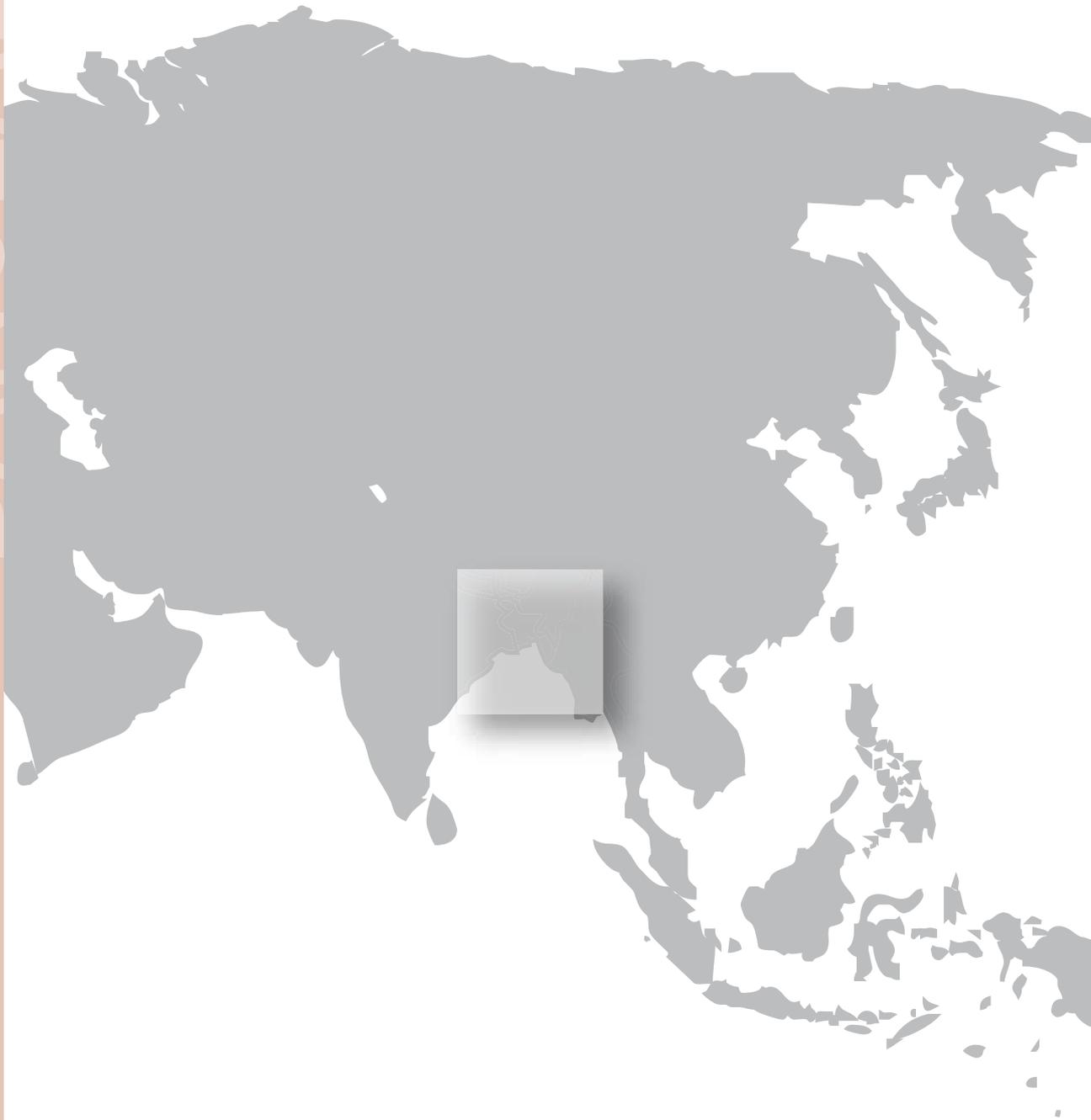


# Poultry sector country review



# Poultry sector country review

**Frands Dolberg**

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views of FAO.



# Foreword

The unprecedented widespread outbreaks of Highly Pathogenic Avian Influenza (HPAI) that occurred in many countries in Asia, Europe and Africa since 2003 have been asking for rapid and active response on a national, regional and international level. The HPAI crisis had to be addressed worldwide at the source, which is the poultry population.

The main danger of this disease, like others, lies in the way in which humans interact with and handle the production, distribution, processing and marketing of live poultry and poultry products. The direct and indirect socio-cultural and economic impacts of disease outbreaks influence policy measures and disturb markets, causing the loss of assets. There are strong negative impacts on the livelihoods of rural communities for all producer groups including small holders. Assessment and guidance on measures along the poultry chain for a safe poultry production is therefore of great importance. Specific consideration should be given to strategies and measures that ensure a sustainable pro poor supporting approach and development.

Better understanding of the specific situations of the different poultry sectors and the related market chains will help to develop appropriate disease control measures and improve biosecurity.

This review is part of a series of Country Reviews that are commissioned by the Animal Production Service (AGAP) of the Food and Agriculture Organization of the United Nations (FAO) for the Socio-Economics, Production & Biodiversity Unit of the Emergency Centre for Transboundary Animal Disease of FAO (ECTAD).

This review is intended as a resource document for those seeking information on the poultry sector at national level. It is not exhaustive. Some topics are only partially covered or not covered at all and the document will be supplemented and updated on an ongoing basis. Contributions and feedback are welcome by the author(s), FAO/AGAP and FAO/ECTAD Socio-Economics, Production & Biodiversity Unit<sup>1</sup>.

This sector review was prepared by Frands Dolberg, international consultant, during a mission in Bangladesh in May-June 2008. Information collected was supplemented with data from the FAO statistical database (FAOSTAT), the World Bank and the United Nations Population Division.

---

<sup>1</sup> For more information visit the FAO website at: [www.fao.org/avianflu/en/farmingsystems.html](http://www.fao.org/avianflu/en/farmingsystems.html) or contact either Philippe Ankers or Olaf Thieme, Animal Production Officers Email: [Philippe.Ankers@fao.org](mailto:Philippe.Ankers@fao.org) and [Olaf.Thieme@fao.org](mailto:Olaf.Thieme@fao.org) Food and Agriculture Organisation, Animal Health and Production, Viale delle Terme di Caracalla, 00153 Rome, Italy.

# Contents

<b>Foreword .....</b>	<b>i</b>
<b>Acronyms and abbreviations.....</b>	<b>iv</b>
CHAPTER 1	
<b>The country in brief.....</b>	<b>5</b>
CHAPTER 2	
<b>Profile of the poultry sector .....</b>	<b>7</b>
2.1 National poultry flock.....	7
2.2. Geographical distribution of poultry flocks.....	7
2.2.1 Chicken .....	7
2.2.2 Ducks.....	9
2.2.3 Pigeons .....	9
2.2.4 Migratory and wild birds.....	9
2.3 Production .....	10
2.4 consumption .....	11
2.5 Trade .....	13
2.5.1 Chicken .....	13
2.5.2 Feed .....	15
2.6 Prices .....	16
CHAPTER 3	
<b>Poultry production systems .....</b>	<b>18</b>
3.1 Background information .....	19
3.2 Sector 1: Industrial and integrated production.....	19
3.3 Sectors 2 and 3: Other commercial production systems .....	19
3.3.1 Breeding stocks and hatching eggs .....	19
3.3.2 Broiler meat .....	19
3.3.3 Hen table eggs .....	20
3.3.4 Other species .....	20
3.4 Sector 4: Village or backyard production .....	20
3.4.1 Chickens.....	20
3.4.2 Ducks.....	21
3.4.3 Other species .....	23
3.4.4 Case study one: microfinance and technical support project .....	23
3.4.5 Case study two: Thengamara Mohila Sabuj Sangha (TMSS) and HPAI.....	24
3.5 Poultry value chain analysis .....	25
3.5.1 Day-old chicks .....	25
3.5.2 Chicken meat .....	25
3.5.3 Table eggs .....	27
3.5.4 Other species .....	27

CHAPTER 4	
<b>Trade, marketing and markets</b> .....	<b>28</b>
4.1 Domestic market.....	28
4.2 Import.....	30
4.3 Export .....	30
4.4 Slaughtering facilities .....	30
CHAPTER 5	
<b>Breeds</b> .....	<b>31</b>
5.1 Exotic breeds.....	31
5.2 Local breeds.....	31
CHAPTER 6	
<b>Veterinary health, public health, biosecurity measures</b> .....	<b>33</b>
6.1 Highly pathogenic avian influenza.....	34
6.1.1 Bangladesh – ecological context.....	34
6.2 Other major poultry diseases.....	35
6.2.1 High mortality due to predators – link to wildlife.....	36
6.3 Biosecurity measures.....	37
CHAPTER 7	
<b>Current policies, legal framework</b> .....	<b>38</b>
7.1 Poultry in the livestock policy.....	38
7.2 Legal framework .....	39
CHAPTER 8	
<b>Analysis</b> .....	<b>40</b>
8.1 Current strengths and weaknesses of the poultry sector .....	40
8.2 Prospects of the poultry sector over the next five years .....	41
ANNEX I	
<b>Who is who (contact list)</b> .....	<b>43</b>
ANNEX II	
<b>List of major projects – poultry sector</b> .....	<b>48</b>
ANNEX III	
<b>Bibliography</b> .....	<b>53</b>
ANNEX IV	
<b>Maps</b> .....	<b>57</b>

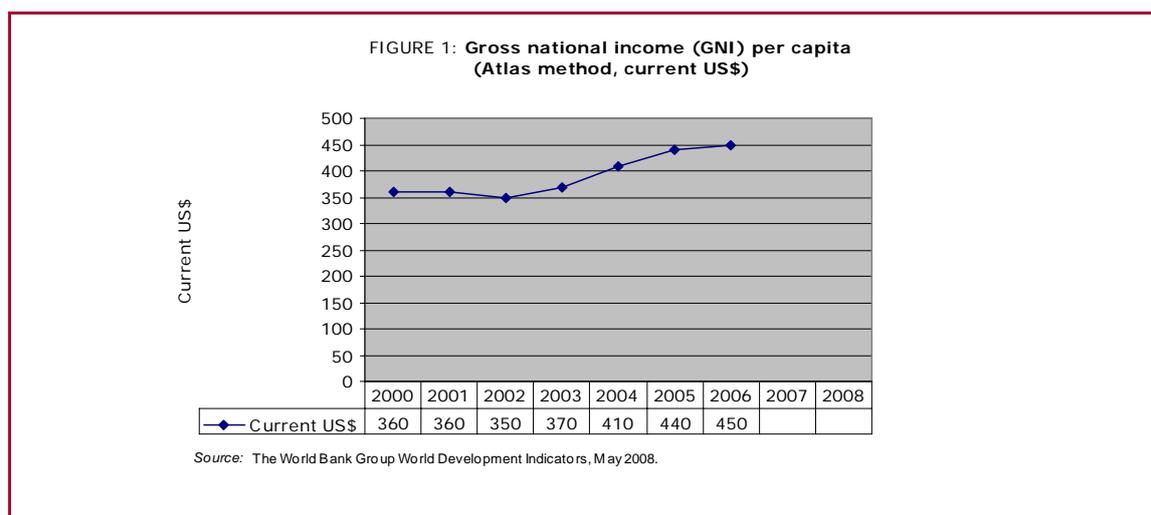
## Acronyms and abbreviations

<b>ADB</b>	Asian Development Bank
<b>AI</b>	Avian Influenza
<b>ATDP</b>	Agro-based Industries and Technology Development Project
<b>BB</b>	Bangladesh Branch
<b>CIDA</b>	Canadian International Development Agency
<b>CIMMYT</b>	International Maize and Wheat Improvement Centre
<b>Danida</b>	Danish International Development Agency
<b>DLS</b>	Department of Livestock Services
<b>DOC</b>	Day old chick
<b>FAO</b>	Food and Agriculture Organization
<b>GNI</b>	Gross National Income
<b>GOB</b>	Government of Bangladesh
<b>GPS</b>	Grand Parent Stock
<b>HPAI</b>	High Pathogenic Avian Influenza
<b>IFAD</b>	International Fund for Agricultural Development
<b>JICA</b>	Japan International Cooperation Agency
<b>MFTSP</b>	Micro Finance Technical Support Project
<b>NGO</b>	Non Government Organization
<b>PKSF</b>	Palli Karma Sahayak Foundation
<b>PLDP</b>	Participatory Livestock Development Project
<b>PRIME</b>	Program for Monga (Hunger) Eradication
<b>PRSP</b>	Poverty Reduction Strategy Papers
<b>PS</b>	Parent Stock
<b>RIR</b>	Rhode Island Red
<b>Taka</b>	Bangladeshi Taka
<b>TMSS</b>	Thengamara Mohila Sabuj Sangha
<b>UNDP</b>	United Nations Development Program
<b>UNICEF</b>	United Nations Children's Fund
<b>USAID</b>	United States Agency for International Development
<b>WAPSA</b>	World's Poultry Science Association-Bangladesh Branch

## Chapter 1

## The country in brief

Country:	Bangladesh	
Location:	South Asia, bordering the Bay of Bengal, between Burma and India	
Population, total	144 300 000 (2006 estimate)	Source: World Bank, 2008
Population, growth rate:	1.9%	Source: World Bank, 2008
Economy group:	Low income economy	Source: World Bank, 2008

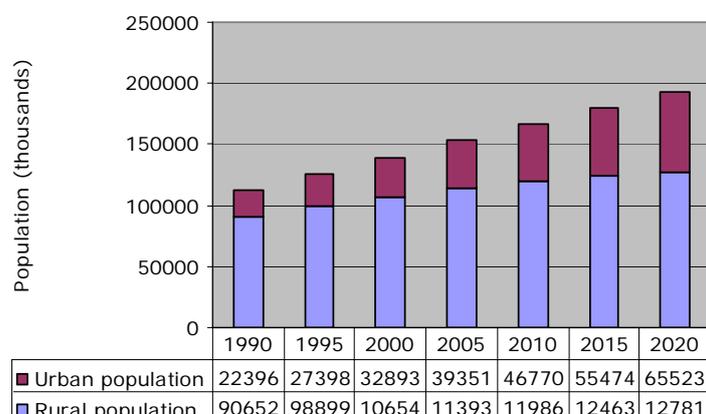


Bangladesh is by mid 2008 classified as a low income economy, i.e. with a GNI per capita of US\$ 450 in 2006 below the cutting line of US \$ 935<sup>2</sup>. Its population of more than 144 million in 2006 places it as the seventh most populous country in the World<sup>3</sup>.

<sup>2</sup> [http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458-menuPK:64133156-pagePK:64133150-piPK:64133175-theSitePK:239419\\_00.html](http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458-menuPK:64133156-pagePK:64133150-piPK:64133175-theSitePK:239419_00.html)

<sup>3</sup> [http://www.xist.org/earth/pop\\_top50.aspx](http://www.xist.org/earth/pop_top50.aspx)

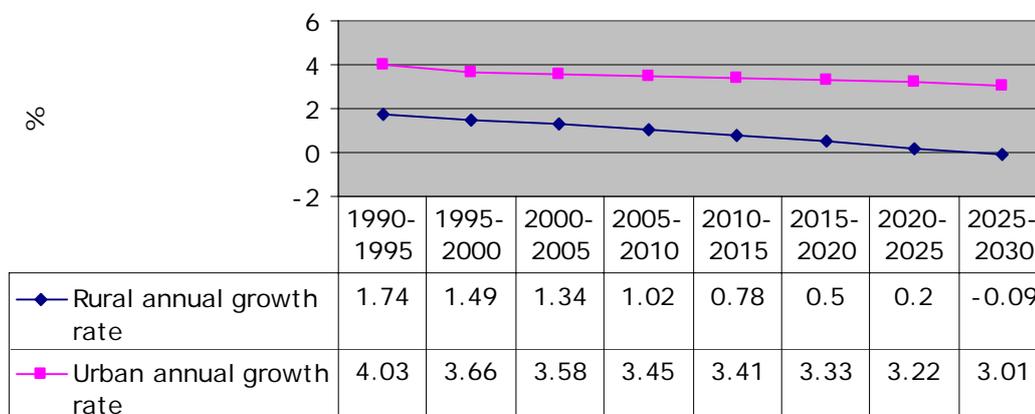
FIGURE 2: Demographic profile



Source: United Nations, Department of Economic and Social Affairs, Population Division, June 2008.

The projections about the size of the population of Bangladesh vary with the assumptions. The United Nations Populations Fund<sup>4</sup> projects the population to be by 2021 between 159 and 174 million. One important feature in recent years is that about 85% of all children go to school and that the ratio of girls to boys in primary school has reached parity according to UNICEF<sup>5</sup>.

FIGURE 3: Annual population growth rates



Source: United Nations, Department of Economic and Social Affairs, Population Division, June 2008.

There is a strong trend in Bangladesh towards urbanisation, which results in an important population growth for the urban areas and reducing population growth in rural areas. This is a trend that is expected to continue. The United Nations, Department of Economic and Social Affairs, Population Division (2007) predicts that more than 30 million people will live in the cities of Dhaka, Chittagong, Khulna and Rajshahi by 2020.

<sup>4</sup> <http://www.unfpa-bangladesh.org/>

<sup>5</sup> [http://www.unicef.org/infobycountry/bangladesh\\_35367.html](http://www.unicef.org/infobycountry/bangladesh_35367.html)

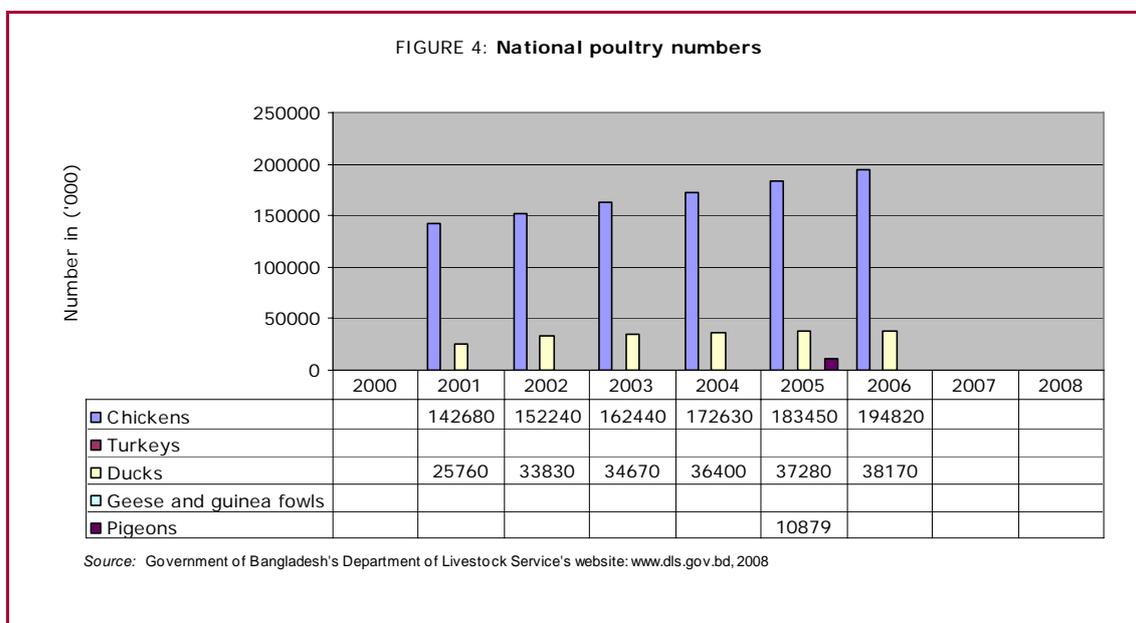
## Chapter 2

# Profile of the poultry sector

In Bangladesh, the national poultry flock includes mainly chicken, ducks and pigeons, which are kept in different production systems.

### 2.1 NATIONAL POULTRY FLOCK

Poultry population estimates differ depending on the source of information. According to numbers provided by the Government of Bangladesh's Livestock Department (figure 4), the total chicken population is steadily increasing, from about 143 million birds in 2001 to 195 million birds in 2006. Over the same period the duck population increased from 25.8 million in 2001 to 38.1 million in 2006. The pigeon population was reported to be 10.8 million in 2005 (Bangladesh Bureau of Statistics (BBS) (2006, p.172). Other types of domesticated birds such as geese are present in only small numbers.



