# CHAPTER 2: ACCELERATING INCOME GROWTH IN RURAL BANGLADESH

## I. Introduction

2.1. ***Bangladesh has enjoyed major successes in rural development, in both agriculture and the non-farm sector.*** Agricultural output has grown at an average rate of 2.9 percent since 1980, outpacing population growth and allowing the country to strengthen its food security and make a significant dent on rural poverty. In particular, rice production – which accounts for two-thirds of total value added of crops – has more than doubled since independence as a result of public and private investments in irrigation, dissemination of improved seeds and fertilizer, and a policy environment that maintained incentives for domestic production. At the same time, significant investments in roads contributed to the development of well-functioning markets for major agricultural products. The rural non-farm sector – employer of 40 percent of rural workforce – has also been growing fast, at over 4 percent per year since the early 1990s.

2.2. ***However, the rural sector is faced with a number of emerging challenges in order to sustain good performance***. Agriculture is under pressure to improve its productivity due to a shrinking land base. As urban development continues, area cultivated has declining steadily. As a result, total area sown has also declined, and, in fact, the rate of decline is expected to accelerate. Furthermore, agricultural diversification is lacking, with potential in higher-end products largely unexploited: agriculture production is dominated by crops which, in turn, are largely rice based. The rural non-farm sector is faced with a number of structural constraints that (if unaddressed) risk undermining its future growth prospects. Sharp productivity increases in both agriculture and rural non-farm sector are necessary to support sustained high growth and faster poverty reduction. This calls for the next generation of agro reforms and addressing the major investment climate constraints faced by rural enterprises.

## II. Agriculture Sector Performance: Trends and Issues

2.3. ***Agriculture sector growth has been sporadic***. The sector recorded relatively good growth of about 5 percent in the second half of the 1990s, recovering from weak performance in the first half. Growth has since fallen to its long-term trend of just under 3 percent in the 2000s (**Table 2.1**). In common with other fast growing developing countries, the rest of the economy has outpaced the agriculture sector, resulting in a decline in the sector's share in (producer price) GDP, from 30 percent in 1990 to 20 percent in FY06.

**Table 2.1: Bangladesh: Agricultural Growth, 1981-2005**

| | All Agriculture | Crops | Livestock | Forestry | Fish |
|---|---|---|---|---|---|
| **Growth Rates** | | | | | |
| 1981-90 | 2.5 | 2.7 | 2.1 | 2.7 | 2.3 |
| 1991-95 | 1.6 | -0.4 | 2.4 | 2.8 | 7.9 |
| 1996-00 | 4.9 | 4.1 | 2.6 | 4.4 | 8.6 |
| 2001-06 | 2.8 | 2.6 | 5.1 | 4.8 | 1.8 |
| ***1981-06*** | ***2.9*** | ***2.3*** | ***2.9*** | ***3.5*** | ***4.5*** |
| **Share of GDP at Producer Price (%, period average)** | | | | | |
| 1981-90 | 31.5 | 23.1 | 3.5 | 1.6 | 3.2 |
| 1991-00 | 26.7 | 16.2 | 3.4 | 2.0 | 5.1 |
| 2001-05 | 21.9 | 12.6 | 2.6 | 1.8 | 4.9 |
| ***1981-05*** | ***27.6*** | ***18.2*** | ***3.3*** | ***1.8*** | ***4.3*** |

*Source: Calculated from BBS data.*

2.4. ***The sector is dominated by crops, although fish production has gained considerable share since the 1980s.*** Crops account for about 60 percent of agricultural GDP (AGDP), compared with 73 percent in 1980. The slack was mostly picked up by fisheries, the fastest growing sub-sector in agriculture, which saw its share increasing from 10 percent to 23 percent in AGDP over the 1980-2000 period, benefiting especially from the high growth in the 1990s (**Table 2.1**). Fish production growth has slackened significantly since 2001, however, resulting in fisheries' share in AGDP falling to 21 percent by FY06. The livestock sub-sector (including poultry) has seen a small decrease in its share in AGDP since 1980 (from 13 percent of AGDP to 12 percent), while forestry has doubled its share to 8 percent.

2.5. ***Intensifying land pressures are a major constraint on agricultural growth***. Owing to extremely high population density (one of the highest in the world) and rapid urbanization, the net cultivable area declined by an average rate of 2 percent per year in the first half of the 1990s and by close to 1 percent in the second half, as potential agricultural land was diverted to other uses such as housing, roads, and industrial development (**Table 2.2**). The net area sown has also been on a decline, albeit at a more gradual pace, resulting in an increase in the ratio of net area sown to total cultivable area from 85 percent in FY90 to 95 percent in FY03. *With less than 5 percent of total cultivable land not sown, further shrinkage in cultivable land would lead to an almost equivalent decline in net area sown.*

**Table 2.2: Bangladesh Agricultural Land and Labor Productivity, 1980/81 to 2004/05**

| | Net Cultivable Land Million Hectares | Net Area Sown Million Hectares | Crop VA (Tk bn 1996 prices) | VA (Tk bn 1996 prices) /Net Area Sown (mill. Hectare) |
|---|---|---|---|---|
| 1981-90 | 9.5 | 8.6 | 212.3 | 24.8 |
| 1991-95 | 9.0 | 7.9 | 243.5 | 30.9 |
| 1996-00 | 8.4 | 7.9 | 261.4 | 32.9 |
| 2001-06 | 8.6 | 8.1 | 314.1 | 38.8 |
| 1981-06 | 9.0 | 8.2 | 251.2 | 30.6 |
| **Average Annual Growth** | | | | |
| 1982-90 | 0.5 | -0.2 | 2.5 | 2.7 |
| 1991-95 | -2.1 | -1.5 | 1.0 | 1.1 |
| 1996-00 | -0.7 | 1.0 | 1.8 | 3.1 |
| 2001-06 | -0.1 | -0.1 | 2.6 | 2.7 |
| 1982-06 | -0.4 | -0.2 | 2.0 | 2.5 |

*Source: BBS and Ministry of Agriculture.*

Note: Data on cultivable area and area sown are available only through 2002. Data for these variables for 2003 through 2006 assume no changes relative to 2002.

