Strategy to Overcome Barriers of Agricultural Machinery Industry in Asian Developing Countries with Special Reference to Bangladesh[1]

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ABSTRACT

This paper highlights the barriers in agricultural machinery industries and strategies to overcome the same, with a particular focus on the case of Bangladesh. As the world population continues to increase, the problem of food security arises. With the amount of cultivable land remaining the same, the way in which agricultural production is conducted must change to increase output to meet the rising food demand. Government policies play a pinnacle role in helping rural communities and agri-businesses to prosper. The following provides a case study for how Bangladesh has managed these issues and has helped their agricultural mechanization market and production flourish.

Keywords: Bangladesh, cultivable land, food security, agricultural mechanization

1. INTRODUCTION

The population of the world is expected to reach eight billion by the year 2025. It also a fact that more than 90% of the world population increase is occurring and will continue to occur at higher rates in developing countries. Some research says that of the potential size of cultivable land, which is about 3 billion hectares or only 22 percent of the world's land mass, less than half is being used productively. The challenge faced by these developing countries is to feed their increasing populations where there is little to no additional cultivable land available. This means that in order to meet the future food demands, these countries have to adopt more intensive cropping practices using all possible mechanization and management techniques. For intensive cropping, timeliness of operations is one of the most important factors which can only be achieved only with appropriate use of agricultural machines.

2. STATUS OF AGRICULTURAL MACHINERY INDUSTRY IN DEVELOPING COUNTRIES

As has been mentioned above, for most parts of the Asian region one of the most pressing needs is to feed a growing human population for which they require sustainable food

[1] Presented by Mr. Omar Faruque, President Machinery Manufacturers Association in Bangladesh

production. This can be realized by increasing land and labour efficiency in agriculture through farm mechanization and other modern inputs. Modernization and mechanization have two separate meanings; so while modernization is beneficial for the industrialized countries, developing countries need mechanization for which they have to rely mostly on imported farm machines, which are often not suitable for the small farms of the developing countries.

Asian agriculture is rapidly increasing with the rise in farm mechanization support. Most developing countries in the region are now in transition from labour-intensive to controlled-intensive agriculture. Irrigation system machines such as diesel engines, electric motors and pumps, planting machines, powered sprayers, combine harvesters, dryers using biomass fuel, silo and storage handling, and advanced, high-quality rice mill machines are likely to be adopted by Asian farmers in the near future[2].

The barriers that impede the growth and sustainability of the farm mechanization industry and problems in the region can be classified into the following groups:

- Technological constraints
- Socio-cultural constraints
- Behavioral barriers
- Economic problems
- Environmental issues.
- Constraints in developing the standard of machines available in the domestic market
- High acquisition costs make farmers unable to procure what machines are available in the domestic market.
- Small size of the farms
- Poor rural infrastructure

Because of the above constraints, farmers' incomes have remained low and the value of working every day cheap. In terms of environmental issues, high energy consuming tractors and large machines that produce greenhouse gases and other pollutants have become another concern.

In view of the above situation the possible alternatives are as follows:

1. Machines should be compact, light, low-powered and multi-purpose. Locally-available materials must be utilized in fabricating machines to reduce the manufacturing costs. Manufacturing procedures and production of parts must also be precise.
2. Small-size tractors, mini-power tillers, and small farm equipment must meet the needs of small farmers. Operator's safety and comfort must also be considered.
3. The high cost of fossil fuel in some countries exacerbates the need for high energy-efficiency and the possible harnessing of non-conventional sources of energy.

[2] Breaking the barriers to small –farm mechanization-www.agnet.org/library/article/nc148a.html

3. PRODUCTION, MARKETING, TRADE (EXPORT & IMPORT)

Table 1. World production of major crops in 2004-Based on FAO estimate

	Million MT
Cereals	2,264
Vegetables & melons	866
Roots and Tubers	715
Milk	619
Fruit	503
meat	259
Oil crops	133
Fish(2001 estimate)	130
Eggs	63
Pulses	60
Vegetable fibre	30

Source: UN Food & Agriculture(FAO)

