

**Poverty Alleviation Through Agriculture and Rural  
Development in Bangladesh**

Paper 39

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The present paper, **Poverty Alleviation Through Agriculture and Rural Development in Bangladesh**, has been prepared as part of CPD's on-going agricultural policy research and advocacy activities with the International Rice research Institute (IRRI) under the Poverty Elimination Through Rice Research Assistance (PETRRA) project.

The present paper titled *Poverty Alleviation Through Agriculture and Rural Development in Bangladesh* has been prepared by *Dr Mahabub Hossain*, Head, Social Sciences Division, International Rice Research Institute (IRRI), Manila, Philippines.

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## **Poverty Reduction Through Agricultural and Rural Development: The Bangladesh Case**

### **I. Introduction**

Poverty is a multi-dimensional concept. Traditionally poverty is viewed as pronounced deprivation in well-being. “To be poor is to be hungry, to lack shelter and clothing, to be sick and not cared for, to be illiterate and not schooled” (World Bank, 2001). Poverty is usually measured with reference to a threshold level of income or expenditure (called poverty line) needed to meet food and non-food basic needs for a person to maintain a healthy and productive life. These measures are called “income poverty”. Social scientists and policy makers now agree that low levels of education and health are of concern in their own right. The deprivation in education and healthcare merit special attention when accompany material deprivation. The 2000 World Development Report on poverty broadens the notion of poverty to include vulnerability and exposure to risk. In Bangladesh most of the studies on poverty have focused mainly on income measures.

Rural development means improvement in the well being of the people living in rural space. If the livelihood improvement brings into its fold people who lack capabilities to meet the basic needs, rural development would encompass poverty reduction. Since three-fourths of the population in Bangladesh still lives in rural areas, a broad based rural development that improves the well being of the bottom 50 percent of the rural population would contribute substantially to poverty reduction in the country.

Rural people use natural resources – land, water, and biotic resources – as the base of their livelihood. These resources are dominant factors of production in agriculture, the major economic activity in rural areas. However, many non-agricultural activities such as processing and manufacturing, trading and business, transport, construction, and various types of personal and financial services (that are highly concentrated in urban areas) also develop in rural areas to support agriculture or to satisfy the needs of the people dependent on agriculture. Agriculture and non-farm activities are the means to achieving rural development.

This paper is organized as follows. Section II provides an overview of the progress made so far in agricultural, rural development and poverty reduction. Section III discusses the role of agriculture in poverty reduction in the Bangladesh context. Major challenges facing Bangladesh for further reduction in poverty and the opportunities for addressing them are outlined in Section IV. Conclusions are made in the last section.

The background information for the paper is drawn from a) official statistics published by the Bangladesh Bureau of Statistics, and b) findings from a nationally representative household survey conducted by the Bangladesh Institute of Development Studies (BIDS) and the International Rice Research Institute (IRRI), henceforth called the BIDS-IRRI survey. The benchmark survey was conducted in 1987-88 covering 1245 households from 62 villages in 57 districts. The sample was drawn using a multi-stage random sampling method. The same villages were re-surveyed during 2000-2001 period to assess the changes in rural economy during the period 1987-88 to 2000-2001. The 2000-01 survey

covered a sample of 1888 households drawn randomly by classifying households by wealth ranking method. The 1987-88 sample households were included in the 2000-01 sample to generate panel data.

## II. Progress in agriculture, rural development and poverty reduction

### *Agriculture and rural development*

Agriculture performed relatively well in the 1990s. The growth of agricultural incomes is estimated at 3.5% per year during 1990-2001 compared to 2.6% during 1974-90. The acceleration of agricultural growth has contributed substantially to improved performance of the overall economy. The national income grew at 5.3 percent in the 1990s compared to 4.1 percent during the previous two decades (Table 1).