2.6. ***Land productivity has been improving since the early 1980s (Table 2.2) due to increased productivity/hectare of individual crops, increased multiple cropping, and, to some extent, a shift to higher valued crop production***.[21] Given that net cultivable land and net area sown have reached their limits, future improvements in the crop sector performance will depend mainly on productivity growth.

[21] There is no statistical evidence that land fragmentation has significantly lowered total factor productivity in Bangladeshi crop agriculture. Econometric evidence from Pakistan suggests that plot size does not affect productivity there, controlling for crop choice and other factors (Pakistan Poverty Assessment, World Bank (2002), and; *Pakistan Rural Factor Markets: Policy Reforms for Growth and Equity,* World Bank (2004),). The Green Revolution agricultural technology (improved seeds, irrigation and fertilizer) is to a large extent scale-neutral (i.e. there are little or no economies of scale in increasing farm size), particularly for the major grains (rice, wheat, maize). Some scale economies may exist in marketing, particularly of highly perishable fresh fruits and vegetables. There is evidence of economies to scale in aquaculture, however, particularly in coastal areas where the need to coordinate the timing of water flows may make large farms more efficient than small farms.

For one, this will require continued improvements in rice yields, especially in the *aman* season when the HYV rice variety is used only in half the sown area. Ultimately though, raising real agricultural incomes will require more diversification into higher-valued crops and increased output of the livestock and fishing sub-sectors. In particular, Bangladesh would need to better avail of its long-term competitive advantage in inland aquaculture, where productivity performance in recent years has fallen well short of potential.

**Crops Sub-Sector**

2.7. ***Sustained growth of crops production – rice and wheat, in particular – in the 1980s and 1990s enabled Bangladesh to achieve its food grain production targets.*** Growth in foodgrain production has outpaced population growth, eliminating the so-called "food gap" (calculated as the difference between the amount of foodgrain required to meet the consumption target of 454 grams of foodgrain per person per day and net domestic production) by FY00. However, growth has slowed down considerably since FY02, averaging 1.8 percent per year over FY02-06, compared with an average 2.4 percent over FY81-01. This was essentially on account of a slowdown in growth of rice production, a sharp decline in wheat production (which fell by 12 percent per year, on average, over the FY02-05 period), and continued poor performances of other crops such as jute, sugarcane, pulses, and oilseeds.

2.8. ***Diversification of crop production to non-rice crops, especially the higher value added ones, is important, but is being held back by a number of factors***. Marketing constraints including shortage of cold storage facilities and a functioning cold chain, lack of grades and standards, insufficient processing capacity and, to some extent, weak consumer demand related to low incomes and consumer preferences remain a major impediment. Transport bottlenecks also slow delivery of fresh vegetable products and lead to reduced quality and sales price.

Rice and Wheat Production

2.9. ***Rice production, which accounts for two-thirds of crops value-added of, doubled between 1980 and 2005, growing at an average rate of 3 percent per year.*** Growth has been on a declining trend, however, falling from an average 3.7 percent during the 1980s to 2.7 percent in the 1990s and further to 1.9 percent in the 2000s. Growth was also quite uneven in the 1990s; averaging -1 percent a year in the first half of the decade (due to droughts and problems with fertilizer supply and distribution) and a whopping 6.6 percent in the second half.

2.10. ***Growth in rice production has been underpinned by improvements in land productivity, as the land area under cultivation has not changed much***. In fact, most of the increase in rice production since 1980 has been on account of the winter season (January-May) *boro* crop (**Table 2.3**).[22] Traditionally, the main rice crop in Bangladesh was the monsoon season *aman* crop (August-December), which depends almost entirely on rainfall and regular seasonal flooding of rivers and streams. Following the liberalization of imports of diesel engines and pumps for tubewell irrigation and expansion in fertilizer in the 1980s and with growing use of high yielding varieties of rice (HYV's), the area planted to *boro* increased sharply.[23] The *boro* area has almost quadrupled since 1980, replacing the lower yielding *aus* rice crop (April-August) in many areas. In the meanwhile, as a result of concomitant productivity improvements, *boro* production has increased almost six-fold. The area planted to *aman* crop, in the meanwhile, has shrunk by about 10 percent and although its yield has improved the rate of improvement has been declining.

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[22] The dates of planting and harvest of the *aman* and other rice crops given in this section are indicative; actual dates vary slightly across Bangladesh.
[23] Ahmed 2001.