A FAO study suggests that agricultural trade will play a larger role in securing the food needs of developing countries, as well as being a source of foreign exchange. Net cereal imports by developing countries will almost triple over the next 30 years while their net meat imports may increase by a factor of almost five. For other products such as sugar, coffee, fruits and vegetables, the study foresees further export potential. How much of this export potential will materialize depends on many factors, not the least of which is how much progress will be made during the ongoing round of multilateral trade negotiations. Developing countries face trade barriers in all areas, not only in agriculture. In many resource-rich but otherwise poor countries, a more export-oriented agricultural system could provide an effective means to fight rural poverty and thus become a catalyst for overall growth. Resource-poor countries may face higher prices for large import volumes as they lack the capacity to step-up production

4. MARKETING OF AGRICULTURAL MACHINERY

Improvement of marketing systems for both farm produce and inputs in developing countries and the emerging economies necessitates a strong private sector reinforced by an appropriate policy framework and effective government support services. Such services should include provisions for market infrastructure, supply of market information, and agricultural extension services that advise farmers on production and marketing.

In addition, governments need to ensure that the legislative and regulatory environment is suitable for competitive and efficient private-sector marketing. Training in marketing at all levels is also needed, from farmers' groups to post-graduate students at universities. New marketing links between agribusinesses, large retailers and farmers need to be developed, e.g. through contract farming and group marketing, with those working in

marketing and agribusinesses joining together in associations to promote their common goals. Financing of marketing is another important issue, as is the whole question of the development of improved food supply chains to supply the world's rapidly growing cities.

5. OECD POLICY

OECD policy is to reduce tariffs and export subsidies, following the perception that everyone will win with equal market access. In order to facilitate adjustment, there may be a need for transitional assistance aimed at those who may be affected negatively. Developing countries need to develop their capacities to enter into the OECD markets and for this they need special and differential treatment.

Capacity building can be done effectively through targeted payments decoupled from production while dismantling trade-distorting border measures and product price support. With the significant gains from market orientation and open trade, it is possible for OECD countries to, at the same time, address a wide range of domestic objectives such as farm household incomes, the environment, food security, food safety and viability of rural areas. Domestic agricultural polices generally fall into two categories: those concerned with correcting market failures and those focused on the incomes of agricultural households.

Developing countries in Asia are lagging behind in both the production of and access to agricultural machinery and thus are facing low levels of both production and exports. In order to build capacities of the countries, knowledge and technology collaboration within the region is very important. A regional technology chain and network should be developed.

5.1 Common Interest and Collaboration and Cooperation Issues

The GDP contribution of agriculture in Asian countries varies from over 50 percent in Laos and Cambodia to as low as 11 percent in Thailand[3]. Rice is one of the major staple

[3] Development of Appropriate Machinery for Southeast Asian Countries by Vilas M Salokhe and Akira Oida.

foods in these countries. About 70 percent of farms in these countries operate on a plot of land that is less than one hectare. Due to this fragmentation, it is not possible for the adoption of large machines. It is seen that within the region, Thailand is the highest user of agricultural machinery. Throughout the Asian countries, rice is the major crop and farming is mostly labour intensive.

6. BANGLADESH CASE

For centuries, Bangladesh was considered to be agrarian country, with most of its GDP coming from agricultural products. At present, about 73 percent of the people living in rural areas are directly or indirectly engaged in a wide range of agricultural activities. The agriculture sector's contribution to the nation's economy is about 22 percent of its GDP. About 52 percent of the labour force is employed in agriculture. With a very high population density, the country suffered food deficits for several decades, demanding policy changes that would alleviate this problem addressed by successive governments during the last few decades, after the partition of India in 1947 and since the liberation of the country in 1972.

The Bangladesh economy has grown at a strong rate of over five percent in recent years, as shown in Table 2.

Table 2. Bangladesh economic growth rate by sector, %

Sectors	FY-03-04	FY-04-05	FY-05-06
Agriculture	4.09	2.21	4.49
Industry	7.60	8.28	9.56
Services	5.66	6.36	6.47
Total	5.82	5.93	6.91

Source: Bangladesh Economic Survey-2006

The pace of economic development is more or less satisfactory, although development practitioners believe that it would have been much better if politics had not overtaken economics much of the time. Obsession with political issues pushes the economy to the back seat and apart from the several negative factors such as overpopulation, scarcity of land, and political factors.

Lack of tolerance and continued confrontational politics are primarily responsible for failing to achieve a higher growth rate. If the agricultural sector had access to quality machinery and engineering services at reasonable costs, the result would have been the reduction of drudgery, crop wastage and production costs, and enhancement of land and labour productivity. As poverty reduction is one of the main objectives of all economic agendas, prime goals should be to increase yields through avoiding crop wastages, produce higher value-added products targeting higher value markets, developing skilled manpower and establishing agriculture as one of the most profitable industries.

