

Evaluation of PIM and TIM Models for the Adoption of Versatile Multi-crop Planters

Under the

Pilot Project on Commercialization of Smallholders' Conservation Agriculture (CA)-based Planters in Bangladesh

Submitted to:

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Table of Contents

Abbreviations	3
Acknowledgements	5
Executive Summary	6
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Objectives and Scope of the Assignment	2
1.3 Approach and Methodology	2
1.4 Limitations	3
2.0 AGRICULTURAL MECHNIZATION IN BANGLADESH – AN OVERVIEW	4
2.1 Research and Development in CA-based Technology	4
2.2 Promotion of Agricultural Machinery in Bangladesh	7
2.3 History of Policy Issues on Agricultural Mechanization in Bangladesh	9
3.0 OVERVIEW OF POLICIES & STRATEGIES ON AGRI MECHNIZATION	11
4.0 PERFORMANCE OF VMP UNDER THE PROJECT	16
4.1 Performance under PIM Model	17
4.2 Performance under TIM Model	17
5.0 PRIMARY DATA COLLECTION	19
5.1 Survey of LSPs and Farmers	19
5.2 Survey Findings	19
5.3 Findings from One-to-One Interviews	20
6.0 CONCLUSION AND RECOMMENDATIONS	25
Appendix 1: Key Features of VMP manufactured by Hoque Corporation	26
Appendix 2: Questionnaire for Local Service Provider (LSP)	27
Appendix 3: Details of survey findings	33

Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AD	Additional Director
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi Taka
BMDA	Barind Multipurpose Development Authority
BP	Bed Planting
BRRRI	Bangladesh Rice Research Institute
BSRI	Bangladesh Sugar-cane Research Institute
CA	Conservation Agriculture
CASI	Conservation Agriculture-based System Intensification
CASPA	Conservation Agriculture Service Providers Association
CEO	Chief Executive Officer
CIMMYT	International Maize and Wheat Improvement Centre
CHT	Chinese Hand Tractor
CP	Country Plough
CSISA-MI	Cereal Systems Initiative in South Asia- Mechanization and Irrigation (Project)
CSO	Chief Scientific Officer
CT	Conventional tillage
DAE	Department of Agriculture Extension
DD	Deputy Director
DSR	Direct Seeded Rice
EGP	Eastern Gangetic Plain
FGD	Focus Group Discussion
FMD	Farm Machinery Division
FMPHT	Farm Machinery and Post-Harvest Technology
FMPE	Farm Machinery and Post-harvest Process Engineering
FYM	Farm Yard Manure
GoB	Government of Bangladesh
HC	Hoque Corporation
HP	Horse Power
ICM	Integrated Crop Management
IDE	International Development Enterprises
LSP	Local Service Providers
MoA	Ministry of Agriculture
MP	Murat of Potash
MU	Murdoch University
NAP	National Agricultural Policy
NGO	Non-Government Organization
OFRD	On-Farm Research Division
PTOS	Power Tiller Operated Seeder
RCT	Resource Conserving Technology
RDA	Rural Development Academy
RDRS	Rangpur Dinajpur Rural Services

RWRC	Regional Wheat Research Centre
SDG	Sustainable Development Goal
SPST	Single Pass Shallow Tillage
SRFSI	Sustainable Resilient Farming Systems Intensification (Project)
ST	Strip Tillage/Strip Planting
TMSS	Thengamara Mohila Sabuj Sangha
TSP	Triple Super Phosphate
USAID	United State Agency for International Development
VMP	Versatile Multi-crop Planter
ZT	Zero tillage
2WT	Two Wheel Tractor

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M. Khairul Bashar
Consultant

Executive Summary

Conservation Agriculture (CA)-based production system, involving mechanized seeding of crops and non-puddled transplanting of paddy could have a major role to reduce farm labour and production costs. CA is a relatively new concept in Bangladesh compared to other regions of the globe. Research over the last two decades has demonstrated that CA practices could have a major role in reducing cost of production in crop production.

Versatile Multi-crop Planter (VMP) are now being commercialized to encourage planting crops with minimum soil disturbance and crop stubble retention. ACIAR-funded LWR-2010-080 Project led by Murdoch University, Australia in partnership with BARI, BRRI, BARC, Hoque Corporation, DAE and BAU has been experimented to disseminate VMP in different regions of Bangladesh. With the funding support of ACIAR for the project "LWR-2018-111: Pilot Project on Commercialization of Smallholders' Conservation Agriculture (CA)-based Planters in Bangladesh" a study was undertaken to identify the barriers to rapid adoption and dissemination of CA practice and VMP in Bangladesh (Baksh et al., 2020).

In the last part of the LWR-2018-111 Project, a further study was conducted. The broad objective of this study was to test the feasible commercialization models for scale out of the CA-based planter by providing support to a private company which has demonstrated the commitment and capacity needed to scale-out the CA-based mechanization in Bangladesh.

Information for this study was collected both from primary and secondary sources using different data collection methodologies like literature review, survey and key informant interviews.

BRRI, BARI, BAU, DAE have established linkages with a good number of manufacturers involved in fabrication and manufacturing of agricultural machineries. NGOs are also promoting machines by organizing landless farmers as a part of poverty reduction campaigns. CIMMYT supports mechanization in terms of demonstration and training. Ministry of Agriculture has been taken various measures to popularize the machineries in country. Some specialized projects funded by GOB and donor agencies in the recent past have been designed for wider extension, adaptation and utilization of some selected items of farm machinery. Among others, some of the projects are:

- a. Popularization of Agricultural Machinery (PAMP) Project, 2001-06,
- b. Agricultural Engineering Technology Extension Project, 2005-11,
- c. Farm Machinery Technology Development & Dissemination (FMTD) project, 2010-15,
- d. Enhancement of Crop Production through Farm Mechanization Project, 2010-2012.

During 2009, Murdoch University-Australia designed and developed the VMP and tried to popularize VMP in some selected area of Bangladesh with the support of DAE and research organizations. Hoque Corporation has been manufacturing VMP and also working for commercialization of VMP in LWR-2018-111 project jointly with MU, BAU, National Bank Ltd.,

CASPA. They are also working on its demand creation, value chain, operator training and follow-up, after sales services as well as availability of spares.

As revealed from the interaction with different stakeholders, lack of awareness about CA benefits due to limited promotional activity and awareness build-up of CA technology, limited demonstration plots on farmers' fields, limited field day/ farmers rally, insufficient fund allocation for extension activities hinders the popularization of VMP in the country. Therefore, intensive promotion among the farmers, further improvement of VMP for accelerating the adoption of CA machineries, GoB subsidy and so on can help boost commercialization of VMP in the country.

In the past, lack of skills of operator, inadequate technical knowledge of LSPs, low availability of spares for 2WT and VMP also hindered the commercialization of VMPs in different areas. Through the special funding project, the Government of Bangladesh providing 50% subsidy on Power tiller operated seed (PTOS, however the PTOS are using mostly for fine tilled soil but not as seed drill) and 2-wheel tractor (2WT), Reaper, Power Thresher, Combine harvester, Rice Transplanter, and Foot Pump through DAE. Inclusion of the VMP under GoB subsidy programme on agricultural mechanization projects should be pursued in order to increase the use of VMPs by the farmers. Present planting incentive by the LWR-2018-111 Project should also be continued. Bank loan facilities for purchasing 2WT/Power Tiller (PT) and VMP need to be continued as well.

Commercialization of the CA-based technology needs to be brought to the doorsteps of the small farmers. Therefore, efficient private sector driven intervention must be encouraged for sustainable benefits to the grass-root level through dealer networks as well as by providing on time after sales service (e.g., repairs, spare parts supply, trouble shooting, etc.).

Based on the above findings, the study recommended the following recommendations points in order to increase the adoption of VMP together with comparative advantages of financing models.

- a. Awareness and knowledge building at farmer level: Understanding the benefits of adopting VMP and CA against other options should be convincing to farmers. Apart from financial benefits, transferring of technical know-how (operation, repair and maintenance, etc.) should be carried out properly. Government wings and development partners should extend supports to private entrepreneurs (e.g., Hoque Corporation) in disseminating the required knowledge and motivating the farmers at grassroots level.
- b. Field level training and demonstration: Initial foundation training should be backed with periodic refresher courses by the project and its extension team for easy and wider adoption of the machine. More demonstration plots should be arranged for wider promotion.
- c. Continuation of price support/subsidized pricing: Awareness and adoption of VMP is still at in early stage (1-2%) as opined by the researchers in this discipline. The farmers are not yet ready to purchase the machine at regular price. Subsidy in the form of price support, combined with promotional incentives, should be continued either by the

donor funded Project or by the Government of Bangladesh. All CA planters including VMP should also be rewarded with >50% price support/subsidy similar to other agricultural machineries (e.g., combined harvester, transplanter). Bangladesh Agricultural University, Conservation Agriculture Service Providers' Association (CASPA), RDA, DAE and other stakeholders may work on advocacy issues in this connection.

- d. Financing options: As observed from the responses of farmers and LSPs, PIM model has greater acceptance than TIM models. Farmers want to avoid stringent banking formalities, documentation and time-based repayment pressure. That's why, most of them preferred equity financing. However, TIM model must also be continued to capture the users having equity shortage. It will also help prepare the financial institutions to operate financing packages in mechanized agriculture.
- e. Monitoring and after care: Successful adoption of a new technology depends on frequent monitoring and instant trouble shooting. After sales service should be done by the machinery supplier(s) with utmost sincerity and within shortage of time. Strict clause needs to be included in the contract made with the machinery suppliers.

1.0 INTRODUCTION

1.1 Background

Farm mechanization, though at a slower pace, has been gaining momentum in Bangladesh in the recent years. 2-wheel tractors (2WT) for land preparation have been widely used in the country and other small farm machineries are also attracting farmers due to cost and time saving appeals. The LWR-2018-111 project with its partners promotes small-scale mechanization of planting operations through VMP using CA practices.

The LWR-2018-111 project was designed to identify policy level bottlenecks and barriers to the adoption of CA and mechanized planting; and pilot test two commercialization models for scale out of the CA-based planter (i.e., VMP) which are needed at this critical juncture to advance the CA-based mechanization program for smallholders in Bangladesh.

Several agricultural mechanization projects have been implemented by GoB and foreign funds in selected districts of Bangladesh and sold more than 5,000 units of subsidized (up to 70%) 2-wheel tractor (or, power tiller), power tiller operated seeder (PTOS), bed planter, thresher, combine harvester, etc. The adoption of PTOS and bed planter for seeding was not substantial; as in most cases farmers' have been utilizing only the 2WTs and PTOS for full tillage. The subsidized PTOS and bed planters remain largely unused due to lack of demand, repair and maintenance training, poor quality of the machinery, and lack of continuous monitoring and mentorship of new LSPs, etc.