**Table 2.3: Bangladesh: Area, Yield and Production of Rice and Wheat, 1981-2005**

| | Annual Average | | | Growth Rates | | |
|---|---|---|---|---|---|---|
| | **1981-90** | **1991-2000** | **2001-05** | **1981-90** | **1991-2000** | **2001-2005** |
| **Aus** | | | | | | |
| Production (th tons) | 2992 | 1900 | 1781 | -0.78 | -3.27 | -2.38 |
| Area (th ha's) | 2906 | 1655 | 1204 | -2.75 | -4.94 | -5.23 |
| Yield (tons/ha) | 1.03 | 1.15 | 1.48 | 1.94 | 1.73 | 2.81 |
| **Aman** | | | | | | |
| Production (th tons) | 7920 | 9127 | 10886 | 3.02 | 1.81 | -0.59 |
| Area (th ha's) | 5872 | 5683 | 5593 | -0.30 | 0.13 | -1.49 |
| Yield (tons/ha) | 1.35 | 1.61 | 1.95 | 3.07 | 1.39 | 0.77 |
| **Boro** | | | | | | |
| Production (th tons) | 4100 | 7745 | 12517 | 10.20 | 6.33 | 4.70 |
| Area (th ha's) | 1666 | 2863 | 3877 | 8.46 | 3.99 | 2.17 |
| Yield (tons/ha) | 2.46 | 2.71 | 3.22 | 1.58 | 2.16 | 2.46 |
| **Total Rice** | | | | | | |
| Production (th tons) | 15011 | 18772 | 25184 | 3.71 | 2.75 | 1.86 |
| Area (th ha's) | 10444 | 10201 | 10682 | 0.33 | 0.24 | -0.62 |
| Yield (tons/ha) | 1.44 | 1.84 | 2.36 | 3.36 | 2.46 | 2.46 |
| **Wheat** | | | | | | |
| Production (th tons) | 1092 | 1400 | 1403 | 2.26 | 7.85 | -11.64 |
| Area (th ha's) | 572 | 699 | 684 | 4.36 | 3.68 | -7.61 |
| Yield (tons/ha) | 1.91 | 2.00 | 2.05 | -1.88 | 4.04 | -4.50 |
| **Total** | | | | | | |
| Production (th tons) | 16103 | 20172 | 26587 | 3.56 | 3.00 | 1.07 |
| Area (th ha's) | 11016 | 10900 | 11367 | 0.46 | 0.44 | -1.07 |
| Yield (tons/ha) | 1.46 | 1.85 | 2.34 | 3.06 | 2.52 | 2.12 |

*Source: Staff calculations from BBS data.*

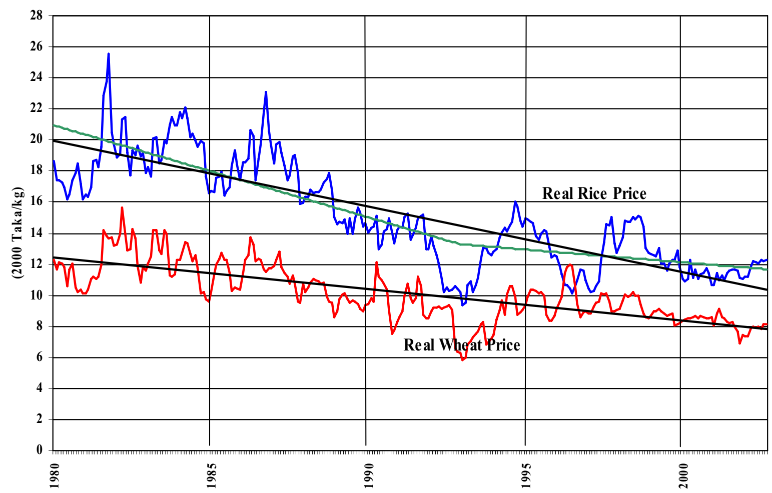
2.11. ***Production of wheat (the second largest crop) has also seen a substantial increase since the early 1970s, although production levels have declined sharply after peaking in FY99 (Table 2.3).*** Wheat production increased from an average of about 100 thousand tons per year during FY70-75, to an average of more than 1.8 million tons in FY00, due to a seven-fold expansion in area and a doubling of wheat yields. Production growth was especially rapid in the 1970s (37 percent per year), as area increased by 19 percent per year and yields rose by 15 percent per year, and also in the 1990s when production increased by 83 percent and area under cultivation by 39 percent. In recent years, however, area under wheat production has declined from a peak of 0.9 million hectares in FY99 to only 0.6 million hectares in FY05, as area planted to *boro* rice, maize and potatoes expanded. In the meanwhile, per acre yield has dropped by more than 20 percent since FY99, resulting in halving of wheat output since then.

2.12. ***The long-term increases in rice and wheat production have resulted in declining domestic prices (Figure 2.1.).***[24] From the late 1970s to the early 1990s, real rice prices fell by about 30 percent.

[24] Imports of rice over these periods were rather small (about 250 thousand tons per year in the 1980s and 700 thousand tons per year in the 1990s (Dorosh, 2001).

Real rice prices have, more or less, leveled off since, although with substantial fluctuations. Nonetheless, real incomes of farmers who adopted new technology, particularly those who increased their area planted with *boro* rice, have improved in general. Farmers unable to adopt the new technology because of lack of irrigation, appropriate drainage or other constraints, particularly in southern and northeastern parts of Bangladesh, however, may have experienced declines in real incomes.[25] Lower real prices would also have directly benefited consumers of rice, a staple for the majority. Moreover, the increased size of the rice harvest and the more even seasonal spread between the monsoon season (*aman*) rice crop and the winter season *boro* crop have helped prevent large spikes in price following years of drought or floods that damaged the *aman* crop.[26] In addition, private sector rice imports (made possible by trade liberalization in the early 1990s) have added to price stability in years of poor rice harvests (FY95, FY98 and FY99), by keeping domestic prices from rising above the cost of imports.[27]

**Figure 2.1: Bangladesh: Real Prices of Rice and Wheat, 1980-2003**




Note: Prices are deflated using the non-food Dhaka middle-income Cost of Living Index (and the national CPI after June 1998).
*Source: FPMU data and author's calculation.*

2.13. ***Despite the improvements, rice yields in Bangladesh remain substantially lower than in the East Asian economies, although better than in India and Pakistan. Wheat yields, on the other hand, are significantly lower than both the South Asian and East Asian comparators.*** Average rice yields in Bangladesh are about 5 to 10 percent higher than in India and Pakistan, but 45, 20, and 25 percent lower than in China, Vietnam and Indonesia, respectively (FAO production data). Wheat yields in Bangladesh are about 30 percent lower than in India, 15 percent lower than in Pakistan, and are less than half of those in China. Rice cultivation in Bangladesh lacks the water control (in *aus* and *aman* seasons) and warm temperatures (in winter/*boro* season) enjoyed in the East Asian countries. In addition, fertilizer use is significantly lower than in China. Bangladesh, however, had higher yield *growth* of both rice and wheat over the 1980-2003 than India and Pakistan.