6.1 Agro-sector in Bangladesh

The traditional agro-industry and trade in Bangladesh is large. A recent survey of MIDAS (Micro Industries Development Assistance Services) shows that there are 1.31 million SMEs[4] related to agriculture with over 290,000 relating to grains, vegetables, fruits, beverages and spices. The manufacturing sector has about 857,000 SMEs, among them almost 16,000 are rice mills, over 6,000 are food industries and nearly 2,000 relate to bakery products. Large enterprises are limited and are reported to be just over 100. Among them only a very few could enter into global market.

Table 3. Sub-sector number of agro-Industrial Small & Medium Size Enterprises (SMEs)

Sub-sectors	Rural	Urban	Total
Agriculture	1,242,000	72,000	1,314,000
1. Grains	247,000	1,000	248,000
2. Vegetables & Sp.crops	32,000	1,000	33,000
3.Fruits, beverages, spices	10,000	70	10,070
Manufacturing	651,000	206,000	857,2000
Grain milling	15, 000	1,000	16,000
Animal Feed	300	200	500
Bakery Products	1,000	700	1,700
Chocolate & Sugar products	2,000	200	2,200
Other Food products	6,000	400	6,400
Beverages	-	40	40
Trade			
Agricultural wholesale			30,000
Agricultural retail shops			40,000

Source: MIDAS: National Private sector survey of Enterprises in Bangladesh, 2003, p.17

[4] If an enterprise produced agricultural goods and sold at least 75% of the goods, it was classified agricultural activity. If the enterprise did not sell 75% of the goods , it was not included in the survey.

Agro-industrial enterprises of Bangladesh are not only small, but also produce low- or medium-level value-added products. Because of their small operations and low-value addition, the enterprises' earnings and savings are also low, hence investment capacity is correspondingly low. In spite of this, however, the existing agro-industries contribute significantly to GDP and have tremendous potential to grow more. This demonstrates the potential of growth and modernization for higher contribution to GDP and to act as a driving force for crop diversification and commercialization of agriculture.

Table 4. Agricultural exports and imports

M US$

Year	**Export Value**	**% increase & decrease**
1998-99	**31.92(too many digits)**	
1999-00	**25.85**	**- .06%**
2001-02	**15.31**	**- .10%**
2002-03	**12.79**	**-.02%**
2003-04	**24.40**	**+.69%**
2004-05	**40.36**	
2005-06	**82.47**	
2005-06	**105.40**	

Table 5. Import of some agricultural products

Value in million US $

Commodities	**2004-05**	**2005-06 (July-May)**
Rice	265	111
Wheat	312	270
Milk & Dairy products	87	68
Spices	41	29
Oil seeds	86	69
Edible oil	439	427
Pulse all sorts	159	148
Sugar	221	104
Cotton	667	672
Total	2277	1898

The average number of employees in agricultural enterprises in Bangladesh is estimated at 11.8 percent and in manufacturing at 6.3 percent. Both sectors together employ about 21 million people. The recent ADB study on the feasibility of an agribusiness development project estimated the contribution of agriculture and agribusiness to be about 35 percent of the GDP in 1999/2000, of which ten percent was contributed by agribusiness (source Estimates of Consultant's of ADO feasibility study of ADB project based on BBS data).

6.2 Reasons for slow growth of modernization:

- Small size of farms
- Inadequate capacity building of the small manufacturers/traders/artisans, etc.
- Marketing and sales service systems are not efficient
- Unavailability of the right type of machines
- Absence of level-playing field for the small producers
- Unjustified taxes and duties for local producers

6.3 Some Important Agricultural Supporting Institutions in Bangladesh

Bangladesh Agricultural Development Corporation(BADC): The main function is to help farmers by providing seeds, fertilizers, plant protection equipment, pesticides, and agricultural machinery and implements.

Bangladesh Agricultural Institute (BAI): Provides training and conducts research for the development of this sector.

Bangladesh Agricultural Research Council (BARC): The major objectives of the council are to identify priority areas of research under the guidelines of the national agricultural policy.

Bangladesh Agricultural Research Institute (BARI): Works under the Ministry of Agriculture and is responsible for conducting research on all crops except rice, jute sugarcane, and tea, for which there are separate institutes.