### 2.2. GEOGRAPHICAL DISTRIBUTION OF POULTRY FLOCKS

#### 2.2.1 Chicken

The Agricultural Sample Survey of Bangladesh, which was conducted in May 2005, contains information about the distribution of poultry in the country. The report on the survey, dated June 2006, makes a distinction between subsistence and commercial poultry, but not between ducks and chicken. It contains separate columns for pigeons (pp. 172-198).

TABLE 1:  
Distribution of poultry by Administrative Division

Division	Commercial		Backyard		Total	
	Number	%	Number	%	Number	%
Barisal	1001077	4,6	17172806	10,3	18173883	9,7
Chittagong	4281804	19,6	30626134	18,4	34907938	18,5
Dhaka	11634021	53,3	36749528	22,1	48383548	25,7
Khulna	1668594	7,7	21980208	13,2	23648801	12,6
Rajshahi	2052593	9,4	52296364	31,4	54348957	28,8
Sylhet	1171560	5,4	7763610	4,7	8935171	4,7
<b>Total</b>	<b>21809649</b>	<b>100,0</b>	<b>166588650</b>	<b>100,0</b>	<b>188398299</b>	<b>100,0</b>

Source: Bangladesh Bureau of Statistics, June 2006, pp. 172-198, and own analysis.

The total duck and chicken population at the time of the survey was 188 million in rounded figures. Two divisions out of six, namely Dhaka and Rajshahi, accounted for more than 50% of the total flock. 25,7% were found in Dhaka division and 28,8% in Rajshahi division.

The production systems were very different in these two divisions. Only 9,4% of the birds in Rajshahi were commercial birds against, 53,3% in Dhaka division because of the demand for poultry meat and eggs in the capital Dhaka. The presence of urban consumers is a precondition for the development of commercial poultry production. 72,9% of the total commercial chicken production in Bangladesh is located in the divisions of the country's two largest cities Chittagong and Dhaka.

While the statistics presented by the Agricultural Sample Survey do not distinguish between ducks and chicken it is safe to assume that all the commercial poultry is predominantly chicken as the ducks in Bangladesh are still kept in traditional scavenging system(s), although the Department of Livestock Services lists 2226 registered commercial duck farms by December 2007.

Each administrative division consists of a number of districts. An analysis of the data for the districts of Dhaka division reveal a further concentration within the division as eight of the sixteen districts contain 81% of the commercial chicken. These eight districts are listed in order of the size of their percentage of commercial chicken of backyard poultry in table 2 below.

TABLE 2:  
Concentration of commercial poultry with dhaka division

District	Number of poultry		Ratio of commercial chicken/backyard chicken and ducks
	Commercial production	Backyard production	
Gazipur	2783235	1408118	1.98:1
Narsingdi	2072386	2201441	0.94:1
Dhaka	1242835	1720669	0.72:1
Manikganj	594686	1425470	0.42:1
Kishoreganj	1076970	2859708	0.38:1
Tangail	1200636	4207908	0.29:1
Narayanganj	253237	943358	0.27:1
Munshiganj	209178	853585	0.25:1
<b>Total for eight districts</b>	<b>9433163</b>	<b>15620257</b>	<b>0.60:1</b>

Source: Bangladesh Bureau of Statistics, June 2006, pp. 172-198 and own analysis.

The district of Gazipur stands out as the commercial poultry production is almost two times (198%) that of the backyard population. The presence of commercial poultry is also very strong in Narsingdi and Dhaka districts at 94% and 72%. For these eight districts the ratio of commercial birds to birds in backyard production at one given time is 0.6:1 against 0.32:1 for all of Dhaka division and 0.13:1 for the country. In Chittagong, the presence of commercial poultry is much lower with a ratio of 0.14:1. In Chittagong district, it is 0.43:1.

### 2.2.2 Ducks

Unpublished, recent estimates of the duck population in the country vary from 8% of the chicken population (reported by FAOSTAT) to 20% (reported by the DLS) (as shown above) in both cases for 2006. Such variation can be explained by the fact that ducks are largely found in the traditional system where the number of ducks is strongly influenced by season. The timing of the census is not known.

The Agricultural Sample Survey from 2005 shows that ducks: chicken ratio is 1:5. It also gives information on duck population distribution. The proportion of ducks within the poultry population is high in the divisions of Barisal (1:3), which is located in the southwest of the country and Sylhet (0.69:1) located in the east of the country. In both divisions there is a large number of ponds and water bodies suitable for duck production. In comparison there are relatively few ducks in the divisions of Dhaka (0.13:1) and Khulna (0.15:1), while the figures are intermediate for the divisions of Rajshahi (0.22:1) and Chittagong (0.26:1).

There are also pockets of high duck: chicken ratios within each division like Char Fasson on the Island of Bhola in Barisal division, the sub-districts of Burichang in Chittagong division; Tarail and Netrakona in Dhaka division and Kalia in Khulna division. The highest ducks: chicken ratios are in Sylhet division with 12 of the division's 35 sub-districts having ratios over 1:1. The highest ratio is in Habiganj sub-district.

### 2.2.3 Pigeons

In 2005, Bangladesh had a population of 10.8 million pigeons of which 11% were kept on what is termed commercial farms (2005 Agricultural Sample Survey, p. 172). Such farms are however not defined. In no division do pigeons kept under commercial farm conditions exceed 1% of the poultry population.

### 2.2.4 Migratory and wild birds

244 species of migratory birds visit Bangladesh from October to March. 21 of these species may carry the H5N1 virus according to the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan for Bangladesh for 2006-2008<sup>6</sup>. The migratory birds stay in wetlands, rivers and estuaries and areas distributed all over the country as shown in table 3.

TABLE 3:  
Sites for migratory birds

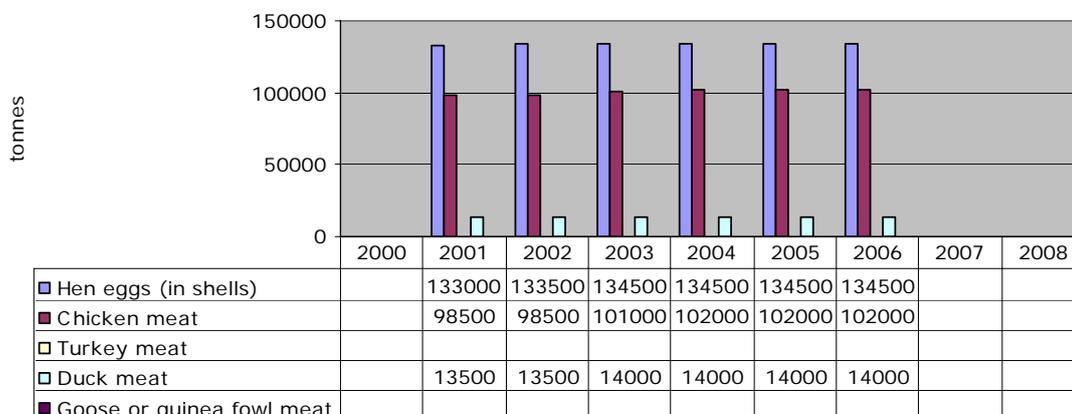
Region	Sites
Central – south coast	Coastal islands of Bhola, Noakhali and Potuakhali districts
South – west coast	Borguna, Pirojpur, Bagerhat, Satkhira and Khulna districts
South – east coast	Coast line and coastal island of Chittagong and Cox's Bazar districts
North – east Hoar basin	Hoars and Beels of Sunamgonj, Sylhet and Moulavibazar, Mymensingh and Kishoreganj districts
Lower stream of Padma and Jamuna river	Aricha, Mowa and Shaitnal of Manikgonj, Munshigonj and Chandpur districts
High Altitude wetland	Kaptai lake of Rangamati District

Source: National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan for Bangladesh for 2006-2008

<sup>6</sup> <http://www.sdnbd.org/sdi/issues/health/birdflue/document/avianInfluenzareponseplan.pdf>

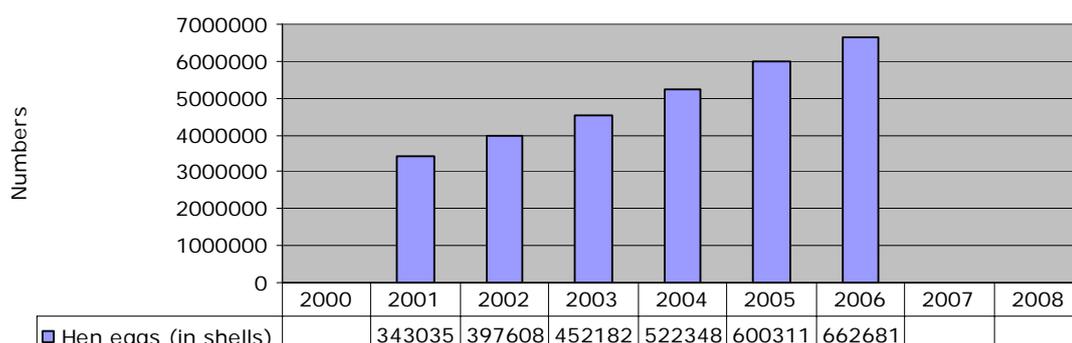
## 2.3 PRODUCTION

FIGURE 5.1: National production in the poultry sector (FAOSTAT)



Source: FAOSTAT, May 2008

FIGURE 5.2: National egg production (in number of eggs)



Source: Data provided by Bangladesh Poultry Industries Association, 2008

Figure 5.1 provides consolidated estimates for the production of eggs from both the backyard and commercial sectors. According to recent figures provided by the Bangladesh Poultry Industries Association, there has been a steady and linear increase in egg production from 3 430 350 000 in 2001 to 6 626 813 000 in 2006, linked to the expansion in commercial production.

We will now estimate egg production from both the commercial and backyard production systems.

A precise estimate is difficult to make, but may be attempted under the following set of assumptions: Rahman<sup>7</sup>, in his survey of backyard, rural producers, found that the number of eggs produced per farm per year for landless, marginal, small, medium and large farmers were 205, 200, 250, 292, 216 respectively. About 20% of households do not keep poultry (Dolberg, 2003). The average production of a rural household may therefore not be more than 200 eggs per year.

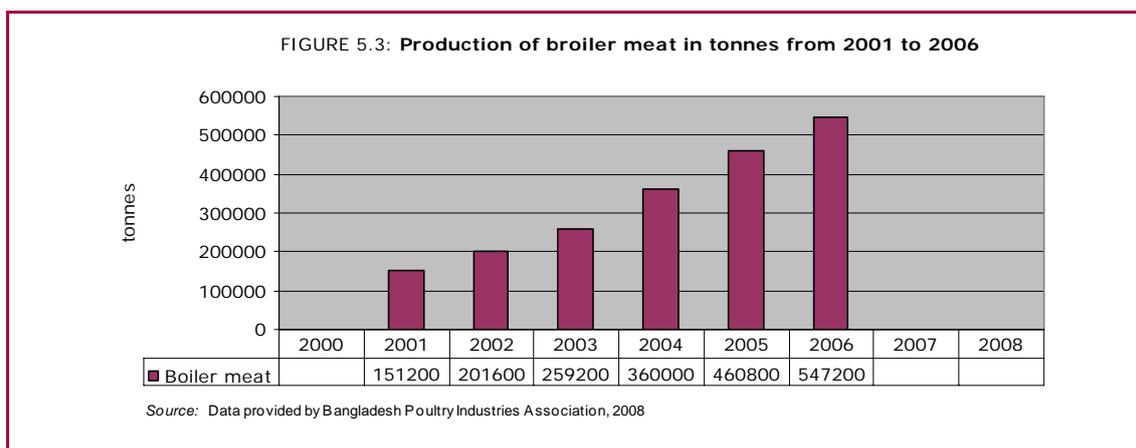
Bangladesh rural population is estimated at 108 million people. Assuming an average of 5 people per household, it can be estimated that there are 22 million rural households in which an average of 200 eggs are produced per household per year or 4 400 000 000 eggs.

<sup>7</sup> <http://www.ilri.org/Link/Files/Theme3/Avian%20Flu/bangladesh%20poultry%20systems.pdf>

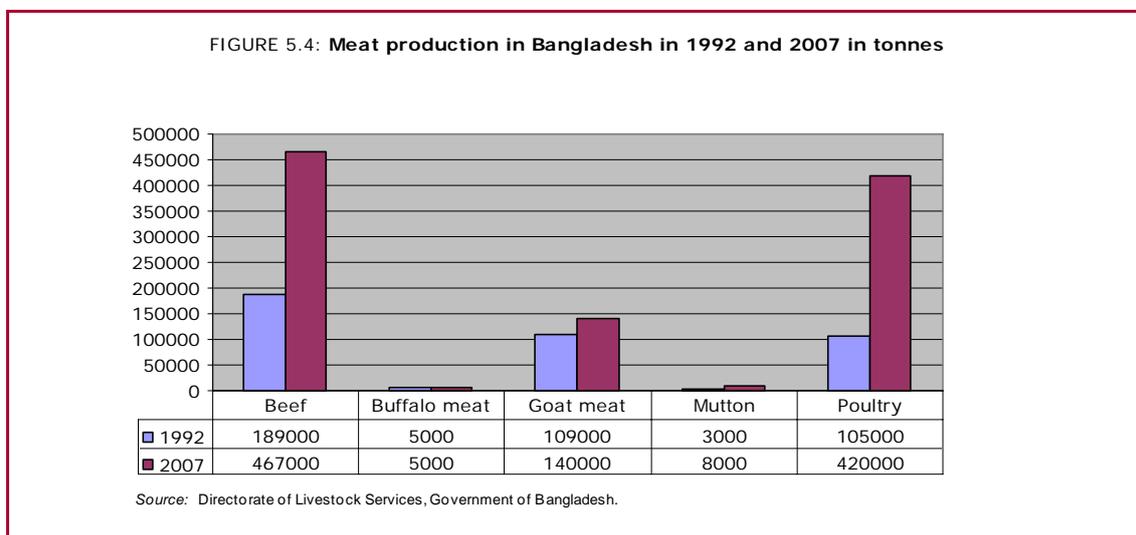
If this number of eggs produced by the backyard system is compared to the total number of 6 626 813 000 egg produced in Bangladesh in 2006 according to the data provided by the Bangladesh Poultry Industries Association, it can be estimated that about 33% of the eggs in Bangladesh come from the commercial system and 67% from the backyard system.

Production estimates for chicken meat vary according to source. Consolidated estimates from FAOSTAT are provided in figure 5.1.

Estimates of broiler meat production provided by the Bangladesh Poultry Industries Association are provided in figure 5.3. Village chicken production and spent layers should be added to get the total national poultry meat production, but figures are not available.



Comparison of meat production by species comes from another source (figure 5.4). According to figures provided by the DLS, beef was the largest single source of meat in 1992 as well as 2007. In 1992 the supply of goat meat was more than poultry meat. Between 1992 and 2007 the goat meat production has stagnated, while beef production has increased by a factor of 2.5. Poultry meat production has had the largest expansion by a factor of four from 105 000 tons in 1992 to 420 000 tons in 2007. Due to discrepancies in numbers, information provided here above indicates trends rather than quantities.



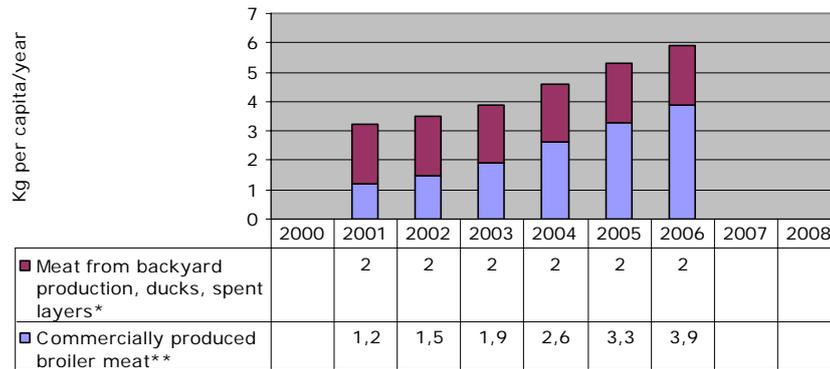
## 2.4 CONSUMPTION

Estimates of poultry meat consumption per capita are provided in figure 6.b.

Figure 6.a: Poultry meat (in average calories/capita/day)

*This information has not yet been sourced*

FIGURE 6.b: Poultry meat (in kg/capita/year)



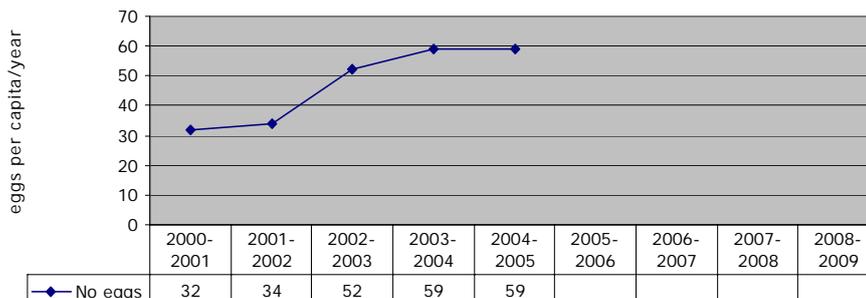
Source: \* Author's estimate. \*\* Estimated on the basis of data provided by Bangladesh Poultry Industries Association

Poultry meat from backyard chicken, ducks and spent layers has been added to commercially produced broiler meat. According to Saleque (2007) the total figure for meat consumed in 2004 is 4.6 kg per capita, suggesting about 2 kg in 2004 came from backyard chicken, ducks and spent layers. It is assumed that this contribution of about 2 kg remains static while the expansion in poultry meat supply comes from commercial broiler meat. In 2006 the total consumption becomes 5,9 kg per capita with 3,9 kg coming from the commercial broiler production sector (66%).

Figure 6.c: Eggs (in average calories/capita/day)

*This information has not yet been sourced*

FIGURE 6.d: Eggs (in eggs/capita/year)

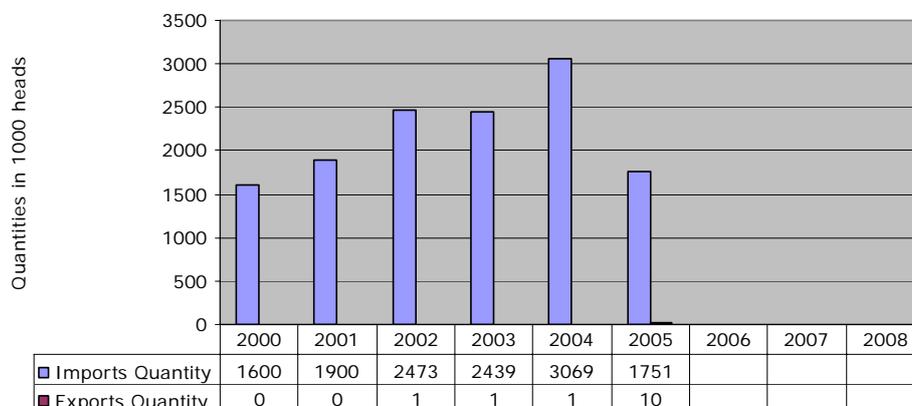


Source: Bangladesh Bureau of Statistics, 2006, p. 411

## 2.5 TRADE

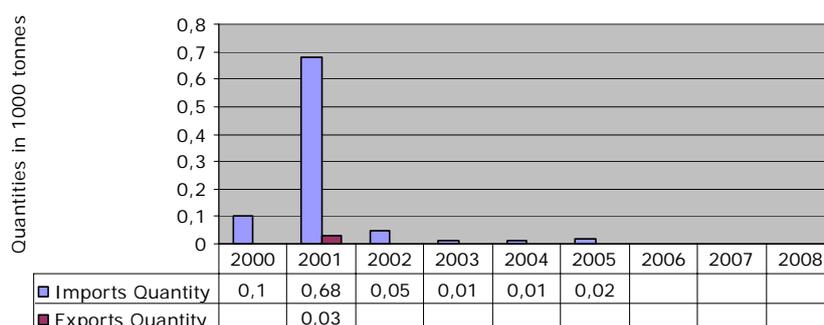
### 2.5.1 Chicken

FIGURE 7.a: Import/Export of live chickens (up to 185 g. only)



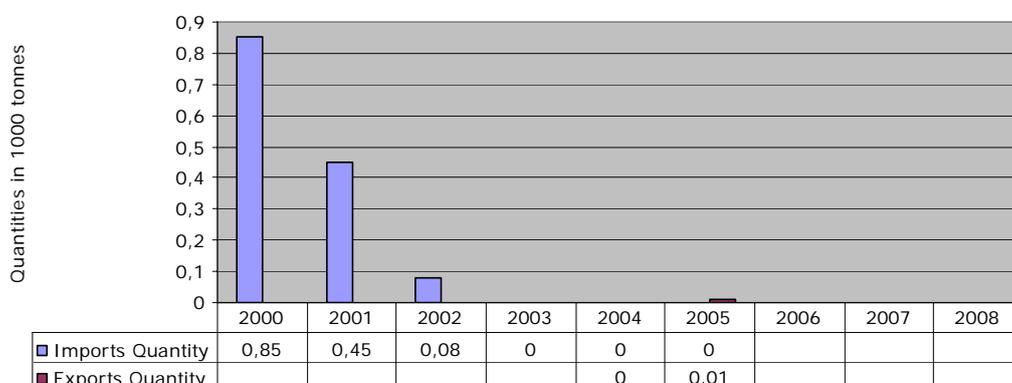
Source: FAOSTAT, August 2008

FIGURE 7.b: Import/Export of chicken meat



Source: FAOSTAT, May 2008

FIGURE 7.c: Import/Export of hen eggs with shells (including hatching eggs)



Source: FAOSTAT, May 2008

The import or export of chicken meat and eggs is very limited. Companies, such as Kazi Farms had begun exporting hatching eggs and day old chicks<sup>8</sup> to India and Nepal before the HPAI outbreak. GOB was applying a cash incentive of 15% to export hatching eggs and day old chicks (Ahmed, 2008). Import of eggs is now banned (see below).