The "Pilot Project on Commercialization of Small Holders' Conservation Agriculture (CA)-based Planters in Bangladesh" was funded as a Small Research and Development Activity by the Australian Centre for International Agricultural Research (ACIAR). The Project has three major objectives:

- (i) to identify gaps in policy, capacity, and roadblocks for the adoption of CA-based farm mechanization on small farms;
- (ii) to evaluate commercialization models for smallholders' 2-Wheel Tractor (2WT)-operated CA-based farm machinery (i.e., VMP) in Bangladesh; and
- (iii) to assess the opportunities and scope for 4WT planters on small farms in Bangladesh; and initiate research on and testing of appropriate 4WT-based CA (strip) planters in Bangladesh.

In this project, Hoque Corporation (HC, private company) leads the VMP manufacturing and piloting of VMP commercialization models. For VMP commercialization, HC are working with the Conservation Agriculture Service Provider Association (CASPA) to identify new and prospective local service providers (LSP) of VMP. National Bank Ltd. (NBL) and Social Islami Bank Ltd. along with CASPA, RDA-Bogra, Solidariadad-Noakhali and HC worked together to help new LSP to secure a loan for purchasing of the VMP alone or with a 2WT and to undertake planting services.

Commercialization models of VMP: Under ACIAR project LWR/2010/080, two commercial models were developed for out scaling of VMP. This project tested the relative merits of the

two business models and between them aim to sell at least 150 units of VMP. The commercialization models are as follows:

- (a) **Planting Incentive Model (PIM):** under this model; each and every new VMP owner received a once-only planting incentive @Tk. 400-500/- per bigha for up to 50 bigha of planting. This model is applicable for the purchase of VMP alone. The Project and HC conducted audits to verify that planting is completed before the PIM is approved. The audits are also used to identify cases of poor planting performance or planter faults so that these can be corrected. Previous experience with LWR/2010/080 suggests that PIM helps the LSP to quickly build a client base for future business, and reduces the risk for first time users of the VMP planting service so that they can gain confidence in its reliability and cost effectiveness. These plantings also serve as demonstrations to advertise to local farmers the effectiveness of the planting.
- (b) **Tri-party Investment Model (TIM):** Through TIM model, the LSP/farmer provided 25% of the purchase price as cash, receive 61.5% loan support (from National Bank Ltd. or Social Islami Bank [later included]), and 13.5% from project to buy a VMP along with a 2WT. Based on National Bank policy, the farmer/LSP cannot take a loan individually; the spouse will be registered as the co-receiver. The LSP/farmers has to ensure 50 bigha planting by VMP within two seasons to receive 13.5% project support. The 13.5% project support to ensure 50 bigha planting will help to create demand for ongoing (post-project) VMP services at farmer level.

1.2 Objectives and Scope of the Assignment

The assignment intends to test the feasible commercialization models for scale out of the CA-based planter by providing support to a private company (e.g., Hoque Corporation) which has demonstrated the commitment and capacity needed to scale-out the CA-based mechanization program in Bangladesh.

The study looks in to the adoption level of VMP and make a comparison of both of the models considering merits, de-merits, lessons learnt and finally draw the recommendations of the suitable model for commercialization of small-scale CA machineries in Bangladesh.

1.3 Approach and Methodology

Due to the barriers caused by the COVID 19 situation, instead of physical meetings and/or visits, most of the data collected through virtual contacts the targeted key informants as well as LSP/farmers. The following steps were taken to compile data from different types of stakeholders jointly selected by the project and the consultant.

- 1) Meeting with project personnel (HC, MU, CASPA, BAU, NBL, SIBL).
- 2) Review project documents and literature
- 3) Mobile phone based one-by-one survey/interviews with Farmers' groups, LSP and Banks, NGOs and other stakeholders.

1.4 Limitations

The consultant could not physically move to the field areas due to restrictions imposed by the authority during the COVID-19 pandemic situation. It affected the data gathering and analysis to a considerable extent. The phenomenon also lengthened the study duration as well as report submission.

2.0 AGRICULTURAL MECHNIZATION IN BANGLADESH – AN OVERVIEW

2.1 Research and Development in CA-based Technology¹

Initial research and development of planting implements started in 1995 through the introduction of the Chinese-made 2BG-6A seed drills (which was named variously as the Chinese Hand Tractor [CHT] seeder; Bangladesh Hand Tractor [BHT] seeder; PTOS, etc.). Afterwards several types of single-pass planters/seeder were tested or developed to establish crops in Bangladesh including PTOS, bed planter, strip planters (sometimes called strip tillage planters), zero tillage planters. Not all of these planters are suitable for CA planting. The PTOS seeder accomplishes three operations i.e., shallow tillage (up to 60 mm), placement of seed in a furrow and leveling which can be done in single pass. Although this planter is often called a CA planter or minimum tillage planter, research results confirmed high levels of soil disturbance with the PTOS as well as with a bed planter. Hence neither the PTOS nor the bed planter qualifies as a minimum soil disturbance planter that qualify for CA planter.

BARI, BRRI, BSRI and BAU have been engaged in research and development of farm machineries and technologies in Bangladesh. Some other organizations and NGOs, such as, CIMMYT Bangladesh, Murdoch University and so on are also have agenda on research and development in the area. Over time, a good number of farm machinery implements have been developed in these institutes. In the past, emphasis was given to improve the manual and animal operated equipment to increase their capacity and efficiency. With the availability of engines and power tiller (2WT) at an affordable price (after the trade liberalization in 1988), adaptation of power-driven machinery is getting preference over manual equipment day-by-day.

The use of 2WT for land preparation and rural transportation has increased rapidly in the country due to its versatile use, lower cost for tillage, less time required for cultivation and resulting in higher crop yields. Since mid-1990s, R&D works on CA-based resource conservation technologies (RCTs) started with locally developed small machinery, such as - minimum tillage or no tillage planters, crop production on permanent bed systems, and residue retention. BARI, BRRI and CIMMYT have been conducting research and development on resource conserving technologies in Bangladesh since 1995 in collaboration with partner NGOs, private sector and farmers in different parts of the country. The tentative population of farm machinery in Bangladesh may be viewed in the table below. Table 2.2 shows the different mechanized implements being tested in Bangladesh since 1995.

Table 2.1: Population of Different Farm Machinery in Bangladesh Over Years

Name of Machine	Units used/imported in selected years				Remarks
	1977	1996	2012	2017	
2 Wheel Tractor/Power Tiller	2000	100,000	>700,000	>713,182	Imported from China
4 Wheel Tractor	300	2000	>35,000		Imported from China

¹ Policies and Roadblocks for Small Scale CA Farm Machinery Adoption - FGD and Survey Report, Dr. Elahi Baksh et al, October 2020

High Speed Rotary Tiller/PTOS	-	-	>5,000	>6,655	Imported and locally made
Weeder	-	-	>200,000		Locally made
Seed-cum-fertilizer distributor	-	-	>100		Locally made
Sprayer	-	-	1,450,000		Imported and locally made
Combined harvester	-	-	160	1,943	Imported
Reaper	-	-	200	3,246	Imported
Open drum thresher	-	10,000	180,000		Locally made
Closed drum thresher	-	5,000	40,000	47,017	Locally made
Winnower	-	-	1,200		Locally made
Dryer	-	-	500		Locally made
Hand maize sheller	-	-	12,000		Locally made
Power maize sheller	-	100	2,000	15,600	Locally made
Deep tube well	4,461	24,506	30,000		Imported
Shallow tube well	3,045	325,360	1,200,000		Imported
Low lift pump	28,361	41,816	120,000		Imported
Strip till planter				175	Imported & locally made (excl. VMP)
Bed planter				456	Locally made
No till planter				13	Locally made
VMP				205*	Locally made (up to 2018)

Source: Shoeb 2015, DAE 2013, Hossain 2017 and Hoque Corporation

Table 2.2: Characteristics of Different Mechanized Agricultural Implements

Year	Implements	Characteristics	Observations
1995	Chinese Hand Tractor (CHT), Bangladesh Hand Tractor (BHT) Seeder	Chinese-made 2BG-6A seed drills	Not suitable for CA planting
1995	Single Pass Planters/Seeders/PTOS, bed planter, high speed rotary tiller		Not suitable for CA planting
1995	Strip planter/strip tillage planter, zero tillage planter		Suitable for CA planting but has no demand and available for farmers use.
2001-2011	PTOS – high speed rotary tiller	Accomplishes 3 operations; shallow tillage (up to 60 mm), placement of seed in a furrow and leveling which can be done in single pass	Not suitable for CA planter. Initially import and commercialization started by Green Machineries; later manufactured by Mahbub Engineering Workshop (Jamalpur), Rahman Engineering (Kushtia), and Alim Industries.
2017-Present	VMP	Planter used for Single Pass Shallow full Tillage (SPST), Strip Planting (SP), Zero Tillage (ZT), Bed Planting (BP), and for Conventional Tillage (CT) using full	Developed by Murdoch University and manufactured and commercialized by Hoque Corporation

		<p>rotary tillage, when driven by 12-16 HP 2WTs. VMP was designed with capability for banding seed and fertilizer in four rows.</p> <p>Current version of VMP has rotary shaft with attached blades, vertical disk type seed meter, fluted type fertilizer meter, a toolbar frame, depth controller-cum-press roller, driving seat, furrow opener, etc.</p>	
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Development of VMP: The PTOS has been the most popular attachment to the 2WT, but few of them are used for planting. The growth of the PTOS market has mostly been for tillage purposes as a high-speed rotary tiller to prepare soil to transplant onion seedlings. Hence, commenced in 2006, another ACIAR funded project concluded that none of the planters imported or developed locally for 2WTs, including the PTOS, were capable of planting in all modes of tillage. Consequently, need for innovating a new planter was felt that can be used for Single Pass Shallow full tillage (SPST, like PTOS), Strip Planting (SP), Zero Tillage (ZT), Bed Planting (BP), and for Conventional Tillage (CT) using full rotary tillage, when driven by 12-16 HP 2WTs. Incorporating features from a range of earlier planters for 2WTs, the Versatile Multi-crop Planter (VMP) was designed by Murdoch University in 2009 under the ACIAR funded project with the capability for banding seed and fertilizer in four rows. The SPST, ST, ZT and BP by VMP saved 38, 82, 50 and 13% diesel fuel, respectively over CT. VMP saved 50-68% labor in land preparation, seeding and fertilizer application. The greatest savings were with SPST and ST, followed by ZT and BP (Haque et al. 2011).

