

COUNTRY REPORT – BANGLADESH¹

1. Agriculture and Economy

Agriculture plays a dominant role in Bangladesh economy in terms of food security, value addition, employment and export earning. Like many other Asian economies, contribution of agriculture to the economy has been declining over the decade. It decreased from 30 percent in 90s to 23 percent recently to the GDP (at constant price of 1995/96). Crop (more particularly, rice) contributes 15 percent, followed by fisheries at 5 percent. 62 percent of the labour force is engaged in agriculture. The cropping intensity is almost 180 %. About 50% of the cultivated area is under irrigation.

The GDP grew at 5.2 percent during last year while agriculture grew at 3.5%. On the other hand the growth in the manufacturing is almost 7%. Fisheries and livestock sub-sectors are having higher growth recently among the agriculture. The per capita GDP has been 421 US dollars.

Bangladesh achieved success in foodgrain production equivalent to 27 million tons during 2003 in a net cropped area of more than 10 million hectares. The production level marginally surpluses the required food requirement of the country. Most of the production gain came from winter irrigated HYV rice and to some extent wheat. However, the profitability of rice or wheat is low. The increased production of food adds little to the rural income, as rice price remains stagnant. Moreover, considering the projected income growth, future growth requirement for rice will be less while food of animal origin will increase substantially. Thus, future growth in agriculture thus demands for agricultural diversification with the intensification of present production trend.

The major crops grown are rice, wheat, Jute, sugarcane, pulses & oilseeds, potato, vegetables and fruits.

The production for pulse, oilseed, vegetables and fruits are in deficit to the requirement. The production of those crops has stagnated or declined during last few years due to over emphasis of rice. The high value crops like vegetables and fruits are also termed as risky due to its perishable nature and the producers devote less area in those crops compared to rice and wheat.

About 87% i.e. 7.2 million ha of the total cultivable area have already been brought under cultivation. Triple cropped area of the country is only 0.98 million ha which is 12% of the total

¹ Report presented during 3rd TAC meeting of Asia Pacific Center of Agricultural Engineering and Machinery held during 13-14 December 2004 in Hanoi, Vietnam

cultivated area. Double-cropped area is 3.90 million ha and rest is single cropped. Total cropped area of the country is 14.00 million ha (with a cropping intensity of 178%).

Small holders primarily dominate farming system, totalling 12 million farm holdings (80% ranging from 0.05 to 2.5 acres). Objectives of smallholder farming in Bangladesh are:

1. Provide food for family from own farms
2. Make most profit from farming
3. Employ family members on own farm
4. Create opportunities to have off-farm works
5. Provide education of own children and other basic needs

Poverty reduction has been the major development agenda in the country. It has been observed that incident of poverty is prominent in the agriculture than other sector. The poverty is reducing at a slower rate (about one percent per year) and the government is keen to accelerate the poverty reduction campaign through different approaches including micro credit and small & medium enterprise development.

2. Mechanization Strategy and Trend

2.1 Government Policy on Mechanization:

The serious scarcity of draft power necessitates the use of mechanical power for agricultural production activities. The government has, therefore, attached special importance to agricultural mechanization. To encourage the use of machines in agriculture, testing and standardization restrictions have already been withdrawn in the free market distribution system. As a result, the use of agricultural machinery has increased significantly and immense potential is created for further increase. In order to accelerate the current trend of agricultural mechanization, various facilities including exemption of import duties on agricultural machinery have been provided and the same will continue.

The following steps will be taken to promote agricultural mechanization:

- The type of agricultural machines or the level of mechanization needed in any region depends on the socio-economic condition of the people, number and quality of draft animals and availability of agricultural labor in that region. Measures will be taken to collect and publicize these information through the mass media in order to attract private investment in this sector.
- In order to gradually reduce dependence on draft power, efforts will be made to grow farmers' interest on mechanization as well as to provide credit facilities. To achieve

this goal, information relating to increasing potential demand for and profitable investment in agricultural machinery will be publicized through the mass media so that the private sector can play an active role in creating a competitive market.

- Despite increasing use of mechanical power in agriculture, the use of animal power will continue in future depending on the socio-economic conditions of the farmers in different regions. Therefore, improved 'power delivery system' (meaning delivery of energy from the shoulder of the draft power to the agricultural implement) will be evolved through research so that the scarce draft power can be utilized more efficiently.
- Production and import of agricultural machines will be specially encouraged so that the farmers can procure machines from the market according to their choice and convenience. Machinery workshops and industries engaged in agricultural mechanization activities will be provided with appropriate taxes/duties facilities for the import of necessary raw materials. This is expected to keep the machine prices within the purchasing capacity of the farmers.
- To speed up the process of agricultural mechanization both producers and users of machines will be provided with necessary credit supports.
- Use of machines, which are usually expensive, is not often affordable by the individual farmers. In order to popularize mechanization in addition to the use of draft power, farmers will be motivated in purchasing or taking lease of agricultural machines through the cooperatives. Formation of such self-motivated cooperatives will be encouraged and necessary supports will be extended to mechanized cultivation based on cooperatives.

