



Mechanization Status and Enabling Environment for Custom Hiring of Agricultural Machinery in Bangladesh



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Bangladesh with Regional Countries



Bangladesh is a South Asian country lies between $23^{\circ} 34'$ and $26^{\circ} 38'$ N latitude and between $88^{\circ} 41'$ and $92^{\circ} 41'$ E longitude. The country is bounded by India on the west, north, and northeast; Myanmar on the southeast; and the Bay of Bengal on the south.



General Statistics on Bangladesh



Area of Bangladesh	1,47,570 sq.km
Total population	144.05 million
GDP	US \$ 118.42 billion
GDP Growth rate*	6.03%
Per capita Income	US \$ 1044
Manufacturing Sector contribution to GDP	18%
Manufacturing Sector Growth rate	5.73%
Small and Cottage Industries	6.3%
Medium and Large Industries	5.5%
Agriculture contribute to GDP	18.70%
Agricultural Growth rate	2.17%
No. of Farm Household	15.18 million
No. of Non-Farm Household	13.51 million
Cultivated Area	8.52 million ha
Cultivated Area per Household	0.51 ha
Cropping Intensity	190%
Irrigated area	62.96%

Source: Statistical Year Book of Bangladesh (BBS, 2013; *Global Finance, 2012, www.gfmag.com)



History Agricultural Mechanization in Bangladesh



- Bangladesh agriculture was absolutely traditional and nature dependent
- In 1950-51
 - Introduction of Mechanized Cultivation and Power Pump Irrigation (MCPP) scheme.
 - That was the first known attempt of using machines in the field of agriculture in the country.
- During 1960-65, mechanization program, the government distributed
 - 2,238 power pumps
 - 200 tractors,
 - 13,828 sprayers and dusters among the farmers and
 - Established two workshops at government level to facilitate repair and maintenance of these machines.



History Agricultural Mechanization in Bangladesh (Cont.)

- Shortly local **engineering workshops emerged** in the service market
 - for repairing and maintenance and
 - Started producing small spare parts with the limited resources and skill.
 - That was the **landmark for manufacturing of agricultural spare parts and equipment in the country.**
- The introduction of **HYV rice in 60s and expansion in 70s** had a positive change in
 - cropping pattern and cropping intensity **and**
 - created an **increasing demand for agricultural machinery.**
- **In the year 1988,** after the devastating flood,
 - Heavy loss of livestock and
 - serious shortage of **animal draught power.**



History Agricultural Mechanization in Bangladesh (Cont.)



- As a result of this policy change, in 90s, the government prompted with several measures,
 - Exemption of tax on imported tilling machines, Small diesel engines and motors,
 - Waiver of standardization certification and
 - End the monopoly of government sector importing.
 - Huge influx of Chinese made power tillers, diesel engines and motors in the country.
- As well as the local manufacturing
 - farm implements, irrigation pumps, pedal and power threshers (rice and wheat), maize shellers, hand and knapsack sprayers, etc.
 - spare parts for irrigation pumps, diesel engines, power tillers etc. have gained a significant ground, based on the demand at farmers' level.



Farm Machinery Statistics in Bangladesh



Sl. No.	Farm Machinery	Number of unit
1	Power tiller	About 7,00,000
2	Tractor	> 60,000
3	High speed rotary tiller	> 4,000
4	Weeder	> 2,50,000
5	Seeder Transplanter	> 1000 > 150
6	Sprayer	12,50,000
7	Combine harvester	130
8	Reaper	500
11	Open drum thresher	> 2,80,000
10	Closed drum thresher	> 50,000
11	Winnower	> 3,000
12	USG Applicator	> 16,000
13	Hand maize sheller	12,000
14	Power maize sheller	30,000



Agricultural Machinery Adaption Status in Bangladesh



✓ Land preparation	:	>90% mechanical power
✓ Seeding ✓ planting ✓ Transplanting ✓ Fertilizer application ✓ Insecticide application	:	Started by machine (Showing encouraging)
✓ Irrigation	:	>95% by power operated STW/DTW /LLP pump
✓ Harvesting ✓ Reaper & combine harvester	:	Mostly manually >90-95 % >10-5 %
✓ Threshing	:	Rice-wheat >75%
✓ Shelling ✓ Cleanning ✓ Dryer ✓ Storage	:	maize >95% by sheller Started by machine (Showing encouraging)\



Status of Agri-Machinery Manufacturing in Bangladesh



Manufacturing Units	Number
Foundries	70
Agri-Machinery Manufacturing Workshops and Industries	800
Spare Parts Manufacturing Workshops	1500
Repair and Maintenance Workshops	20,000
Mechanics	5,00,000
Village Artisans	1,00,000