Design features of VMP: The main functional parts of the current version of the VMP are: rotary shaft with attached blades; vertical disk type seed meter fitted in a seed box, fluted type fertilizer meter fitted in a fertilizer box; a toolbar frame; depth controller-cum-press roller; driving seat for transportation; furrow opener, etc.



A comparative description of all the available planters in the Bangladesh is given in Table 3.

Table 2.3: Description of Available Planters for Two-Wheel Tractors

Planter type	Main features	Comments
PTOS/SPST	The PTOS/SPST seeder accomplishes three operations i.e., shallow tillage (up to 6 cm), placement of seed and fertilizers (but the imported PTOS do not have fertilizer placement capacity) in a furrow line by tyne /furrow opener and leveling which can be done in single pass. Soil is more	This is not a CA planting operation.

	pulverized with the PTOS/SPST. PTOS is the most widespread planter for 2WT in Bangladesh at this stage.	
Strip Till Planter (VMP and BARI ST planter)	In each line, 2-4 cm wide and 4-8 cm deep tilled strips are made (that preserved about 80 % of untilled soil) in untilled flat land to place seed and fertilizers at the base of the strips by a tyne/furrow opener in single pass operation. However, if needed (for higher moisture and slow drying soil) the width of strips can be increased by increasing the curvature of the blades.	ST planting is a CA planting operation
Zero tillage (ZT)	Up to 10 cm deep and 6 cm wide slits could be made (about 80 % undisturbed soil) by tyne/furrow openers in untilled flat land by VMP. Seed and fertilizers are placed simultaneously behind tyne/furrow opener in a single pass operation. Seed and fertilizers were dropped in the furrow behind the opener and the following roller pressed soil down to ensure adequate seed/soil contact.	ZT is a CA operation
Bed planting (BP)	About 60 cm base width and 18-20 cm height of the bed can be made by VMP and seed and fertilizers can be placed in rows near the two edges of the beds in a single pass operation or in a single row (e.g., maize) in the middle of the bed. Soil is more pulverized with a Bed Planter.	Bed planting is not a CA operation.

Source: Information used from Haque et al., 2018

2.2 Promotion of Agricultural Machinery in Bangladesh

The national research institutes, such as BRRI and BARI have established linkages with a good number of manufacturers, capable of fabrication and manufacturing of agricultural machineries. These private manufactures receive technical assistance i.e., prototypes, drawings and expert services from the national research institutes mentioned above. NGOs are also promoting machines by organizing landless farmers as a part of poverty reduction campaigns. CIMMYT also supports mechanization in terms of demonstration and training. Ministry of Agriculture has a goal to popularize the machineries that have been tested in different locations of the country and found to be suitable for specific socio-economic settings of the farming system. Therefore, in order to disseminate mechanization and irrigation technologies, the Ministry of Agriculture established Irrigation and Farm Machinery Wing under DAE, 2006. Some specialized projects funded by GOB and donor agencies have been designed to provide special efforts for wider extension, adaptation and utilization of selected items of farm machinery. The salient features of some projects are given below:

Table 2.4: Salient features of major Govt funded projects on Agri Mechanization in Bangladesh

Period	Project	Key Features	Implementing Agency	Funding Agency
1999-2004	Agricultural Services and Innovation and Reform project (ASIRP)	Demonstration of reaper, thresher & water mgt. technology in 21 districts.	Dept. of Agricultural Extension (DAE)	GoB with FAO, WB & ADB
2001-2006	Popularization of Agricultural Machinery (PAMP) Project	Demonstration of weeder, reaper, thresher and winnower in 21 districts.	Farm Machinery & Post-harvest Technology Division, BRRI	GoB
2005-2011	Agricultural Engineering Technology Extension Project	Enhancement of Production and Rural Employment through Agri Engg. Technology in 112 Upazila of 56 districts	Dept. of Agricultural Extension (DAE)	GoB
2010-2015	Farm Machinery Technology Development and Dissemination (FMTD) project	Awareness building, training and strengthening R&D on farm machinery.	BARI, BRRI and DAE	GoB
2010-2013	Development and Validation of USG Applicator and Rice Transplanter (DUART) Project	Design, development and adoption of an user-friendly manually-operated USG applicator.	Farm Machinery & Post-harvest Technology Division, BRRI	NATP
2010-2014	KOICA-BRRI Collaborative Research Programme	Enhancing capacity of BRRI scientists with knowledge and skill to develop and adapt farm machineries.	BRRI	KOICA, GoB
2010-2012	Enhancement of Crop Production through Farm Mechanization Project	Promoting agri machinery to the farmers with 25% subsidy and conducting farm level demo and training.	DAE	GoB
2013-2018	Enhancement of Crop Production through Farm Mechanization Project (2nd Phase)	Promoting agri machinery to the farmers with 50-70% subsidy and conducting farm level demo and training.	DAE	GoB
2016-2019	Project on Custom Hiring Service Centre of Ag Machinery at Farm Level	Making easy access of modern Agri machinery, providing custom hiring services with minimum charge and extending services to marginal and small farmers	DAE	GoB

2.3 History of Policy Issues on Agricultural Mechanization in Bangladesh

Import of Tractors and Power Pumps: In late 1960s as a part of 'Green Revolution' activities. Comilla BARD worked out a cooperative based model to promote the service of 4-wheel tractor (4WT) in the Comilla area, whereas BADC also installed DTW in the northern part of the country where farmers used to get the water free of charge. Irrigation system development and a cooperative-model were associated with the government promotion of 4WT since 1960s. However, small land holding coupled with further fragmentation of land impeded the wide-scale adoption of 4WT. Government of Bangladesh also allowed continued import of farm machinery after the independence to help mechanize farming activities. Agricultural mechanization in Bangladesh thereby started with 4WT and DTW for irrigation.

Restricted Import of Agri Machinery: Before 1988, the import of agricultural equipment was restricted. The 'Standardized Committee of Bangladesh' was responsible for controlling the quality of imported machinery including agricultural equipment and only a list of standardized machines required for agricultural operations could be imported.

Liberalizing import markets: In 1988, the Government of Bangladesh started liberalizing markets: it lowered the tariffs on machine imports, and dissolved the Standardized Committee (GoB, 1989) following a devastating flood that caused loss of a large population of draught animals. This policy change resulted in an import surge of low-cost small engines and engine powered machinery such as power tillers (2WTs), diesel pumps and other equipment into Bangladesh, primarily from China.

After the trade liberalization in 1988, cost of these machines especially power tillers and minor irrigation pumps fell by 50%, resulting in increases of 400% in sales of diesel engines and more than 1000% in power tillers compared to sales three years before the liberalization.

Mechanization in crop establishment and management: Mechanization in Bangladesh is now prevalent in land preparation. Almost 80% of land preparation including primary tillage uses 2WTs and/or 4WTs. However, mechanization of other agricultural field operations is still very low in Bangladesh and thus, adoption of other agricultural equipment such as transplanter, seeders, weeders, harvesters and winnowers are not common.

National Agricultural Policy (NAP), 1999: The overall objective of the first NAP is to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all. It identified 18 programme areas where actions or policies might be undertaken for achieving these objectives, agricultural mechanization is one of the programme areas, emphasized to meet the deficit of animal draught power through import of machines and raw materials needed for local fabrication with tax relief, providing credit to both users and traders and encouraging formation of user groups.

Establishment of Irrigation and Farm Machinery Wing under DAE: Ministry of Agriculture has been taken decisions to popularize the machinery that have been tested in different locations of the country and found to be suitable for specific socio-economic settings of the farming

system. Therefore, in order to disseminate mechanization and irrigation technologies, the Ministry of Agriculture established a wing on Irrigation and Farm Machinery under DAE.

3.0 OVERVIEW OF POLICIES & STRATEGIES ON AGRI MECHNIZATION

While in 2003-04, the availability of labor in agriculture was 51.60% it has come down to 40.20% in 2018-19. It may further be reduced to 30% by 2030. Due to rising education rates, rapid urbanization and industrial development, people no longer want to work as hard as agricultural workers. There are many alternative and easy jobs such as, battery-powered rickshaws and vans pullers, masons and painters can earn more than agricultural labors. Besides, the number of small traders is increasing day by day owing to better electricity supply and communication systems in the villages. New jobs are being created through the establishment of fish farming, poultry farms and dairy farms. Therefore, labour crisis in agriculture has been increasing and manual labours are scarce and expensive now-a-days.

The country lags far behind in terms of agricultural mechanization compared to other developing nations. Agricultural machines are commonly used in land cultivation, planting of seeds/saplings, weeding, intercropping, irrigation, fertilizer application, crop cutting, threshing, cleaning, drying and other functions. The use of agricultural machinery in different functions (such as - tilling, planting, weeding, intercropping, irrigation, fertilizing, crop cutting, threshing, cleaning, drying and so on) can increase the cropping intensity and crop production as well as reduce the cost of production. In the last 2-3 decades, implementation of projects through different research institutes, universities and the department of agricultural extension (DAE) created awareness as well as willingness towards mechanized farming in the country. DAE project with funding from the Ministry (2012-2019) reveals that the use of agricultural machinery in the project area has increased production as well as reduced production costs. In addition, the post-harvest loss has been reduced by 20-90%, cropping intensity has increased by 190-204% and new employment has been created in the project area.

On the other hand, although 90% of the machinery is used for agricultural land preparation, the use of machinery in seed sowing, transplanting and harvesting is still far behind. Farmers are facing severe financial losses especially due to no-use of machinery for seed sowing, transplanting and harvesting/threshing. Seed drill/planter, transplanters and harvesters can play an important role in reducing the cost of production and making it profitable.

The GoB has planned to invest heavily in making agriculture profitable and commercial. More agricultural machines will be provided to farmers at subsidized rates through the DAE project in future. Farmers can buy different types of agricultural machines at 70% subsidy in haor areas and up to 50% subsidy in other areas of the country.

In 2020, 1,240 combined harvesters, 499 reapers and 13 rice transplanters have been sold to farmers in the haor area at 70% subsidized price through the farm mechanization project of DAE. In other areas, 217 combined harvesters and 90 reapers have been sold at 50% subsidized price.

According to a recent study², about 7.06 million different types of agricultural machines (power tillers, tractors, irrigation pumps, hoes, threshing machines, maize shellers, sprayers, winnowers, etc.) are being used in the country. At present, more quality combined harvesters, reapers, rice transplanters imported from abroad are being sold in the country. Skilled drivers, mechanics and repairing workshops are required to properly operate and repair all these machines. The government will have to provide adequate training on machine operation, repair and maintenance. Adequate training is usually provided in GoB projects.