2.2 Trend of Mechanization

Mechanization has been taking place in Bangladesh agriculture in the backdrop of fragmented and decreasing farm size, from 0.81 during 80s to 0.61 ha recently. Occurrence of small and marginal farmers has been increasing while the large farms being decreased. Both road networks and electricity supported private/commercial agricultural input supply chains and service structures.

Mechanization in agricultural production process has been recognized as a potential contributor for rural development through rural income generation. Moreover, under the higher income and literacy rate, drudgery reduction became an important player towards mechanization. The energy available is 0.388 kilowatt/hectare.

Fragmented approach to mechanization and lack of coordination within and between government and private sector in R & D have been found to be major reasons for not being successful in mechanization efforts.

Most of the farmers use machine power for land preparation of potato (72%) followed by boro (dry winter) rice (65%) and then aman (monsoon) rice (56%). Irrigation is mainly dependent on the power-operated pumps.

The transformation towards mechanization is taking place for:

- ◆ Increase yield per unit of land and hence to increase cropping intensity through timeliness of cropping
- ◆ Increase yield through improved water control, better soil preparation, better weed and insect control and better harvesting and post harvest processing
- ◆ To promote agro-based industries to generate employment and save crops from spoilage and value addition.
- ◆ Reduce cost of cultivation and add value to the produce

Following operations of the agricultural production and processing have been mechanized to a greater extent in the country.

- Land preparations -Tillage
- Irrigation
- Chemical spraying
- Husking and Milling

Recent growth in fisheries and livestock is mostly led by private sector. There is no R & D for mechanization of fisheries and livestock operations and mostly catered by the imported machines for the dairy and fisheries enterprise.

2.3 Non-agricultural application of farm machinery

To popularize farm machinery, government has waived tax and duties on farm machinery. For irrigation, shallow tubewells have been installed in almost all the areas of the country. Most of these shallow tubewells, popularly known as 'shallow', are run by Chinese engines. These cheap engines have versatile uses. It is used to run small country boat and people call it by mistake 'shallow boat' as shallow tubewell engines are used. This has created opportunity to move faster in river-dominant rural areas. Many people are using these engines for milling rice. Small hullers are fitted on tricycle vans and are moved door to door for milling rice. These small engines are also used to manufacture 3-wheeled vehicles for human haulage. In rural areas many people use engines for agricultural operations in non-agricultural operations for income generation as well as poverty alleviation. Some power tillers are used in rural areas for haulage in addition to tillage operation. Owners of power tillers think that they can earn extra money during the off-season if they transport non-agricultural materials. Majority of the

tractors in Bangladesh are used for haulage of bricks, sands, woods etc. as these are cheaper than trucks.

2.4 Agricultural Machineries Developed In the NARS Institutes

In recent years, power tiller-operated potato planter, power tiller operated potato digger, power operated potato graders, and multi-crop seed drills have been developed by the institutes. There is no government organization to extend and popularize these new farm machineries to farmers. Department of Agricultural Extension mainly deals with crop, not machinery. They set up hundreds of demonstrations on new crop varieties nationwide. On the other hand, scientists demonstrate new machinery to a very limited scale. Cost of crop demonstrations is comparatively lower than farm machinery demonstrations. Typical cost of a small plot demonstration of crop variety is only a few US dollars, whereas that of farm machinery is a few hundred US dollars. Therefore, it may take time to introduce appropriate equipment to meet farmers' demand.

The following machines have been developed or adapted from foreign designs and tested by the R & D institutes and produced by the private workshops/manufacturers.

- Power tiller (also imported)
- Weeder (Manual)
- Treadle pumps, suction lift and reciprocating
- Seed drill
- Reaper-rice & wheat
- Maize sheller (manual & power)
- Thresher (manual & Power)

The R & D institutes are the constituent parts of Bangladesh Agricultural Research Council, the national research coordinating body. The institutes are:

- Bangladesh Rice Research Institute (BRR)
- Bangladesh Agricultural Research Institute (BARI)
- Bangladesh Sugarcane Research Institute (BSRI)

Other agencies involved are

- Bangladesh Agricultural University
- Bangladesh Council for Scientific and Industrial Research (BCSIR)

There is now dearth of skilled scientist-engineer in the institutes. It is believed that the efficiency of farm machinery use in Bangladesh is low due to lack of proper information, training and skill of the operators, service providers and traders.