**Table 1. Long-term growth of agriculture and economy, 1973-74 to 2000-01**

Sector	Percent per year		
	1973-74 to 1989-90	1989-90 to 2000-01	1973-74 to 2000-01
Agriculture	2.6	3.5	3.0
Crop	1.7	2.5	2.0
Forestry	3.8	3.8	3.8
Livestock	5.2	7.3	6.0
Fisheries	2.3	7.8	4.5
Non-agriculture	6.0	6.2	6.1
Gross domestic product	4.1	5.3	4.6

Source: Estimated from BBS, Statistical Yearbook of Bangladesh and Monthly Statistical Bulletin, Various issues.

The acceleration in the growth of agricultural incomes was mainly on account of non-crop agricultural sectors particularly from livestock and fisheries. These sub-sectors experienced substantial increase in physical output, as well as favorable prices compared to the crop sector. The fisheries income grew by 7.8% per year in the 1990s, compared to 2.3% during the previous two decades. The income from livestock activities picked up in the 1980s and continued to grow at a robust rate of 7.3% in the 1990s. Only the forestry sub-sector grew at a moderate rate of 3.8% per year. Thus, agriculture has become much more diversified than it was at the time of independence (Mandal 2000; Ahmed and Chowdhury 2000). The share of livestock, fisheries and forestry in agricultural incomes was only 20 per cent during 1973-74; by 2000-2001 they contributed nearly 44 percent to agricultural incomes.

However, the crop sector is still dominated by the production of rice. Although the area under rice increased marginally from 9.8 to 10.6 million ha, rice production (in paddy units) increased from 16 million tons before independence to 38 million tons in 2000-01 (Table 2). It implies a rate of growth 2.6% per year, much faster than the growth of population. Development and diffusion of high-yielding rice varieties supported by the development of minor irrigation through shallow tube wells and power pumps was the main driving force behind this growth (Hossain 1988; Hossain et al. 1994). More than

half of the land is now irrigated, and over 65 percent of the rice area has been brought under the cultivation of the high yielding modern rice varieties.

**Table 2. Technological progress and its effect on the growth in rice production**

Indicators	1965-66	1975-76	1990-91	2000-01
Rice harvested area (million ha)	9.35	10.36	10.32	10.80
Coverage of modern varieties (%)	0	15	44	63
Rice yield (ton/ha)	1.52	1.70	2.59	3.48
Rice production (million tons)	14.26	17.64	26.78	37.62
Population (million persons)	62.8	80.8	109.6	129.4
<b>Rice production per capita</b> (Kg of milled rice)	151	146	163	194

Source: Bangladesh Bureau of Statistics. Statistical Yearbook of Bangladesh, and Monthly Statistical Bulletin. Various issues.

The long-term trend in rice production however shows a cyclical pattern with a few years of rapid growth followed by a few years of stagnation. This pattern is partly due to depression in prices in seasons following consecutive good harvests that provides disincentives to farmers to further increase production, and partly due to occasional natural disasters - floods and droughts.

Bangladesh has also experienced respectable growth in the production of wheat which turned it from a minor to a major crop during 1976-84. Wheat production increased from 0.14 million tons in 1976 to 1.4 million tons in 1984, but remained stagnant at that level during the next decade. The growth resumed again in the late 1990s in response to favorable prices, reaching a production level of nearly 2.0 million tons.

The rapid expansion of wheat and the dry season boro rice was however achieved partly through reduction in the area under jute, sugarcane, pulses and oilseeds. As a result Bangladesh has to spend scarce foreign exchange for import of non-cereal food products in increasing amounts. The reduction in the availability of pulses, which are important sources of protein and micronutrients has adversely affected balanced nutrition, particularly for the poor (Jahan and Hossain, 1998)..

Among other food crops, the growth was respectable only for potatoes and vegetables. Bangladesh has comparative advantage in the production of these crops (Shahabuddin 2000), and production can increase substantially if foreign markets can be tapped. Because of limitations of market, the prices of these high value crops collapse at harvest time, which is main constraint to the expansion of production.