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[25] See Ahmed (2001) and Arndt et al (2002).

[26] In addition, changes in cropping patterns resulting from an increase in minor irrigation and availability of modern varieties have reduced the susceptibility of Bangladesh agriculture to floods by leading to a reduction in deepwater (broadcast) *aman* rice, grown on flood-prone land during the monsoon season; and greatly increasing the quantity of rice produced within five to six months of any damaged monsoon season rice harvest (Hossain, Bose and Chowdhury, 2001; del Ninno, Dorosh, Smith and Roy, 2001; Chowdhury and Haggblade, 2000).

[27] See Dorosh (2001).

2.14. ***Sustained increases in rice production through yield improvements are needed to keep real prices from rising, as well as to free up land for diversification into high-valued crops.*** The comparisons with the East Asian economies suggest that significant scope for further improving rice productivity exist. Apart from *aman* rice, few crops can be profitably grown on flooded land during the monsoon season (jute is an exception in some areas). Since only about half of the *aman* crop (53 percent in FY04) is cultivated with HYV varieties, (compared with 95 percent of boro), continued expansion of HYV cultivation in the aman season is one potential source of further rice productivity and production growth. In the winter season, many crops compete with *boro* rice, and greater diversification of agricultural production has the potential to increase rural incomes and lead to increased consumption of non-foodgrains in the citizens' diet.[28]

**Table 2.4: Bangladesh: Area, Yield and Production of Major Crops, 1981-2005**

| | Annual Average | | | Growth Rates | | |
|---|---|---|---|---|---|---|
| | **1981-90** | **1991-2000** | **2001-2005** | **1981-90** | **1991-2000** | **1991-2005** |
| **Maize** | | | | | | |
| **Production (th tons)** | 2 | 3 | 307 | 15.01 | 0.79 | 46.10 |
| **Area (th ha's)** | 3 | 3 | 55 | 6.19 | -1.04 | 26.64 |
| **Yield (tons/ha)** | 0.76 | 1.05 | 5.66 | 8.30 | 1.85 | 15.36 |
| **Jute** | | | | | | |
| **Production (th tons)** | 977 | 879 | 819 | -0.06 | -1.05 | -0.89 |
| **Area (th ha's)** | 658 | 514 | 437 | -0.95 | -2.06 | -2.12 |
| **Yield (tons/ha)** | 1.49 | 1.71 | 1.87 | 0.90 | 1.03 | 1.25 |
| **Sugarcane** | | | | | | |
| **Production (th tons)** | 6970 | 7312 | 6642 | 0.32 | -0.70 | -1.05 |
| **Area (th ha's)** | 166 | 179 | 165 | 1.62 | -1.03 | -1.07 |
| **Yield (tons/ha)** | 41.99 | 40.83 | 40.20 | -1.28 | 0.33 | 0.03 |
| **Pulses** | | | | | | |
| **Production (th tons)** | 430 | 500 | 348 | 12.03 | -2.09 | -3.64 |
| **Area (th ha's)** | 619 | 666 | 449 | 11.19 | -3.15 | -4.36 |
| **Yield (tons/ha)** | 0.69 | 0.75 | 0.78 | 0.76 | 1.09 | 0.75 |
| **Oilseeds** | | | | | | |
| **Production (th tons)** | 424 | 462 | 281 | 6.84 | -0.20 | -3.91 |
| **Area (th ha's)** | 496 | 544 | 365 | 8.15 | -1.68 | -3.81 |
| **Yield (tons/ha)** | 0.85 | 0.85 | 0.77 | -1.21 | 1.50 | -0.10 |
| **Potatoes** | | | | | | |
| **Production (th tons)** | 1115 | 1715 | 3376 | 0.55 | 8.37 | 9.66 |
| **Area (th ha's)** | 107 | 153 | 251 | 0.00 | 6.30 | 6.99 |
| **Yield (tons/ha)** | 10.59 | 11.11 | 13.44 | 0.55 | 1.95 | 2.50 |

*Source: Staff calculations from BBS data.*
Note: Data for jute, sugarcane, pulses, oilseeds and potatoes are through 2003/04.

[28] Note also that there remains a substantial yield gap between national average yields and experiment station results ranging from 29 percent for boro to 53 percent for *aus* (*Revitalizing the Agricultural Technology System in Bangladesh,* World Bank, 2005). Part of this yield gap is due to improved management, which may require increased labor and other inputs that are not necessarily financially optimal from the farmers' perspective.

Other Crops

2.15. ***Maize production has expanded by nearly 100 times in the past seven years (Table 2.4)***, with area cultivated and production increasing from only 2.8 thousand hectares and 2.6 thousand tons in FY98 to 102 thousand hectares and 230 thousand tons in FY05. Maize production has benefited from dissemination and adoption of highly profitable hybrid seeds (essentially all maize in Bangladesh is now planted with hybrids) and ample domestic demand for poultry feed. Production is concentrated in the northwest corner of Bangladesh (Thakurgaon, Panchogarh, Dinajpur, Nilphamari) and in parts of western Bangladesh (Kushtia and Jessore).