2.5 Demand of New Machines

- Machines for Harvesting rice and wheat
- Machines for transplanting rice seedlings
- Equipment for corn shelling (improvement of existence one)
- Low cost and effective drying system for grains and other farm produces
- Robber roll hullers of small capacity suitable for small scale rice mills and itinerant rice hulling vendors to replace the efficient and obsolete “Engelberge” type steel hulling machines.

2.6 Constraints Affecting Mechanization

- Lack of knowledge and skill for efficient use, proper maintenance and repair of machinery at all levels of users, artisans and traders.
- Absence of any public sector agricultural extension activity for demonstration involving farm machinery, mechanization and post harvest activities.
- Poor quality of fuel, lubrication oil available in the village areas.
- Scarcity of proper spare parts, replaceable tools and accessories and adequate after-sale services.
- Irregular supply or high cost of raw materials for local manufacturing
- Poor quality of many imported as well as locally fabricated machines.
- Low tariff on imported machines and high tariff on spare parts and materials of fabrication.
- Absence of product standards and quality certification for helping traders and users to make informed choices.

2.4 Promotion of the Machineries

Under the National Network, the National Research Institutes, such as BRRI and BARI have established linkages with a good number of manufacturers, capable for fabrication and

manufacturing of agricultural machineries. These private manufacturers receive technical assistance i.e., prototypes, drawings and expert services from these national research institutes. NGOs are also promoting machines by organizing landless farmers as a poverty reduction campaign.

There has been no public sector agency responsible for the extension of the machineries to the farmers. One machinery and engineering extension unit under the Department of Agriculture Extension (DAE) service has been discontinued since 2002. CIMMYT also supports mechanization in terms of demonstration and training.

Project based attempts have been made to popularise the machineries those have been tested in different locations of the country and found suitable for specific socio-economic settings of the farming system. The machineries have been put into special efforts for wider extension, adaptation through different specialized projects. The projects are:

- **The Popularisation of the Agricultural Machinery Project (PAMP-government project):**

The project is designed for the extension of BRRRI developed machineries with a duration of four years through demonstration.

- **Research and Extension in Farm Power Issues (REFPI-DFID):**

The project was implemented by Bangladesh Agricultural University with the support of DFID-UK through number of sub-projects in association with NGOs and private sector. The project was designed for sustainable livelihood approach with special interest of entrepreneurship and skill development.

The machineries those have been popularised are:

Manual seeder: Suitable for wheat, jute, oilseed and pulse with adjustable seed rate.

Dryland weeder: One man or woman can operate, manufactured in the local workshop.

Rice-wheat reaper: Power tiller mounted, significantly reduces the cost of harvesting. Constrained with lodged crop. Suitable for large farmers.

Open drum power thresher: Woman friendly with capacity of 350-400 kg/hr. Can be operated by PT, STW engine. Saves over traditional threshing. Cannot clean grains.

Rice-Wheat thresher: Man and woman can conveniently operate, Capacity ranges from 700-1000kg/hr for rice and 300-400 kg/hr for wheat. Winnowing is done in single operation. Powered by PT, STW engine. Suitable for large farmers.

Manual maize sheller: Simple in operation. Manufactured with locally available materials in local workshop. Capacity ranges from 30-35 kg/hr.

Power maize sheller: Capacity is 2 tons/hr. locally made. Powered by STW, PT.

Potato digger: Power tiller operated for row potato.

3. Present Trend of Research and Development in Agri-machinery

- Development and evaluation of Chinese hand tractor seeder
- Manually and power operated Paddy Transplanter
- Performance and comparative study of Chinese reaper and seed drill
- Design and development of a low cost self propelled multi-crop seeder-cum thresher
- Development of bed former cum seeder
- Test and evaluation of Japanese fixed bed drier
- Testing of storage facilities
- Development of a rasp bar type power thresher for wheat
- Development of multi-crop power thresher
- Improvement of manually operated maize sheller
- Milling and processing technology development through Power Tiller operated mobile rice huller
- Development of power thresher for pulse
- Design and Development of power tiller operated potato digger
- Development of a potato grader
- Development of Chula and pan for cost effective gur production
- Development of crusher for high juice extraction and sugar extraction efficiency in sugar mills.

3.1 Farm Machinery in Agricultural Production

Land preparation

About 65-70 percent of the land preparation is done by the power tiller and marginal farmers have access to the tilling machine through hiring service. Traditional country plough, power tiller and four-wheel tractors are used for land preparation. More than 350,000 power tillers are present in use along with 5000 four-wheel tractors.

Apart from soil preparation, PT engines are frequently used to power irrigation pumps and boats, hullers, shellers and oil expellers and transport vehicles. Bangladesh imports 10,000 power tiller every year, owned by the large farmers and available on custom hiring basis.