The growth in farmers' income has however been much lower than the growth in crop output due to a) substantially higher requirement of modern inputs (water, fertilizers and pesticides) in cultivation of modern varieties, b) an increase in wage rates faster than price of agricultural produce, as the agricultural labor market has become tight with the expansion of the rural non-farm activities and rapid rural-urban migration of population, and, c) a long term decline in the price of rice adjusted for inflation.

The growth of agricultural productivity has however promoted a healthy development in the rural non-farm sector by triggering what economists call “backward and forward linkages”. Agricultural growth has generated opportunities for employment and income in the rural non-farm sector through its effects on a) the demand for irrigation equipment and chemical fertilizers produced and transacted in the non-farm sectors, b) the demand for services for processing, storage and marketing of additional agricultural produce, and c) the demand for trade, transport, construction, education and health care services, as farm households spend a larger proportion of additional incomes for purchasing non-farm goods and services.

The official national income statistics in Bangladesh does not provide a rural-urban breakdown of employment and incomes. So it is difficult to draw a reliable picture of the nature, composition and growth of the rural non-farm sector in Bangladesh. The BIDS-IRRI sample household survey in 62 villages reveals that the employment in the rural non-farm sector has increased by 4.5 percent per year while the number of workers employed in agriculture has declined by nearly 1.2% per year (Table 3). The agricultural income grew at only 1.4% per year during the 1987-2001 period, but the household income grew at 3.8% per year mainly due to a robust seven percent growth in income from rural business and service sector activities. The income from agricultural wages declined in absolute term (Table 4). The proportion of rural households dependent on the agricultural labor market for their livelihood became also half during 1987-2000. Many of them took opportunity of renting land from the tenancy market as large landowning households living cultivation in favor of trade and business. Others found employment in transport operation and petty trade, stimulated by the expansion of rural road network and growth in marketed surplus of agricultural produce (Hossain et al. 2002).

**Table 3. Changes in the source of employment for rural workers, 1987-88 and 2000-01**

<b>Occupation</b>	<i>Percent of workers</i>		
	<b>1987-88</b>	<b>2000-01</b>	<b>Percent change</b>
Agriculture	<u>67.0</u>	<u>47.9</u>	-29
Cultivation	42.6	35.2	-17
Agricultural labor	21.8	11.7	-46
Other agriculture	2.6	1.0	-62
Non-agriculture	33.0	52.1	58
Trade & business	9.0	13.7	52
Services	14.0	21.9	56
Non-agricultural labor	10.0	16.5	65
All sources	100.0	100.0	

Source: BIDS – IRRI survey.

**Table 4. Growth of rural household income, 1987-88 and 2000-01**

Sources of income	Rate of growth (Percent/yr)	Percent of income from the source	
		1987-88	2000-01
Agriculture	1.4	64	49
Crops	0.4	46	32
Non-crop agriculture	8.3	8	13
Agricultural wages	-3.8	10	4
Non-agriculture	6.8	36	51
Trade & business	7.0	15	21
Services	6.5	16	22
Other non-agriculture	7.5	5	8
Household income	3.8	100	100

Source: BIDS – IRRI survey.

### ***Poverty reduction***

An accurate assessment of the trend in reduction of income poverty is difficult, in spite of a large number of studies conducted for Bangladesh on the subject (Muqtada, 1986; Hossain and Sen 1992; Ravallion and Sen 1996; Sen 2003). The household expenditure surveys (HES) conducted by the Bangladesh Bureau of statistics that report the incidence of poverty and income inequality through periodic generation of household level data changed overtime the method of data collection and the measurement of poverty line. Thus, while making a judgment about poverty trend one needs to be cautious about the interpretation of the information.