Bangladesh Agricultural University (BAU): The premier seat of higher agricultural education and research in the country covers all the domains of agricultural sciences having a direct bearing on terrestrial and aquatic productivity.

Agricultural Machinery Manufacturing Association of Bangladesh(AMMA-B): This is a private sector association that works for profitable growth of this sub-sector and to identify problems, constraints and opportunities of the farm machinery industry in Bangladesh. The Association is also trying to unite all the manufacturers exclusively involved in the manufacture and marketing of farm machinery to work for a common cause and benefit.

6.4 Agricultural Machinery Manufacturing Sector

The agricultural machinery and equipment manufacturing industry provides vital support for the development of the agricultural sector in Bangladesh. It manufactures a wide range of products including: diesel engines, pumps, electric motors, power tillers, threshers, rice haulers, implements, and hand sprayers. Irrigation equipment constitutes the majority of the total demand for agricultural equipment. There is some research on developing appropriate farm tools and machinery to increase productivity of farm labour, conducted by the Bangladesh Agricultural Research Institute (BARI). The institute has developed some types of agricultural machinery such as a moldboard plough, four-cylinder, manual pumps, and pedal and power threshers. These machines are tested at the institute's project sites. It has been suggested that these machines should be manufactured commercially in the private sector.

More than two-thirds of the employed production-labour are semi-skilled and skilled. The industry is an import-substituting one; sometimes the products are sold under international tender, but within the country with all of the benefits entitled to exported goods. In this type of industry, it is possible to manufacture a product from a different line of production when there is not enough demand for the item they are presently producing.

Generally, the firms in this industry are geared to manufacture one or two items, although they may manufacture other products as well. For example, Milnar Pump Ltd. (private-sector) and Bangladesh Diesel Plant (public-sector) both produce equipment outside of pumps and diesel engines. The capacity utilization of Milnar was 35 percent and that of BDP was ten percent in 1993/94. Electric motors of up to 25 hp for irrigation pumps are the main product of the electric machinery sector. Small-scale producers of these electric motors are competing effectively with importers and also larger domestic public- and private-sector producers.

Diesel engines are now used mainly for irrigation. They power the Low-Lift Pumps (LLP), Shallow Tube Sells (STW) and Deep Tube Wells (DTW). They are also used in other farm machinery such as threshers, grain driers, tillers and tractors, as well as for transport and other purposes. Bangladesh Diesel Plant (DBP), a public-sector unit, is currently producing diesel engines in Joydevpur, Dhaka. BDP produces the air-cooled type of diesel engine. Government agencies are the only buyers of BDP engines. In 1995/96, BDP engines were being sold to the government-sponsored Barendra Project. Now diesel engines are being replaced by electric motors as the prime engine in mechanized irrigation systems where there is electricity, due to their cost effectiveness and ease of operation and maintenance (TIP 1986). However, electrically-powered irrigation systems without electric current can result crop failure.

6.5 Present Status of Mechanization

Over the last two decades, the use of mechanized power in agriculture has increased rapidly. Irrigation is now practically fully mechanized by Deep Tube Wells, Low Lift Pumps, and Shallow Tube Wells. It is estimated that about 70 to 80 percent of the land (first phase) is tilted by power tillers imported from China, with over 350,000 units are working for this purpose.

Some of the spare parts are locally manufactured in small workshops. Demand for reapers, dryers, threshers, shellers, transplanters, potato planters and other agro-tools is increasing. The non-farm rural economy is growing rapidly. Thousands of service providers, distributors, repair and maintenance workshops have also developed and are gradually increasing.

The agricultural machinery sector also faces some problems One of them is that the public sector is dominating in agricultural mechanization and the quality of machinery produced is sometimes not acceptable. Because of inadequate R&D funds for innovation of machinery, promotion, extension and dissemination efforts by the GoB is limited,

though in consecutive budgets the agriculture sector received the highest allocation. The agricultural machinery sector is mostly import dependent. Local manufacturers have to compete with low tariff imported machinery.

A lack of adequate, trained manpower and the inadequate technical know-how of manufacturers are barriers to the successful fabrication quality machinery and to developing a market demand for Bangladeshi machinery. There are limited funds available for R&D and an absence of linkages among researchers, manufacturers and extension personnel. The high price of raw materials and imported parts and inefficient marketing and sale services negatively impact the development of this sector. Non-availability of soft and hard infrastructure like credit facilities and material testing facilities are other mentionable constraints faced by the sector.