2.16. ***Potato production increased by 7.0 percent per year from FY90 to FY04.*** Area planted to potatoes surged by 120 thousand hectares (an 80 percent increase) in FY99 after the opening of the Jamuna bridge that helped connect potential growing areas around Bogra with the Dhaka market. Since then, area under cultivation has remained steady, but production has continued to increase due to yield increases; yield increased by 28 percent between FY99 and FY03.

2.17. ***In contrast, area and production of jute, sugarcane, pulses and oilseeds have declined over the last 15 years.*** Area planted to jute, once a major export of Bangladesh, declined by an average of 0.9 percent per year between FY90 to FY04. Likewise, area planted to sugarcane declined by an average of 1.1 percent per year. The declines in pulses (3.6 percent per year) and oilseeds (3.9 percent per year) were even steeper, as there has been little improvement in technology in these crops, unlike in rice, wheat, maize and potatoes.

## Non-Crop Agriculture

2.18. ***Non-crop agriculture, fish and poultry in particular, has shown good growth since the early 1990s and continues to hold significant potential for growth, although there are emerging concerns that need to be addressed***. The fish sub-sector, nearly 80 percent of which derives from inland water (i.e. rivers, ponds, flood plains, etc.), grew at a rapid pace of 8 percent per year during the 1990s, but then experienced a major setback in 2001 with a 4.5 percent decline in output; growth has since recovered somewhat to about 3 percent. In the 1990s, fish output was buoyed by doubling of frozen food exports (mostly shrimps) during the first half of the 1990s. Shrimp exports – the second largest source of foreign exchange and employer of about 600,000 workers – fell during FY96-99 due in large measure to problems in meeting sanitary and phyto-sanitary (SPS) requirements of importers, and remained at the FY96 level through FY03. It also appears that expansion of the poultry industry may be slowing down on account of subdued demand and high cost of feed.

Fish and Shrimp[29]

2.19. ***Fish production has increased rapidly since the early 1990s, mainly due to increases in aqua-culture (fish raised in ponds); output of the capture fisheries sub-sector has stagnated***. Within this basic division between aqua-culture and capture fishing, there are also substantial differences in the types of fish, production growth rates, and distribution of benefits between inland aquaculture (fresh water fish ponds) and brackish-water aquaculture (mainly shrimp), and between inland capture fisheries (rivers, floodplains, ox-bow lakes and the Sundarbans) and marine capture fisheries (including both trawling, i.e. Industrial coastal fishing and artisanal, i.e. small-scale fishing) (**Table 2.5**). *The aquaculture sub-sectors*

[29] This section is based largely on the World Bank Bangladesh Water CAS (2005), supplemented with material from other major studies on fish and shrimp in Bangladesh, including Collis (2004), *Revitalizing the Agricultural Technology System in Bangladesh* (World Bank 2005), Cato and Subasinge (2004), and Dobson and Quader (2004).

*(inland and brackish water) have the potential for significant sustained growth. Capture fishing, by contrast, is likely to continue to stagnate***.**

**Table 2.5: Projections of Fishery Sector Output (tons)**

| **Production sector** | **2002 (mt/year)** | **2012 (estimate) (mt/year)** | **Annual change (%)** |
|---|---|---|---|
| Inland aquaculture | 850,000 | 1,465,744 | 5.6 |
| Coastal aquaculture | 94,580 | 129,597 | 3.2 |
| Inland capture fisheries | 750,419 | 606,919 | - 2.1 |
| Coastal/marine capture fisheries | 589,500 | 501,689 | - 1.6 |
| **Total** | **2,284,499** | **2,703,949** | **1.5** |

*Source: Fisheries Sector Review and Future Development (FSRFD); World Bank Bangladesh Water Country Assistance Strategy 2005.*

### *Aquaculture Fisheries*

2.20. ***Production of both inland and brackish-water aquaculture has grown rapidly since the early 1990s – at over 10 percent per year***. Most of the growth has derived from utilization of existing ponds and established technologies. Relatively high growth rates are expected as long as internal prices remain stable and shrimp exports are not reduced. Projections by a Fisheries Sector Review and Future Development (FSRFD) study suggest medium term growth rates of 5.6 and 3.2 percent per year for inland and coastal aquaculture, respectively (**Table 2.5**).

2.21. ***Inland aquaculture is the largest source of fish production amongst the various fisheries sub-sectors, production in 2002 stood at an estimated 850,000 tons with over 80 percent from small holder-pond polycultures***. (Other areas of importance include seed production, pen and cage culture and commercial aquaculture.) New ponds continue to grow at a rate of 2 percent or more per year. Small pond carp polycultures will continue to offer the greatest potential for expansion and increased production within the sector. Fresh water shrimps (*golda*) are cultivated by about 105 thousand farmers, with total production of about 10 thousand tons,[30] about 1 percent of total inland aquaculture production by weight. Integrated rice-aquaculture systems have proven highly productive, although on an, as yet, limited scale.

2.22. ***Brackish-water aquaculture produces shrimp, prawn and fish, and is expected to double its small base (almost 95,000 tons in 2002) over the next decade, although much depends on the ability to meet SPS requirements of importers***. Tiger shrimp (*bagda*) produced by this technique comprise most of Bangladesh's shrimp exports.

2.23. ***There is a strong need and, fortunately, significant potential remains for improving productivity in shrimp production.*** Since total pond area is not expected to increase significantly, major increases in total shrimp production will have to come through increased productivity per hectare. Current productivity in Bangladesh shrimp production (100-150 kgs/hectare) is far below that of Thailand (4-7 tons/hectare), the leading shrimp exporter.[31,32] Raising productivity is possible through increased support of extension, improved pond construction, better hatchery and water management, reduced Post Larvae (PL) mortality, and improved stocking ratios. Most important are improvements in post harvest handling to raise quality and safety of the final products, issues of major concern to international buyers (see **Annex Table 2.1**).