Status of Agricultural Machinery Use in Bangladesh³

Alongside of import and after sale service provisions rendered by the private sector companies, agricultural machinery manufacturing sub-sector in the country has been growing quite significantly. The number of power tiller (2WT) per thousand hectares is quite satisfactory, however, the four-wheel tractor (4WT) is replacing the power tiller gradually because of the advantages of tractor over power tiller in terms of capacity, tilling quality and cost effectiveness. The numbers of irrigation machines of different types are also quite satisfactory. Other machines, such as - threshers, corn sheller and sugarcane crushers are quite available against their use and demand. However, seeder, planter, transplanter and harvester are introduced to Bangladesh agriculture quite recently and the machines need intervention to popularize. The installed power per hectare of cultivable land is only 2.84 kW, which is quite inadequate to sustain farming operation profitably. Policy support and implementation strategies involving public and private sectors need to be devised urgently to scale-up of these crucial agricultural operations.

Among the crop production activities tilling, irrigation and threshing operations are fairly mechanized in Bangladesh. Labor intensive operations like planting and harvesting of crops are still manual, however, in recent time, modern machines like VMP, transplanter, reaper and combine harvesters are being introduced and gaining popularity because of agricultural labor shortage and high wage of labor during harvesting and planting seasons (see the table below). Machines for drying and storage are also needed to be popularized in the country.

Table 2.1: Status of Agricultural Mechanization

Activity Type	% Mechanized
Tilling	97
Irrigation	95
Transplanting	0.1
Fertilizer Application	1
Weeding	65
Insecticide Application	80
Harvesting	0.8
Threshing	70
Winnowing	6
Drying	2
Storing	4

² <https://www.daily-sun.com/post/517623/Present-Status-of-Farm-Mechanisation-in-Bangladesh>

³ http://kgf.org.bd/en/PUBLICATION-INFO/KGF_Final.pdf

Policy and strategy on agricultural mechanization by Ministry of Agriculture⁴

In formulating this policy by GoB agencies, the principles of prioritizing the welfare of agriculture and farmers, especially small and marginal farmers and farmers' cooperatives, sustainable environment, competitive market, safe and quality agricultural system and maintaining equity among all stakeholders have been followed.

Selection of Appropriate Agricultural machinery considering the purchasing capacity of farmers, farmers' cooperatives, service providers' entrepreneurs and the farm size, steps will be taken to supply qualitative, sustainable and suitable machinery. Besides, encouragement will be given to make appropriate machinery easily available in adverse situations (clay soil and lodging of plants etc.). In such circumstances, agricultural extension related organizations will continue their efforts to arrange field demonstrations and popularization activities of local and imported modern machinery.

Extension of Government Incentives: The existing incentive activities regarding the supply and extension of agricultural machinery use will be continued and in particular cases, it will be increased. In providing government incentives, the following strategies will be followed.

- Initially, this incentive will be provided for a fixed period among the farmers and farmers' groups/farmers' cooperatives for familiarity and popularization of agricultural machinery. The incentive must apply to standardized/certified 6 agricultural machinery. Emphasis will be given on short term useable essential machinery during the year.
- The demand for agricultural machinery will be increased by coordinating the supply and demand of machinery without harming the private sector and incentive rates and management will be restructured in line with the increase in supply to the private sector.
- The incentive system will be more transparent and rely on information technology to ensure supply among suitable farmers, farmers' cooperatives and agricultural machinery service providers.
- Coordination at the Upazila level will be strengthened in providing incentives.

Providing Loans for Purchasing Agricultural Machinery: To encourage farmers and agricultural machinery service providers, easy access to agricultural loans will be ensured for purchasing agricultural machinery from government, commercial, NGOs and financial institutions. Minimum interest or special interest-free loans will be provided to farmers/service providers for purchase of agricultural implements used for a short period in a year related to sowing, planting, cutting, drying, storage and processing. In this case, the government can pay interest to the concerned bank as a government subsidy.

Besides, necessary assistance will be provided to the farmers or farmer's groups/ farmer cooperative organizations so that they can purchase agricultural machinery by paying the price in installments with a down payment.

Agriculture is the main source of employment and income of about 41 percent people of Bangladesh. Agriculture contributes about 15 percent in the total GDP of Bangladesh, of

⁴ <https://moa.gov.bd/sites/default/files/files/moa.portal.gov.bd/policies/....pdf>

which contribution of crop sub- sector is about 9 percent. Improvement of agriculture is one of the key solutions of the alleviation of poverty of a country. So, modernization of agriculture is very important for reduction of poverty.

Agricultural and Rural Credit Policy of Bangladesh Bank⁵: Prioritizing this sector, Bangladesh Bank has continued its support actively to enhance agricultural sector by ensuring adequate loan with the help of public and private banks through formulating and implementing Annual Agricultural and Rural Credit Policy and Program. The annual agricultural credit disbursement target was set at BDT 262.92 billion for FY 2020-21, which is 8.99% higher than in FY 2019-20.

According to Bangladesh Krishi Bank (BKB), 60% out of total annual allocation of loan portfolio is allocated for crop financing. The loan is disbursed according to the norms set by the Bangladesh Bank. The interest rate for this sector is 9%. The interest rate varies from time to time. Both the landowner and sharecroppers are normally the target group for this loan. Marginal farmers are also eligible for the loan.

In order to meet up the changing demand of this sector, BKB offers credit facilities both for production and marketing of different agricultural equipment and farm machinery including irrigation equipment. All sorts of irrigation equipment like Low Lift Pump (LLP), HPTW, Shallow Tube Wells (STW), Deep Tube wells (DTW) are eligible under the sector.

National Agriculture Mechanization Policy 2020⁶ : Ministry of Agriculture published National Agriculture Mechanization Policy-2020 for Bangladesh in January 2020. The overall goal and objectives of this policy are;

Goal:

- Facilitate the adoption of farmers' favorite Ag machineries considering socioeconomic condition, small farm and land size, and land suitability.
- Make the Ag works and occupation more efficient, easy and risk free considering different changing environment and variable weather conditions.
- Prompt Ag mechanization with the aims to make profitable, commercial and sustainable production systems.

Objectives:

- a. Enhance uses and adoption of low cost and profitable Ag machineries at farm level.
- b. Increase Ag productivity through increasing efficiency of Agricultural labourer.
- c. Increase the usage of machinery, electricity and renewable energy resources for crop cultivation for increasing crop yield.
- d. Increase overall crop productivity through increasing cropping intensity.
- e. Strengthening research and development activities on Ag machineries.
- f. Enhance/ motivate local Ag machinery manufacturer and will help them for their existence in the competitive market situations.
- g. Arrange special credit facilities with easy terms and conditions for Ag machinery importer, manufacturers, local service providers (LSP), and for farmers for enhancing Ag mechanization process.

⁵ Agricultural and Rural Credit Policy and Programme for FY 2020-21, Agricultural Credit Dept., Bangladesh Bank

⁶ Study on Policies and Roadblocks for Small Scale CA Farm Machinery Adoption - FGD and Survey Report, Dr. Elahi Baksh et al, October 2020

- h. Create an authorized legal institution for standardizations of locally made and imported Ag machineries and spare parts.
- i. Strengthen mechanization for horticultural crop cultivation in addition to field crops.
- j. Empower Ag machinery service providing systems, training, multipurpose use and repair and maintenance systems.

Conservation Agriculture (CA): By adopting CA system, farmers can easily maintain soil fertility and soil moisture, can save production cost and time, reduce green-house effect and can increase cropping intensity. To achieve these goals following steps will undertake.

- a. Steps will take to motivate farmers to cultivate crops with zero till, minimum tillage considering soil and land type. And works will be done to popularize crop residue incorporation after crop harvest.
- b. Arrange training for the farmers, LS on proper use and maintenance of CA based machinery with the aim to extend the adoption of CA.
- c. Proper steps will be taken to innovate and development of appropriate machineries for crop residue management.
- d. Different steps will be taken for development and expansion of CA based technologies for improving soil organic matter and reduces soil erosion.
- e. Will increase financial incentive, credit facilities and developmental helps for increasing CA base machinery adoption and extension.
- f. Will enhance the use of digitalized systems for water saving technology extension and for irrigation water measurement.

Review of Current Policies

- a. Before 2005, there was no explicit set of actions to guide the nature and extent or to set goals of agricultural mechanization in Bangladesh.
- b. Except for assigning low tariffs for import of machines, other items mentioned in the 1999 Agricultural Policy, have not enjoyed any follow up action.
- c. DAE activities before 2010 gave emphasis on adoption and dissemination of tillage and irrigation machineries with some emphasis on thresher, reaper and hand seeding machine. The use of 2WT for land preparation and rural transportation has increased rapidly in the country due to its versatile use, low cost for tillage; lesser time required for cultivation and higher crop yields. Before 2010, there were no programmes on the training of the users, traders and service providers to maximize the benefits of mechanization and to increase longevity of the machines.
- d. Through DAE project on 'Enhancement of Crop Production through Farm Mechanization Project', the 1st phase has been disseminating tiller, thresher/Shellor, combine harvester, seeder and reaper to the farmers with 25% subsidized prices and modified the subsidy rate in 2nd phase of the project to 50 - 70% (depending on location).
- e. There is proposed target area coverage on CA in the Road map activities and was a proposed project on CA but practically no steps was not yet taken by DAE, GoB to execute the proposed project on CA and to popularize CA machineries.
- f. Some international organizations (e.g., Murdoch University-Australia, CIMMYT-Bangladesh) with some limited number of project support, tried to popularize machines like VMP in some selected areas of Bangladesh with the support of DAE and research organizations.

4.1 Performance under PIM Model

A total of 114 VMP were sold under PIM model during 2020-21. The machines covered 4,551 bigha land with a coverage of 912 farmers (at an average rate of 41.75 bigha/machine). The table below reveals that Debiganj upazila under Panchagarh district covered most land areas.