Annual Market Size of Selected Agri-Machinery



Agri-machineries	Market size/yr (in million US \$)
Power Tiller (Imported)	50.0
Tractor (Imported)	80.1
Diesel Engine (Imported)	256.9
Tillage machinery (Imported)	9.7
Centrifugal Pump (STW & LLP)	16.7
Spare parts (Local)	237.9
Spare parts (Imported)	71.4
Sprayer (local)	1.5
Sprayer (imported)	0.4
Thresher (Open & Closed drum)	39.5
Maize Sheller	1.3
Weeder	0.6
Harvesting equipment (Imported)	1.2
Rice milling machinery (Imported)	35.1
Sub-total	802.3
Repair & Maintenance	105.2
Total market size	907.5



Present population of Power Tiller (2WT) and Tractor (4WT)



- ❑ Power tiller: 7,00,000 units
- ❑ Annual import: 41,000 unit, worth 4100 million TK. (US \$ 50.0 million)
- ❑ Tractor: 60,000 units
- ❑ Annual import: 6,200 unit, worth 6570 million Tk. (US \$ 80.0 million)

Tilling cost (PT/2WT & 4WT):

- Land preparation hiring charge ranges from
 - ✓ Taka 3000.00 to 3500.00 per hectare for one pass
 - ✓ Taka 6000.00 to 7500.00 per hectare 3-4 pass (Complete)
- (1 US\$ = BDT 78.00)





Centrifugal Pump

- Present population of STW: 14,98,386 units
LLP: 1,77,216 units
- Annual production : 5,60,000 unit, worth 16.6 million US \$
- Potential demand : 8,50,000 units annually
- Unmet market size : 5.6 million US \$ annually

Irrigation water charge ranges

- Boro season: Taka 25000.00 to 32000.00 per hectare
- Aman and Rabi crops: Taka 3.000 to 3.500 per hectare
- Wheat, Maize and Potato: Taka 7500.00 to 8000.00. 0per hectare





Transplanting





Power tiller Operated Seeder (PTOS/HSRT)



- ❑ The service providers opined that renting out of PTOS/HSRT is a highly profitable business in selected areas.
- ❑ The area under land preparation and seed sowing by PTOS/HSRT per year ranged from 7.00 to 65.00 hectare with an average of 36.00 ha.
- ❑ Custom hiring charge of PTOS/HSRT ranged from Tk. 4,500.00 to Tk. 5,600.00 per hectare.
- ❑ Average gross income by a service provider is about Tk. 1,30,500.00 per year.



Conservation Agriculture



Successful crop production combination with

- **Less soil disturbance**
 - **Beneficial crop rotation and**
 - **Residue management**
-

- **Minimum tillage**
- **Strip tillage**
- **No tillage**
- **Bed planting**



Different tillage techniques



Minimum tillage



Strip tillage



Zero tillage



Bed planting



Power tiller operated seeder (PTOS)



(Minimum tillage)



❖ Working as tilling, seeding in line and seed covering in a single pass

- Minimize turn around time
- Timely planting
- Utilize residual soil moisture
- Simple operation
- Seed saved 20%
- Reduced crop establishment cost

❖ Becoming popular among the farmers

❖ Three local workshop start manufacturing



Mung after wheat



- ❖ Mungbean can be fitted with Rice-wheat cropping system
- ❖ Farmers can harvest bonus crop after wheat



Effective capacity: 0.15 ha/hr



Multicrop seeding by PTOS



- Jute seed mix with rice husk (1:4)
- Groundnut planting maintaining proper spacing



Most of the crops can be sown by
PTOS



Wheat yield and cost of seeding



Planting methods	Average yield, t/ha		Cost of planting (Tk./ha)
	Wheat	Mungbean	
PTOS/minimum till	4.8	1.2	1873.0
Strip till	4.9	1.0	1850.0
Farmer's practice	3.5	0.75	4900.0

•PTOS saved :61.7% planting cost



USG Applicator



- Machine application method saved **time about 80%** and
- **cost of application about 75%.**
- **Urea save 25 to 30%**





Hand and Foot Sprayers



- Hand and foot sprayers are produced locally
 - **Knapsack sprayers are imported from China, Korea, Brazil and India**
 - The local manufacturers collect raw materials from Dhaka market and
 - **Sell their product 30% to district market and 70% to other districts.**
 - Producer are facing some constraints such as
 - ✓ high price and lack of quality raw materials,
 - ✓ lack of skill and knowledge related to production,
 - ✓ lack of market information, etc.
 - ✓ Farmer's are using for their own land as well as custom hiring for other farmers.
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- ❑ **Annual production of Hand and Foot sprayers: 3,00,000 units**
 - ❑ **Annual market size of Hand and Foot sprayers: 1.5 million US \$**
 - ❑ **Annual market size of imported Knapsack sprayer: 0.4 million US \$**



Conventional methods





Reaper and Combine harvester



- **Total Number of Combine Harvester 130**
- Harvesting charge of rice and wheat range
 - ✓ Rice Taka 11,500 to 12,000.00 per hectare
 - ✓ Wheat Taka 13,500 to 14,000.00 per hectare

- **Total Number of Reaper 500**
- Manual method average harvesting, threshing and winnowing cost
 - ✓ taka 16000.00 per hectare and
 - ✓ It 35% higher than average cost of harvesting by combine harvester.