According to the World Bank estimate based on the HES data, nearly 40 percent of the rural population in Bangladesh lived below the poverty line in 1995-96. A study by Ahmad and Hossain (1983) estimated that the number of poor households in rural Bangladesh remained almost stagnant at 75 percent during 1963-64 to 1973-74, but increased to 84 percent in 1976-77, after the famine in 1974-75. According to the Bureau of Statistics the poverty ratio for rural areas declined from 74 percent in 1981-82 to 48 percent in 1988-89. The dramatic improvement in the poverty situation in the 1980s, as shown by the official figures, was however highly debated in the literature and was partly attributed to the change in the data collection method in the 1983-84 HES. During 1983-84 to 1989-90 there was a decline in poverty ratio from 54% to 50% for rural areas and from 40 to 36% for urban areas. An independent estimate by the Bangladesh Institute of Development Studies based on household level primary data collected from a nationally representative sample showed a reduction in rural poverty rates from 59 to 51% during 1987-88 to 1994-95. It is now widely recognized that the poverty ratio has been declining by one percent per year which is very slow considering that over 40 percent of the rural population are still poor. The slow progress in poverty reduction in spite of the acceleration of economic growth in the 1990s is attributed to growing inequality in the distribution of income for both rural and urban areas (Sen 2003).

**Table 5. Progress in non-economic indicators of well-being**

<b>Indicator</b>	<b>1990</b>	<b>1999</b>
Infant mortality rate (per 1000)	94	57
Under five mortality rate (per 1000)	151	102
Maternal mortality rate (per 100,000)	478	440
Adult literacy rate (%)	37	53
Children enrolled in primary school (%)	43	70
Primary school enrolment rate (%) <sup>a/b</sup>	60	75
Fertility rate <sup>a</sup>	6.1	3.1
Population growth rate	2.2	1.5
<sup>a</sup> The numbers are for 1980		
<sup>b</sup> Percent of the relevant age group		
<i>Source: World Bank (2001); UNDP (2002), Human Development Report.</i>		

There are indications that Bangladesh has made moderate progress in other dimensions of poverty. The primary school enrolment ratio has improved from 60 to 75 percent, and the infant mortality rate declined from 132 to 73 per thousand live births during the 1980-97 period. The access of the population to safe drinking water has increased from 40 to 84%, and to improved sanitation from 4 to 35 percent. The most impressive progress has been made in population control. The number of births per woman has declined from 6.1 to 3.1. The preliminary findings from the 2001 population Census show a decline in population growth from 2.2 percent in the 1980s to 1.5 percent in the 1990s. The BIDS-IRRI surveys support the findings of improved literacy and school participation rates, and show that the gender disparity in the school participation rate has almost disappeared for primary level, and has turned in favor of girls at the secondary level. The school participation at both secondary and tertiary level however still remains at a low level.

The extent of vulnerability to external shocks has also been reduced. People have become more resilient to natural disasters because of the change in the seasonal composition of food production. The area under pre-monsoon aus rice which was highly susceptible to droughts has been reduced from 3.4 to 1.3 million ha; the land has been diverted to growing dry season high-yielding and relatively safe boro rice or the highly profitable vegetables and fruits. The risk of the loss of aman rice from droughts has also been reduced due to large scale expansion of the shallow tubewells that could be used for supplementary irrigation. The area under deep water broadcast aman rice has been reduced from 2.1 to 0.7 million ha, substantially reducing the loss in rice output from abnormal floods. In the deeply flooded area farmers now keep the land fallow during the monsoon season and grow boro rice with irrigation during the dry season (Table 6). The boro area has expanded from 0.9 to 3.4 million ha over the last three decades, which together with wheat brings nearly 55 percent of the cereal harvest during the May- June period. So the losses in the rice output from floods or droughts could be recovered within a few months. Earlier, farmers had to wait for the next aman harvest to recover the loss. With the year round production of rice, the seasonality in employment and income for the landless workers is now much less pronounced than it was earlier.