Table 4.1: Performance on adoption and farmers served at different upazilas (PIM Model)

District	Upazila	# of VMP+2WT					Adoption (Bigha Covered)					No. of Farmers Served				
		A	B	C	D	Total	A	B	C	D	Total	A	B	C	D	Total
Panchagarh (49)	Boda	1	3	13	10	27	198	251	360	70	879	24	55	109	92	280
	Debiganj	3	2	5	7	17	609	203	213	47	1,072	70	90	36	11	207
	Sadar	-	-	1	4	5	-	-	50	9	59	-	-	10	4	14
Thakurgaon (9)	Sadar	1	-	1	3	5	200	-	50	279	529	20	-	10	5	35
	Ranisankoil	-	-	-	4	4	-	-	-	42	42	-	-	-	7	7
Rajshahi (3)	Durgapur	2	-	-	-	2	500	-	-	-	500	160	-	-	-	160
	Godagari	-	-	1	-	1	-	-	40	-	40	-	-	7	-	7
Natore (2)	Sadar	-	-	1	1	2	-	-	60	4	64	-	-	15	2	17
Kurigram (1)	Chilmari	-	1	-	-	1	-	115	-	-	115	-	20	-	-	20
Pabna (4)	Sadar	-	-	-	3	3	-	-	-	28	28	-	-	-	2	2
	Ishwardi	-	-	-	1	1	-	-	-	10	10	-	-	-	2	2
Bogra (3)	Sherpur	1	-	-	-	1	125	-	-	-	125	55	-	-	-	55
	Sonatola	-	1	-	1	2	-	70	-	20	90	-	20	-	4	24
Noakhali (11)	Subarnachar	-	1	1	1	3	-	106	48	5	159	-	14	7	1	22
	Maijdee	-	-	8	-	8	-	-	200	-	200	-	-	36	-	36
Lakshmipur (3)	Kamalnagar	-	1	-	-	1	-	93	-	-	93	-	14	-	-	14
	Ramgoti	-	-	-	2	2	-	-	-	15	15	-	-	-	3	3
Sunamganj (1)	Maddhanagar	-	-	-	1	1	-	-	-	150	150	-	-	-	1	1
Barguna-NUMAN	Amtoli	-	-	-	1	1	-	-	-	5	5	-	-	-	2	2
Khulna-NUMAN	Dakop	-	-	-	1	1	-	-	-	5	5	-	-	-	2	2
BARI-Soil Sc. Dept.	Joydevpur	-	-	-	1	1	-	-	-	10	10	-	-	-	2	2
BARI-Barisal	Rahmatpur	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
DAE Demo	Badda	-	-	-	1	1	-	-	-	1	1	-	-	-	-	-
RDA-Bogra	Sadar	-	-	-	18	18	-	-	-	360	360	-	-	-	65	-
Total	24 Upazila	8	9	31	61	109	1,632	838	1,021	1,060	4,551	329	213	230	205	912

Note: LSP Category; A=120-300+, B=70-119, C=21-69, D=0-20 Bigha

4.2 Performance under TIM Model

30 PTOS were under TIM model during the same period and 2,341 bigha land of 402 farmers were covered. Subarnachar upazila under Noakhali district covered the most land areas in this category.

Table 4.2: Performance on adoption and farmers served at different upazilas (TIM Model)

District	Upazila	# of VMP+2WT					Adoption (Bigha covered)					No. of Farmers Served				
		A	B	C	D	Total	A	B	C	D	Total	A	B	C	D	Total
Panchagarh (3)	Boda	1	-	-	1	2	218	-	-	12	230	30	-	-	3	33
	Debiganj	1	-	-	-	1	509	-	-	-	509	110	-	-	-	110
Thakurgaon (6)	Sadar	-	-	1	4	5	-	-	50	9	59	-	-	10	4	14
	Ranisankoil	-	-	-	1	1	-	-	-	15	15	-	-	-	4	4
Rajshahi (7)	Durgapur	2	-	2	3	7	300	-	100	-	400	55	-	18	12	85
Natore (3)	Sadar	-	-	-	3	3	-	-	-	46	46	-	-	-	15	15
Noakhali (11)	Subarnachar	1	6	2	2	11	284	679	99	20	1,082	30	94	12	5	141
Total (30)	7 Upazila	5	6	5	14	30	1,311	679	249	102	2,341	225	94	40	43	402

Note: LSP Category; A=120-300+, B=70-119, C=21-69, D=0-20 Bigha

Figure 4.1: Upazila wise VMP sale during 2020-21 (in number)

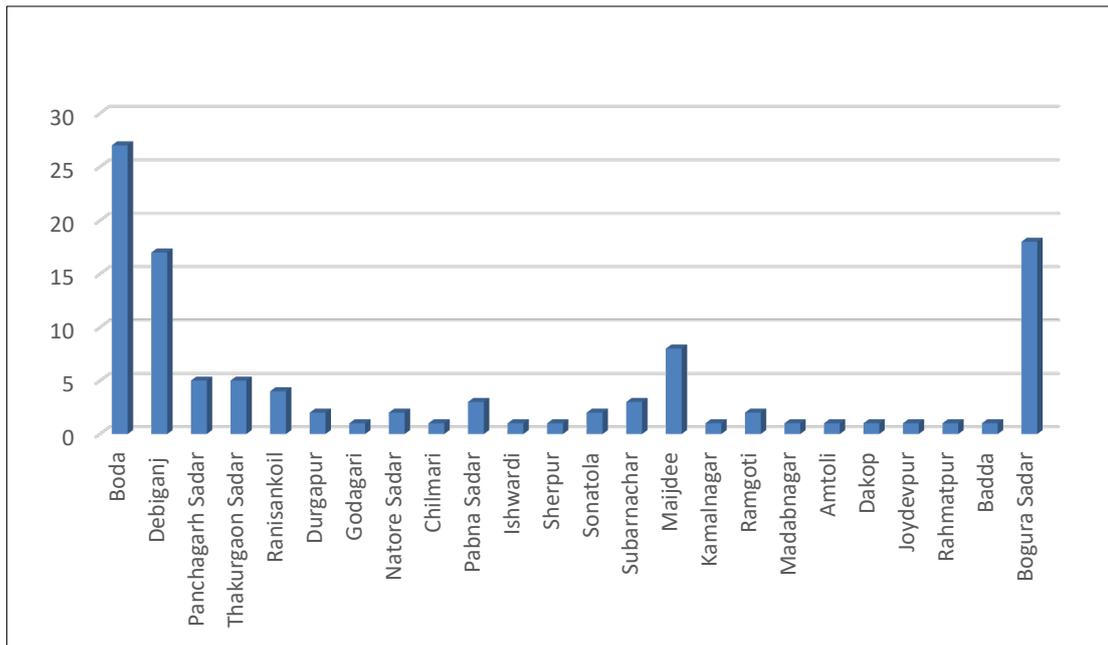
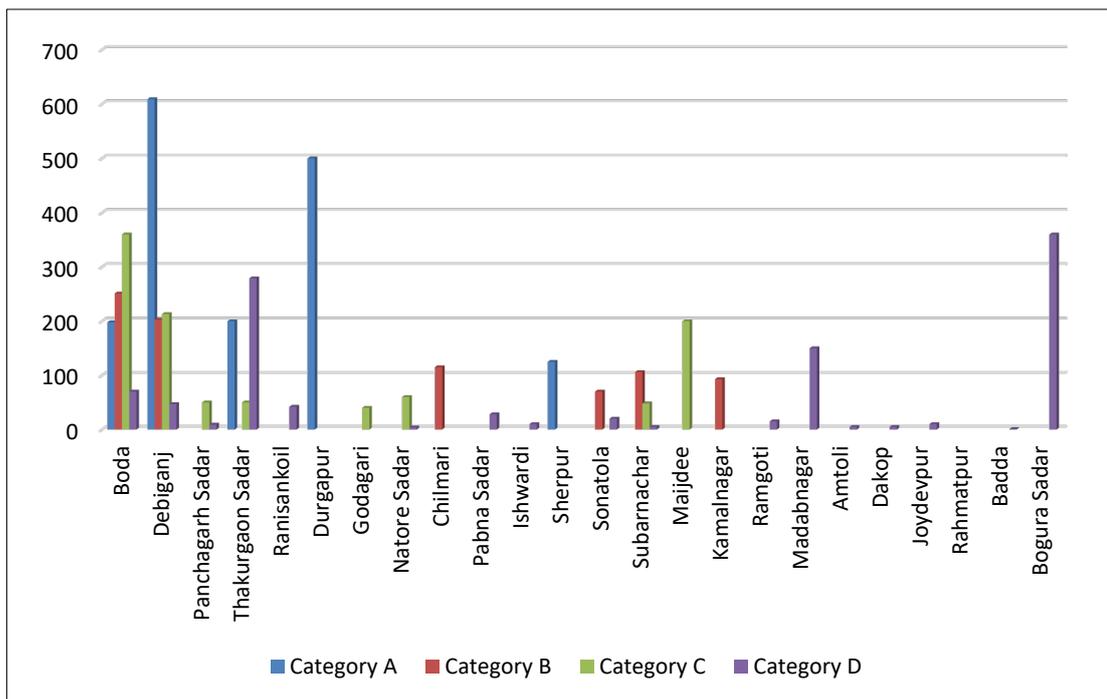


Figure 4.2: Upazila wise area covered during 2020-21 (in bigha)



5.0 PRIMARY DATA COLLECTION

As decided during the planning stage, field level primary data were collected through mobile-based survey and key informant interviews with the selected stakeholders of the project. The findings are summarized in the following sections.

5.1 Survey of LSPs and Farmers

Due to the pandemic situation, the survey team could not physically move to the field. A mobile-based survey was conducted based on pre-designed questionnaire (Attachment A) among the farmers and LSPs. Categories of respondents are shown below:

Table 4.1: Respondent categories of farmer/LSP survey

#	Respondent	Farmer & LSP					Total
		Durgapur	Boda	Debiganj	Subarnachar	Natore Sadar	
1	PIM - Category A	1	0	1	0	0	2
2	PIM - Category B	0	1	0	1	0	2
3	PIM - Category C	0	1	1	0	1	3
4	PIM - Category D	0	1	1	1	0	3
5	TIM – Category A	1	0	1	0	0	2
6	TIM – Category B	0	0	0	2	0	3
7	TIM – Category C	0	0	0	1	0	1
8	TIM – Category D	2	1	0	1	1	5
	TOTAL	4	4	4	6	2	21

5.2 Survey Findings

The detailed survey findings may be viewed in tabular form in the Attachment B. The summarized findings and inference thereto are shown below:

- a. Most of the LSPs and farmers are involved in farming for more than 10 years (85%).
- b. LSPs and farmers mostly (75%) less than 20 bigha land. However, 60% of them cultivate 21-70 bigha land.
- c. 50% use VMP for about 2 years. 10% use VMP for more than 4 years.
- d. VMP is used more (33%) in peanut farming. Soybean, lentil, wheat, mustard and black gram farmers also use VMP. But, chickpea, sesame, chilly, jute, cotton and rice farmers so far did not use VMP.
- e. VMP owners most drive the machine. Hired + owner driven practice is also common.
- f. 65% VMP owners received 3-day training and 25% received 1-day training.
- g. 80% VMP owners knew about the machine from Hoque Corporation or his agents.
- h. 65% farmers charge BDT 500 per bigha of VMP use, whereas most of farmers mentioned that fuel cost is BDT 100 and driver cost (if operated by hired driver) is BDT 150 per bigha.
- i. 95% responded that they do not face difficulties in buying spare parts from local market/Hoque Corporation.
- j. 40% assumed that 2-5 VMPs are used in their union, whereas 35% assumed that more than 10 VMPs are used in their union.