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[30] Collis (2004), p. 89.
[31] Dobson and Quader, 2004.
[32] Collis (2004) reports a somewhat higher average yield of 214 kgs/hectare in 2001/02 (See Table 9). According to the Bangladesh Shrimp Foundation, yields in Bangladesh are about 250 Kg/ha compared to 1000 Kg/Ha in India.

2.24. ***Key issues in the sub-sector – particularly for poorer farmers – are*** (i) availability of information, (ii) extension support and (iii) quality of available fish seed and access of the poor to production units. Landless and marginal farmers and the fish seed industry will require additional investment and technical support. Government–NGO partnerships have proven to be the most effective means for promoting and improving smallholder aquaculture.

***Capture Fisheries***

2.25. ***Open water capture fisheries – a major income source for the rural landless poor – have been in decline in recent years.*** Catches of the critically important *hilsa*, Indian Salmon, the major carps (*Rui, Catla, Mrigal and Kalabaus*) among others have declined precipitously. Production losses in *inland capture* fisheries have been on account of habitat loss, reduced dry season flows and unregulated over-fishing as wetlands and other aquatic resources are lost to infrastructure, agriculture, urbanization and increasing pollution. Portions of the *marine capture* fisheries – inshore coastal and tiger shrimp capture – are also experiencing a decline, which is especially worrisome as the sub-sector is a primary source of income and nutrition for at least half-a-million households in the coastal region and also employs about 0.4 million poor in seasonal shrimp larvae collection.

2.26. ***Key issues for the sustainable use and preservation of the capture fisheries*** include maintenance of dry season flows, protection of key aquatic habitats, creation and maintenance of fish sanctuaries, limitation to further disruption of migratory pathways and avoidance of further pollution and chemical degradation. In addition, the future of the sub-sector will require a reduction of fishing effort. Recent small scale efforts have shown that communities working with local governments are capable, with technical and other support, of managing local resources in a sustainable manner.

Livestock and Poultry

2.27. ***There has been virtually no growth in the number of large animals (mainly cattle and dairy cows) since the early 1980s.*** This is a significant loss to the rural economy. High cost of feed and fodder, and productivity and animal losses from disease are major constraints on production. In addition, shortage of veterinary personnel and equipment to prevent and treat infectious diseases contributes to high mortality rates of animals.[33] Increasing the number of improved breed cattle appears to be a priority for raising productivity in the sector.

2.28. ***The formal sector commercial dairy market is growing rapidly and increasing its relatively small market share, while the markets for meat remain almost entirely in the informal sector.*** As recently as 2000, the informal sector accounted for more than 95 percent of total milk marketed. In recent years, however, formal sector enterprises have established chilling centers, and milk collection networks linked to village milk co-operatives. BRAC Dairy now sells 40-45,000 liters of milk per day, equivalent to 20 to 25 percent of the commercial milk market.[34]

2.29. ***In contrast to large livestock, the poultry sector, particularly chickens and eggs, has seen good growth.*** Chicken meat and egg production each rose by 6 percent per year between 1986 and 1996. Figures for later years vary widely according to source. FAO data indicate a slowdown in growth since 1997, while BBS figures indicate an average annual growth rate of 6.7 percent from 1995 to 2000. Estimates from the Bangladesh poultry association suggest growth rates closer to those of BBS. Urbanization and rising incomes are the major forces driving increased demand for poultry products in

[33] Control of disease is complicated by the unregulated cross border import of livestock from India (Alam (1997)).

[34] Sales of other processed products such as yoghurt and flavored milk are also increasing rapidly, and account for about 20 percent of BRAC Dairy's sales. (Source: interviews with BRAC Dairy, 2005).

Bangladesh. Since most commercial demand is concentrated in major urban centers, poultry production on the approximately 65,000 commercial farms is largely a peri-urban activity.

2.30. ***Indications are that expansion of the poultry industry may be slowing down, as it confronts lingering concerns.*** According to the Bangladesh Poultry Association, operators of about 800 – 1,000 medium-sized poultry farms have appealed to the government for assistance with servicing their outstanding debt from commercial sources. Demand fluctuations (related to consumer fears surrounding the Asian bird flu) are reported as major reasons for some recent failure of poultry operations.

2.31. ***High costs of maize and soybean meal have also slowed growth in recent years and also threaten the competitiveness of the poultry sector in the medium-term.***[35] Informal estimates by the Poultry Association suggest that imports (about 60 percent from India) account for about half of total annual use of maize as poultry feed.[36] Partly as a result of the transportation and marketing costs involved in importing, maize prices in Bangladesh are about 30 percent higher than in India and also higher than in other maize exporting countries, putting domestic poultry producers are at a disadvantage. It is estimated that higher costs of feed add about 20 percent to the production cost of layers and 8 percent to the production cost of broilers relative to the producers in India.[37]

## III Rural Non-Farm Sector[38]

2.32. ***The rural non-farm sector accounts for more than 40 percent of all rural employment and more than half of rural household income, and is growing fast***. The RNF sector here is defined as all activities located in villages, rural towns, and peri-urban areas excluding the primary production of crops, fish, trees, and livestock. The number of non-farm enterprises increased from about 2 million in FY90 (BBS Integrated Annual Survey of Non-Farm Activities (IASNF)) to about 4 million in 2003 (National Private Sector Survey of Enterprises in Bangladesh (NPSEB)). **Annex Table 2.4** describes the main characteristics of the micro, small, and medium enterprises, including those in the rural areas. These data also suggest that employment in rural non-farm activities increased from 5 million to 9 million over the same period. As in many other developing countries, wholesale and retail trade is the most common non-farm activity, with about 57 percent of rural firms engaged in this sector. Another quarter of the enterprises in rural areas are manufacturing firms.