Bangladesh shares most of its border with India and there is considerable trade with India. Smuggled imports from India to Bangladesh are estimated to be 30% of the value of total imports in 2002/03 and the main items imported are sugar and cattle (World Bank, 2006, p. 64). The same report notes that Bangladesh protects its agriculture, which includes livestock:

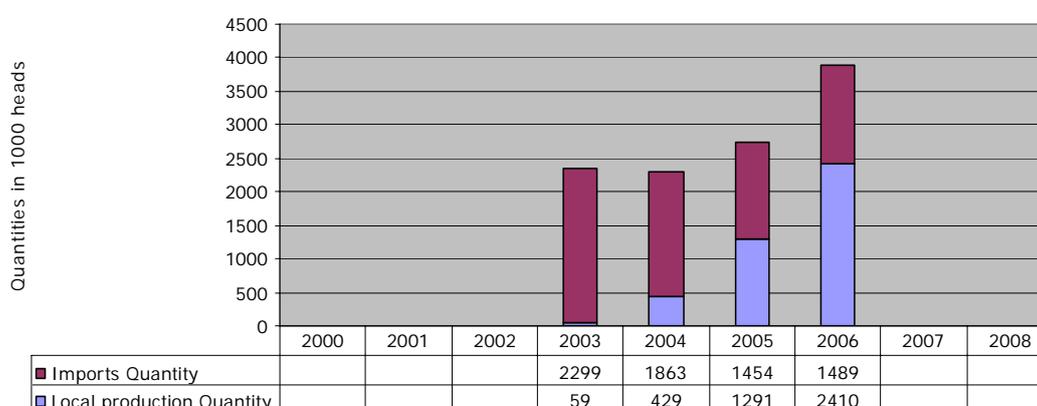
“In contrast to industrial tariffs, tariffs on “agricultural” products (defined in the broad sense to include fisheries, livestock and livestock products, agricultural products and processed foods) were left out of the new tariff reduction program: they came down just a bit in 2004/05 but in 2005/06 on average they were about 40%, almost three times the level of non-agricultural tariffs.” (World Bank, 2006, p. 12).

There are quantitative restrictions on the import of some items. According to the GOB Import Policy Order for 2006-2009<sup>9</sup> import of all kinds of eggs is banned. The same applies to chicks, except day old chicks of Parent Stock and Grand Parent Stock<sup>10</sup> (GOB, n.d.). It is however legal to import poultry feed.

Prices for poultry meat and eggs tend to be lower in India. In June 2008, the price of broilers in India is reported to be US\$ 1.35 per kg in Mumbai against US\$ 1.82 in Bangladesh. For eggs the price in India is US\$ 4.7 per 100<sup>11</sup> against US\$ 7.3 per 100 in Bangladesh (own data).

Presently India is constructing a 4 000 km long barbed wire fence 3 meter high around Bangladesh, which over some stretches may be electrified<sup>12</sup> to prevent smuggling, illegal migration and terrorists.

FIGURE 7.d: Import and local production of day old chickens as parent stock



Source: Saleque, 2007

There is a very clear trend in increase in local production of parent stock day-old chicks from 2003 to 2006. Imports fall from 2003 to 2005. Globally, there is an increase in the total number of parent stock day-old chicks from 2 745 134 in 2005 to 3 898 719 in 2006 or 42%. In 2006 there were five grand parent farms producing 62% of the parent broiler day-old chicks (Saleque, 2007).

<sup>8</sup> [http://www.kazifarms.com/about\\_us.html](http://www.kazifarms.com/about_us.html)

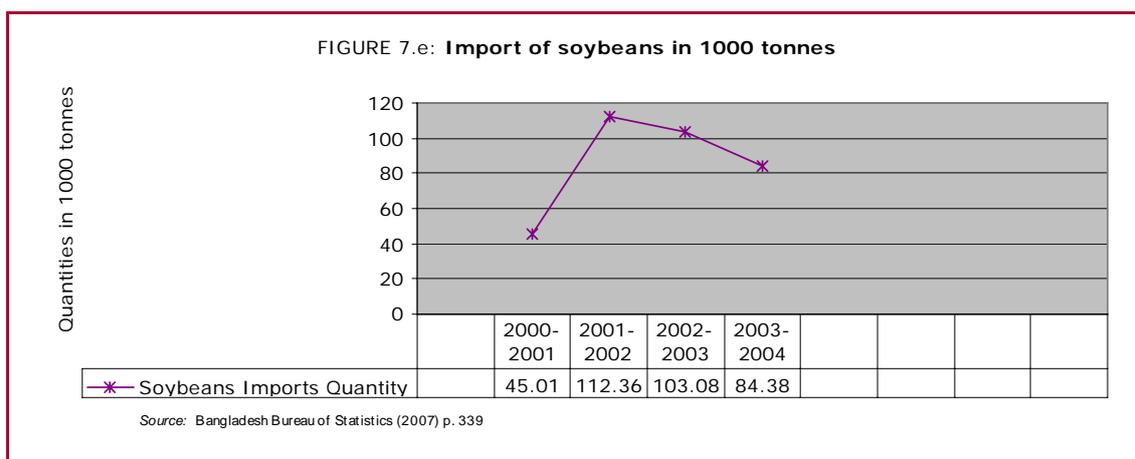
<sup>9</sup> [http://www.mincom.gov.bd/index.php?page\\_id=272](http://www.mincom.gov.bd/index.php?page_id=272)

<sup>10</sup> [http://www.mincom.gov.bd/index.php?page\\_id=272](http://www.mincom.gov.bd/index.php?page_id=272) p. 65 and p. 52.

<sup>11</sup> <http://www.wattpoultry.com/PoultryInternational/News.aspx?id=23914>

<sup>12</sup> [http://en.wikipedia.org/wiki/Indo-Bangladeshi\\_barrier](http://en.wikipedia.org/wiki/Indo-Bangladeshi_barrier)

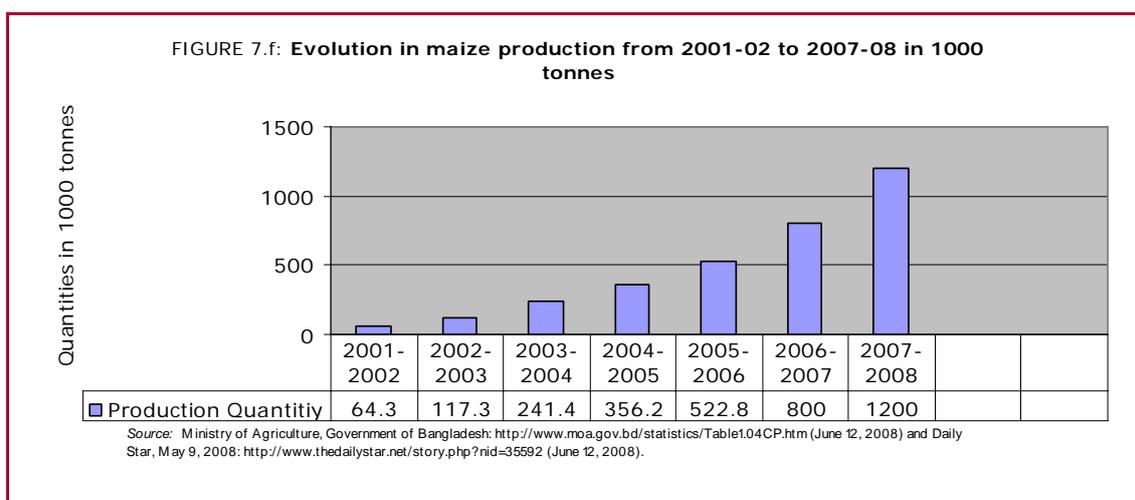
## 2.5.2 Feed



It has not been possible to compile information on poultry feed imports from official statistics, especially with regard to maize. Almost all broiler feed and only 18% of layer feed come from feed mills. 50% of the raw materials in poultry feed are imported (Saleque, 2007).

Bangladesh has been relying on imports for soybeans. Soybeans were first introduced to the area, which is now Bangladesh in 1942 (Yamazaki, 2003) and the NGO Mennonite Central Committee has during the 1970s, 1980s and 1980s researched on the crop, but it is only recently that Bangladesh has started to produce soybeans in quantities that enter the National Statistics. Over the years 2000-01 to 2003-04 the area covered by soybeans was reported to be only 5 to 10 acres, but this increased to 725 acres in 2004-05 (Yearbook of Agricultural Statistics of Bangladesh for 2005, p. 71). However, the production jumped to 44 705 ha in 2005-2006 and has drifted around that level since resulting in a production of some 70 thousand tons (Soybean Project of the Department of Agriculture Extension)<sup>13</sup>. To compensate for the lack of domestic production there were substantial imports of soybeans as shown in figure 7.e.

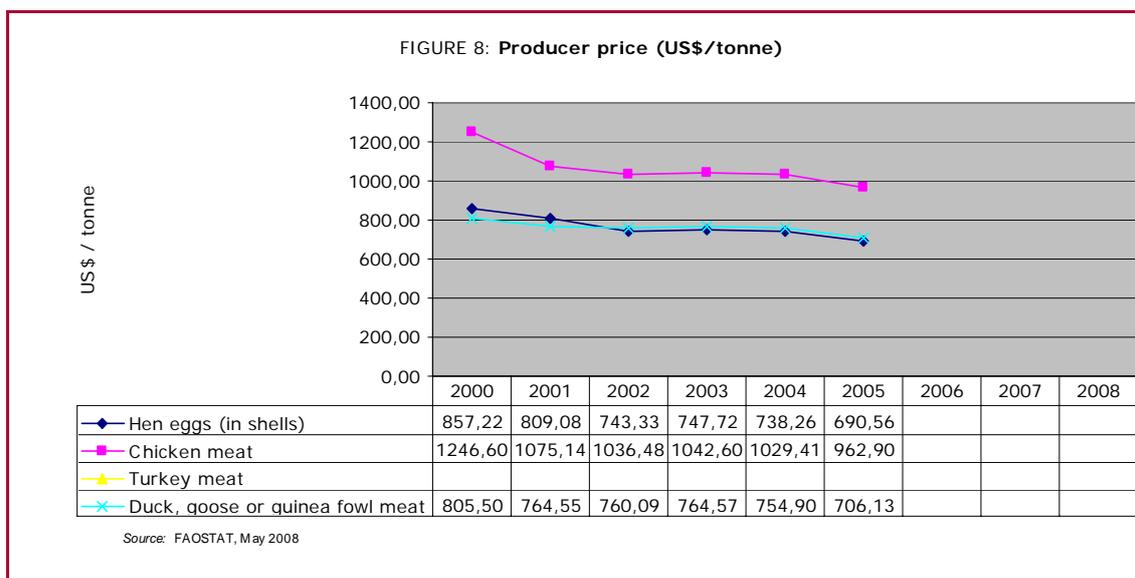
Compilation of data on maize imports was not possible. Maize domestic production hovered around 2 to 3 thousand tons per year since the formation of Bangladesh in 1971 till 1991. It then began to increase from 2001-02 till the present time. This increase has been dramatic from 64.3 thousand tonnes in 2001-02 to 1.2 million tonnes in 2007-08 as is apparent from figure 7.f. A substantial research effort by the Bangladesh Agricultural Research Institute (BARI) with support from CIMMYT seems to be behind these results<sup>14</sup>.



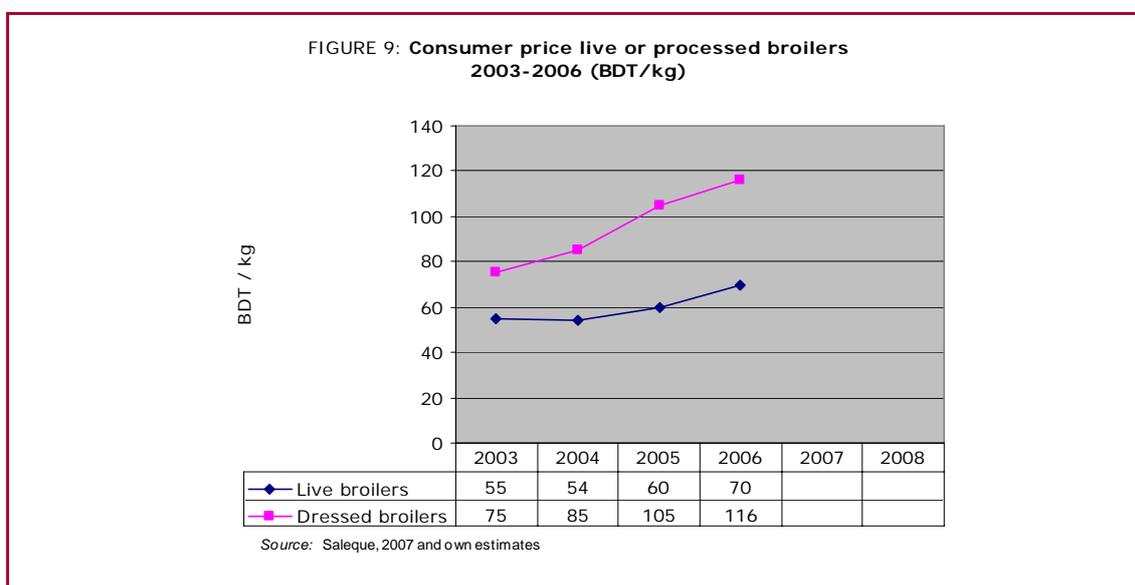
<sup>13</sup> Mr. Edward Mallorie, International Consultant, facilitated this information.

<sup>14</sup> [http://www.rwc.cgiar.org/RSCRCC/2005/Sessions/6/FIROZA\\_Consort.pdf](http://www.rwc.cgiar.org/RSCRCC/2005/Sessions/6/FIROZA_Consort.pdf)

## 2.6 PRICES



Data available from the FAOSTAT data based is provided in figure 8. The major part – more than 95% according to Saleque, 2007 – of poultry meat and eggs are bought and sold by traders coming to the farm or in local markets and the route to the consumer may be through several middlemen, which makes it actually difficult to collect information on farm gate or producer prices. The consumer's price for live broilers is close to the producer's price, while dressed meat prices are at the expensive end of what the consumers' have to pay. A comparison of such prices for the years 2003 to 2006 are provided in figure 9.



The prices of live broilers range from Taka 55 in 2003 to Taka 70 in 2006. In US dollar the price was, however, almost constant as one dollar was valued at Taka 58 in 2003 and Taka 69 in 2006<sup>15</sup>. The price difference between live broilers and processed broilers has grown tremendously between 2003 when it was 36% to 2005 when it has become 75%; but it should be remembered at this point that the quantity out of the total production that is processed is very small and it may well cater to an elite section of the consumers, who are prepared to pay a premium price.

<sup>15</sup> <https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html>

A point that needs to be kept in mind is that there is a price difference between commercial broilers and backyard chicken, which during the author's visit to Bangladesh in May 2008 was about 50% in favour of the backyard chicken.

## Chapter 3

## Poultry production systems

TABLE 4:  
FAO classification of poultry production systems

Sectors (FAO/definition)	Poultry production systems			
	Industrial and integrated	Commercial		Village or backyard
		Bio-security		
		High	Low	
Sector 1	Sector 2	Sector 3	Sector 4	
Biosecurity	High	Mod-High	Low	Low
Market outputs	Export and urban	Urban/rural	Live urban/rural	Rural/urban
Dependence on market for inputs	High	High	High	Low
Dependence on goods roads	High	High	High	Low
Location	Near capital and major cities	Near capital and major cities	Smaller towns and rural areas	Everywhere. Dominates in remote areas
Birds kept	Indoors	Indoors	Indoors/Part-time outdoors	Out most of the day
Shed	Closed	Closed	Closed/Open	Open
Contact with other chickens	None	None	Yes	Yes
Contact with ducks	None	None	Yes	Yes
Contact with other domestic birds	None	None	Yes	Yes
Contact with wildlife	None	None	Yes	Yes
Veterinary service	Own Veterinarian	Pays for veterinary service	Pays for veterinary service	Irregular, depends on govt vet service
Source of medicine and vaccine	Market	Market	Market	Government and market
Source of technical information	Company and associates	Sellers of inputs	Sellers of inputs	Government extension service
Source of finance	Banks and own	Banks and own	Banks and private <sup>16</sup>	Private and banks
Breed of poultry	Commercial	Commercial	Commercial	Native
Food security of owner	High	Ok	Ok	From ok to bad

*Sector 1:* Industrial integrated system with high level of biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity).

*Sector 2:* Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife).

*Sector 3:* Commercial poultry production system with low to minimal biosecurity and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).

*Sector 4:* Village or backyard production with minimal biosecurity and birds/products consumed locally.

<sup>16</sup> Money lenders, relatives, friends, etc.

### 3.1 BACKGROUND INFORMATION

Statistical information available does not allow a classification according to FAO's classification of poultry production systems with different levels of biosecurity as the main criteria. However, Saleque (2007) in his analysis of the poultry industry in Bangladesh distinguished between (i) contract farming or integrated systems, (ii) commercial systems (iii) semi-scavenging and (iv) traditional rural backyard scavenging system. His analysis is used as a basic reference for this section.

### 3.2 SECTOR 1: INDUSTRIAL AND INTEGRATED PRODUCTION

See chapter 3.5.

### 3.3 SECTORS 2 AND 3: OTHER COMMERCIAL PRODUCTION SYSTEMS

#### 3.3.1 Breeding stocks and hatching eggs

The commercial poultry farms are supported by 130 parent stock farms and 8 grand parent farms, which were, however, not always in production (Saleque, 2007) According to the same source, five hatcheries are the most important producers. By early 2008 any import of day-old chicks is for the grand parent and parent farms and not the broiler and layer farms. A significant factor in the growth of parent and grand parent farms appears to have been the protection of the parent stock poultry units from the importation of day-old broiler and layer chicks (GOB, n.d.) according to information collected during interviews.

In 2006 the weekly production of day-old chicks was 5 542 000 broiler chicks and 488 000 layers chicks (Saleque, 2007). In June 2008 – after HPAI outbreaks - the national weekly day-old chick production for layers stands at 350 000<sup>17</sup> or 72% of what it was in 2006.

There is a concentration of the production of day-old chicks and Saleque (2007) reports that in 2006 five grand parent farms produced 62% of the parent broilers.

The government runs a few poultry farms and they have been instrumental in introducing the crossbreed between the Fayoumi female and Rhode Island Red male called Sonali, which is a popular bird in poverty alleviation projects.