- k. In addition to VMP (old or new version), a few farmers also use reaper machine (9%), rice planter (4%) and combined harvester (2%).
- l. 73% purchased VMP (under PIM method) at BDT 65,000 and received subsidy of BDT 30,000 per machine. Actual out-of-pocket cost is BDT 35,000.
- m. 78% purchased 2WT+VMP with BDT 180,000 under TIM method with loan support from banks. Maximum VMPs under TIM method were bought in 2017 (44%).
- n. 78% VMP owners (under TIM method) received BDT 140,000 as loan from bank.
- o. In 67% cases, loan installment size is BDT 20,000 on quarterly basis.
- p. After several of experience, 100% VMP owners will opt to buy (if needed) in future by own financing to avoid high price, interest burden, installment pressure and so on.
- q. 80% VMP owners are interested to continue the business, because it is profitable, faster and demand has been increasing in the locality.

5.3 Findings from One-to-One Interviews

Key informant interviews were intended to gather views of the key stakeholders involved in the LWR-2018-111 Project with different types of roles and responsibilities. The interview guidelines are appended in the attachment – 3 of the report. Their experience and ideas on the project performance, especially for comparison of PIM and TIM models have provided valuable insight and guidelines for future direction of the project. Major observations of the interviewees are summarized below:

a. Mr. Shahidul Islam, Manager, SIBL, Maijdee Branch, Noakhali

- 1. About 20 VMPs along with 2WT were supplied to the farmers selected by Solidaridad.
- 2. Key loan features were: loan amount – BDT 100,000; Collateral – nothing; Personal guarantor – wife; Installment numbers – 24 (EMI).
- 3. Recovery rate is about 25-30% (Bank is keeping pressure on the borrowers with the support from Solidaridad).
- 4. Poor performance of 2WT from the very beginning resulted in annoyance of the borrowers and poor recovery.
- 5. The success of a similar loan package will require better quality 2WT (or power tiller), proper training, after sales service, intensive monitoring and support from Solidaridad.
- 6. They may be interested if HC and Solidaridad will provide guarantee in addition to the spouse's guarantee.

b. Mr. Ali Haider Mortuza, Regional Manager, National Bank Limited, Rajshahi & Rangpur Division

- 1. National Bank Limited sanctioned loans for VMP purchase to more than 100 loans since 2016.
- 2. The terms and conditions for the VMP loan were: Interest rate = 9% (at present 8% as per the recent GoB decision); Bank loan = BDT 100,000 (including a 2WT or power

tiller); Farmer's equity = BDT 65,000; Repayment period = 2 years; Debt: Equity ratio = 80:20 (maximum); Repayment installment = Flexible (3 installments per year).

3. Recovery performance of the bank was quite satisfactory (about 90%).
4. Bank officials have been following up the overdue loans on regular basis.
5. Some borrowers in Naogaon district have overdue installments. However, they have been continuing repayment in smaller installments.
6. Bank will continue lending support for VMP purchase to genuine and interested farmers in future as well.
7. He appreciated the services of Hoque Corporation in providing training, follow-up services and grievance redressing on timely basis.
8. He opined that farmer will be interested to borrow from bank if the loan processing can be simplified more farmer-friendly.
9. Bank should cautiously select the borrowers, so that the money can be optimally utilized in purchasing VMPs.

c. Mr. Atikuzzaman, Program Manager, Solidariadad - Noakhali

1. Although Bangladesh has leverage on young labour force, sourcing labours for farming has been scarce day-by-day.
2. Climatic conditions (extreme weather) have an adverse impact on the farmers and they cannot work 8 hours a-day in the field.
3. Mechanized agriculture needs to be adopted quickly to increase land acreage and productivity in Bangladesh.
4. Continuous R&D on adoption of mechanized tools in agriculture should be carried on by different organizations. At the same time, technology transfer and dissemination to the real farmers also be done side by side.
5. Experimental use of 6 VMPs (along with 2WT) by Solidariadad was splendid. However, 2WT supplied to the farmers through bank loan performed poorly due to some mechanical problem. After sales service by the 2WT suppliers was not up to the expectation.
6. VMP has been performing very well, especially for soybean farming in the areas covered by Solidariadad.
7. Adjustment of 2WT with VMP must be done properly to perform the tillage and seeding activities with extra load. 2WT should be strengthened with 20-22 HP engine.
8. The poor quality of 2WT supplied by Chittagong Builders created problems from the very beginning. That's why, farmers could not operate the machine properly. It resulted in non-payment of loan installment of the bank.
9. 65-70% loan extended by the bank is still overdue. The NGO played supporting role in farmer loanee selection and loan recovery.
10. Market size and VMP adoption is negligible in the southern region. Project support with subsidy must be continued for at least another 4-5 years to create awareness and increase of VMP use.

11. Advocacy and lobbying should be done by RDA and other organizations to introduce GoB subsidy for VMP.

d. Prof. Md. Hamidul Islam, Dept. of Farm Power Machinery, Bangladesh Agriculture University, Mymensingh

1. BAU is involved in a 4WT based piloting study in association with Murdoch University.
2. Prof. Islam observed that 4WT is not effective for small holdings (less than 1 hectare) which are common in Bangladesh.
3. 2WT-based VMP is appropriate for small holdings and should be promoted in Bangladesh.
4. As the adoption rate of mechanized agriculture (especially 2WT based VMP) is still quite low (1-3%), more financial and promotional supports need to be continued.
5. Strong after sales service is a must to ensure proper use of 2WT based VMP is a must.

e. Mr. Abdullah Al Mamun, Director, Rural Development Academy (RDA), Bogra

1. RDA was involved in promoting VMP in 8 districts (40 upazelas) in the Northern Bangladesh during 2018. It participated in the VMP training and demonstration in different areas.
2. Mr. Mamun opined that VMP of MU has been performing better than BARI Seeder.
3. 2WT should be strengthened by 18-20 HP to operate properly with VMP.
4. As VMP is relatively new technology for the rural farmers, hands-on training, field level demonstration and practice, refresher course, trouble-shooting mechanism need to be included in the whole package.
5. Awareness program together with subsidy must be continued to increase the adoption of VMP in the coming days.
6. PIM model is better option for the farmers. But, loan conditions, interest rate, etc. should be easier for those who cannot buy through equity financing.
7. Effective monitoring, innovative incentive mechanism and after care support should be included in the project budget.
8. VMP has a bright future in Bangladesh and GoB should come up with attractive subsidy package similar to combined harvester and transplanter.

f. Mr. Mizanul Hoque, CEO, Hoque Corporation, Dhaka

1. Since 2015, HC supplied and commercialized >350 VMP machine including 147 to LWR-2018-111 Project and exported 100 machines to other countries.
2. **Price and subsidy mechanism** for VMP financing was as followed:

Under PIM model, VMP machine was sold @ BDT 60,000 under this model. The net selling price of the machine came down to BDT 35,000 after BDT 25,000 subsidy per machine. As per agreement with the purchaser, the subsidy amount will be transferred to him after completion of farming 50 bigha land by the machine (either by the VMP owner or by hired driver).

Under TIM model, HC submitted the list of interested loanees to the bank. Bank officials then verified the cases and initiated the loan processing formalities. Formalities were: a) opening of bank account with BDT 10 deposit; b) submission of the copy of Farmer Card (issued by Govt. authority); c) Submission of copy of NID, etc. Farmers were supported by CASPA and HC (Solidariadad for NBL) in the process. After completion of loan documentation, disbursement of BDT 100,000 (SIBL) was disbursed to the loanee by SIBL as per following terms:

- a) Interest rate = 9%
- b) Bank loan = BDT 100,000
- c) Farmer's equity = BDT 65,000
- d) LWR-2018-111 price support/incentive = BDT 25,000
- e) Total cost = BDT 130,000 (for a power tiller) + 60,000 (for a VMP), total BDT 190,000
- f) Repayment period = 2 years
- g) Delivery place of machine = at farmer's house
- h) Repayment installment = equal monthly installment (EMI)

In case of NBL, terms were as follows:

- a) Debt: Equity ratio = 80:20 (maximum)
- b) Interest rate = 9%
- c) Repayment period = 2 years
- d) Repayment installment = 3 installment per year (seasonal)

In reality, Hoque Corporation sold the machine with a price support/incentive at the beginning after obtaining a written guarantee from the owner-farmer that he will use VMP for at least 50 bigha land. After the confirmation on 50 bigha planting, Hoque Corporation got refund of BDT 25,000 from SRA by following due process.

Supply mechanism: Initially, awareness building was being carried out with the support from Upazila Agriculture Officer and SAAO. They convinced potential buyers of VMPs on the advantage of using VMP (planting rate, operating cost, price, subsidy, after care and so on).

Incentive package: For sustenance of the project, BDT 3,000 per VMP are paid to Hoque Corporation as Value Chain development cost which was utilized for 2-4 day training, accommodation, food, allowance and so on. 2 persons per machine (1 owner and 1 operator) were trained under the arrangement.

3. **Warranty and servicing:** HC provided 1 year warranty and free servicing. However, HC provided free servicing beyond 1 year. After completion of LWR-2018-111 Project, HC will charge small amount for servicing. HC developed links between the LSPs and farmers in the meantime.
4. **Technical supports:** Minor technical problems of VMP are being faced. After sales service arrangement were done either by the LSPs or HC.

5. **Training & demonstrations:** 2-4 days training were conducted for the owners and drivers of VMP. In addition, refresher course (hands on) at the farmers' areas were conducted by HC trainers.
6. **Opinion on price and benefits:** Current incentive-based price structure is affordable to the farmers and LSPs. But, they may not be willing to purchase if the price is increased. As it is a new technology, the new farmers are not convinced in a mass scale for using VMP. Adoption rate is still low (about 1%) as farmers are not much aware about the VMP, whereas power tiller has a high adoption rate. A VMP owners can earn BDT 35,000 – 60,000 per season from a VMP.
7. **Financing Mechanism:** PIM model is preferred by the farmers. As it does not require cumbersome loan processing, documentation and other formalities with the bank. No tension for payment of installment in a certain time. No interest burden.
8. **Problems & challenges of VMP business by HC:**
 - a) Market size is quite limited, b) Low volume of VMP sale. If 200 units VMPs can be sold per year, then the business can be profitable and can be run without support from the project., c) As the cost of raw materials and parts has increased currently, selling price will need to be increased by 25%.