**Table 6. The changes in rice cropping pattern in Bangladesh, 1969-70 to 2000**

Season/type of rice crop	1969-70		2000	
	Area (m ha)	% of rice area	Area (m ha)	% of rice area
Aus	3.42	33	1.33	13
Deepwater Aman	2.09	20	0.75	7
Transplanted Aman	3.92	38	5.09	48
Boro	0.88	9	3.43	32
Total	10.31	100	10.60	100

Source: Bangladesh Bureau of Statistics. Yearbook of Agricultural Statistics, and Monthly Statistical Bulletin, Various issues.

Needless to point out, the insecurity and vulnerability due to violence, lawlessness and lack of justice have substantially increased.

In Bangladesh poverty is concentrated mostly in households who do not have assets (**resource-poor**). Manual labor is the only resource available to poor households. A self-assessment of poverty estimated by participatory rural appraisal method by the BIDS-IRRI survey revealed that 43 percent of the rural households considered themselves as poor (Table 7), almost the same as estimated by the World Bank for 1995-96. The study found that most of the households engaged in agricultural wage labor and transport operations were extreme or moderate poor, and households engaged in trade or business and services were non-poor. The incidence of poverty was 80% among households with no cultivated land, 60% among those holding up to 0.2 ha, and almost none among households owning more than 1.0 ha (Table 8). Households who were unable to provide three meals a day to members were reported at 40% among those with no cultivated land, 26% among those with up to 0.2 ha and very little among households owning over 0.4 ha.

**Table 7. Incidence of poverty among occupational groups***(Percent of households)*

Principal occupation	Moderate & extreme poor	Extreme poor
Agricultural labor	92.1	39.6
Non-agricultural labor	72.3	18.6
Farming	22.1	2.3
Services	22.3	8.1
Trade & business	35.0	6.3
All households	42.7	12.0

Source: BIDS-IRRI survey.

**Table 8. Incidence of poverty among landownership groups, 2000-01**  
(Percent of households)

Landownership (ha)	Moderate & extreme Poor	Extreme poor	Percent of days having meal without fish	Consumption of rice grams/capita/day
With no cultivated land	76.5	25.4	62.5	436
Up to 0.2 ha	60.0	15.4	53.9	448
0.21 to 0.4	29.8	3.5	47.3	473
0.41 to 1.0	10.7	1.1	37.1	484
1.01 to 2.0	2.1	-	34.5	519
2.01 to 3.0	-	-	30.1	502
Above 3.0 ha	-	-	17.9	492
All households	42.7	12.0	49.6	474

Source: BIDS-IRRI survey.

### III. Agriculture's role in poverty reduction

Agriculture is an economic activity based on land. Agricultural development aims to increase the productivity of land resources. In Bangladesh almost one-third of the households do not own any cultivable land and another 17 percent own only up to 0.2 ha (Table 9). So how can agriculture improve the livelihood of the people of these bottom 50 percent of the households who do not own any land and constitute the vast majority of the poor?

**Table 9. Change in the distribution of landownership, 1987-88 and 2000-01**

Landownership group (ha)	1987-88		2000-01	
	Percent of households	Share of land (%)	Percent of households	Share of land (%)
Nil	5.2	0.0	5.1	0.0
Up to 0.2	38.5	3.8	45.6	4.8
0.21 to 0.40	13.6	5.8	16.2	8.1
0.41 to 1.0	21.9	20.9	16.3	18.3
1.01 to 2.0	12.1	25.8	10.1	24.7
2.01 to above	8.5	43.6	6.7	44.1
All households	100.0	100.0	100.0	100.0
Size of land ownership (ha/hh)	0.65		0.58	

Source: BIDS-IRRI survey.