#### 3.3.2 Broiler meat

The broiler - and egg production - is in the private sector. A company named "Eggs and Hens"<sup>18</sup> started operating in 1954. But production began in earnest with a government initiative in the late 1970s, when a poultry farm was set up under the Bangladesh Biman Airline company. There was not much expansion during the 1980s. Bessei, in 1990 writes: "There is, with the exception of Biman Airways, no industrial poultry production in Bangladesh". A large number of private companies and NGOs began to invest in poultry in the early 1990s. In March 2008, the Government of Bangladesh reported 41 653 registered farms and estimated that there are 27 757 unregistered farms, mainly small commercial farms, and that the Avian Influenza epidemic, leading to a fall in demand and prices of birds, meat and eggs and increasing feed cost have caused 17 900 farms to close and more may follow (The Daily Star, 2008<sup>19</sup>). In comparison BRAC (Saleque, 2007) in a survey in 2005 found that more than one hundred thousand commercial farms had been established, mainly around the large cities, which is in agreement with section 2.2 above that contains a discussion on the distribution of poultry.

---

<sup>17</sup> <http://www.wattpoultry.com/PoultryInternational/News.aspx?id=23914>

<sup>18</sup> <http://www.thepoultrysite.com/poultrynews/7854/bangladesh-grand-parent-poultry-farm-starts-operation-in-june>

<sup>19</sup> [http://www.thedailystar.net/pf\\_story.php?id=26511](http://www.thedailystar.net/pf_story.php?id=26511)

The BRAC survey found the size distribution of the farms to be as shown in table 4.

TABLE 4:  
Size of commercial farms

Number of birds	Percentage of farms
200 – 500	48%
501 – 1000	26%
1001 – 3000	22%
>3000	4%

Source: Saleque, 2007.

The majority of farms are small with less than 500 birds, while only 4% keep more than 3000 birds.

### 3.3.3 Hen table eggs

The chicken table egg production in broad terms has followed the same evolution as the one described for broilers above, but there are fewer layer than broiler farms. In May 2008, the DLS farm monitoring unit (personal communication) estimated there were 21,712 layer farms and 40,323 broiler farms of which 33 were government farms. In the discussion in connection with figure 5.2 above, it was estimated that about 33% of the eggs in Bangladesh come from the commercial sector.

#### Example of a large commercial company: Kazi Farms

Kazi Farms: [www.kazifarms.com](http://www.kazifarms.com) is the largest private poultry company in Bangladesh. It was founded in 1996 and now is rated to cover 25% of the market for day-old chicks and 20% of the broiler feed. It began exports of hatching eggs and day-old chicks in 2004. Kazi farms have grandparent as well as parent farms. Birds are confined in closed sheds. In 2006, the day-old broiler and layer chicks as well as the poultry feed were sold through a network of 650 distributors spread all over Bangladesh. The network included 7 hatcheries, 80 sales offices and 12 Regional offices. The company has begun to establish its own wholesale and retail stores, which includes several retail outlets in Dhaka city. Kazi Farms maintains alliances with leading world companies such as Cobb-Vantress<sup>20</sup> for the Cobb-500 broiler, Hy-line International<sup>21</sup> for layers and Cargill<sup>22</sup> for feed (Bubli, 2006).

### 3.3.4 Other species

Ducks and pigeons were discussed in sections 2.2.2 and 2.2.3 above.

## 3.4 SECTOR 4: VILLAGE OR BACKYARD PRODUCTION

### 3.4.1 Chickens

It is very common to keep poultry in Bangladesh and surveys show that about 80 – 90% of rural households keep poultry and the very poor tend to keep no other animal than poultry (Dolberg, 2003). Alam (2008) has estimated that in comparison to land and cattle, there is much less inequality in the distribution of poultry and that the Gini coefficient – a measure of equality and inequality – is 0.66 for land, 0.37 for cattle, but only 0.17 for poultry. This was on the basis of agricultural census figures from 1996, but although the figures may be different in 2008, the trends will be the same. The flocks in the villages are small with 3-10 birds and the annual egg production per hen may be between 40 – 60 eggs although the yield can go up to 120 eggs through selection, according to Huque (1999). There are an estimated 140 million birds kept in this system, mainly looked after by women. The production is partly for the household and partly for the market. Rahman (not dated)<sup>23</sup> showed that in the case of eggs, proportionally more eggs were sold by the poorest households than used for consumption, presumably for the cash to be used to buy other

<sup>20</sup> <http://www.cobb-vantress.com/>

<sup>21</sup> <http://www.hyline.com/>

<sup>22</sup> <http://www.cargill.com/>

<sup>23</sup> <http://www.ilri.org/Link/Files/Theme3/Avian%20Flu/bangladesh%20poultry%20systems.pdf>

needed items such as food (Alam, 1997). Poultry products from this system are traded at a premium price in comparison to the commercial broilers and eggs.

**Semi-scavenging system.** A semi-scavenging poultry model was developed in Bangladesh in the late 1970s by the Department of Livestock Services (DLS) and the NGO Bangladesh Rural Advancement Committee (BRAC) with support from the World Food Program. The basic model consists of a supply chain of 7 enterprises - Model Breeders, Mini Hatcheries (see case below), Chick Rearers, Key Rearers, Poultry Workers, Feed Sellers and Egg Collectors. It was used subsequently in three large national smallholder poultry development projects in partnership with the DLS and a number of NGOs. The projects were the smallholder Livestock Development Project I (SLDP I 1992-98), Participatory Livestock Development Project (PLDP 1998-2002) and SLDP II (1999-2003) supported by DANIDA, IFAD, ADB, the Government of Bangladesh and several NGOs and the large World Bank sponsored human nutrition projects and program also draw on these experiences<sup>24</sup>.

The first aim of these projects was not to increase poultry production, but to use poultry as a tool in poverty alleviation for women. Danida as a donor has been involved in many of these projects and a review (Riise et al., 2005) of the experiences stretching over twelve years estimated the income sources of more than 600 women who had been involved in project activities, which enabled a comparative assessment of the income from poultry and income from other sources (table 5).

TABLE 5:  
Monthly income from poultry and other sources

Project	Number of households in sample	Monthly Income from					
		Poultry		Other livestock		Non-livestock sources	
		Number of households	Taka <sup>25</sup>	Number of households	Taka	Number of households	Taka
SLDP-1	232	223	246	98	332	58	162
PLDP	224	196	157	74	155	68	272
SLDP-2	211	205	226	39	227	74	234
<b>Total</b>	<b>667</b>	<b>624</b>		<b>211</b>		<b>200</b>	

Source: Riise et al., 2005.

The study showed that, for poor women, poultry can be an important source of income as many more women keep poultry than other types of livestock.

Some of the extra eggs and poultry meat produced was consumed at home and some was sold and the sale contributed importantly to a diversification of the diet through purchases of milk, fish, vegetables and more rice (see summary in Dolberg, 2003)<sup>26</sup>.

The study concluded:

“Smallholder poultry keeping does contribute to poverty reduction and tends in itself to target poor women, due to the social and production characteristics of the poultry sub-sector. While absolute income increases are fairly marginal, poultry nevertheless facilitates improvements in social status and can – together with other factors – have a catalyzing effect, assisting farmers to graduate out of poverty. “Riise et al. (2005)”.

Particularly in times of increasing food prices as is the case for Bangladesh at the time of writing, such types of income can be important. Since October 2006 till April 2008 the rice retail prices have doubled from Taka 18 to Taka 36 according to The Economist<sup>27</sup>.

### 3.4.2 Ducks

Ducks are mainly kept in the traditional scavenging system, but in fact there is not only one system, but at least two different sub-systems, defined by the absence or presence of large water bodies with large water bodies being associated with big duck flocks from around one hundred to more than one thousand (Khanum et al., 2005). When such water bodies are not present, a household will keep just a few ducks in association with chicken as shown by

<sup>24</sup> [http://www.hki.org/research/pdf\\_zip\\_docs/HFP\\_BD\\_Bulletin\\_2.pdf](http://www.hki.org/research/pdf_zip_docs/HFP_BD_Bulletin_2.pdf)

<sup>25</sup> At the time of the survey one US\$ was equal to 60 Bangladesh Taka

<sup>26</sup> <http://www.fao.org/ag/againfo/programmes/en/ppipi/docarc/wp6.pdf>

<sup>27</sup> Economist April 17, 2008: [http://www.economist.com/world/asia/displaystory.cfm?story\\_id=11058143](http://www.economist.com/world/asia/displaystory.cfm?story_id=11058143)

Rahman (n.d.). In other words land ecology has a strong influence on duck production systems.

Barua and Yoshimura (1997) presented some basic parameters concerning local ducks kept under backyard conditions, which showed age at sexual maturity to be 218 days, adult body weight to be between 1.5 – 2.0 kg and annual egg production to be 60 – 70 eggs.

Production is influenced by season, supplementation and breed.

**Season.** During the July to October rainy season, there will be plenty of feed for ducks to scavenge. In the winter season - November to February – there is moderate feed supply, while the summer March to June produces little duck feed according to crop and gizzard studies by Kabir et al., 2007. Huque (1999) in his survey of 500 households in Chittagong, Dhaka, Dinajpur, Khulna and Sylhet districts used slightly different seasonal divisions, but found that the season October to December produced no ducklings, while ducklings constituted 19%, 23% and 28% of the duck flocks during July-September, January-March and April-June, respectively. In the study (Huque, 1999), it was found that the total number of ducks, including ducklings, was 56% higher in the season April-June, compared to the season with the lowest number from October to December, implying that there is, indeed, a seasonal dimension to duck production, but the same applies apparently even more markedly to chicken production, where the study found chicks to constitute as much as 72% of the total chicken flock in an average household of the survey during January to March. This reflects a much more pronounced seasonality than in the case of ducks. However, in none of the four seasons did the ducks constitute less than 19% of the total chicken population of the surveyed households.

**Supplementation and breed.** Kabir et al. (2007) involved 50 farmers in a 500 days' trial from April 2005 to August 2006 on supplementation in Potuakhali District in the South of Bangladesh. The ducks were of the Jinding breed and each farmer received twenty five day old ducklings with a male to female ratio of 1:6. There were no supplements provided to the ducklings of sixteen farmers, which survived by scavenging. The amount of supplementation was not fixed, but decided on the basis of the feed available for scavenging and consisted of a mixture of wheat, maize, wheat bran, rice polish, soybean meal, oil cakes, vitamins, oyster shells, bone meal etc. The net result was that the supplemented groups received much more feed than the control group (table 6).

TABLE 6:  
Effect of supplementation of scavenging jinding ducks on productivity

Parameter	Supplementation group		
	Control	Level I	Level II
Initial weight (g)	39	39	39
Final weight (kg)	1.46	1.63	1.67
Total dry matter intake (kg)	19	28	33
Days to first egg	141	128	126
Egg production (%)	23	43	46
Average egg weight (g)	57	61	62
Mortality (%)	12	9	9

Source: Kabir et al. (2007).

The results show that the supplemented ducks ate more and as result attained heavier adult weight, matured earlier and began laying eggs at around 126 to 128 days in comparison to 141 days in the case of the un-supplemented and they produced more eggs as their egg production percentage was 43 to 46% compared to 23% for the un-supplemented group. Supplementation produced heavier eggs and resulted in lower mortality, which, however, was not statistically different, while all the other differences were significant statistically at the  $p < 0.01$  level. The calculations on cost and return showed supplementation level I to be profitable, but there was no extra net return achieved by going up to supplementation level II (Kabir et al., 2007).

Other trials have shown (Khanum et al., 2005 and Huque et al., 1993) that egg yields increase with supplementation and that the production without supplementation is in the interval of 10 – 25% egg production per “duck-day”, while it may reach even 60% with supplementation combined with an exotic breed like Khaki Campbell. However, without supplementation exotic breeds will not perform better than the local breeds (Huque, 1999).

### 3.4.3 Other species

Pigeons were discussed in sections 2.2.2. and 2.2.3. above and no reports on their production could be sourced. The same applies to other species.

### 3.4.4 Case study one: microfinance and technical support project

This case study was undertaken before the outbreak of HPAI in Bangladesh and is from the IFAD sponsored Microfinance and Technical Support project (MFTSP) implemented by the Palli-Kama Sahayak Foundation (PKSF).



Rawshan Ara has changed her living standard by hatching eggs without electricity.

She is living in Nilakshi Village of Bajitpur sub-district of Kishoregonj district 200 km to the northeast of Dhaka. Her husband is a tailor. Before joining the project her husband Md. Nuruzzaman was the only one in the family, who earned an income. They were living in a hut and did not have any land. She joined the NGO POPI in 1996 and the size of her first loan was US\$ 30. She invested her loan, partly in her husband's tailor shop and partly in some local ducks and chickens. Subsequently, she increased the sizes of the loans she took and became chairwoman of her microcredit group. She made a new house of tin.

Soon after POPI started the activities of the MFTS project in her area she heard about livestock income generating activities. First, she trained as a poultry worker and started a vaccination program within her village, but she wanted to expand her activities and trained in how to run a rice husk mini hatchery. In the first batch, she got 95 chicks of the Sonali breed from 100 fertile eggs, which she sold to her neighbours. This gave her self-confidence and the profit she earned and the market demand for her products made her see production of chicks as a way to improve the life of her family and herself in addition to the vaccination work.

Subsequently, she faced a problem with scarcity of fertile eggs. She discussed the problem with the staff of POPI and they advised her to establish a Parent Breeder/Model Breeder farm with one male of the Rhode Island Red (RIR) bred for every 9 hens of the Fayoumi breed in order for her to have enough fertile eggs. She agreed and used Fayoumi hens that came from her own hatchery production while POPI supplied her RIR cocks.

She now produces her own fertile eggs and after hatching them, she sells the chicks in her own and nearby villages. Her achievements encouraged other villagers. There are now four Chick Rearing Units (from one day old to 2 months) and 5 duckling rearing units.

### 3.4.5 Case study two: Thengamara Mohila Sabuj Sangha (TMSS) and HPAI.

Background. Thengamara Mohila Sabuj Sangha (TMSS) is a big NGO that uses poultry production as one of its 28 income generating activities. For instance in the Participatory Livestock Development Project-II (PLDP-II), financed by the Asian Development Bank, 250 000 families are involved. 30%, i.e. 75 000 do poultry production. They also participate in other projects like Programme for Monga (Hunger) Eradication (PRIME) and the IFAD sponsored Microfinance and Technical Support Project (MFTSP).

TMSS work in ten districts, 43 sub-districts in the North of Bangladesh

Outbreak in April 2007. TMSS experienced outbreak of HPAI in four farms. One in Bogra with 700 birds, one in Joypurhat with 1200 birds, Naogaon 2500 birds and one in Pabna with 700 birds. They were of Sonali (Fayoumi x Rhode Island Red) and Fayoumi breed.

Stamping out and compensation. When an outbreak was identified, the Upazilla Livestock Officer and the army moved in and stamped out birds in a radius of 1 km of the infected farm. The money took about two months to arrive and the amount was Taka 80 per bird, where it should have been per kg, but the birds were not weighed. Compensation was paid only to the registered farms. No compensation was paid to the owners of the stamped out birds and birds that were attacked by HPAI from small, unregistered backyard farms. Approximate number of birds stamped out: In Bogra was 450, in Joypurhat 1000 and in the other two places it was 400 to 500 each place.

Under-reporting. Government staff attended to the registered farms, but not the unregistered, resulting in many unreported cases.

Prices.

Item	Sonali/Fayoumi			Broiler/commercial layer		
	Before outbreak in April 2007 per kg	Immediately after outbreak in 2007 per kg	May 2008 per kg	Before outbreak in April 2007 per kg	Immediately after outbreak in 2007 per kg	May 2008 per kg
Live broiler	90 -95	90	180	60 – 65	30 – 50	125 – 130
Eggs	Taka 3.5/egg	Taka 3/egg	5 – 5.5/egg	Taka 3.5/egg	Taka 3/egg	5 – 5.5/egg

Social Impact. All poultry producers felt the HPAI one way or another. They felt the fall in prices and it was not considered safe to keep poultry and demand was reduced. All farms registered and unregistered supported by TMSS and other organizations like BRAC stopped production for three months. The TMSS parent farm stopped production for three months after outbreaks in late 2007.

Alternative production. In stead of poultry production many went into beef fattening, goat and sheep rearing and fish cultivation.

Situation in May 2008. About 70% of those who stopped have started again and there are more who show interest in starting again, but the problem is not only fear of HPAI, but also high prices of feed and lack of supply of day-old-chicks.

TMSS parent farm. This farm produces Sonali day-old chicks. The parents are obtained from Department of Livestock Services in Savar. Before the outbreak the farm produced 25000 day old chicks per month that were sold at Taka 15/day old chick. In May 2008 the farm sold 16000-18000 day old chick at Taka 18/chick. They produce Sonali and Fayoumi because they catch the same high price as local chicken and these chicks adjust well with local conditions and the taste is the same as the local chicken. Chicks are sold to women who run chick rearing units with about 400 chicks per unit.

Source of HPAI virus. There were several possibilities mentioned: (i) wild birds, (ii) from across the border from neighboring countries. It was not from the government farms as the birds were obtained two to three years prior to the outbreak.

Awareness raising of the community. TMSS has included a session about HPAI in all training programmes across the different disciplines of TMSS: human health, education, community workers, micro-finance, and agriculture. They started in April 2007 and it is still going on. They use the material prepared by PKSF.

Vaccinators and paravets. TMSS has 700 poultry vaccinators (all women) and 150 paravets to be expanded to 500, who are men and women.

### 3.5 POULTRY VALUE CHAIN ANALYSIS

Documentation available on the poultry value chain in Bangladesh is still very limited, which reflects upon the present section that draws heavily on a report prepared by the USAID sponsored Agro-based Industries and Technology Development Project (ATDP) II (USAID-ATDP II, 2005) and to some degree on Alam et al., (2008) and Centre for Policy Dialogue (2007).

#### 3.5.1 Day-old chicks

Day old chicks are produced in three main systems and sold to producers in arrangements like:

The commercial poultry farms are supported – as explained in the section 2 – by 130 parent stock farms and 8 grand parent farms (Saleque, 2007).

For the semi-scavenging model the day old chicks have mainly come from government poultry farms, NGOs and small private hatcheries (see cases 2 and 3 above) and the backyard system has been self-reliant through brooding hens with very little trade of day-old chicks as most poultry keeping households have produced their own chicken.

USAID-ATDP II (2005, annex III) in its analysis concentrates on the commercial farms and notes that with regard to:

- Grand parent farms: There are shortcomings with regard to technical know-how, which comprises a lack of trained people as well as technologies and a lack of experiences with regard to crisis management and there is a lack of research in genetic engineering.
- Parent farms: Biosecurity is impaired by too many farms located in one geographic location. Baqi and Khyam (2007)<sup>28</sup> mention as one example that in Gazipur district – the district with the highest concentration of commercial birds - near the capital Dhaka there is a bird density of 15073 birds per km<sup>2</sup>. Disease control capabilities are sub-optimal as there are limited diagnostic facilities and the equipment is not sufficient in quality as well as quantity.
- Hatcheries: They lack diagnostic and testing facilities and there is mismanagement of waste. The eggs are not graded according to the age of the mother hen. Other shortcomings are that many of the hatcheries are too small and not economically viable and the association with their customers, i.e. the small farmers is weak.

Government poultry farms have been – and are still – important direct and indirect (as they supply parent stock to NGOs) sources of day-old chicks for the poor women and their families, who are the main target group of the semi-scavenging poultry model. There are not many studies on the government poultry farms, but Hossain (2003) studied five of them in a study that was designed to calculate the prevalence of Salmonellosis and to determine rate of mortality from different diseases and the proportion of mortality due to fowl typhoid and other bacterial diseases. The results reveal that the prevalence of Salmonellosis, especially fowl typhoid and pullorum disease is high.

It is concluded that both studies (USAID-ATDP II (2005) and Hossain, 2003) point at problems of high risk of disease transfer from grand parent or parent farms to the producers.

#### 3.5.2 Chicken meat

The chain that a product like chicken meat – and eggs – has to go through can include several links in Bangladesh. The most common chains are set out in table 7 below based on the results of a survey made on 450 broiler farms reported by Shah et al., 2006.

---

<sup>28</sup> <http://www.unescap.org/icstd/SPACE/Workshops/2007/em-avian-influenza/Avian-Influenza-Bangladesh.pdf>  
Presentation to Regional Expert Meeting on Using Space Technology for Avian Influenza Monitoring and Early Warning in Asia, Bangkok, Thailand, 1-3 August 2007.

TABLE 7:  
Marketing channels for broiler marketing

Marketing channels	No. of farmers	%
Farm – consumer	8	2
Farm – broker – institutional buyer	28	6
Farm – middleman – wholesaler – retailer – consumer	274	61
Farm – middleman – wholesaler – middleman – consumer	140	31
<b>Total number of farmers</b>	<b>450</b>	<b>100</b>

Source: Shah et al., 2006.