Considering the current trends, it can be concluded that price support/incentive/subsidy could help for popularizing VMP in farmers community and market demand will be increased. To do so, more projects support like LWR-2018-111 is required.

9. Other opinions:

- PIM model is farmers' preferred model and which could be applicable for future project.
- From benefit-cost perspective, VMP is lucrative device for the farmers and LSPs but price support is essential
- Selling price cannot be increased
- After sales service is a must
- SRA or similar type of project support is needed at this stage.

6.0 CONCLUSION AND RECOMMENDATIONS

Based on the above findings, the following recommendations are proposed to increase the adoption of VMP together with comparative advantages of financing models.

- f. Awareness and knowledge building at farmer level: VMP is a relatively new technology in Bangladesh and the technical knowledge at user level is still inadequate. Understanding the benefits of adopting of VMP against other options should be convincing to farmers. Apart from financial benefits, transferring of technical know-how (operation, repair and maintenance, etc.) should be carried out properly. Government should extend supports to private entrepreneurs like, Hoque Corporation in disseminating the required knowledge and motivating the farmers at grassroot level.
- g. Field level training and demonstration: Initial foundation training should be backed with periodic refresher course by the project and extension team for easy and wider adoption of the machine.
- h. Continuation of subsidized pricing: Awareness and adoption of VMP is still at in early stage (1-2%) as opined by the researchers in this discipline. The farmers are not yet ready to purchase the machine with the regular price. Price incentives/price support or subsidy, combined with promotional incentives, should be continued either by the Project or by the Government. VMP should also be included in Government subsidized agricultural projects. Conservation Agriculture Service Providers' Association (CASPA), RDA, BAU, DAE and other stakeholders may work on advocacy issues in this connection.
- i. Financing options: As observed from the responses of farmers and LSPs, PIM model has shown higher acceptance than TIM models. Farmers want to avoid stringent banking formalities, documentation (loan agreement, guarantor, paper works, etc.) and time-based repayment pressure. That's why, most of them prefer equity financing. However, TIM model must also be continued to capture the users having equity shortage. It will also help prepare the financial institutions to operate financing packages in mechanized agriculture.
- j. Monitoring and after care: Successful adoption of a new technology depends on frequent monitoring and instant trouble shooting. After sales service should be done by the machinery supplier(s) with utmost sincerity. Strict clause needs to be included in the contract made with the machinery suppliers.

Appendix 1: Key Features of VMP manufactured by Hoque Corporation

Manufacturer & Exporter: HOQUE CORPORATION, House # 12, Road #03, Block # F, Sector # 01, Aftabnagar, Badda, Dhaka - 1230, Bangladesh.

Our VMP is exported to Ethiopia, Tanzania, India, Mexico, Myanmar, Uganda, Vietnam, Zimbabwe, Tajikistan etc. Versatile Multi-crop Planter (VMP) is designed in such a way that achieve improved flexibility for multi-crop planting and has capacity for rapid adjustment of row spacing on a field-by-field basis.

"Planters such as VMP could be used to develop conservation agriculture practices across a wide range of cropping systems used by smallholder farmers in Asia, Africa, and other regions"

Versatile Multi-crop Planter (VMP):

The VMP is a unique multi-functional and multi-crop planter powered by 12-16 hp 2-wheel tractor (power tiller) with the capability for seed and fertilizer application in variable row spacing using single pass shallow tillage, strip tillage, strip tillage, zero tillage, bed planting and conventional tillage (CT).

Technical Features of VMP:

- a) Power requirements: 12-16 hp
- b) Type of the hitching point: with Dongfeng or Saifeng 2 wt.
- c) Total number of tine pocket: 36 Nos.
- d) Number of rows can be sown per operation: 4 rows maximum
- e) Fertilizer apparatus number: Maximum 4 (adjustable)
- f) Seed meter device: Vertical ABS plate
- g) External dimension (mm): 900*1100*975 (L*W*H)
- h) Net weight: 152-155 kg
- i) Capacity in strip planting mode: 35 decimal/hour
- j) Diesel fuel requirement: 6 L/hectare
- k) Crops suitable to sow: wheat, peanut, maize, soybean, mungbean, lentil, mustard, sesame, chili, blackgram, chickpea, jute, cotton, rice, etc.

The use of VMP:

- a) Reduced crop establishment cost from 30-59%
- b) Reduced diesel fuel uses up to 80%
- c) Reduced labour use from 16-54%
- d) Reduced irrigation water uses up to 36%
- e) Reduced CO₂ emission up to 82%
- f) Increased grain yields up to 40%
- g) Increased profit from 10-30%

Evaluation of PIM and TIM Models for the Adoption of Versatile Multi-crop Planters (VMP)

Appendix 2: Questionnaire for Local Service Provider (LSP)

1.0 Personal Data

Name			Main Occupation	
Age			Education	
Mobile #			Annual Income	
Address	Village		Union	
	Upazela		District	

2.0 Farming related Data

2.1 How many years you are involved in farming?

0-1 year	1-3 years	3-5 years	5-10 years	10+ years

2.2 What is the size of your own land (in bigha)?

0-20	21-70	71-120	121-300	300+

2.3 What is your cultivable land area (in bigha)?

0-20	21-70	71-120	121-300	300+

2.4 How many years you are serving with VMP machine?

<1 year	1-2 years	2-3 years	3-4 years	4+ years

2.5 Rank crops in order of importance for sowing by your VMP? (Put tick mark)

1	Wheat		2	Peanut		3	Maize		4	Black gram	
5	Soybean		6	Mung bean		7	Lentil		8	Chickpea	
9	Mustard		10	Sesame		11	Chilly		12	Jute	
13	Cotton		14	Rice		15	Any other (please mention)				

2.6 Who has been driving/operating VMP (please tick mark)?

a) Owner himself	b) hired operator/driver	c) both hired and owner himself

2.7 Have you/your operator received training on VMP operation, repair and maintenance?

Yes	No
-----	----

2.7.1 If yes, for how many days? _____

2.7.2 If yes, was the training adequate?

Yes	No
-----	----

2.8 Area coverage (bigha) by VMP and charge (Tk/bigha)

Year	Crop 1 (say wheat)			Crop 2 _____			Crop 3 _____		
	Area (bigha)	No. of Farmers received services	Charge (Tk/bigha)	Area (bigha)	No. of Farmers received services	Charge (Tk/bigha)	Area (bigha)	No. of Farmers received services	Charge (Tk/bigha)
Year 1									
Year 2									
Year 3									
Year 4									
Year 5									

2.9 How many days you have served with VMP (per year)?

Year 1	Yea 2	Year 3	Year 4	Year 5

2.10 How much was the operation cost for VMP only

Year	Fuel cost (Tk/bigha)	Repair and maintenance cost (Tk/year)	Cost for operator/driver/helper (Tk/bigha)
Year 1			
Year 2			
Year 3			
Year 4			
Year 5			

2.11 Have you faced difficulties to buy spare parts from local market or quick delivery from Hoque Corporation?

Yes	No
-----	----

2.11.1 If yes, please describe.

2.12 How many farmers have been using VMP machine in your union? (Put tick mark)

1	2-5	6-10	10 +	Don't know

2.13 How did you come to know about the VMP machine? (Put tick mark)

#	Particulars	Tick
1	From Agri. Extension Officer	
2	From local agricultural machinery seller	
3	From machinery supplier Hoque Corporation or his agent	
4	From financial institution/bank	
5	Any other (please specify)	

3.0 VMP procurement, payment and other related information

3.1 Name the machineries (including VMP with old/new version) you are using for tillage?

- _____
- _____
- _____
- _____

3.2 Provide following information about VMP.

#	Purchase year	Actual purchase price/Tk.	Subsidy/loan (if any)/Tk.
a			
b			
c			
d			
e			

3.3 How did you procure the VMP machine

#	Particulars	
1	Own finance from designated seller	
2	Own finance from another farmer (for used machine)	
3	Bank loan	

4	Any other (please specify)	
---	----------------------------	--

3.4 If procured through bank loan, please mention your opinion/feedback relating to:

#	Particulars	Opinion/Feedback
1	Loan amount	
2	Loan installment size	
3	Installment interval	
4	Processing fee	
5	Any other (please specify)	

3.5 In your opinion, what are the advantages and disadvantages of procuring through own finance and bank loan?

#	Advantage	#	Disadvantage
Own finance/Equity:			
1		1	
2		2	
3		3	
4		4	
Bank Loan:			
1		1	
2		2	
3		3	
4		4	

3.6 Considering the pros and cons, which option (own finance, bank loan or any other means) you feel is better one and why?

Own finance		Bank loan		Any other means (.....)	
Reasons behind your preference:					

3.7 How important was the subsidy or planting incentive paid for your purchase of the VMP?

--

3.8 How important was the planting incentive paid for contacting farmers to start up business with the VMP and demand creation of VMP?

--

3.9 Are you satisfied with the VMP seller (Hoque Corporation) services provided for repairing, know-how, training and other problems being faced during operation of VMP?

Yes	No
-----	----

3.9.1 If No, what are problems you have been encountering and what should be the remedies?

#	Problems	#	Suggested remedies
1		1	
2		2	
3		3	

3.10 What is your opinion about the VMP use? (e.g., Cost saving, seed saving, higher yield, etc.)

1. _____
2. _____
3. _____
4. _____
5. _____

3.11 Do you have any ideas on how to increase the number of days per year using the VMP? (e.g., direct seeding of rice)

3.12 Would you like to continue the VMP contracting business (tick mark first in appropriate box and then explain)?

Yes	No
-----	----

3.12.1 Reasons behind your reply:

3.12 Any other opinion(s):

Thank you for your cooperation!