The BIDS-IRRI study estimated that in 2000 an average farm household operated only 0.65 ha. With the level of land productivity prevailing in 2000, this size of farm could generate an income of only US\$ 100 per person per year, which was only 70 percent of the income needed to meet the most basic human needs (poverty line). A poor household owned 0.29 ha of land, which at the prevailing productivity level generated only 30

percent of the poverty level income (Table 10). Therefore, the poor households must engage themselves in multiple occupations including engagement in non-farm activities in order to escape poverty. In that sense a broad-based rural development rather than a narrowly focused agricultural development is absolutely essential for poverty reduction for an extremely land scarce country such as Bangladesh.

**Table 10. Contribution of land to rural livelihoods, 1987-88 and 2000-01**

Indicators	All households		Poor households	
	1987-88	2000-01	1987-88	2000-01
Farm Size	0.89	0.65	0.32	0.29
Land productivity (US\$/ha)	642	895	650	830
Household incomes (US\$/yr)	571	582	208	241
Per capita income (US\$/yr)	93	101	40	46
Rural poverty line (US\$/person)	133	141		

Source: BIDS-IRRI survey.

One can argue that agriculture generates wage employment for the landless households, as medium and large farmers hire labor for conducting farm operations. But since the proportion of medium and large farmers is very small, the agricultural labor market can generate employment for only a small fraction of the vast landless and marginal land owning households in the country. The BIDS-IRRI surveys found that only 22% of rural workers had agricultural wage labor as primary occupation in 1987-88, and their number declined to 12 percent by 2000 (Table 3). Agricultural wage income accounted for 11 percent of the rural household incomes in 1987-88; it declined to only 4 percent in 2000. When the modern high yielding rice varieties were introduced the demand for hired labor increased substantially. But overtime the labor use in rice cultivation has declined with the spread of agricultural mechanization in land preparation, irrigation and post harvest processing. Even full employment in agricultural labor market cannot provide a poverty escaping income at the prevailing agricultural wage of about one dollar per day.

It is the expansion of the non-farm sector that has been contributing to the increase in incomes of the households who are poorly endowed with assets. Many landless households have migrated to rural towns and cities and found jobs as transport operators or construction laborers. The impressive development in the rural road network in the 1990s coupled with the increase in marketed surplus rice and vegetables and fruits have created employment opportunities in transport operation and petty trading. This is the main reason why the supply of agricultural labor has declined in recent years and farmers have been complaining regarding the scarcity of agricultural labor. The increase in the number of shallow tubewells, pumps, power tillers and rickshaw and rickshaw vans has created jobs as in the operation and repair and maintenance. Last but not the least, many marginal landowning households with some skills for utilizing capital have been able to generate self-employment in livestock and poultry raising, petty trading, and various kinds of personal services with the vast increase in micro-credit supplied by the NGOs.

Agricultural development has contributed to poverty reduction in an indirect way. Agriculture produces food for the people. The increase in the supply of food faster than demand has helped keep food prices within affordable limits of the low-income people,

and thereby has contributed to achieving food security. The amount of food the poor can access from the market with their limited income depends on the price of food. An analysis of the 2000 Household Income and Expenditure Surveys (HIES) conducted by the BBS reveal that rural landless and the urban laboring class spend 68% of their income on food and 35% percent on rice alone, compared to 44% and 10% respectively for the top 10 percent in the income scale. So a reduction in the price of food grains relative to the industrial products benefits the poor relatively more than the non-poor households. In Bangladesh the poverty situation deteriorated in the early 1970s due mainly to the decline in the per capita availability of rice. The soaring price of rice caused tremendous hardship to the landless, marginal farmers and artisans in the rural areas, and industrial laborers and transport and construction workers in urban areas.