The USAID-ATDP II (2005) study found that there was a lack of price monitoring. But daily retail prices are now provided on the Internet by the Department of Agricultural Marketing<sup>29</sup> and the Trade Corporation of Bangladesh<sup>30</sup> for “today’s price” as well as the price a year ago and the change over the year in percentage. At the site [bangladeshpoultry.com](http://bangladeshpoultry.com)<sup>31</sup>, producer egg and broiler prices are provided daily.

The USAID-ATDP II (2005) study went on to record a lack of monitoring of licensed or unlicensed sales of food and drugs.

Specifically with regard commercial broiler farms the USAID-ATDP II (2005) study noted

- *Problems with consistent availability of quality, disease free chicks*
- *High variation on the cost of rearing*
- *Lack of quality feed*
- *Lack of finance*
- *Lack of awareness and training in biosecurity*
- *Vaccinations not effective due to poor quality and storage*
- *Abuse of antibiotics and other medicine*
- *Lack of technical support and diagnostic facilities*
- *No database of prices*

Source: USAID-ATDP II (2005), annex 3.

In other studies contract farming has been in focus (Jabbar et al. [2007] and Begum [2005]).

Jabbar et al. (2007) in their study made the point that “Apart from classical contract farming within vertically integrated enterprises, there are also formal and informal contract arrangements in input marketing and output marketing.”

The same study, undertaken before Avian Influenza broke out in Bangladesh in 2007, showed that there was a high drop out from broiler farming and listed the reasons in the table below:

<sup>29</sup> [www.dam.gov.bd](http://www.dam.gov.bd)

<sup>30</sup> [www.tcb.gov.bd](http://www.tcb.gov.bd)

<sup>31</sup> <http://bangladeshpoultry.com/index.php?base=Egg&keyword=Egg&op=S&PHPSESSID=fde206950c04c20e170e3dff2e55d7c#top>

TABLE 5<sup>32</sup>:  
**Causes of dropping out of poultry farming as reported by a sample of farms**

Perceived main reason(s) for dropping out	% sample
Input price higher than output price/lower price of output/output price not remunerative	81
Day old chicks related problems:	
Price was high	63
Desired quality was not available	51
Timely supply was not available	34
Adequate quantity was not available	31
Shortage of capital	60
High mortality of birds	47
Low productivity of birds	43
Low demand for products in local market	33
Moved into other business	29
Disagreement among family members/partners	26
Difficult to sell in distant markets	17

Source: Jabbar et al., 2007.

The study concluded that “problems with supply of DOCs and of quality drugs appeared to be a major reason for low productivity leading to losses and failure of the business, although other reasons could have also played some role”.

### 3.5.3 Table eggs

The links of the value chain for eggs look much the same as they do for broilers and the weak points that the USAID-ATDP II (2005) study noted for broilers apply to the table egg value chain as well. In addition the USAID-ATDP II (2005) study noted the followings:

- The egg producers association is weak
- A monitoring and information system on prices is missing
- A problem with illegal import of eggs
- No monitoring of egg quality.

However, some changes have occurred since that study in 2005 and The Department of Agricultural Marketing<sup>33</sup> and the Trading Corporation of Bangladesh<sup>34</sup> publish egg prices on the Internet - although prices are not always available for all locations. Prices are also reported in local newspapers.

### 3.5.4 Other species

The market for other species is organised like the chicken markets.

<sup>32</sup> This is a quote from the paper by Jabbar et al. (2007), which explains the table is numbered 5 here.

<sup>33</sup> www.dam.gov.bd

<sup>34</sup> www.tcb.gov.bd

## Chapter 4

# Trade, marketing and markets

It is estimated that 95% of all poultry meat and eggs go through a live market and so far the poultry market has predominantly been a free, unregulated market with most of the products sold unprocessed.

Das et al. (2008) describe how most farmers sell either at the gate or in the local market.

“Two-step transactions are usually observed in the marketing channels; first is the assemblers who accumulate live birds and eggs from local market, and the second is the retailers in urban or semi-urban areas, who collect the products from assemblers and sell to customers.”

“Assemblers either sell the products to wholesalers or transport the accumulated products to the retail market in urban or semi-urban areas. In addition to profit margin, rural assemblers/middlemen, who spend their time and money for the business, also bear the cost of transportation; sometimes incurring and encountering physical losses during the collection and moving the birds or eggs.”

### 4.1 DOMESTIC MARKET

Practically all poultry products produced in Bangladesh are sold on the local market, although before the outbreak of H5N1 there was an emerging, but still small export of day old chickens to Nepal and the Middle East with several of the commercial companies having export plans (Bubli, 2006).

Birds originating from the backyard production system and commercial farms are very often handled together on markets. Different species of birds i.e. wild birds, ducks, pigeons, quails and chicken are mixed. If they are not caged together, then cages with the different species may be stacked upon one another.

The Bangladesh Centre for Communication Programs (BCCP), (2006) in a study of poultry market noted in Dhaka city and Dhamarai Upazila in Dhaka district; In Gazipur town, Sreepur Upazila in Gazipur district; in Habiganj town and Chunaroghat Upazila in greater Sylhet district and in Rajshahi District it was Rajshahi town and Chapainawabganj Upazila. These locations were chosen as (i) most of the poultry farms are located in these areas (ii) smuggled day old chicks usually enter through these areas and (iii) migratory birds visit water bodies which are located there:

- “75% ... poultry that were sold in the market originated from intensively reared farming conditions.
- 66% .... of the markets surveyed, sold more than 200 poultry per day and that included ... broiler and ... backyard poultry. Ducks and pigeons constituted over 40% of the total poultry sold in the market.
- 2/3rd of the respondents (58.3%) caged their birds separately however they stack their cages when they carry from one place to the other. Most of the cages were made of steel wire .... while .... of the cages were made up of bamboo.”

With regard to cleanliness the same study reported:

- “2/3rd of the retailers cleaned their market place daily. However, 75% of the dead birds (8/12) were not found to be removed during cleaning. Despite cleaning efforts, a significant proportion of the poultry market places were kept unclean daily.
- 50% of the respondents used soap as disinfectant while some used bleaching powder.
- 83% of the respondents 10/12 were of the opinion that there is no specific cleaning programme to enforce hygiene in poultry market place.

- Children are mostly employed in slaughtering and eviscerating the slaughtered chicken."

The study reported that "Veterinarians do not visit poultry market and 83% respondents replied that dead chickens have never been tested for any disease. Only 1 respondent had reported about sick birds."

The Department of Agricultural Marketing<sup>35</sup> and the Trading Corporation of Bangladesh<sup>36</sup> publish chicken prices on the Internet, although prices are not always available for all locations.

Alam et al., (2008) included studies of prices received by the farmer and paid by the consumer in their study on the impact of Avian Influenza and the results are in table 8 for broilers.

TABLE 8:  
**Broiler market prices for producers and consumers before, during and after ai situations**

Prices	Unit	Before	During	After
Consumer's purchase price	Taka/100 kg	8050	7153	8636
Net price received by farmers	Taka/100 kg	6657	5535	6945
Difference	Taka/100 kg	1393	1618	1691
Difference as% of farmers' price		21%	29%	24%

Source: Alam et al., 2008.

These results suggest that the consumer will have to pay between 20 to 30% above the price that the farmer receives. For eggs the same study showed a price difference between the price the farmer received and what the consumer paid of 18% to 26%.

The Centre for Policy Dialogue in a report from 2007 made a break up of the value chain for eggs. They mention three intermediaries (before the HPAI outbreak) between the farmer and the consumer based on a survey from the Tejgaon market in Dhaka table 9.

TABLE 9:  
**Value chain – and values - for eggs from consumer to farmer**

Link in the chain	Percentage of price	Price (estimate) – Taka per egg
Farmer	87	2.83
Local buyer	88	2.86
Wholesaler	89	2.89
Retailer	93	3.02
Consumer	100	3.25

Source: Centre for Policy Dialogue, 2007.

According to this study the farmer receives 87% of the price paid by the consumer. The farmers production costs are not available.

According to the Bangladesh Poultry Portal [www.BangladeshPoultry.com](http://www.BangladeshPoultry.com) the price on July 8, 2008 of one kg broiler was Taka 53 to the farmer<sup>37</sup>, while it was Taka 100–110 to the consumer, approximately the double. The price for the consumer is obtained from a different source, i.e. the daily statement issued by Department of Agricultural Marketing on retail prices of "Selected Essential Commodities in Dhaka City"<sup>38</sup>, A doubling of the price from producer to consumer is not unusual in other countries<sup>39</sup>.

<sup>35</sup> [www.dam.gov.bd](http://www.dam.gov.bd)

<sup>36</sup> [www.tcb.gov.bd](http://www.tcb.gov.bd)

<sup>37</sup> <http://bangladeshpoultry.com/>

<sup>38</sup> <http://www.dam.gov.bd/jsp/reportsXL.jsp>

<sup>39</sup> Observation from Denmark by the author

## 4.2 IMPORT

Egg import is banned, but import of day-old chicks to grand parent and parent farms is permitted (GOB), (n.d.) and there is probably some illegal imports of eggs and birds for slaughter from India (World Bank, 2006).

## 4.3 EXPORT

There is no export at the moment of writing because of bans related to the presence of HPAI in the country. There had been some export earlier, although very limited, to places like Nepal and the Middle East. Until the HPAI outbreaks, it was government policy to encourage exports (Bubli, 2006) with cash incentives and tax exemptions for income derived from export.

## 4.4 SLAUGHTERING FACILITIES

Birds may be killed and slaughtered in the market or they may be brought home by the buyer to be slaughtered at home. In either case waste will generally be scattered, unprocessed around the point of slaughter.

It is estimated (Saleque, 2007) that only 5% of the poultry meat consumed in Bangladesh was processed in a modern slaughter house, but the HPAI crisis has led consumers to demand processed chicken to greater degree, according to newspaper reports<sup>40</sup>.

---

<sup>40</sup> <http://crofsblogs.typepad.com/h5n1/2008/04/bangladesh-lear.html>

## Chapter 5

# Breeds

The different poultry production systems in Bangladesh use different poultry breeds or breed combinations.

### 5.1 EXOTIC BREEDS

The commercial system. According to Saleque (2007) the commercial system uses breeds such as for broilers: Hybro-PN, Hubbard Classic, Cobb 500, Hybro-PG, Ross, while for layers it is Bovan Nera, Shaver 579, Hisex white and brown, Bovinegold line and ISA brown.

The grand parent stock is imported and the country relies on breeding work conducted outside the country in the case of birds for commercial farms.

Semi-scavenging system. This system is developed for poor women and through trial and error over the years it has been learned that the exotic commercial breeds do not suit the system. DLS in the 1980s found that a cross between a Rhode Island male and a Fayoumi female stood out and this crossbred was named Sonali (golden). This is seen in the study reported by Rahman et al. (1996) (table 10), where the parent lines Rhode Island Red (RIR) and Fayoumi did as well as the cross between them Sonali under confinement. There was however a marked difference in favour of the crossbred under scavenging conditions, irrespective of the quantity of supplement fed daily (25 g or 75 g).

TABLE 10:  
Rate of lay,% for pure breed and crosses, and hybrid vigour

Feeding system	RIR	Fayoumi	Sonali	Hybrid vigour
Free access, in confinement	46	49	50	+5%
Scavenging + 75g supp.feed	19	20	33	+69%
Scavenging + 25g supp.feed	12	10	18	+64%

Source: Rahman et al. (1996)

In a later trial conducted with the participation of more than 300 women as hosts for the experiment, the Sonali was compared with commercial breeds under semi-scavenging conditions. The Sonali performed well as it had the highest egg production and the lowest mortality (Rahman et al. (1997, table 2)). One additional feature in its favour is that in the market the Sonali goes as a local chicken with the associated premium price.

### 5.2 LOCAL BREEDS

According to Bhuiyan et al. (2005) the village flock of poultry in Bangladesh is dominated by non-descript local chicken and there are smaller populations of Naked Neck, Aseel, Hilly and Red Jungle Fowls. Studies show (Okada et al. [1988] referred to in Bhuiyan et al. [2005]) that the genetic distance between these birds in Bangladesh is small.

There have been several attempts to introduce exotic breeds into the scavenging system, but as concluded by Bhuiyan et al. (2005) after a review of project experiences "...it was noticed that after withdrawal of project activities the crossbred birds failed to be sustained in the villages." The work reported by Sazzad (1992) leads to the same conclusion, and more generally it can be said that there is an important interaction between institutional support and poultry breeds in the sense that without modern institutional support, private or public, it is impossible to see any sustained performance by exotic breeds whether they are introduced through cockrel exchange programs, as fertile eggs or through any other arrangement as they tend to die out under scavenging or semi-scavenging conditions without such support.

A pertinent question to ask at this point is the degree to which the HPAI currently present in Bangladesh has had a negative impact on the local breeds.

There have until May 21, 2008 been outbreaks declared in 47 of the 64 districts in Bangladesh leading to culling of 547 commercial and 42 backyard flocks with over 1.6 million birds being destroyed. Among the culled birds, 78% (1,179,344) were from layer flocks and 22% (341,053) from broiler flocks. Layer birds were also the majority of the birds reported to have died due to infection with HPAI (75% layer and 25% broiler). There are also unreported cases as in all countries that experience HPAI. However, on the basis of the information available it may be concluded that the HPAI has not impacted the local breeds disproportionately and it is likely that local poultry breeds will remain in Bangladesh for some years to come as the pool of native birds is large.

## Chapter 6

# Veterinary health, public health, biosecurity measures

The Department of Livestock Services<sup>41</sup> under the Ministry of Fisheries and Livestock is the organisation in Bangladesh that addresses veterinary issues in the country.

The Department is headed by a Director General, who has five directors (where one designation is principal instead of director) under him with the following responsibilities:

- Director administration: administration, the budget, training, farms, animal health, planning and evaluation, livestock economics, the Dhaka Zoological Garden, the Central Veterinary Hospital and the Central Store of Medicines and Equipment.
- Director of Research, Training and Evaluation: Central and Regional Disease Investigation Centres, vaccine production and quality control, media seed culture, animal nutrition, the veterinary and livestock training institutes.
- Director of Extension: artificial insemination and fodder cultivation, divisional, district and Upazilla (sub-district) livestock officers and district artificial insemination centres.
- Director of Production: Central Cattle Breeding and Dairy Farm, District Dairy Farms, Buffalo Breeding Farm, Dairy and Livestock Development Farm, Goat Development Farm, one Central Duck Breeding Farm, one Central Poultry Farm, two Regional Poultry Farms, twenty-three District Poultry Farms, seven Poultry Rearing Unit, one the Pig Farm and three Regional Duck Breeding Farms.
- Principal: Principal of the Officers Training Institute.

The total number of approved posts in the Department is 8428 of which 1541 are for livestock professionals. According to the Internet site of the Department on July 10, 2008, there were 303 vacancies, leading to active staff strength of 1238.

In table 11 the ratio of the various animal groups to livestock professionals have been estimated, using the figures for animals from 2005-06.

TABLE 11:  
Ratio of animals (2005-06) to livestock professionals working in dls

Type of animal	Number	Livestock professionals	Ratio
Cattle	22 800 000	1238	18 417:1
Buffalo	1 160 000	1238	937:1
Goat	19 940 000	1238	16 107:1
Sheep	2 570 000	1238	2 076:1
<b>Total ruminants</b>	<b>46 470 000</b>	-	<b>37 537:1</b>
Chicken	194 820 000	1238	157 366:1
Ducks	38 170 000	1238	30 832:1
<b>Total poultry</b>	<b>232 990 000</b>		<b>188 198:1</b>

Whether these ratios are small or large depend on factors such as production systems, disease situation, human and animal densities i.e. distances that have to be travelled to get veterinary treatment and economic situation in the country.

<sup>41</sup> <http://www.dls.gov.bd/index.htm>

However, in the present situation whereas HPAI is considered as endemic it seems fair to conclude that the veterinary service is stretched considering requirements for disease surveillance. The Centre for Policy Dialogue in several of its analyses state that there is a need for more veterinarians in the areas with high commercial poultry densities such as Gazipur and Savar.

## 6.1 HIGHLY PATHOGENIC AVIAN INFLUENZA

See also chapter 6.2.1.

Highly Pathogenic Avian Influenza H5N1 was first declared in March 2007 in Bangladesh. Islam et al., (2008) report on the results of a total of 47 avian influenza virus samples that were sent to the FAO/OIE Reference Laboratory for Avian Influenza, the Veterinary Laboratories Agency, Weybridge, U.K to “determine nucleotide sequence of the HA gene segment of 25 isolates. These included 15 isolates from 2007 and 10 isolates from 2008.” Earlier 5 samples were sent to the National Institute for Animal Health (NIAH), Bangkok, Thailand.

The conclusion that Islam et al. (2008) drew from these studies was that

“The origin of HPAI in Bangladesh still remains obscure. Although HPAI isolates from Bangladesh are closely similar to those from Kuwait, Mongolia, Russia and Afghanistan, Bangladesh does not have any poultry trade link with these countries. Therefore, from the findings of the present study poultry trade cannot be blamed for introduction of HPAI in Bangladesh unless a missing common poultry trade link between these countries could be identified. The close similarities between the HPAI isolates of these distant countries would suggest that migratory birds might be responsible for initial introduction of HPAI in Bangladesh.”

### 6.1.1 Bangladesh – ecological context.

There are several factors that make HPAI eradication more difficult in Bangladesh. Some of them are discussed hereunder.

The many wetland areas of Bangladesh<sup>42</sup> are homes to migratory birds, including wild ducks. Bangladesh’s low height above sea level and rivers running through the country on the way to the Bay of Bengal makes it a deltaic country with large areas covered by water in the rainy season. There are many similarities between Southern China and Bangladesh with regard to factors such as: high human population density, the extensive presence of ponds and deltas, rice cultivation, large areas that are seasonally under water and the presence of ducks and chicken in the same households. This is relevant since there are discussions on whether Southern China is the epicenter of HPAI (for example: Shortridge and Stuart-Harris, 1982).

Gilbert et al., (2008) published results of mapping exercises on H5N1 occurrences in Southeast Asia. The authors concluded that similar environmental factors had high relevance not only in Bangladesh, but in the entire Bengal region made of both Bangladesh and the state of West Bengal in India. The core of the findings of Gilbert et al. (2008) is provided in box 1.

**BOX 1: Association between environmental variables and the presence of H5N1 (Gilbert et al., 2008)**

*“This article analyses the statistical association between the recorded HPAI H5N1 virus presence and a set of five key environmental variables comprising elevation, human population, chicken numbers, duck numbers, and rice cropping intensity for three synchronous epidemic waves in Thailand and Vietnam. A consistent pattern emerges suggesting risk to be associated with duck abundance, human population, and rice cropping intensity in contrast to a relatively low association with chicken numbers.”*

The 144 million people living in Bangladesh are part of the 220 million population of Bengal, a geographical area unified by a common language Bengali. The population density in Bangladesh at 1075 people per km<sup>2</sup> is among the highest in the world, but not much higher than West Bengal, which has a density of around 900 people per km<sup>2</sup>. Poultry density in Bangladesh is high at 1194 chicken per km<sup>2</sup> (1460 per km<sup>2</sup> when all domesticated birds, mainly ducks, are included). Bangladesh is reported to have a duck population of 38 million

<sup>42</sup> [http://en.wikipedia.org/wiki/Category:Wetlands\\_of\\_Bangladesh](http://en.wikipedia.org/wiki/Category:Wetlands_of_Bangladesh)

(figure 4), while West Bengal is one of the Indian states with the highest number of ducks. According to the 2005 Bangladesh Agricultural Sample Survey, the cropping intensity is 180 in Bangladesh, while it is 174 in West Bengal<sup>43</sup> and in both geographical areas rice dominate, occupying more than 80% of the total cropped area. In other words factors such as rice cropping, presence of ducks and high human population density match with the findings by Gilbert et al., (2008) for Thailand and Vietnam.

Other factors can be mentioned. The Bengal region is home to two megacities, which may contribute to the presence of H5N1. The Bangladesh capital Dhaka has more than 16 million inhabitants and Kolkata in West Bengal has more than 17 million inhabitants. Megacities can be distinguished by rapid growth, formal as well as informal economies, poverty, low law enforcement and social fragmentation. In other words it is a huge challenge to implement the maintenance of government rules and regulations with regard to transport, hygienic keeping of poultry in farms and poultry products in sales outlets, which in turn may influence the ability to control zoonotic diseases.