Combine harvester



Small size



Midium size



Large size



Midium size



Open and Closed Drum Thresher

Threshing paddy/rice and wheat:

□ Hiring charge ranges from TK. 100.00 to 140.00 per ton



Population of Open Drum Thresher (ODT) : 2,80,000 units

Close Drum Thresher (CDT) : 50,000 units

Annual production of Open & Close Drum Thresher: 20,000 & 80,000

Annual market size: 3240 million TK. (US \$ 39.5 million)



Rice Milling Machinery



Present population of Rice Mill:

- ❑ Semi-automatic 650
- ❑ Automatic 350,
- ❑ Husking 15239 and
- ❑ Traditional huller (Engleberg) 1,00,000
- ❑ Annual market size: 35.1 million US \$





Snapshot of different types of Rice Mill



Mill type	Dryer	Roller	Polisher	Color Sorter	Capacity (kg)
Dheki	Sun drying	Manual	No	No	40 per day
Engleberg (Chatal)	Sun drying	Steel Roller	No	No	600 per hour
Engleberg (Huller)	Sun drying	Steel Roller	No	No	350 per hour
Semi-Auto	Sun drying /Automatic	Steel /Rubber roller	Mostly Local made	No	1200 per day
Auto	Automatic	Rubber Roller	Yes	Yes	1800 per hour



Power Maize Sheller

- ❑ Present population of Maize Sheller: 30,000 units
- ❑ Annual production of Maize Sheller: 6,500 units
- ❑ Annual market size: 1.3 million US \$

- ❑ Shelling charge ranges from TK. 30.00 to 50.00 per ton





Future Thrust

- Development and adaptation seeding/planting/transplanting and fertilizer application equipment
- **Development and adaptation of harvesting**
- Utilization of renewable energy in agriculture
- Development of improved tillage systems including conservation agriculture
- **Dryers, Postharvest machinery and process equipment**
- Knowledge sharing among the CSAM member countries to introduction of Mechanization policy as well as custom hiring policy



CONSTRAINTS AFFECTING MECHANIZATION



- ❑ Lack of knowledge and skill at all levels of users, artisan and traders.
- ❑ Activate public sector agricultural extension (Directorate of Agricultural Extension, DAE)
- ❑ In-adequate after-sales services for agri-machinery
- ❑ Poor quality of many imported and some locally fabricated machines.
- ❑ Low tariff on imported machines, high tariff on imported spare parts and raw materials
- ❑ Absence of product standards and quality certification
- ❑ Absence of testing and other technical facilities and
- ❑ Insufficient credit facilities with higher interest rate.



Conclusions



Intergraded approach to be taken

Promotional activity and after sale service to be strengthen for extension of locally proven machinery

Capacity of local manufacturers be strengthened with technical assistance, skill training for quality production

Fund for R&D and extension of machines have to be increased to support innovation and interventions needs in this sector.

Enabling environment for the local traders, manufacturers, workshops be created for the growth of agro-machinery sector in the country



Conclusions (Cont.)



- There is a great potential of agricultural machinery custom hire business
- Crop diversification and potential yields can be achieved through machinery use
- Both time, cost and labour can be cut down compare to the traditional methods of production practices
- Great scope of saving natural resources
- Policy support needed to boost up small scale mechanization and accelerate custom hire business by the educated youth.



Recommendations

- Establishment of 'Agri-machinery Production Zone (APZ)' on the outskirts of the Bogra and Jessore towns to accommodate existing and potential agri-machinery industries and workshops.
- Establishment of 'Common Facility Centre' at each APZ to facilitate quality services related to heat treatment, material testing, test and standardization, advisory services etc. on public & private sectors and development partners initiative.



Recommendations

- **Modernization of local Foundries through collaboration and experience sharing with CSAM member and industrialized countries.**
- **Strengthening capacity of Agri-machinery entrepreneurs through transfer of proto-type machines and technologies among the CSAM member countries.**
- **Establishment of National Standardization Committee for agri-machinery and spare parts.**



Recommendations (Cont.)



- **Formulation of National Agricultural Mechanization Policy.**
- **Policy options for removal of multiple VAT on imported raw materials for the growth and development of agri-machinery sub-sector.**
- **Policy options for zero tariff/nominal tariff on modern capital machinery import for agri-machinery sub-sector.**
- **Access to soft and flexible long and mid-term credit facility for capital machinery and working capital.**



**Thank You Very
Much.....**