6.6 Agricultural Mechanization Policy

The serious scarcity of animal draft power creates the need for 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 from the free-market distribution system. As a result, the use of agricultural machinery has increased significantly and immense potential has been created for further increases. 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 this 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 attract farmers' interest in mechanization as well as to provide credit facilities. To achieve this goal, information relating to increasing the 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 the future depending on the socioeconomic conditions of farmers in different regions. Therefore, an improved 'power delivery system' (meaning delivery of energy from the shoulder of the draft power to the agricultural implement) will be developed through research so that the scarce draft power can be utilized more efficiently.

Production and import of agricultural machines will be specifically encouraged so that the farmers can procure machines from the market according to their preference and

convenience. Machinery workshops and industries engaged in agricultural mechanization activities will be provided with appropriate taxes/duties 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 will be provided with the necessary credit support.

The use of machines, which are usually expensive, is not often affordable for individual farmers. In order to popularize mechanization, in addition to the use of draft power, farmers will be motivated in the purchasing or leasing of agricultural machines through cooperatives. Formation of such self-motivated cooperatives will be encouraged and necessary supports will be extended to mechanized cultivation based on cooperatives.

6.7 Changed Situation

Government policy is favourable for improving the capacity and sustainability of the sector. Increasingly, private sector entrepreneurs and investors are getting involved in mechanization. Agri-researchers, skilled mechanics, operators and support services are developing in rural Bangladesh. Government policy providing relatively easy access to credit support from financial institutions, resulting in a large number of agro-tools being produced domestically.

Existing incentives are as follows:

- Cash incentives for exports of agri-products are available
- Fresh and frozen fruits and vegetables receive 30 percent cash incentives
- Agro-processed (60 items) receive 30 percent cash incentives
- Subsidies on electricity used in agro-industries are 20 percent
- Credit support of about 1000 million taka is also extended to this sector
- Entrepreneurs Equity Fund (EEF) has been established to the support agri-sector. So far about 7,300 million taka has been disbursed to 212 projects.
- Tax-exemption has been extended to the poultry sector.
- Reduction of custom duties from 15 percent to 7.5 percent on raw materials of agro-processing products.
- 30 percent supplementary duty on import to local industry protection
- Exemption trade VAT on PP
- 500 million allocation for micro entrepreneurs in rural areas

Because of these incentives, exports of agro-products are increasing gradually.

6.8 Common Interest to the Agricultural Machinery Industry Sector

Common regional policies and strategies that are required for strengthening the industry include establishing supporting infrastructure (network of testing facilities), increasing collaboration and removing barriers to international machinery trade.

In order to meet these objectives, the following recommendations are given:

- Specialized Agro-Export Processing Zones (ag-EPZ) in regional countries As well as increased communication facilities for agro-products exports
- Universities should include curriculum for agri-business courses
- Strategy for bio-safety act, food safety and intellectual property rights
  Agricultural research and extension of high-value commodities and regional quality standards should be established with modern quality control laboratories
- Appropriate regulatory framework
  Niche markets for products produced regionally
  Creation of cargo facilities
- Activities of trade associations should be increased to undertake quality control function
- Support for market access and technology
- Continuity of incentives, concessional logistics and tax rebates.
- Removal of non-financial barriers
- Investment incentives
- Agri-buisness trade fairs
- Market study

Information barriers include technical problems including lack of knowledge about farm transfers, an unfulfilled demand for information about alternative agriculture, and a need for improved business management skills.

7. CONCLUDING REMARKS

Agricultural businesses are necessarily part of a conventional, input-intensive agricultural paradigm.

Community concerns expressed by focus groups included a lack of cooperation and communication between different agencies, an impression within the education system that agricultural courses are generally meant for students who are incapable of handling traditional classroom instruction, a community-wide perception that the local, state agricultural college is not a respected post-secondary education institution, conflicts among the agricultural and non-agricultural community members, and confusion among the agricultural service industry regarding who is a farmer deserving of support services, and who is not. Social issues facing the farmers included relationship strife and disagreements amongst themselves, an independent mindset that prevents farmers from seeking assistance, isolation, apathy and depression, and a need to organize the agricultural sector for political purposes. Recommendations include suggestions for helping farmers work together, capitalizing on new agricultural trends for diversification and niche marketing, and acknowledging the importance of local agriculture on a community-wide basis.