There is a combination of factors, common to the region, that favor the presence of the H5N1 virus and will make it difficult to locate, contain or eradicate it.

## 6.2 OTHER MAJOR POULTRY DISEASES

Saleque (2007) mentions that the rapid growth of the commercial sector has brought a number of diseases with it and that in general bio-security ought to be improved. Among the diseases he lists are Newcastle disease, Duck Plague, Infectious Bursal Disease or Gumboro, Marek's disease, Fowl Pox, Leucosis, Infectious Bronchitis, Fowl Cholera etc.

A team of researchers from the Bangladesh Livestock Research Institute (Giasuddin et al., 2002) examined a total of 1653 dead or sick birds from commercial as well as backyard production systems during the period January 1999 to December 2000. The birds were "received from all over the country" and there is no geographical break down. The main results are in table 12.

TABLE 12:  
Major poultry diseases in Bangladesh

Disease	Year								Total	
	1999				2000					
	Layer		Broiler		Layer		Broiler		Number	%
	Number	%	Number	%	Number	%	Number	%		
Aflatoxicosis	145	26	203	39	42	12	66	26	456	28
Infectious Bursal Disease	51	9	68	13	30	9	46	18	195	12
Newcastle	36	7	33	6	31	9	24	10	124	8
Salmonellosis	28	5	1	0	57	17	6	2	92	5
Fowl Cholera	20	4	0	0	27	8	4	2	51	3
Chronic Respiratory Disease	55	10	29	6	36	11	24	9	144	9
Colibacillosis	23	4	18	4	15	4	17	7	73	4
Coccidiosis	25	5	20	4	16	5	3	1	64	4
Nutritional deficiency	75	13	67	13	38	11	25	10	205	12
Others*	45	8	54	11	31	9	31	12	161	10
Unidentified	49	9	22	4	10	3	7	3	88	5
<b>Total</b>	<b>552</b>	<b>33</b>	<b>515</b>	<b>31</b>	<b>333</b>	<b>20</b>	<b>253</b>	<b>15</b>	<b>1653</b>	<b>100</b>

Source: Giasuddin et al., (2002)

\* Others: Fowl Pox, Avian Leucosis, Parasitic Disease, Staphylococcosis, Eggs Drop Syndrome etc.

The data presented in table 12 must be read with the understanding that they are not collected in a randomized way, but obtained from birds that were purposely brought to the Bangladesh Livestock Research Institute by the owners of the birds, veterinarians or staff of development projects, who needed a diagnosis. Yet, the data does give an indication on poultry diseases present in Bangladesh.

<sup>43</sup> [http://www.ipni.net/ppiweb/eindia.nsf/\\$webindex/611F74913BDFD7E3852569D300478046?opendocument&navigator=West+Bengal](http://www.ipni.net/ppiweb/eindia.nsf/$webindex/611F74913BDFD7E3852569D300478046?opendocument&navigator=West+Bengal)

Disease and death of poultry is often related to feed. Aflatoxicosis accounts for 28% of the cases, while nutritional deficiencies account for another 12%. In a comparison that is not contained in the table above Giasuddin et al., (2002) show that in terms of sero-prevalence difference between birds from commercial and backyard systems respectively, the incidence of Infectious Bursal Disease is lower in indigenous birds (56% against 80% for commercial chicken). The same applies to the incidence of Salmonella Pullorum (12% against 56%). There was also much less Chicken Infectious Anemia in the native than in the commercial chicken (3% compared to 22%). In both the commercial and the native chicken with regard to Newcastle disease the sero-prevalence was above 90%.

### 6.2.1 High mortality due to predators – link to wildlife

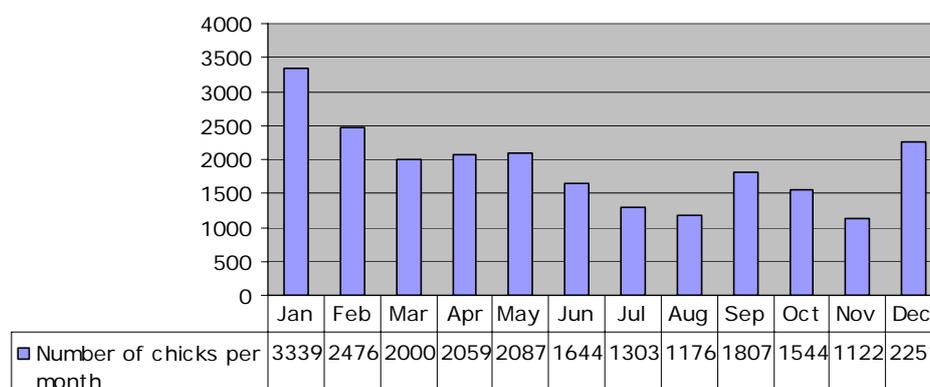
One aspect that the data in table 12 does not account for is the heavy mortality in very young chicks caused by predators. It has long been recognised that predators are a big problem in chick raising under scavenging conditions (together with nutrition and diseases) and that is one important argument in support of the chick raising component of the Bangladesh semi-scavenging poultry development model. Helmrich (1983) in his research on backyard poultry production in Bangladesh was probably the first to put some figures on the phenomenon and he showed a very high mortality in young chicken due to predation, especially after the age of 4 to 5 weeks, when the chicks begin to move away from the protection of the mother hen and scavenge on their own, thereby becoming easy prey to the predators. According to Helmrich (1983) the result was that only two out of ten chicks reached adult life.

Recently, Biswas et al. (2008) have examined the question in 80 smallholder households over a one year period (Sept. 2003 – Aug. 2004) in the life of the chick from the day of hatch till 60 days or two months of age. The study was done under the conditions of a poultry development project, where one component was to use broody hens of local breed to raise chicks and supplementary feed offered inside an enclosure for some of the day, the likely implication being that mortality in this study was lower than in the backyard, scavenging system without any project interventions.

Nevertheless, Like Helmrich (1983) Biswas et al. (2008) found mortality due to predation to be higher in the second than in the first month of the life of the chick for the same reasons, i.e. the chick began to move away from the mother hen and outside her protective reach. The main predators were crows, feral dogs, eagles, foxes, jackals, mongooses, rats and wild cats with crows, eagles and mongooses accounting for 21%, 12% and 18% or a total of 51% of the chicks killed. Losses due to predation were almost as high as losses due diseases (ratio of 83:100).

An important conclusion in the present context, but apparently unexplored is that young chicks caught by predators seem to become an important link to wildlife and may therefore serve as a pool of virus for the spread of diseases like HPAI or other diseases. Season may be added as a dimension as the number of chicks hatched were high in the cold months December to February (figure 10) and continued to be comparatively high through March, April and May. Combined these six months account for 62% of the chicks hatched in the study by Biswas et al. (2008) confirming the seasonality reported by Huque (1999).

FIGURE 10: Seasonality: Number of chicks by month



Source: Biswas et al. 2008.

HPAI tends to occur in the cold months (Sims and Narrod, 2007), but any link between the seasonality of chick (or duckling) production on the backyard system and HPAI occurrence has not been reported although it has been reported recently from Bangladesh that HPAI in commercial units was preceded by high mortality in backyard chicks (Osmani et al., 2008). The link between backyard poultry and wild life via young – and adult – chicken killed by predators may well be reciprocal, i.e. the predators bringing diseases into chicken flocks and the captured chicken bringing diseases to the predators.

These possible links might deserve closer study as the number of predated chicks – and ducklings – run into millions every year.

### 6.3 BIOSECURITY MEASURES

For Bangladesh, USAID-ATDP II (2005) in its analysis concentrates on the commercial farms and makes observations on problems with biosecurity, among other problems:

- Parent farms. Biosecurity is impaired by too many farms located in one geographic location. Baqi and Khyam (2007)<sup>44</sup> mention as one example that in Gazipur district – the district with the highest concentration of commercial birds - near the capital Dhaka there is a bird density of 15073 birds per km<sup>2</sup>. Disease control capabilities are sub-optimal as there are limited diagnostic facilities and the equipment is not sufficient in quality as well as quantity.
- Hatcheries. They lack diagnostic and testing facilities and there is mismanagement of waste. The eggs are not graded according to the age of the mother hen. Other shortcomings are that many of the hatcheries are too small and not economically viable and the association with their customers, i.e. the small farmers is weak.
- Grand parent farms (annex three in USAID-ATDP II, 2005) that there are shortcomings with regard to technical know-how, which comprises a lack of trained people as well as technologies and a lack of experiences with regard to crisis management and there is a lack of research in genetic engineering.

Government poultry farms have been – and are still – important sources of day-old chicks for the poor women and their families, who are the main target group of the semi-scavenging poultry model or they provide grand parent stock to NGOs that run parent farms. There are not many studies on the government poultry farms, but Hossain (2003) studied five of them in a study that was designed to calculate the prevalence of Salmonellosis and to determine rate of mortality from different diseases and the proportion of mortality due to fowl typhoid and other bacterial diseases. The results reveal that the prevalence of Salmonellosis, especially fowl typhoid and pullorum disease is high.

The Government's Livestock Policy from 2007 is critical of the biosecurity situation as it states:

*"While the growth of the poultry industry has contributed to economic growth and income of commercial farmers, indiscriminate and unplanned growth of breeder farms and commercial poultry farms, particularly in and around cities and towns is creating environmental hazards. There are at present no guidelines for environmental protection and bio-security when establishing poultry farms. The use of antibiotics in feeds is thought to be common and a cause of public health concern."* GOB (2007, p.9)

It is concluded that there is a strong need to improve biosecurity in commercial and government poultry farms.

---

<sup>44</sup> <http://www.unescap.org/icstd/SPACE/Workshops/2007/em-avian-influenza/Avian-Influenza-Bangladesh.pdf>. Presentation to Regional Expert Meeting on Using Space Technology for Avian Influenza Monitoring and Early Warning in Asia, Bangkok, Thailand, 1-3 August 2007.

## Chapter 7

# Current policies, legal framework

The present livestock policy was formulated in a document from 2007 (GOB, 2007).

The general objective of the policy is stated to be:

*“To provide the enabling environment, opening up opportunities, and reducing risks and vulnerability for harnessing the full potential of livestock sub-sector to accelerate economic growth for reduction of rural poverty in which the private sector will remain the main actor, while the public sector will play facilitating and supportive role.”*

According to the general objective it is thus the role of the livestock sector to contribute to economic growth by being a tool to reduce poverty and this should happen in the private sector with the public sector facilitating and supporting the process.

This leads to the following specific objectives:

- *“To promote sustainable improvements in productivity of milk, meat and egg production including processing and value addition;*
- *To promote sustained improvements in income, nutrition, and employment for the landless, small and marginal farmers; and*
- *To facilitate increased private sector participation and investments in livestock production, livestock services, market development and export of livestock products and by-products.”*

While all the specific objectives require further work and refinements, there are subjects on which this may be needed in particular i.e. on modalities for processing, livestock services, market development and export and quality control on a range of subjects as stated in the livestock policy document (see below).

### 7.1 POULTRY IN THE LIVESTOCK POLICY

The policy sees a role for (i) the pro-poor semi-scavenging models developed in Bangladesh, (ii) community based organizations (CBOs) and (iii) producer organizations as well as (iv) commercial poultry production, but lists a number of constraints that need to be addressed such as:

*“(i) lack of infrastructure beyond the Upazilla (sub-district) Head Quarters for providing services to poultry farmers; (ii) shortage of skilled manpower; (iii) shortage of quality chicks and breeding materials; (iv) shortage of poultry feed/feed ingredients and high prices; (v) poor quality of inputs; (vi) lack of quality control facilities for medicine, vaccines and biological products, feed and feed ingredients, chicks, eggs and birds; (vii) drug and vaccine residues in poultry meat; (viii) shortage of vaccines; (ix) lack of organized marketing systems; (x) poor provision of veterinary services; and (xi) insufficient credit and capital especially for the poor. The possible threat of Avian Influenza exacerbates some of these concerns and shortcomings and would require additional measures to be taken.” (GOB, 2007, p. 9)*

The livestock policy in the 2007 document is in agreement with the Bangladesh Poverty Reduction Strategy Paper (PRSP) (GOB, 2005) and can be seen as an elaboration of what was stated in the PRSP.

## 7.2 LEGAL FRAMEWORK

The Legal Framework for animal as well as human health is presented and discussed in the National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan for Bangladesh from 2006 (GOB, 2006) and repeated in the report on a rapid assessment for the control of HPAI in Bangladesh by the FAO Crisis Management Centre (FAO, 2007).

*"Bangladesh Diseases of Animals Act, 2005, and Bangladesh Animal and Animal Product Quarantine Act, 2005, Bangladesh Wildlife (Preservation) (Amendment) Act 1974 are the three main legal instruments for keeping Bangladesh free from HPAI/H5N1 in animals and enables the control and eradication of the disease in case of an outbreak. Moreover, Bangladesh Penal Code (BPC), Bangladesh Customs Act 1969 and Imports and exports (Control) Act, 1950 Section 3A are used for quarantine and import bans respectively. According to Bangladesh Diseases of Animal Act, 2005, HPAI/H5N1 is a notifiable disease. The Wildlife Act makes killing, catching, poaching and illegal trade of wildlife a punishable offence. While these legal instruments are in place, they are not fully implemented and enforced prior to and in the event of a scenario of rapid spread of the disease is needed. The main constraint here would be appropriately-trained personnel, and financial resources to fully implement these laws."*

Overall, the livestock policy document (GOB, 2007, p.9) notes that while

*"Laws and Regulations are essential for high quality service delivery and quality assurance of products for trade. Some laws and regulations are in place but overall regulatory framework and implementation remain very weak."*

With regard to human health hope is placed on the International Health Regulations<sup>45</sup>, which came into full effect in 2007 to ensure reporting of outbreaks to the international community.

---

<sup>45</sup> See: <http://www.who.int/csr/ihr/en/>

## Chapter 8

# Analysis

### 8.1 CURRENT STRENGTHS AND WEAKNESSES OF THE POULTRY SECTOR

#### *Strengths*

In the introduction of the National Livestock Development Policy document (GOB, 2007) it is pointed out that growth in the livestock sector is high in Bangladesh and in 2004-05 the growth rate in GDP for livestock was the highest of any sub-sector at 7.2% compared to 0.2% for crops and 3.7% for the fisheries sub-sector. As shown by Alam (2008, p. 185) chicken among all livestock is the most equally distributed species. In the traditional, semi-scavenging and small commercial systems, women, control the production. Poultry production is a tool for both poverty alleviation and better gender equity.

#### *Weaknesses*

The National Livestock Development Policy document (GOB, 2007) not only list strengths, but also a number of constraints or weaknesses, which need to be addresses as mentioned above in section 7.1 on poultry in the livestock policy.

The USAID Agro-based Industrial and Technology Project<sup>46</sup> lists a number of problem areas in a report on Issues and Interventions in the Poultry Sector from 2005. Some are listed below, but any interested reader is recommended to consult the report as it contains very detailed comments from a stakeholder validation workshop concerning different categories of farms such as grand parent, parent, broiler and layer, hatcheries, training, traders, medical services, processors and feed mills. Some of the points made are:

- Lack of comprehensive poultry policy guideline to ensure proper implementation of rules and regulations.
- Weak association of the poultry farmers across the entire value chain.
- Lack of technical know-how, both technologies as well as trained people to handle the technology.
- Maintenance of biosecurity.
- Management of operations.
- Lack of trained manpower (technical, medical, management) to facilitate training programs at all levels.
- Lack of proper management information system regarding demand, pricing, new product, feed, medication, manufacturers (poultry, feed, medicine & vaccine).
- Lack of adequate laboratory testing facility to quality control of feed, medicine, chicks and\_disease control.
- Improper handling of medicine and vaccine.
- Knowledge and practice on quality standards for feed, medicine, vaccination, and chicks.
- Disaster management preparedness by actors across the production chain.

Other weaknesses listed by the GOB (2007, p. 10) Livestock Policy paper relate to the fact that no registration is required for feed additives such as toxins binder, antibiotics, and vitamin- mineral premixes, animal protein and that most of the drug traders and shop keepers have no formal training on drug handling, transportation, storing and dispensing,

<sup>46</sup> [http://www.usaid.gov/bd/files/atdp\\_poultry.pdf](http://www.usaid.gov/bd/files/atdp_poultry.pdf)

and readily sell drugs such as antibiotics, hormones, and sedatives across the counter without prescription.

## 8.2 PROSPECTS OF THE POULTRY SECTOR OVER THE NEXT FIVE YEARS

HPAI is now endemic in Bangladesh and this makes it appropriate to discuss the future prospects of the poultry sector under (i) a best case and (ii) a worst case scenario.

However, before going into details on the scenarios, the expected economic development in Bangladesh is presented as this will determine the demand for poultry products, whether domestically produced or imported (Upton, 2008).

Rahman (2006) in his paper to the conference "Asia 2015: Promoting Growth, Ending Poverty", observes economic growth in Bangladesh in 1970s was 1-2%, in the 1980s 3-4% and 4-5% in the 1990s to over 5% in the years after 2000, implying a steady, although not outstanding economic performance over the years, irrespective of the political turmoil that the country has suffered now and then. Ms. Hua Du after 6 years as country director for the Asian Development Bank upon her departure from Bangladesh noted with due acknowledgement to the impacts that floods and other "normal" natural disasters may cause:

"With the current growth trends, the country has the potential to reach the threshold of a middle income country by the year 2020." Du (2008).

Upton (2008) has classified countries according to income group and the associated levels of per capita poultry meat and egg consumption (table 13). There is a marked jump in consumption when a country moves from the low income country category, as Bangladesh is at the moment, to the lower middle income category, which Bangladesh may become in the not too distant future.

TABLE 13:  
Mean per capita incomes and consumption of poultry meat and eggs, by country income categories

Income group	Mean GNI per capita (\$US)	Mean poultry meat consumption (kg/year)	Mean eggs consumption (kg/year)
Low income	585	2.81	1.30
Lower middle-income	1923	14.04	5.70
Upper middle-income	5634	30.06	8.64
High income	35,264	27.80	10.71

Source: Upton, (2008)

Currently, the annual per capita consumption is around 6 kg for poultry meat and 3 kg for eggs. Demand will grow fast with economic development and the country moving towards the lower middle-income category. Figures from table 13 show an average annual per capita consumption in this category of countries of 14 kg for poultry meat and 5.7 kg for eggs. Situation will vary between countries.

### Best case scenario

In the best case scenario, economic growth and hence demand for poultry products will evolve as described in the section above and HPAI or any other disease will not become a major problem.

A second important assumption is that domestic production will continue to benefit from governmental protection. Presently, GOB Import Policy Order for 2006-2009<sup>47</sup> bans import of all kinds of eggs and chicks, except day old chicks of Parent Stock and Grand Parent Stock<sup>48</sup> (GOB, n.d.). Other policy support includes tax exemptions for poultry farms and a waiver of all customs duties on poultry feed, medicine, capital machinery and spare parts (Centre for

<sup>47</sup> [http://www.mincom.gov.bd/index.php?page\\_id=272](http://www.mincom.gov.bd/index.php?page_id=272)

<sup>48</sup> [http://www.mincom.gov.bd/index.php?page\\_id=272](http://www.mincom.gov.bd/index.php?page_id=272) p. 65 and p. 52.

Policy Dialogue, 2008a, pp.23-24 and 2008b, p.9). It was shown in the section on trade that there is a price difference in favour of the Indian poultry products. Products from Brazil are even more competitive.

In the best case scenario the commercial type of poultry production will expand with the use of specialised layer and broiler breeds to which may be added in country progeny testing to make sure that the breeds used are able to perform well under the conditions of Bangladesh. In this situation there will be scope for the broiler as well as the egg production to expand.

With regard to feed the present trends in maize cultivation are expected to continue and may lead to self-sufficiency, while the protein supply is likely to continue to depend on imports to a large degree and therefore world market prices.

Bangladesh has a comparative disadvantage with countries that are better endowed with natural resources like available land for poultry feed production. The availability of highly qualified specialised managers and good management practices are of great importance for the commercial poultry sector in Bangladesh to control its costs of production in today's environment. The comparison with Brazil is illustrative. Brazil has a population density of 22 people per km<sup>2</sup> against 1075 km<sup>2</sup> for Bangladesh and, besides good management capacities, plenty of land that can be used for poultry feed production (Upton, 2008) implying a comparative advantage in economic terms that has to be made up in Bangladesh by other factors like efficient management of all links of the production chain. This is a major challenge.