Since the mid-1980s the food grain prices have increased at a much slower rate than the general price index, due to favorable growth in agriculture in general and the rice production in particular. The large farmers have been hurt by the decline in the real rice price, but the landless have gained. An agricultural wage-laborer could buy 2.8 kg of rice with their daily wage in 1987-88. The rice-equivalent wage was 5.7 kg in 2000, an increase of 5.8% per year during 1987-2000 (Table 11). **Agriculture's main role in poverty reduction lies in maintaining the supply of food at least at a rate at which the demand has been growing, thereby keeping the food prices stable and within affordable limits of low-income households.**

**Table 11. Changes in the real wage for agricultural workers, 1987-88 and 2000-01**

Indicators	1987-88	2000-01	Change (%/yr)
Wage rate (Tk/day)	30	66	6.3
Rice price (Tk/kg)	10.91	11.59	0.5
Real wage (Kg of rice)	2.75	5.69	5.8
Cost of living index	55.7	100	4.7
Real wage adjusted by cost of living	54	66	1.6

Source: Bangladesh Bureau of Statistics. Yearbook of Agricultural Statistics, Various Issues.

#### **IV. Major challenges and opportunities**

The major obstacle to poverty reduction in Bangladesh is its over-population in relation to natural resources. A rising population puts pressure on the limited land resources for producing food, and limits the capacity of the household and the nation to accumulate physical capital, due to diversion of resources for maintaining a large proportion of young and unproductive population. Because of inadequate investment in education and health care, the human capital content of the population remains poor. Instead of becoming a resource, the illiterate and unskilled population becomes a burden for the nation. The lack of physical capital and skills constrains the development of the industry and services sector and limits generation of productive employment for the rising labor force. Unemployment and underemployment breed social ills like violence and terrorism that in turn hinders development.

Fortunately, Bangladesh has started making respectable progress in population control, particularly since the mid-1980s. The population growth has declined from 2.8 percent per annum at independence, to 2.2 percent in the 1980s, and further to 1.5 percent in the 1990s. However, we should not be complacent. The population is still growing by two million every year, and may increase by another 30 million over the next 20 years (Table 12). It will not be easy to provide food and employment for the additional people and the labor force. As the population has started declining, the proportion of population in the working age group will continue to grow for some time, putting additional challenge for policy makers for generating productive employment.

Bangladesh has almost exhausted the potential for increasing rice with existing technology and in the process has over-exploited the fertility of the soil and ground water resources. Modern varieties have been adopted on lands that are suitable for them. The arable land has been declining to accommodate increasing demand from housing, commercial and infrastructure development activities. There is little scope for further expansion of irrigation infrastructure. Without development and diffusion of new generations of modern rices with higher yield potentials, and improved varieties tolerant to drought, submergence and problem soils, and dissemination of improved crop management technologies for reducing the yield gap, it would be difficult to maintain the demand-supply balance for rice, and sustain the food grain self-sufficiency achieved only recently. The public sector investment for research & development and for harnessing of modern science and technology for increasing the productivity of natural resources must continue.

**Table 12. Increase in population: The main determinant of the increase in demand for agricultural products**

Year	Projected population based on			
	1991 Census Total	2001 Census		
		Total	Rural	Urban
1990 (actual)	109.8	109.8	88.2	21.6
2000 (actual)	132.4	127.4	97.6	29.8
2010	153.4	143.2	102.3	40.9
2020	172.9	156.8	100.8	56.0

Source: World Bank, 1998: World Population Projection, Washington DC.; BBS, 2001: Population Census 2001: Preliminary Report.

The strategy of poverty reduction through keeping food grain prices low may not work in the future due to growing urbanization and spatial separation between the producers and the consumers of food. So far the vast majority of the population lived in rural areas. Subsistence was the main driving force behind the growth in food production, as the farm household had to produce food to feed its own members. Urbanization is however growing fast and soon most of the increase in population will be located in urban areas (Table 12). Farmers may not produce surplus food for the urban population unless the price of inputs and outputs provide adequate incentives. Profitability, rather than subsistence will increasingly become more important motive for sustaining the growth in food grain production.

