firms over Time

Type of Worker	Present	Before Five Years	Before Ten Years
Households	1.62	1.18	1.60
Permanent	2.52	2.40	1.86

A change in average nominal daily wage rate is remarkable in the case of permanent workers. Ten years ago, a permanent worker was receiving Tk40 per day, while at present; they are receiving Tk94 per day (Table 8). However, while considering the change in inflation rates, there has not been much increase in the real wage rate for the permanent workers. Average daily nominal income of the household worker has been increased immaterially and declined in real terms.

Table 8: Change in Average Daily Wage Rate Over Time in Tk

Type of Worker	Present	Before Five Years	Before Ten Years
Households	57.74	43.39	42.50
Permanent	94.25	60.36	40.43

Labour skill in poultry sector in terms of schooling years remain almost same in case of household worker, while average years of schooling in the case of permanent workers declined (Table 9). The current average years of schooling of the permanent worker are 3.83 years while the corresponding figure was 5.33 years ten years ago.

Table 9: Labour Skill in Poultry Sector (Education)

Type of Worker	Present	Before Five Years	Before Ten Years
Households	9.36	10.36	9.50
Permanent	3.83	3.89	5.33

Table 10 shows a declining trend in the profit margin in the poultry industry over time. This fall in profit margin might be attributed to increased competition in the poultry sector overtime. At present, a poultry farmer earns Tk31.77 per 100 eggs, while this profit margin was Tk87.41 five years ago and Tk92.22 ten years ago. While profit margin was Tk21.25 per kg meat production before ten years, the present profit margin per kg meat production is only Tk10.78 .

Table 10: Dynamics of Profit Over Time (per 100 eggs and per 1 kg chicken)

Rate of Profit	Present	Before Five Years	Before Ten Years
Egg (per 100)	31.77	87.41	92.22
Meat (per kg)	10.78	11.50	21.25

At present the cost of production has increased incredibly in case of both egg and meat production. At present the production cost per 100 eggs is Tk340.13, while this cost was Tk192.78 five years ago and Tk153.89 before ten years. The production cost of per kg meat currently is Tk63.10, while this cost was Tk47.50 five years ago and Tk28 ten years ago.

Table 11: Production Cost over time

Production Cost	Present	Before Five Years	Before Ten Years
Egg (per 100)	340.13	192.78	153.89
Meat (per kg)	63.10	47.50	28

The policies that can promote poultry sector in Bangladesh according to the poultry farmer are government procurement of raw materials, loans at favourable condition, NGO financing etc. The feed prices, absence of comprehensive poultry policy, bird flu has been considered the major constraints in the poultry sector.

Problems and the Future Policy Direction

Most of the stakeholders in the industry view the lack of a comprehensive poultry policy guideline as a major constraint to ensure proper implementation of rules and regulations pertaining to the sustenance of the poultry industry in Bangladesh. The stakeholders also opine that the broiler marketing system does not benefit fully from the economies of scale that exist in the industrialised production system. Another important factor that hampers production growth is the lack of efficient marketing system such as collection, storage, processing and marketing of eggs and poultry meat, particularly in the rural areas.

The perception survey also revealed that there is a serious lack of technical know-how among the people involved in this industry. Trained people to handle technology are found to be inadequate regarding chicken rearing, diseases handling, productivity and other levels of the value chain. There is also inadequate trained manpower to facilitate training programmes at all levels like technical, medical and management. It is also highlighted that there is lack of adequate information regarding demand, pricing, new product, feed, medication, manufacturers (poultry, feed, medicine and vaccine), etc are considered important not only for the producers but also for the business development services. Lack of adequate laboratory testing facility is also considered another major hurdle to inadequate quality and disease control practices.

It also appeared that the disaster management preparedness is another area of concern. It is strongly felt that majority of the actors across the chain including the government and NGO mechanisms are not fully equipped to handle disaster such as epidemic or even flood or other such natural disasters.