Appendix 3: Details of survey findings

1.0.a Education level of the respondents		
Particulars	Frequency	Percentage
Class V	11	55%
Class VIII	5	25%
Class X	2	10%
Class XII	2	10%
Total	20	100%

1.0.d Annual Income		
Particulars	Frequency	Percentage
100000-150,000	9	45%
151,000-200,000	7	35%
201000-300,000	3	15%
300000+	1	5%
Total	20	100%

2.1 How many years you are involved in farming		
Particulars	Frequency	Percentage
0-1 Year	0	0%
1-3 Year	0	0%
3-5 Year	1	5%
5-10 Year	2	10%
10+ Year	17	85%
Total	20	100%

2.2 What is the size of your own land?		
Particulars	Frequency	Percentage
0-20 Bigha	15	75%
21-70 Bigha	3	15%
71-120 Bigha	1	5%
121-300 Bigha	1	5%
300+ Bigha	0	0%
Total	20	100%

2.3 What is your cultivable land area?*		
Particulars	Number	Percentage
0-20 Bigha	2	10%
21-70 Bigha	12	60%
71-120 Bigha	2	10%
121-300 Bigha	2	10%
300+ Bigha	2	10%
Total	20	100%

* Cultivable land includes the land of other land owners in addition to their own land

2.4 How Many Years you are serving with VMP machine?		
Particulars	Frequency	Percentage
< 1 Year	4	20%
1-2 Years	6	30%
2-3 Years	4	20%
3-4 Years	4	20%
4+ Years	2	10%
Total	20	100%

2.5 Rank your crop in order of importance for sowing by your VMP?		
Particulars	Frequency	Percentage
Wheat	3	10%
Peanut	10	33%
Maize	3	10%
Black Gram	1	3%
Soybean	5	17%
Mung Bean	0	0%
Lentil	5	17%
Chickpea	0	0%
Mustard	3	10%
Sesame	0	0%
Chilly	0	0%
Jute	0	0%
Cotton	0	0%
Rice	0	0%
Total	30	100%

2.6 Who has been driving/operating VMP?		
Particulars	Frequency	Percentage
Owner himself	9	45%
Hired Operator	4	20%
Both Hired & Owner	7	35%
Total	20	100%

2.7.1 Have you/your operator received training on VMP, repair and maintenance?		
Particulars	Frequency	Percentage
Yes	19	95%
No	1	5%
Total	20	100%

2.7.2 If yes for how many days?		
Particulars	Frequency	Percentage
1 day	5	25%
2 days	1	5%

3 days	13	65%
Didn't get training	1	5%
Total	20	100%

2.7.3 If yes, was the training adequate		
Particulars	Frequency	Percentage
Yes	18	95%
No	1	5%
Total	19	100%

2.8 Area Coverage by VMP				
Year	Crop	# of LSPs	Area/Bigha	# of farmers
2015	Wheat	1	30	25
	Peanut	0	0	0
	Soybean	0	0	0
	Mustard	1	80	40
	Lentil	1	40	20
	Coriander	0	0	0
	Maize	0	0	0
2016	Wheat	0	0	0
	Peanut	0	0	0
	Soybean	0	0	0
	Mustard	1	100	45
	Lentil	1	40	20
	Coriander	0	0	0
	Maize	0	0	0
2017	Wheat	2	55	30
	Peanut	1	60	20
	Soybean	0	0	0
	Mustard	0	0	0
	Lentil	0	0	0
	Coriander	0	0	0
	Maize	0	0	0
2018	Wheat	1	45	30
	Peanut	2	110	45
	Soybean	1	35	50
	Mustard	1	70	35
	Lentil	0	0	0
	Coriander	0	0	0
2019	Maize	0	0	0
	Wheat	1	20	10
	Peanut	5	285	110
	Soybean	2	80	24
	Mustard	0	0	0
	Lentil	1	20	40

	Coriander	0	0	0
	Maize	0	0	0
2020	Wheat	0	0	0
	Peanut	7	380	157
	Soybean	4	81	62
	Mustard	0	0	0
	Lentil	0	0	0
	Coriander	0	0	0
	Maize	0	0	0
2021	Wheat	2	125	70
	Peanut	7	325	150
	Soybean	2	105	65
	Mustard	0	0	0
	Lentil	0	0	0
	Coriander	1	30	20
	Maize	1	10	10

2.9 How many days you have served with VMP (per year)			
Particulars		Frequency	Percentage
Year 1	<10 days	3	15%
	10 -15 Days	7	35%
	16-20 Days	5	25%
	21-30 Days	5	25%
	30+ Days	0	0%
	Total	20	100%
Year 2	<10 days	4	20%
	10 -15 Days	4	20%
	16-20 Days	2	10%
	21-30 Days	4	20%
	30+ Days	0	0%
	0 Days	6	30%
Total	20	100%	
Year 3	<10 days	3	15%
	10 -15 Days	3	15%
	16-20 Days	2	10%
	30+ Days	1	5%
	0 Days	11	55%
Total	20	100%	
Year 4	<10 days	1	5%
	10 -15 Days	1	5%
	16-20 Days	2	10%
	21-30 Days	1	5%
	0 Days	15	75%
Total	20	100%	

Note: As VMP is a relatively new technology, lack of awareness and conviction of the land owners of advantage of using VMP, flood and adverse soil condition during the

tilling season, smaller land size, selective crops for VMP use, etc. are the causes of limited use of VMP.

2.13 How did you come to know about the VMP machine?		
Particulars	Frequency	Percentage
From Agri. Extension Officer	4	20%
From Local Agricultural Machinery Seller	0	0%
From Machinery Supplier Hoque Corporation or his agent and CASPA	16	80%
From financial Institution/bank	0	0%
Any Other	0	0%
Total	20	100%

2.8 VMP Charge (Tk/bigha)		
Particulars	Frequency	Percentage
400	4	20%
450	3	15%
500	13	65%
Total	20	100%

2.10 Operation cost (Fuel)Tk/Bigha		
Particulars	Frequency	percentage
80	2	10%
90	1	5%
100	17	85%
Total	20	100%

2.10 Operation cost (Repair) Tk/year		
Particulars	Frequency	percentage
500-1000	3	15%
1000-2000	2	10%
2000-3000	1	5%
3000-4000	2	10%
5000+	1	5%
No repair cost	11	55%
Total	20	100%

2.10 Operation cost (Driver)/Bigha		
Particulars	Frequency	percentage
100	2	10%
150	6	30%
200	3	15%
No cost	9	45%
Total	20	100%

2.11 Have you faced difficulties to buy spare parts from local market or quick delivery from Hoque Corporation?		
Particulars	Frequency	Percentage
Yes	1	5%
No	19	95%
Total	20	100%

2.12 How many farmers have been using VMP machine in your Union?		
Particulars	Frequency	Percentage
1 Unit	0	0%
2-5 Unit	8	40%
6-10 Unit	4	20%
10+ Unit	7	35%
Don't Know	1	5%
Total	20	100%

3.1 Name the machineries (including VMP old/new version) you are using for tillage?		
Particulars	Frequency	Percentage
Power Tiller	20	42%
VMP Old version	2	4%
VMP New Version	19	40%
Reaper Machine	4	8%
Rice Planter	2	4%
Combined Harvester	1	2%
Total	48	100%

3.2.1 Purchase Year		
Particulars	Frequency	Percentage
2015	2	10%
2016	0	0%
2017	5	25%
2018	1	5%
2019	5	25%
2020	4	20%
2021	3	15%
Total	20	100%

3.3 How did you procure the VMP Machine?		
Particulars	Frequency	Percentage
Own Finance from designated seller	10	50%
Own finance from another farmer	0	0%
Bank Loan	9	45%
Any other (received free from Agriculture Dept.)	1	5%
Total	20	100%

3.2 Purchase year/PIM		
Particulars	Frequency	Percentage
2015	2	18%
2016	1	9%
2017	3	27%
2018	2	18%
2019	3	27%
2020	0	0%
2021	0	0%
Total	11	100%

3.2 Actual purchase price without subsidy/PIM		
Particulars	Frequency	Percentage
60,000	1	9%
65,000	8	73%
82,000	1	9%
Others	1	9%
Total	11	100%

3.2 Subsidy/PIM		
Particulars	Frequency	Percentage
20,000	1	9%
25,000	1	9%
30,000	6	55%
35,000	1	9%
Not mentioned	1	9%
Others (received as grant)	1	9%
Total	11	100%

3.2 Purchase year/TIM		
Particulars	Frequency	Percentage
2015	0	0%
2016	0	0%
2017	4	44%
2018	1	11%
2019	2	22%
2020	2	22%
2021	0	0%
Total	9	100%

3.2 Actual Purchase Price (2WT + VMP)/TIM		
Particulars	Frequency	Percentage
164,000	1	11%
169,000	1	11%
180,000	7	78%
Others	0	0%
Total	9	100%

3.4.1 Bank Loan		
Particulars	Frequency	Percentage
100,000	2	22%
140,000	7	78%
Total	9	100%

3.4.2 Loan Installment Size		
Particulars	Frequency	Percentage
5000	1	11%
6,100	2	22%
20,000	6	67%
Total	9	100%

3.4.3 Loan Interval		
Particulars	Frequency	Percentage
1 Months	3	33%
3 Months	6	67%
Total	9	100%

3.5 Advantage/Own Finance		
Particulars	Frequency	Percentage
Less Price	15	41%
No tension for installments	12	32%
Get subsidized	10	27%
Total	37	100%

3.5 Disadvantage/Own Finance		
Particulars	Frequency	Percentage
Fund Mobilization	3	19%
Need cash money	7	44%
Difficult to arrange money	6	38%
Total	16	100%

3.5 Advantage/Bank loan		
Particulars	Frequency	Percentage
Can be bought without cash money	10	43%
Business can be started without cash money	13	57%
Total	23	100%

3.5 Disadvantage/Bank loan		
Particulars	Frequency	Percentage
Interest burden	7	23%
High price	10	33%
Installment pressure	9	30%
lengthy procedure	4	13%
Total	30	100%

3.6 Considering the pros cons, which option you feel is better than one?		
Particulars	Frequency	Percentage
Own finance	20	100%
Bank loan	0	0%
Total	20	100%

3.7 How important was subsidy		
Particulars	Frequency	Percentage
Beneficial for farmers	13	52%
More farmers will be interested	12	48%
Total	25	100%

3.9 Are you satisfied with VMP seller.....		
Particulars	Frequency	Percentage
Yes	19	95%
No	1	5%
Total	20	100%

3.10 what is your opinion about VMP use?		
Particulars	Frequency	Percentage
Cost saving	13	24%
Faster	12	22%
Heavy weight	7	13%
difficult to operate	5	9%
Pinion quality is not good	6	11%
High Yield	3	5%
Can be used on very few days of the year	9	16%
Total	55	100%

3.11 have any Ideas on how to increase the number of days		
Particulars	Frequency	Percentage
Rice planter should be included	7	35%
No comments	13	65%
Total	20	100%

3.12 would you like to continue the VMP contracting business?		
Particulars	Frequency	Percentage
Yes	16	80%
No	4	20%
Total	20	100%

3.11 Reason behind your reply/ yes?		
Particulars	Frequency	Percentage
Profitable	14	44%
Faster than manual seeding	10	31%
Demand increasing	8	25%
Total	32	100%

3.11 Reason behind your reply/No?		
Particulars	Frequency	Percentage
Less demand	3	75%
Not profitable	1	25%
Total	4	100%