#### ***Worst case scenario***

In the worst case scenario, economic growth and demand may be negatively affected by natural calamities, climate change and political unrest. HPAI or some other poultry disease will become a major problem that will curtail domestic production and it may be commercial egg production that will be worst effected as it is the commercial egg laying farms that have been worst effected by HPAI due to their longer production cycle and greater risk of exposure to the virus in comparison to the shorter cycle of the broiler production. The shorter cycle of this type of production also makes it a more flexible type of production that can be closed or started up with short notice subject to any changes in market opportunities.

However, in order to meet the demand for poultry products that will be caused by population growth and moderate economic progress the government will decide to cease protection of the poultry sector and open up for imports of poultry meat and egg adding to the pressure that the poultry sector may be under due to HPAI (or any other disease).

In that case, it is difficult to see that the commercial sector will survive and it is likely that what will remain of poultry production will be the backyard system in rural areas.

## Annex I

# Who is who (contact list)

Bangladesh is so large in terms of people and organisations that the list below cannot be exhaustive. However, those mentioned can themselves provide useful information or they can be used to ask for advice about the location of specific organisations.

### Government

Category	Ministry
Name	Ministry of Fisheries and Livestock
Address	Dhaka, Bangladesh
Phone	+ 88 2 7164700
Fax	N/A
Email	<a href="mailto:info@dls.gov.bd">info@dls.gov.bd</a>
website	<a href="http://www.mofl.gov.bd/">http://www.mofl.gov.bd/</a>

Category	Department
Name	Department of Livestock Services
Address	Pashu Sampad Bhavan, Kamar Bari, Farmgate, Dhaka-1215, Bangladesh
Phone	+ 88 2 913568, 9114587
Fax	+ 88 2 9135706
Email	<a href="mailto:info@dls.gov.bd">info@dls.gov.bd</a>
website	<a href="http://www.dls.gov.bd/">http://www.dls.gov.bd/</a>

Refer to section 6 for more details.

Category	Research Institute
Name	Bangladesh Livestock Research Institute
Address	Bangladesh Livestock Research Institute, Savar, Dhaka-1341, Bangladesh
Phone	+88 2 7791676, 7791674
Fax	N/A
Email	<a href="mailto:dglbri@bangla.net">dglbri@bangla.net</a>
website	<a href="http://www.blri.gov.bd/">http://www.blri.gov.bd/</a>

The mandate of the Institute is to conduct research on livestock. It hosts the National Reference Laboratory for Avian Influenza. The Institute is affiliated the Ministry of Fisheries and Livestock.

Category	Research and Training
Name	Poultry Research and Training Centre
Address	Chittagong Veterinary & Animal Sciences University Khulshi, Zakir Hossain road, Kulshi, Chittagong, Bangladesh
Phone	+ 88031659093
Fax	N/A
Email	<a href="mailto:principalcgvc@yahoo.com">principalcgvc@yahoo.com</a>
website	N/A

This Centre is new and set up in 2008 with support from Danida through DLS. The overall objectives of the Centre are "Better animal health service provision to the ultimate target group, the poor farmers, through enhanced communication and collaboration between private and public stakeholders in the poultry and livestock sector" The immediate outputs are better national prevention and control of Highly Pathogenic Avian Influenza and other contagious poultry diseases.

Category	Apex microcredit funding and capacity building organisation
Name	Palli Karma-Sahayak Foundation (PKSF)
Address	PKSF Bhaban, Plot: E-4/B, Agargaon Administrative Area, Sher-e-Bangla Nagar, Dhaka – 1207, Bangladesh
Phone	+ 880-2-9126240-3, 9140056-9
Fax	880-2-9126244
Email	<a href="mailto:pkssf@pkssf-bd.org">pkssf@pkssf-bd.org</a>
website	<a href="http://www.pkssf-bd.org">www.pkssf-bd.org</a>

Palli Karma Sahayak Foundation in English means "Rural Employment Support Foundation". Although PKSF's primary purpose is to work with microfinance and supports rural poultry development work as through the loans and specifically through projects like the IFAD sponsored Microfinance and Technical Support Project and the Asian Development Bank sponsored Second Participatory Livestock Development Project. A good entry point to NGOs that work on microcredit and with microcredit frequently follows investments in poultry.

### **Producer organisations**

Category	Association
Name	Bangladesh Egg Producers Association
Address	2/2 Shahjahan Road, Mohammadpur, Dhaka-1207, Bangladesh
Phone	+ 88 2 9116114, 8116953
Fax	N/A
Email	N/A
website	N/A

Association of Egg Producers

Category Association  
 Name Bangladesh Poultry Breeders Association  
 Address Sports Zone Building 7<sup>th</sup> Floor, 5 Moakhali C/A, Dhaka-1212, Bangladesh  
 Phone + 88 2 9882107-8, 8821393  
 Fax + 88 2 8821394  
 Email N/A  
 website N/A  
 Association of Poultry Breeders

Category Association  
 Name Bangladesh Poultry Industries Association  
 Address Adamji Court (Ground Floor), 115-120, Dhaka-1000, Bangladesh  
 Phone + 88 2 9550543, 9564613  
 Fax + 88 2 9332866  
 Email rick@bol-online.com  
 website N/A  
 Association of Poultry equipment and millers

### NGOs

Category Association  
 Name World's Poultry Science Association, Bangladesh Branch  
 Address Sports Zone Building 7<sup>th</sup> Floor, 5 Moakhali C/A, Dhaka-1212, Bangladesh  
 Phone + 88 2 9882107-8, 8821393  
 Fax + 88 2 8821394  
 Email info@wpsa-bd.com  
 website N/A

Bangladesh Branch of World's Poultry Association World's Poultry Science Association plays an important role by conducting an annual International Poultry Show and seminar, where the one planned for March, 2009, will, among other topics, focus on HPAI

Category NGO  
 Name BRAC  
 Address BRAC Centre, 75 Mohakhali, Dhaka-1212, Bangladesh  
 Phone +88 2 9881265-72  
 Fax +88 2 8823542, 8823614  
 Email development@brac.net  
 website <http://www.brac.net/>

BRAC is the largest NGO in Bangladesh and uses poultry as one – among many other tools – in poverty alleviation. BRAC was involved with DLS in developing the semi-scavenging poultry model relevant for poor women.

BRAC activities include:

Parent farms. BRAC runs six parent farms to support its rural poultry program and 3 commercial farms. None of them have had Avian Influenza so far.

Poultry Processing plant. BRAC runs one poultry processing plant at Tongi, near Dhaka with a capacity to process 1000 broilers per hour. Current output is 4000 – 5000 per day.

Training and awareness building. BRAC began to work on Avian Influenza before it reached Bangladesh by training and building awareness in its staff.

Wet markets. After the Avian Influenza outbreak occurred to note in particular is the work BRAC has done in collaboration with South Asia Enterprise Development Facility (SEDF) and DLS, where batches of people working in 912 wet markets in Dhaka city were trained and some equipment was distributed.

Use of network. Like other NGOs it has used its network of micro-finance workers (BRAC reaches out to about 7 million people all over the country) to provide basic information about Avian Influenza.

Category	NGO
Name	CARE Bangladesh
Address	Pragati RPR Center 10 <sup>th</sup> Floor, Dhaka-1215, Bangladesh
Phone	+ 88 2 9112315, 8114207
Fax	+ 88 2 8114183
Email	<a href="mailto:outreach@carebangladesh.org">outreach@carebangladesh.org</a>
website	<a href="http://www.carebd.org">www.carebd.org</a>

CARE Bangladesh has been selected to host a civil society Avian Influenza Secretariat for the period June 1 – December 31, 2008. One part of the NGO strategy is to find a lead NGO for each of the 64 districts in Bangladesh and to have a workshop in each district to raise awareness and for the NGOs to use their wide village based networks in the same manner as mentioned above under BRAC. However, the idea is to have more intensive work in the districts with high poultry densities such as Dhaka, Chittagong and Gazipur. The NGOs fully recognize the Government's leading role and with the right collaboration there can be a strong symbiosis with the DLS and government's other resources.

Category	NGO
Name	PROSHIKA
Address	I/1-Ga, Section-2, Mirpur, Dhaka-1216, Bangladesh
Phone	+88 2 8015812, 8016015
Fax	+88 2 8015811
Email	<a href="mailto:idrc@proshika.bdonline.com">idrc@proshika.bdonline.com</a>
website	<a href="http://www.proshika.org">www.proshika.org</a>

A large NGO with a livestock programme that includes work with poultry

## Others

Category	Human Health Research
Name	ICDDR,B
Address	GPO Box 128, Dhaka-1000, Bangladesh
Phone	+88 2 8860523-32
Fax	+88 2 8823963
Email	N/A – need to know address of individual staff
website	<a href="http://www.icddrb.org">www.icddrb.org</a>

ICDDR,B - the International Centre for Diarrhoeal Disease Research, Bangladesh (also known as the Cholera Hospital) is an international health research institution which is located in Dhaka. The Centre has a regular staff of 1250 of whom 95% are local staff and 5% international staff. It links to the Centre for Disease Control and Prevention in Atlanta, US. ICDDR,B has conducted surveillance on human influenza since 2004 and especially focused on 12 hospitals since 2007. However, so far no H5N1 has been detected in humans. The Centre's Avian Influenza activities are briefly listed below.

Markets and ducks. The Centre began market surveillance for avian influenza in August 2007 covering live bird markets in Netrakona, Rajshahi and Chittagong districts.

It has veterinarians in its staff and will get more.

Level 2 and 3 laboratories. A part of the existing Virology Laboratory has been renovated to set up a biosafety laboratory with level 2 facilities. A specialized biosafety laboratory with level 3 facilities is under construction, expected to be completed by the end of 2008.

Backyard poultry surveillance. From April 2008 surveillance has begun in 100 rural and peri-urban households keeping scavenging poultry.

Socio-economic aspects. The ICDDR,B has had one anthropologist doing research since February 2008 on the human-poultry relationship and will soon get two more anthropologists to expand the studies. The Centre has experiences with developing communication strategies for diseases at community level and its initial steps are evaluative and research oriented in nature and not prescriptive, which is an interesting complement to communication initiatives in Bangladesh (and other countries), which tend to be prescriptive.

Overall the centre is focused on the backyard and small producers and it has several years of experience in working with village people from its more than 30 years of existence in Bangladesh. In the present context, while it is open to collaboration with all stakeholders it mentions the NGO sector represented by the Avian Influenza Secretariat that is hosted by CARE Bangladesh in particular.

## Annex II

## List of major projects – poultry sector

- 1 Project: Rural Development Project  
 Agency: World University Service  
 Duration: 1970s and 80s  
 Geographical area: Three sub-districts around Bangladesh Agricultural University, Mymensingh  
 Directly benefiting: Rural households  
 Status: Closed

The project was implemented by Bangladesh Agricultural University with the objective to improve family income and nutrition through cockerel exchange, vaccination and training.

- 2 Project: Backyard Poultry Development Project  
 Agency: UNICEF  
 Duration: 1970s and 80s  
 Geographical area: 100 villages around Bangladesh Agricultural University, Mymensingh  
 Directly benefiting: Rural households  
 Status: Closed

The project was implemented by Bangladesh Agricultural University with the objective to improve family income and nutrition through cockerel exchange, vaccination and training, but monthly savings and society formation was also part of the project.

- 3 Project: Village Duck Production  
 Agency: Friends in Village Development (NGO), Sylhet  
 Duration: 1970s and 80s  
 Geographical area: Villages in the Sylhet region  
 Directly benefiting: Rural households  
 Status: Closed

The project was confined to ducks and was responsible for introducing the Chinese Rice Husk Hatching method to Bangladesh, which has subsequently been used in larger projects and for chicken as well.

- 4 Project: Rural Poultry Improvement Project BGD/73/010 and BGD/82/003  
 Agency: FAO/UNDP  
 Duration: 1980-87  
 Geographical area: National  
 Directly benefiting: The Government Farms  
 Status: Closed

The project focused on government farms and indirectly through this focus on smallholder poultry keepers. The project assisted in developing the semi-scavenging Bangladesh Poultry Development Model.

5	Project:	Formation of Bangladesh Livestock Research Institute
	Agency:	FAO/UNDP/World Bank
	Duration:	1984-86
	Geographical area:	National
	Directly benefiting:	The staff of the Livestock Research Institute
	Status:	Closed

The project prepared a Master Plan of Research that included research into smallholder poultry production.

6	Project:	Smallholder Livestock Development Project
	Agency:	IFAD and Danida
	Duration:	1988-97
	Geographical area:	16 districts in the centre and east of the country
	Directly benefiting:	300 000 poor women and their families
	Status:	Closed

The project worked for 300 000 landless women and their families with poultry and microfinance to promote gender equality, income generation and poverty alleviation, using the semi-scavenging Bangladesh Poultry Development Model. NGOs were used for outreach.

7	Project:	Agro-based Industries and Technology Project I and II
	Agency:	USAID
	Duration:	1996-2000 and 2001-2005
	Geographical area:	National
	Directly benefiting:	Not specified
	Status:	Closed

The project worked with and helped create – among other activities – the large scale commercial poultry sector in Bangladesh

8	Project:	Participatory Livestock Development Project I
	Agency:	ADB and Danida
	Duration:	1997-2003
	Geographical area:	17 districts in the north of the country
	Directly benefiting:	360 000 poor women and their families
	Status:	Closed

The project design was inspired by the Smallholder Livestock Development Project above.

9	Project:	Poultry Management Techniques Improvement Project
	Agency:	JICA
	Duration:	1997-2002
	Geographical area:	indirectly national
	Directly benefiting:	Bangladesh Livestock Research Institute
	Status:	Closed

The project aimed through research to improve feeding management, breeding and disease control.

10	Project:	Poultry Sector Development Project
	Agency:	CIDA
	Duration:	1997-2003
	Geographical area:	National
	Directly benefiting:	Commercial farmers and feed mills
	Status:	Closed

The project increased the capacity of the poultry feed industry, laboratory testing, extension services and the management capacity of small, medium and large poultry producers. Poultry management and feed utilization was improved through the development of training materials and skills building for 580 formal and non-formal extension workers and 7250 farmers. Feed mills received design assistance, consulting advice and training in facilities management, least-cost feed formulation and poultry nutrition. Project contributed to a draft of a national Animal Feed Act.

11	Project:	Second Smallholder Livestock Development Project
	Agency:	Danida
	Duration:	2000-2005
	Geographical area:	5 districts in the south of the country
	Directly benefiting:	109 000 poor women and their families
	Status:	Closed

The project design was follow-on to the Smallholder Livestock Development Project above, but in a new area. While the project was with DLS, NGOs were used for outreach.

12	Project:	Microfinance and Technical Support Project
	Agency:	IFAD
	Duration:	2003-2010
	Geographical area:	13 districts in the south and northeast of the country
	Directly benefiting:	276 000 poor women and their families
	Status:	ongoing

The project is a follow-on to the Smallholder Livestock Development Project above, but in a new areas and it has changed design so that priority is given to microfinance and the participants free choice of activities to invest in; about 1/3 of the participants invest in poultry. The project is implemented by PKSF, the apex microcredit funding and capacity building organisation, through 24 NGOs.

13	Project:	Participatory Livestock Development Project II
	Agency:	ADB
	Duration:	2003-2010
	Geographical area:	20 districts in the northeast of the country
	Directly benefiting:	900 000 poor families
	Status:	ongoing

The project is follow-on to the Participatory Livestock Development Project II above, but it has changed design so that priority is given to microfinance and the participants' free choice of activities to invest in, but it is expected that there will be substantial investments in poultry. The project is implemented by PKSF, the apex microcredit funding and capacity building organisation, though NGOs with regard to microfinance, but DLS with regard to technical services.

- 14 Project: Agriculture Sector Programme Support  
 Agency: Danida  
 Duration: 2000-2011  
 Geographical area: 5 districts in the south of the country, DLS and Bangladesh Livestock Research Institute  
 Directly benefiting: Poor households in 5 districts in the south and the Poultry Research and Training Centre at Chittagong Veterinary and Animal Sciences University.  
 Status: ongoing

The concept is to continue with the poultry activities within the larger framework of the Danida support to the Agriculture Sector, by, among other activities to build up capacity in DLS and there is support to the National Reference Laboratory for Avian Influenza at Bangladesh Livestock Research Institute.

- 15 Project: Immediate Technical Assistance to Strengthen Emergency Preparedness for Highly Pathogenic Avian Influenza (OSRO/RAS/601/ASB)  
 Agency: FAO  
 Duration: 2006-2008  
 Geographical area: National  
 Directly benefiting: The Department of Livestock Services  
 Status: Ongoing.

The main aim is to strengthen the surveillance capacity of the Department of Livestock Services to fight HPAI.

- 16 Project: Immediate technical assistance to strengthen emergency preparedness for Highly Pathogenic Avian Influenza (HPAI) in Bangladesh (OSRO/RAS/605/USA)  
 Agency: FAO  
 Duration: 2006-2009  
 Geographical area: National  
 Directly benefiting: The Department of Livestock Services  
 Status: Ongoing

The main aim is to strengthen the surveillance capacity of the Department of Livestock Services to fight HPAI.

- 17 Project: Elucidating international migration routes of priority waterbird species in India and the Central Asian Flyway to evaluate their potential to transmit highly pathogenic avian influenza (OSRO/RAS/605/USA, Baby 2)  
 Agency: FAO  
 Duration: 2008-2009  
 Geographical area: National  
 Directly benefiting: The Department of Forestry  
 Status: Ongoing

The main aim is to strengthen the surveillance capacity of the Department of Forestry to fight HPAI.

18	Project:	Avian Influenza Preparedness and Response Project
	Agency:	World Bank
	Duration:	2007-2012
	Geographical area:	National
	Directly benefiting:	The Department of Livestock Services
	Status:	ongoing

The Project has three components: (i) animal health, (ii) public awareness and information, and (iii) Implementation support and monitoring & evaluation. The Project will have a technical assistance team (consisting of international and national experts) hired through FAO.

19	Project:	Civil Society Avian Influenza Secretariat
	Agency:	USAID
	Duration:	2008 - ?
	Geographical area:	National
	Directly benefiting:	CARE Bangladesh
	Status:	ongoing

An important part of the strategy of this project is to find a lead NGO for each of the 64 districts in Bangladesh and to have a workshop in each district to raise awareness about HPAI and for the NGOs to use their wide village based networks to raise awareness.