It was noted earlier that the respectable growth in the production of cereals- rice and wheat- has been achieved at the cost of many minor crops. The pattern of growth of the crop sector has affected not only the relative prices of different food items but also the nutritional balance in food intake. The composition of the food basket estimated by the recent household surveys shows that the consumption of cereals has reached a level much higher than the minimum nutritional requirement, there is a marginal deficit for tubers and vegetables and fish, but substantial deficits for pulses, oilseeds and livestock products. Thus, crop and agricultural diversification must be given priority in agricultural development strategy to achieve balanced nutrition.

Since most of the land and other agricultural resources are tied in rice cultivation, agricultural diversification cannot be achieved unless resources are released from rice cultivation. Thus, further growth in rice productivity is needed so that rice needs can be met with less land, less labor and less water. Agricultural research must be done keeping in view the needs of the system, rather than individual crops. This will require much stronger coordination among different research institutes, and greater interaction between researchers and farmers for assessing the technology needs.

The strategy for agricultural development and poverty reduction must contain strong elements to promote fish and livestock production. These sectors could not make much contribution to agriculture and overall economic growth because of their small size. But they have become large enough to deserve special attention for sustaining a high growth in agriculture. In contrast to rice and vegetables that have weak domestic markets, a high rate of growth of livestock and fisheries output can be sustained without depressing prices and farmers' incomes because of their strong market.

There is a great potential for increasing fish production in Bangladesh through proper utilization of the vast flood plains that has only been marginally tapped. The area under fisheries is estimated at 5.3 million ha (a third of the land area in Bangladesh) of which 2.8 million ha is under flood plains. The flood protection embankments and the use of pesticides in the cultivation of modern rice varieties have had negative effect on culture fishery by affecting the free flow of fish in this vast fish habitat and its pollution with harmful agrochemicals. But with the protection of the area from abnormal flooding, the potential for aquaculture has greatly increased.

The technological potential for raising fast-growing short maturity fish species has already been demonstrated by fisheries research. The problem lies in developing an appropriate institutional mechanism for sharing investment costs and outputs among different groups within the village community, since this fish habitat is considered a common property resource. Involvement of the landless and commercial fishermen in aquaculture in partnership with landowners can not only increase fish production, but also generate substantial employment and incomes for the resource poor households.

Bangladesh does not have comparative advantage in commercial livestock production because of the scarcity of grazing land, and the high cost of imported livestock feed. But here is good potential of poultry production on a commercial scale. An important activity financed with the credit provided by the NGOs to the resource-poor households, is the homestead-based subsistence oriented livestock and poultry farming. The advantage of this system is the low opportunity cost of involving women and children in caring the animals and birds, and the use of crop by-products and homestead forestry as livestock and poultry feed. Thus, the success in sustaining a high growth of livestock production

may depend on supporting the resource-poor households to organize subsistence-oriented production by providing access to credit, veterinary services and medicines, and facilitating marketing of products; than providing subsidies for organizing production on a commercial scale, a policy adopted by the government in the early 1990s.

## **V. Concluding remarks**

The improvement in the livelihood of the resource-poor households and thereby poverty reduction could be better achieved through faster growth in non-crop agriculture than for the crop sector, because the latter is much more land intensive than the former, and the land is so scarce and unequally distributed. The non-crop agriculture generates substantially higher value added in post-production (processing, storage and marketing) activities that can create opportunities for higher productive employment for the land-poor households. Exploitation of this potential will however require support from the public sector for developing rural infrastructure in the field of transport, power and communications, investment in secondary and technical education, as well as providing access to finance to the resource-poor households.

The movement of labor from low-productive agriculture to high-productive non-farm activities is a positive trend for poverty reduction, and should not be an issue of concern. Farmers have started responding to the phenomenon by adopting mechanization. The government could facilitate the process by providing access to credit for financing mechanization and setting up small scale agro-processing enterprises, and removing policy distortions against small scale trading and business enterprises. Also, children from low-income households must be provided greater access to quality secondary education, to facilitate their occupational mobility and to improve the distribution of income from the rural non-farm sector.

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