The stakeholders view that though poultry sector received adequate access to credit mainly from the NGOs but access to working capital by the smaller firms in particular still remains a major hurdle. It is also felt that the overall distribution management of chicks, eggs, medicine, vaccine, and poultry was identified as another cause of high mortality and low profitability.

Conclusion

Battered by the Avian flu, floods and cyclone Sidr, the country's previously booming poultry industry shrunk in 2007 and struggled to recover in 2008, weighed down by higher feed costs and weak demand, industry sources warned.

The poultry industry in Bangladesh is very diverse. It comprises broiler chicken, layer chicken, native chicken, and ducks. The production of broiler and layer chicken is characterised by large-scale, intensive, commercial production systems with modern technology and imported hybrids. Native chicken production, on the other hand, is usually a backyard activity undertaken by rural households using minimal inputs. It appears that the Bangladesh chicken meat industry, including broiler and native chicken, stands to benefit from an increase in demand because of the anticipated growth in population and household income. However, it faces a number of challenges. For the commercial broiler sector, its main concern would be the threat from global competition because it is a high-cost producer by world standards. The future of the commercial sector will depend largely on the availability of cheap feed sources and improvements in production and marketing efficiency.

The poultry sector has not remained as a single sector, rather it has emerged as a multidimensional sector involving multifarious activities and demanding big investments. This is an expanding sector needing diversification in technology, production of feeds, medicine and vaccine, skilled manpower and above all wider scale of investment. In this respect poultry deserves to get more attention from policymakers.

The vision of the government is to achieve self-sufficiency by 2020 in the poultry sector. There will be the need for at least 5.86bn eggs every year and 9,000 tons of wheat and maize. But the preparation to counter the situation is not visible. No pragmatic step has been taken to attain self-sufficiency by 2020 (Nath, 2007). In future Bangladeshi poultry industry stands to benefit from increase in demand because of the expected growth in population and income. However, it faces a number of challenges. Among others, the main concern is the increasing global competition. As the policymakers pursue deregulation of the poultry sector, the future of the poultry sector would depend on the availability of cheap imported inputs and improvement in production and marketing efficiency. These will require coordinated efforts from both the private and public sectors.

The backyard sector, on the other hand, is not directly affected by trade liberalisation at the moment because most of its production is for home consumption by rural households and there are not enough market surpluses to meet the demand for native chicken. However, the backyard sector faces serious issues of low productivity and high mortality rates because of the lack of technical know-how and access to key inputs. In developing countries like Bangladesh, the backyard poultry sector represents the basis on which a sustainable, well-adapted semi-commercial subsector could be progressively developed. The key recommendation here is to undertake more research that would identify not only the constraints to subsistence backyard production but also the means for effective extension and technical assistance.

As the world broiler market is highly competitive, with an increasing number of efficient producers fighting for market share. Major broiler exporters such as the United States, Brazil, and Thailand, succeed in the international market by competitive pricing, aggressive marketing, and new product development. Their successes are based on well-managed and coordinated supply chains that meet changing consumer demand and increasing government regulations. To combat the threat of import from big players, the Bangladesh broiler industry requires improving farm productivity by adopting latest technologies and better management practices. In addition, there appears to be a need for the industry to become fully vertically integrated to benefit more from the economies of scale and scope.

There is need to adopt the latest technology in poultry raising, particularly in the areas of environmental control and automation in feeding, drinking, and other management practices. Production inefficiency, along with the reliance on high-cost imported inputs has resulted in a higher production cost of live birds. Technical skills need to be considered at both farmer and extension levels. Training is essential for both farmers and extension officers in the following areas: disease control, housing and equipment, feeding, genetic improvement and marketing. A basic knowledge in specific features of poultry anatomy/physiology is also important to understand the basis of the above topics. Housing and management could be improved through appropriate farmer training, preferably conducted on-farm. Local craftsmen could be trained to manufacture small equipment, like feeders, drinkers, etc.

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