## Annex III

**Bibliography**

- Ahmed, F.** (2008). Export Strategy of Bangladesh. Power Point presentation prepared for the NDC Course, 22 May, 2008. Ministry of Commerce, Government of the People's Republic of Bangladesh:  
[http://www.mincom.gov.bd/images/additional\\_images/NDC-%20Export%20Strategy-22-5-08-final.ppt](http://www.mincom.gov.bd/images/additional_images/NDC-%20Export%20Strategy-22-5-08-final.ppt) (July 18, 2008)
- Akter, S., and Farrington, J.** (2008). Poverty Transition through Targeted Programme: The Case of Bangladesh Poultry Model. Paper presented at the 82<sup>nd</sup> Annual Conference of the Agricultural Economics Society. Royal Agricultural College. UK.  
[http://ageconsearch.umn.edu/bitstream/36765/2/Akter\\_farrington.pdf](http://ageconsearch.umn.edu/bitstream/36765/2/Akter_farrington.pdf) (July 8, 2008).
- Alam, J.** (2008). Studies on Agriculture and Rural Development. Palok Publishers, Bangladesh.
- Alam, J.** (1997). Impact of smallholder livestock development project in some selected areas of rural Bangladesh. Livestock Research for Rural Development, vol. 9, no. 3:  
<http://www.cipav.org.co/lrrd/lrrd9/3/bang932.htm> (June 20, 2008).
- Alam, J., Akteruzzaman, Md., Rahman, S.M.A and Palash, Md. S.** (2008). Impact of Recent Outbreak of Avian Influenza on Production, Marketing and Consumption of Poultry Meat and Eggs in Bangladesh. Final Draft. Bangladesh Livestock Research Institute and Bangladesh Agricultural University.
- Bangladesh Bureau of Statistics** (2007). 2005 Yearbook of Agricultural Statistics of Bangladesh. Planning Division, Ministry of Planning. Government of the People's Republic of Bangladesh.
- Bangladesh Bureau of Statistics (BBS)** (2006). Agriculture Sample Survey of Bangladesh-2005. Planning Division, Ministry of Planning. Government of the People's Republic of Bangladesh.
- Bangladesh Centre for Communication Programs (BCCP)** (2006). Rapid Assessment on Knowledge, Attitudes & Practices (KAP) on Avian Influenza (AI). UNICEF, Bangladesh.
- Barua, A. and Yoshimura, Y.** (1997). Rural Poultry Keeping in Bangladesh. World's Poultry Science Journal, vol. 53, December 1997, pp. 387-394.
- Begum, I. A.** (2005). An Assessment of Vertically Integrated Contract Poultry Farming: A Case Study in Bangladesh. International Journal of Poultry Science, vol. 4 (3): 167-176:  
<http://www.pjbs.org/ijps/fin332.pdf> (July 2, 2008).
- Bessei, W.** (1990). Lessons from field experience on the development of poultry production. In: S. Mack (ed.) (1990) Strategies for sustainable animal agriculture in developing countries. FAO Animal Production and Health Paper no. 107:  
<http://www.fao.org/docrep/004/t0582e/T0582E25.htm> (July 10, 2008).
- Bhuiyan, A.K.F.H., Bhuiyan, M.S.A. and Deb, G.K.** (2005). Indigenous Chicken Genetic Resources in Bangladesh: Current Status and Future Outlook. In: S. Galan and J. Boyazoglu (eds.) Animal Genetic Resources Information, issue no. 35, FAO:  
<http://www.fao.org/docrep/008/a0070t/a0070t0c.htm> (July 9, 2008).
- Biswas, P.K., Uddin, G.M.N., Barua, H., Roy, D., Ahad, A. and Debnath, N.C.** (2008). Survivability and causes of loss of broody-hen chicks on smallholder households in Bangladesh. Preventive Veterinary Medicine, vol. 83, pp. 260-271.
- Bubli, S.A.** (2006). A Market Share Analysis and Competitor Analysis of Kazi Farms Group Day-Old Chick Broiler Production. Independent University, Bangladesh:  
<http://sb.iub.edu.bd/internship/spring2006/0020120.pdf> (July 21, 2008).
- Centre for Policy Dialogue (CPD)** (2007). Price of Daily Essentials: A Diagnostic Study of Recent trends. A Report Prepared for the Ministry of Commerce, Government of Bangladesh. [http://www.cpd.org.bd/downloads/Executive\\_Summary.pdf](http://www.cpd.org.bd/downloads/Executive_Summary.pdf) (July 21, 2008).
- Chowdhury, M.M.I., Ashraf, A., Mondal, S.P., Mondol, N.M.A.A.M and Hasan, M.M.** (2004). Effect of Season on the Hatchability of Duck Eggs. International Journal of Poultry Science, vol. 3, no. 6: 419 – 421: <http://www.pjbs.org/ijps/fin219.pdf> (July 8, 2008).
- Das, S.C., Chowdhury, S.D., Khatun, M.A., Nishibori, M., Isobe, N. and Yoshimura, Y.** (2008). Poultry Production Profile and Expected Future Projection in Bangladesh. World's Poultry Science Journal, vol. 64, March 2008, pp. 99-118:  
[http://journals.cambridge.org/download.php?file=%2FWPS%2FWPS64\\_01%2FS0043933\\_907001754a.pdf&code=3c0c1a4fe9ae4aa7b810d4d41529542f](http://journals.cambridge.org/download.php?file=%2FWPS%2FWPS64_01%2FS0043933_907001754a.pdf&code=3c0c1a4fe9ae4aa7b810d4d41529542f) (July 8, 2008).

- Centre for Policy Dialogue** (2008a). State of the Bangladesh Economy and an Analysis of the National Budget for FY2008-2009, Dhaka, Bangladesh:  
[http://www.cpd.org.bd/pub\\_attach/op68.pdf](http://www.cpd.org.bd/pub_attach/op68.pdf) (July 18, 2008).
- Centre for Policy Dialogue** (2008b). A Set of Proposals for the National Budget FY2008-09 submitted to the Dr. A.B. Mirza Azizul Islam, Hon'ble Advisor to the Caretaker Government, Ministries of Finance and Planning, Government of Bangladesh, April 17, 2008: [http://www.cpd.org.bd/downloads/budget\\_proposal\\_0809.pdf](http://www.cpd.org.bd/downloads/budget_proposal_0809.pdf) (July 18, 2008).
- Dolberg, F.** 2003. *Review of Household Poultry Production as a Tool in Poverty Reduction with Focus on Bangladesh and India*. FAO, Pro-Poor Livestock Policy Initiative. Working Paper No.6:  
<http://www.fao.org/ag/againfo/projects/en/pplpi/docarc/wp6.pdf> (20.6.2008).
- Dolberg, F., Mallorie, E. and Brett, N.** (2002). Evolution of the Poultry Model – a Pathway out of Poverty. Paper presented at the workshop “People Fight Poverty with Poultry. Learning from the Bangladesh Experience:  
<http://www.ifad.org/english/operations/pi/bgd/documents/poultry.pdf> (July 9, 2008).
- Du, H.** (2008). Bangladesh Economy: Opportunities and Challenges. Speech, June 17, 2008 to the American Chamber of Commerce:  
<http://www.adb.org/Documents/Speeches/2008/sp2008031.asp> (July 17, 2008).
- Ershad, S.M.E.** (2005). Performance of Hybrid Layers and Native Hens under Farmers' Management in a Selected Area of Bangladesh. International Journal of Poultry Science, vol. 4. No. 4: 228-232: <http://www.pjbs.org/ijps/fin349.pdf> (July 8, 2008).
- FAO** (2007). Rapid Assessment for the Control of HPAI. Bangladesh April 13-26, 2007. Crisis Management Centre Mission Report, FAO.
- Giasuddin, M., Sil, B.K., Alam, J., Koike, I., Islam, M.R. and Rahman, M.M.** (2002). Prevalence of Poultry Diseases in Bangladesh. Journal of Biological Sciences, vol. 2 (4), pp. 212-213: <http://www.ansijournals.com/jbs/2002/212-213.pdf> (July 14, 2008).
- Gilberg, M., Xiao, X., Pfeiffer, D.U., Epprecht, M., Boles, S., Czarnecki, C., Chaitaweesub, P., Kalpravidh, W., Minh, P.Q., Otte, M.J., Martin, V. and Slingenberg, J.** (2008). Mapping H5N1 highly pathogenic avian influenza risk in Southeast Asia *PNAS* 2008 105:4769-4774; published ahead of print March 24, 2008, doi: 10.1073/pnas.0710581105: <http://www.pnas.org/content/105/12/4769.full.pdf+html> (July 14, 2008).
- Government of the People's Republic of Bangladesh (GOB)**, (2007). National Livestock Development Policy. Ministry of Fisheries and Livestock:  
[http://www.mofl.gov.bd/pdf/Livestock\\_%20Policy\\_Final.pdf](http://www.mofl.gov.bd/pdf/Livestock_%20Policy_Final.pdf) (July 16, 2008).
- Government of the People's Republic of Bangladesh (GOB)** (2006). National Avian Influenza and Human Pandemic Influenza Preparedness and Response Plan. Bangladesh 2006-2008:  
<http://www.sdnpsd.org/sdi/issues/health/birdflue/document/avianInfluenzaResponsePlan.pdf> (July 16, 2008).
- Government of the People's Republic of Bangladesh (GOB)** (2005). Bangladesh. Unlocking the Potential. National Strategy for Accelerated Poverty Reduction. General Economics Division, Planning Commission, GOB:  
<http://www.imf.org/external/pubs/ft/scr/2005/cr05410.pdf> (July 16, 2008).
- Government of the People's Republic of Bangladesh (GOB)**, (n.d.) Import Policy Order 2006-2009. Ministry of Commerce, Government of the People's Republic of Bangladesh: [http://www.mincom.gov.bd/index.php?page\\_id=272](http://www.mincom.gov.bd/index.php?page_id=272) (July 18, 2008).
- Graham, J.P., Leibler, J.H., Price, L.B., Otte, J.M., Pfeiffer, D.U., Tiesen, T. and Silbergeld, E.K.** (2008). The Animal-Human Interface and Infectious Disease in Industrial Food Animal Production: Rethinking Biosecurity and Biocontainment. Public Health Reports, May-June 2008, vol. 123:  
[http://www.publichealthreports.org/userfiles/123\\_3/282-299.pdf](http://www.publichealthreports.org/userfiles/123_3/282-299.pdf) (July 23, 2008).
- Hartung, J.** (2008). Risks caused by bio-aerosols in poultry houses. Paper presented to the International Conference: “Poultry in the 21st Century – Avian Influenza and Beyond”. FAO, Bangkok, November 5-7, 2007.
- Helmrich, H.** (1983) Tierhaltung in Bangladesh Empirische untersuchungen uber bedingungen, funktionen und entwicklungsmoglichkeiten. The Institute for Rural Development Georg-August-University, Göttingen, Fed. Rep. of Germany.
- Hossain, Md. Anwar** (2003). Salmonellosis in poultry in Bangladesh and the effect of aflatoxin on experimental Salmonella enterica serovar gallinarum biovar pullorum infection. M.Sc. thesis. Department of Veterinary Microbiology and Network for Smallholder Poultry Development. The Royal Veterinary and Agricultural University, Copenhagen:  
[http://www.poultry.life.ku.dk/Information\\_resources/References/~/\\_media/migration%20Folder/upload/poultry/master\\_theses/hossain.pdf.ashx](http://www.poultry.life.ku.dk/Information_resources/References/~/_media/migration%20Folder/upload/poultry/master_theses/hossain.pdf.ashx) (July 4, 2008).

- Hald B, Skovgård H, Bang DD, Pedersen K, Dybdahl J, Jespersen JB, et al.** Flies and *Campylobacter* infection of broiler flocks. *Emerg Infect Dis* [serial on the Internet]. 2004 Aug; <http://www.cdc.gov/ncidod/EID/vol10no8/04-0129.htm> (July 11, 2008).
- Islam, M.R., Giasuddin, M., Samad, M.A., Taimur, M.J.F.A., Baqi, M.A., Mahbub-E-Elahi, A.T.M. and Amin, M.M.** (2008). Phylogenetic analysis of highly pathogenic avian influenza (H5N1) virus isolates of Bangladesh. In: *A Study on Highly Pathogenic Avian Influenza in Bangladesh*. Bangladesh Livestock Research Institute, Savar, Dhaka. pp.12-20: [http://www.blri.gov.bd/admin/banner\\_files/1.pdf](http://www.blri.gov.bd/admin/banner_files/1.pdf) (July 28, 2008).
- Huque, Q.M.E.** (1999). Family Poultry Production and Utilization pattern in Bangladesh. Paper presented to the INFPDE-Conference "The Scope and Effect of Family Poultry Research and Development": [http://www.fao.org/ag/AGInfo/themes/en/infpd/documents/econf\\_scope/add\\_paper12.html](http://www.fao.org/ag/AGInfo/themes/en/infpd/documents/econf_scope/add_paper12.html) (July 9, 2008).
- Huque, Q.M.E., Ukil, M.A. and Hossain, M.J.** (1993). Supplementary Feeding of Laying Ducks under Scavenging Conditions. *Bangladesh Journal of Livestock Research*, vol.1, no.1, pp. 57-62 as used in Huque, Q.M.E., Chowdhury, S.A., Haque, M.E. and Sil, B.K. (1999). Poultry Research in Bangladesh: Present Status and its Implication for future Research. In F. Dolberg and P.H. Petersen (eds.) (1999). *Poultry as a Tool in Poverty Eradication and Gender Equality*: <http://www.fao.org/docrep/004/AC154E/AC154E06.htm#ch4.2> (July 28, 2008).
- Jabbar, M.A., Rahman, Md. H., Talukder, R.K. and Raha, S.K.** (2007). Formal and Informal Contract Farming in Poultry in Bangladesh. Paper Presented at the FAO Conference Poultry in the 21<sup>st</sup> Century. Avian Influenza and Beyond. Bangkok, November 5-7, 2007.
- Kabir, F., Sultana, M.S., Mustafa, G., Rashid, M.M.O., Khan, M.S.I. and Asgar, M.A.** (2007). Study on Production System of Existing Ducks at Potuakhali District of Bangladesh and Development of a Self-sustainable Ducks Rearing Model Under Semi-scavenging System at Farmer's Condition. *Journal of Biological Sciences*, vol. 7 (2): 327-332: <http://www.ansijournals.com/jbs/2007/327-332.pdf> (July 1, 2008).
- Khan, M.M.H., Miah, M.Y., Bhuiyan, M.M., Begum, S., Hussain, M.M. and Khanum, R.** (2006). The Status of Homestead Poultry Production in Sylhet Region. *International Journal of Poultry Science*. Vol. 5 (11): 1092-1095: <http://www.pjbs.org/ijps/fin745.pdf> (July 1, 2008).
- Khanum J, Chwalibog A and Huque K S** 2005: Study on rural duck production systems in selected areas of Bangladesh. *Livestock Research for Rural Development*. Volume 17, Article #113: <http://www.cipav.org.co/lrrd/lrrd17/10/khan17113.htm> (July 28, 2008).
- Okada, I.Y., Maeda, T., Hashiguchi, M.A., Hasnath, M.O., Faruque and Majid, M.A.** (1988). Gene Constitution of indigenous chickens in Bangladesh. *Japanese Journal of Poultry Science*, vol. 25 (1), pp. 15-26 as used in Bhuiyan et al., 2005.
- Osmani, T.A.B.M.G., Rahman, M.A., Loth, L., Kalam, M.A., Hossain, M.A., Khan, F.R. and Khan M.S.U.** (2008). A Case Control Study to Determine Risk factors of HPAI Outbreaks in Commercial Poultry farms in Bangladesh. In: *A Study on Highly Pathogenic Avian Influenza in Bangladesh*. Bangladesh Livestock Research Institute, Savar, Dhaka, pp. 25-64: [http://www.blri.gov.bd/admin/banner\\_files/1.pdf](http://www.blri.gov.bd/admin/banner_files/1.pdf) (July 28, 2008).
- Rahman, S.M.R.** (not dated) Family poultry production and utilization system in relation to landholding at Semi-Arid Area of Bangladesh. Published at website of International Livestock Research Institute's website: <http://www.ilri.org/Link/Files/Theme3/Avian%20Flu/bangladesh%20poultry%20systems.pdf> (20.6.2008).
- Lieberson, J., Gisselquist, D., Sabur, S.A. and Kamal, M.R.** (2005). An Evaluation of the Bangladesh Agro-Based Industries and Technology Development Project (ATDP II). USAID: [http://www.usaid.gov/bd/files/atdp\\_2\\_evaluation\\_report.pdf](http://www.usaid.gov/bd/files/atdp_2_evaluation_report.pdf) (July 9, 2008).
- Rahman, H.Z.** (2006). Bangladesh 2015: Achievements and Future Challenges. Paper prepared for the Asia2015 Conference, March 6-7, 2006: <http://www.asia2015conference.org/pdfs/PPRC-Round.pdf> (July 16, 2008).
- Rahman M M, Baqui M A and Howlader M A R** 2004: Egg production performance of RIR x Fayoumi and Fayoumi x RIR crossbred chicken under intensive management in Bangladesh. *Livestock Research for Rural Development*. Vol. 16, Art. #92. Retrieved July 8, 2008, from <http://www.cipav.org.co/lrrd/lrrd16/11/rahm16092.htm>
- Rahman, M., Islam, N, Sarker, N.R and Islam, M.M.** (1996). Effect of Supplementary Feeding on Production Performance of RIR, Fayoumi and their Crossbred Chicken in Rural Bangladesh. *Bangladesh Journal of Livestock Research*, Volume 5, pp. 184-193.

- Rahman, M., Sørensen, P., Jensen, H. Askov and Dolberg, F.** (1997). Exotic hens under semi scavenging conditions in Bangladesh. *Livestock Research for Rural Development*, vol. 9, number 3: <http://www.cipav.org.co/lrrd/lrrd9/3/bang931.htm> (July 8, 2008).
- Saleque, Md. A.** (2007). Poultry Industry in Bangladesh: Current Status and Its Challenges and Opportunity in the Emerging Market Environment. Poultry Business Directory 2007. Khamar Bichitra, Dhaka.
- Sarkar, K. and Bell, J.** 2006. Potentialities of the indigenous chicken and its role in poverty alleviation and nutrition security for rural households. *INFPD Newsletter*, Vol. 16, no. 2 July – December, 2006: <http://www.fao.org/ag/againfo/themes/en/infpd/documents/newsletters/Infpd162.pdf> (July 9, 2008).
- Sawabe K, Hoshino K, Isawa H, Sasaki T, Hayashi T, Tsuda Y, et al.** (2006). Detection and isolation of highly pathogenic H5N1 avian influenza A viruses from blow flies collected in the vicinity of an infected poultry farm in Kyoto, Japan, 2004. *Am J Trop Med Hyg* 2006;75:327-32.
- Sazzad, H.M.** (1992). Comparative Study on Egg Production and Feed Efficiency of Different Breeds of Poultry under Intensive and Rural Conditions in Bangladesh. *Livestock Research for Rural Development*. Vol. 4, no. 3: <http://www.cipav.org.co/lrrd/lrrd4/3/bangla1.htm> ( July 9, 2008).
- Sazzad, H.M.** (1993). Manipulation of the broody Period to Increase Egg Production of Indigenous Hens under Rural Conditions in Bangladesh. *Livestock Research for Rural Development*. Vol. 5, no. 2: <http://www.cipav.org.co/lrrd/lrrd5/2/bangla2.htm> (July 9, 2008).
- Shah, S., Sharmin, M. and Haider, S.** (not dated). Problems of Small to Medium Size Poultry Farms – Bangladesh Perspective. Paper presented at EPC 2006 – XII European Poultry Conference, Verona, Italy, 10-14 September, 2006: <http://www.animalscience.com/uploads/additionalfiles/WPSAVerona%5C10793.pdf> (July 4, 2008).
- Shortridge, K.F. and Stuart-Harris, C.H.** (1982). An Influenza Epicentre?. *The Lancet*, October 9, 1982.
- Shortridge K.F., Zhou N.N., Guan Y., et al.** 1998. Characterization of avian H5N1 influenza viruses from poultry in Hong Kong. *Virology* 252: 331-42.
- United Nations, Department of Economic and Social Affairs, Population Division** (2007). World Population Prospects: The 2006 Revision, Highlights, Working Paper No. ESA/P/WP.202: [http://www.un.org/esa/population/publications/wpp2006/WPP2006\\_Highlights\\_rev.pdf](http://www.un.org/esa/population/publications/wpp2006/WPP2006_Highlights_rev.pdf) (July 22, 2008).
- Sims, L. and Narrod, C.** (2007). Understanding Avian Influenza. FAO: [http://www.fao.org/avianflu/documents/key\\_ai/key\\_book\\_preface.htm](http://www.fao.org/avianflu/documents/key_ai/key_book_preface.htm) (July 28, 2008).
- Upton, M.** 2008. Scale and Structures of the poultry sector and factors inducing change: Inter-country differences and expected trends. Paper presented to the International Conference: "Poultry in the 21st Century – Avian Influenza and Beyond". FAO, Bangkok, November 5-7, 2007.
- USAID-ATDP II** (2005). Issues and Interventions in Poultry Sector. Final Report: [http://www.usaid.gov/bd/files/atdp\\_poultry.pdf](http://www.usaid.gov/bd/files/atdp_poultry.pdf) (July 4, 2008).
- Yamazaki, M.** (2003). The Development Process of the Extension of Soybean Production in Bangladesh: Collaboration between GO and NGOs. *Research Bulletin*, vol. 34. Keisen College of Horticulture, Japan: [http://nsl.nii.ac.jp/els/110000483276.pdf?id=ART0000872351&type=pdf&lang=en&host=cinii&order\\_no=&ppv\\_type=0&lang\\_sw=&no=1219396488&cp=](http://nsl.nii.ac.jp/els/110000483276.pdf?id=ART0000872351&type=pdf&lang=en&host=cinii&order_no=&ppv_type=0&lang_sw=&no=1219396488&cp=) (August 22, 2008)
- World Bank** (2008). Bangladesh at a Glance: [http://devdata.worldbank.org/AAG/bgd\\_aag.pdf](http://devdata.worldbank.org/AAG/bgd_aag.pdf) (July 17, 2008).
- World Bank** (2006). India-Bangladesh Bilateral Trade and Potential Free Trade Agreement. Bangladesh Development Series Paper no. 13, World Bank Office, Dhaka: <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1168296540386/Volumel.pdf> (July 18, 2008).

## Annex IV

# Maps

*No maps available*