Irrigation

Minor irrigation plays major role in irrigation. This involves abstracting groundwater by pumps or lifting water from surface sources. Irrigation covers about 50% of the total cultivated lands. Minor irrigation acted as an engine of growth in agriculture amounting to 4 million hectare. There are more than one million of shallow tubewells and low lift pumps. Government policy of abolishing standardization requirement of irrigation equipment increased the irrigation coverage and enhanced mechanical power use in tillage operation.

Threshing

Pedal thresher, numbering 200,000 and power thresher (15,000 numbers) are being used widespread along with the traditional hand beating. These are manufactured locally. There is a good potential of manufacturing these equipment locally at different parts of the country.

At the farmers level, sugarcane is crushed by the expellers which are manufactured locally and driven by a pair of bullocks.

Storing

Storage is done in traditional structure in the village. Government godown (LSD) is used for storing rice in gunny bags.

Except potato, storage of fruits and vegetables in Bangladesh is not common. Bangladesh has 200 storage units (cold storage) with a total capacity of about 0.74 million tonnes.

Milling

Rice milling is almost fully mechanized now. Mills are working as a) Semi-automatic rice mill b) Major rice mill and 3) husking rice mills. The husking mill is constituted with non-standard boiler without monitoring steam pressure in Engleberg milling. The automatic mills are running at only 16 % capacity while smaller mills at a better efficiency of 67% due to unsteady supply of raw materials and inadequate management practices.

About 90% of rice is parboiled before milling. Small and large automatic rice mills are also available which processes quality rice for markets in the cities. Mechanical husking of paddy has been adopted in Bangladesh at a faster rate. At present, over 100,000 Engleberg rice

huller mills and 500 small and large automatic rubber roll rice mills in the country. Pulse mills and oil expellers are also in commercial use. Nearly 23% of the total rice area is being cultivated with aromatic rice varieties which has got export potential if the post harvest operation (including milling efficiency) can be improved.

Spraying

Locally made knapsack sprayers commonly do spraying. There are number of manufacturers who are producing and marketing sprayers. Power sprayers are not common and mostly are imported. Presently, application of chemicals for mango trees with high pressure spraying machines has been found to be very much effective.

3.2 Local Manufacture

Decreasing number of draught animals, shortening of time available for land preparation and harvesting due to increased cropping intensity, shortage of labour at peak activity periods and increasing demand for irrigation continued to create demands for appropriate farm machinery in the country. Policy guidelines and assistance from the public sector services, however, remained absent and unavailable to the agricultural machinery sub-sector of the country and mechanization continued to grow on private sector efforts only.

Government is allowing import of fully assembled agricultural machinery at zero or negligible tariff but raw material and spare parts are subject to substantial amount of custom duty and VAT.

There has been more than 40,000 small and medium sized local metal working workshop spread all over the country. These workshops are doing reverse engineering and manufacturing spare parts of all kinds including agri-machineries.

Policy of open market and privatisation is being practiced regarding import, marketing and utilization of agricultural machinery and equipment in the country. Under this situation, practice of standardization of agricultural machinery has also been eliminated. Any agricultural machinery and equipment can be freely imported now in Bangladesh. With this liberalization of import policy including withdrawal of taxes and standardization, cheap equipment with inadequate standard and performance are randomly imported into the country. Free import system is detrimental to the effect that it allows to import agricultural machinery at a much lower rate of import duty compared to a much higher rate in case of raw materials to be used for the local manufacturing of the agricultural machinery. This makes local manufacturing of the machinery much costlier than the imported ones and farmers are obviously attracted to buy imported equipment for its low price. This situation has impeded flourishing of local manufacturing of agricultural machinery.

As many as 15 manufacturers are involved in producing machines developed in Bangladesh. The manufacturers are engaged in manufacturing and fabrication of agricultural machinery. However, the capacity has been less utilized due to lack of marketing.

All the above equipment are completely fabricated in the country; only the prime-movers, such as electric motors and IC engines are imported. Electric motors are also manufactured in the country to a large extent.

4. Focus of the National Institute

- i) Testing (if not standardization) of all imported agricultural machinery should be made and the test results should be published and made available to the buyers.
- ii) Establish an agricultural machinery development and testing center pulling physical, human and other resources scattered in different agencies.
- iii) In order to encourage the manufacturing of agricultural machinery locally, import duty on raw materials should be fixed such that the finished goods can comfortably compete in price with the imported ones.
- iv) Short and long term policies for agricultural mechanization. Prioritisation of specific operation to be mechanized
- v) Assessment of the needs of adaptive and comprehensive R & D during the next 10 years.
- vi) Extensive extension and demonstration program to popularise the successful machines and process.
- vii) A thorough survey on power tiller, threshers and other power operated agricultural machinery in actual use.
- viii) Capacity building of the R & D institutes, manufacturing, processing, and servicing units in specific areas of mechanization and processing.
- ix) Support to the research and development of the machinery and post harvest processing including policy research on mechanization and agro processing industries.