2.33. ***A number of key investment climate weaknesses are holding back the growth potential of the rural non-farm sector.*** The micro, small and medium (MSM) enterprises in non-farm sector, (which constitute almost all of the rural non-farm enterprises) appear to be lacking access even to basic factors of production and services (**Table 2.6**). Only 31 percent of rural enterprises reported having utility connections, compared with 60 percent in urban metropolitan areas.[39] Moreover, only about 2 percent of the MSM firms have own generators[40] and only 1.5 percent have access to a phone. About one quarter of rural enterprises said they had access to formal credit, which was significantly higher than for the urban areas. The widespread and rapidly growing availability of micro-enterprise lending by NGOs appears to be the driving force behind the higher access in rural areas.

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[35] High cost of medicines and vaccines imported from the European Union and the Unites States also contribute to high costs of poultry production in Bangladesh.
[36] Note that official data seriously under-report maize imports.
[37] See Quasem and Islam (2004), p. 348.
[38] This section is based on *Promoting the Rural Non-Farm Sector in Bangladesh,* World Bank, 2004.
[39] The estimate of utility connection may be an under estimate as it is derived from responses of the enterprises about their expenses for utilities.
[40] This compares to 72% of in the Investment Climate Assessment (ICA) Survey, 2003, which collected information on larger firms located in Dhaka and Chittagong.

***Table 2.6: Bangladesh: Access to Services and Credit by Micro, Small and Medium Enterprises***

| | *Rural* | *Other urban* | *Peri-urban* | *Metropolitan* | *Total* |
|---|---|---|---|---|---|
| Enterprises with | | | | | |
| **Access to Services (%)** | | | | | |
| Utility Connection | 31.49 | 59.65 | 57.05 | 59.88 | 40.00 |
| Generator | 1.81 | 3.96 | 3.40 | 4.15 | 3.00 |
| Phone | 1.51 | 5.94 | 4.54 | 9.79 | 4.00 |
| Registered | 13.20 | 37.93 | 22.05 | 41.78 | 21.11 |
| Association Member | 16.21 | 25.08 | 16.04 | 21.95 | 18.41 |
| **Access to Credit (%)** | | | | | |
| None | 41.25 | 47.03 | 54.62 | 49.06 | 43.74 |
| Informal | 22.23 | 20.96 | 27.23 | 32.86 | 23.71 |
| Formal* | 24.62 | 20.02 | 9.89 | 11.02 | 21.45 |
| Both | 11.90 | 11.99 | 8.27 | 7.06 | 11.10 |

*Formal includes micro-lending by NGOs.
*Source: the Rural Non-Farm Sector in Bangladesh, World Bank, 2004; WB Staff estimates based on NPSEB (2003).*

2.34. ***Average labor productivity of rural MSM firms is estimated at only about 60 percent that of urban firms***. Estimates of total factor productivity (TFP) are broadly similar across regions and sectors, but difference among firms within a particular region and/or sector spear to be large. Analysis shows that a*ccess to markets, access to services and to formal finance, education of the proprietor* and *access to a network for contract enforcement* are all statistically significant determinants of TFP, after controlling for other firm characteristics.[41] It is worrisome, therefore, that more than half of the firms covered by the NPSEB reported lack of access to finance as the biggest problem in starting an enterprise, and about 44 percent of firms reported it as the biggest problem in running an existing firm. Floods and disasters, availability of electricity, and road conditions were also identified in the NPSEB as severe problems by at least a third of respondents.

## IV Implications for a Rural Growth Strategy

2.35. ***Agricultural growth remains crucial for rural poverty reduction in Bangladesh, and rice production will continue to play an important role***. The development strategy should neither neglect nor over-emphasize the rice sector, however. Bangladesh has a comparative advantage in rice production, particularly in the *aman* season, when there are few profitable economically viable alternatives to rice cultivation on flooded land, the economic potential of which needs to be exploited. Even though urbanization and related shifts in diets are mitigating factors, growth in overall population and rural incomes can be expected to lead to increased demand for rice. Background projections for this report suggest that total demand for rice is likely to increase by 30 to 40 percent over the next two decades, even with constant real prices. The emphasis would have to be on improving productivity, which would also free up resources for use for non-rice crops.[42] For this, expanding the use of the HYV variety of rice to the *aman* crop (where HYV is being used in only half of the area) holds most promise.

[41] For further details on the TFP calculations see *Promoting the Rural Non-Farm Sector in Bangladesh*, World Bank, 2004, Vol II., pp. 46-48.

[42] Development of shorter-season rice varieties and greater use of mechanization could permit expansion of non-rice crop area and production (mainly in the winter season) while maintaining adequate domestic rice production. Shortage of water in the winter season and problems of flooding and drainage in the monsoon season are perennial issues that remain unresolved in many regions of the country. Increasingly frequent localized water shortages (declining water tables) in the winter season add to the costs of irrigation and reduce the profitability of *boro* rice in some regions, favoring the production of less water-intensive crops.

2.36. ***Ultimately, raising real agricultural incomes in Bangladesh will require more diversification into higher-valued crops and increased output of the fishing, poultry, and livestock sub-sectors***. Analysis of comparative advantage suggests that in the winter season, production of most non-rice crops (including wheat, pulses, potatoes and many vegetables) is economically efficient.[43] Marketing constraints including shortage of cold storage facilities and a functioning cold chain, lack of grades and standards, insufficient processing capacity and, to some extent, weak consumer demand related to low incomes and consumer preferences, remain a major constraint, however. Transport bottlenecks also slow delivery of fresh vegetable products and lead to reduced quality and sales price. Promoting development of more vertically integrated marketing systems through NGOs (e.g. BRAC), private firms (including supermarkets) through improvements in road and electricity infrastructure, and in local governance can help spur the necessary private investments. Medium-term prospects for the poultry sector and the commercial dairy sector are also good, benefiting from rapid urbanization and rising per capita incomes. The country needs to be vigilant against outbreaks of poultry diseases (including the Asian bird flu), and provide improved veterinary services, in general.

2.37. ***Bangladesh appears to have a long-term competitive advantage in inland aquaculture***. Even if past declining trends for inland and marine capture fisheries continue, as is expected, fish production as a whole can still be expected to grow as long as inland and coastal aquacultures continue to do well. In addition to research, information, and extension support from the Government, growth in aquaculture will need improvements in post-harvest handling and marketing and distribution of better quality fish seeds. Coastal shrimp and prawn aquaculture are typically profitable and practitioners are, for the most part, able to finance their own activities – special attention is needed, however, to protect the rights of small farmers and landowners, particularly in coastal areas. Although much of the direct income from production accrues to the land-owners, there are still major pro-poor employment and income effects in the provision of inputs (e.g. capture of wild shrimp post-larvae (PLs) by poor households) and processing. Shrimp exporters also have a role to play.[44] First, they will need to adhere to self-imposed standards and the recognition and acceptance of third-party certification process by importers and regulatory agencies in importing countries. Second, in the medium-term, farmers need to adopt semi-intensive and intensive methods of shrimp farming in place of the prevalent practice of extensive practice.

2.38. ***The Government's role in promoting agricultural diversification is important, albeit limited. In particular, a significant expansion in agricultural research and extension efforts is needed in rice as well as high value added crops, livestock and fish***. Bangladesh currently spends only about 0.2 percent of agricultural GDP on agricultural research, compared to an average of 0.6 percent of agricultural GDP for all developing countries. Given the importance of agriculture and also the potential for future productivity gains, a medium term target of 2.0 percent of agricultural GDP seems appropriate. Establishment of an endowment Trust Fund, and institutional reforms to increase stability of funding and to strengthen research management, (including renewed efforts at prioritizing research) could substantially increase the effectiveness of public research and extension expenditures.[45]

2.39. ***In addition to agricultural research and extension, public investments in rural marketing infrastructure (particularly roads, bridges and telecommunications) combined with a favorable environment for private investment (e.g. in warehouses and cold storage facilities) are needed***. This would reduce storage losses and price risk for non-rice crops, particularly highly perishable fruits and vegetables, and improve farmer incentives for expanded production. Government also has an important

[43] Shahabuddin and Dorosh (2004).
[44] *Bangladesh: Growth and Export Competitiveness,* World Bank, 2005.
[45] *Revitalizing the Agricultural Technology System in Bangladesh. Bangladesh Development Series (paper no. 7),* World Bank. 2005. Dhaka, Bangladesh: World Bank office.

role in providing a growth-friendly institutional environment "rules of the game" for agro-food system and agro-enterprise development (see **Box 2.1** for relevant lessons from a recent study for India).

***Box 2.1: Role of Government in Agro-Food System and Agro-enterprise Development***

**Setting and ensuring enforcement of transparent and consistent 'Rules of the Game'**

- Establish and enforce rules which define and allocate property rights (i.e. property and bankruptcy laws; intellectual property rights; zoning regulations).
- Establish and enforce rules which define permissible and non-permissible forms of cooperation and competition (i.e. licensing laws, laws of contract and liability, company and cooperative laws; anti-trust laws).
- Establish and ensure compliance with bio-safety, food safety, worker safety, and sanitation regulations.
- Negotiate favorable terms for access to international markets and ensure fair practices on the part of international trading partners.

**Addressing market failures**

- Ensure that the country is protected from the harmful introduction/spread of plant pests and animal diseases.
- Ensure the availability of (production, price, industry) information and statistics to facilitate market activity and to monitor market progress.
- Invest in or facilitate risk management instruments for agribusiness system participants (e.g. futures contracts, options, negotiable warehouse receipts, crop insurance).
- Compensate for unbalanced power relationships within the agribusiness system by monitoring potential abuses of market power, by providing training and information, and/or by supporting organizational development among weak participants.
- Compensate losers in structural reform processes through safety nets and other transitional targeted programs.

**Building physical and knowledge capital**

- Invest in social overhead infrastructure, especially that related to transport, and energy.
- Invest in knowledge-building to accelerate the agribusiness learning process and better enable the emergent private sector to participate/compete (i.e. R&D; academic/technical training).
- Facilitate development of agricultural marketing facilities (i.e. marketplaces; wholesale markets).

*Source: India Re-energizing the Agricultural Sector. W*orld Bank. 2004. Report No. 27889-IN.

2.40. ***Improved marketing infrastructure will also promote growth of non-crop agriculture, including the poultry and fish, as well as the rural non-farm sector***. Meeting the growing demand for meat and eggs deriving will require steady increases in the supply of day-old chicks and feed (currently largely based on imported maize). Extension efforts are needed to ensure that poor rural households have access to technology in production and processing.[46]

2.41. ***Policies and investments outside the agricultural sector are also key to promoting non-farm growth***. There is an urgent need to improve rural access to finance and electricity. Although, large farmers have access to formal credit and poor households can often obtain micro-credit, small and medium farmers have difficulty obtaining credit for production activities. Similarly, small rural non-farm enterprises report access to credit as a major constraint to establishing and operating a firm. Furthermore, the experience of Latin America and the Caribbean suggests that improvements in education, transport infrastructure, and engines of non-farm growth that promote female employment can be important components of a successful strategy to promote non-farm growth and rural poverty reduction.[47]

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[46] Sen (2003).

[47] Berdegue, Reardon, Escobar (2000), and *India Re-energizing the Agricultural Sector,* World Bank. 2004. Report No. 27889-IN.