Cereal Systems Initiative for South Asia-Mechanization & Irrigation

(CSISA MI)

Annual Progress Report

(October 2017 to September 2018)

Submitted by

International Maize and Wheat Improvement Center (CIMMYT)

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LIST OF ACRONYMS

ACI	Advanced Chemical Industries
AFP	Axial flow pumps
AIRN	Agro-Input Retailers Network
AOR	Agreement Officer Representative
ASA	Association for Social Advancement
BADC	Bangladesh Agriculture Development Corporation
BARI	Bangladesh Agricultural Research Institute
BDT	Bangladeshi taka
BINA	Bangladesh Institute of Nuclear Agriculture
BMDA	Barind Multipurpose Development Authority
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
CA	Conservation agriculture
CIMMYT	International Maize and Wheat Improvement Center
CLA	Collaborative Local Agreements
COR	Contracts Officer Representative
CSISA III	Cereal Systems Initiative for South Asia Phase 3
CSISA MI	Cereal Systems Initiative for South Asia Mechanization and Irrigation
DAE	Department of Agricultural Extension
DEMs	Digital Elevation Models
DIP	Detailed Implementation Plan
EC_a	apparent electrical conductivity
FFD	Farmers' Field Day
FOC	Filed Office Coordinator
FtF	Feed the Future
GIS	Geographic information system
GJUS	Grameen Jano Unnayan Songstha
GoB	Government of Bangladesh
iDE	International Development Enterprises
iQ	Innovation and Quality
IR	Intermediate results
JCF	Jagoroni Chakra Foundation
JVA	Joint Venture Agreement
KMP	Krishi Machine Porichiti
LLA	Local Level Agreement
LoA	Letters of Agreement
LSP	Local Service Provider
LSPN	LSP network
M&E	Monitoring and evaluation
M&EO	Monitoring and Evaluation Officer
MDO	Machinery Development Officer
MEL	Monitoring Evaluation and Learning
MoA	Ministry of Agriculture
MRM	Monitoring and Results Management
MSME	Micro, Small, and Medium Enterprises
NGO	Nongovernment organization
OBF	Officers-Business Facilitation
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PNGO	Partner nongovernment organization
PSP	Private Sector Partner
PTOS	Power Tiller Operated Seeder
Q4	Quarter 4
RFL	Rangpur Foundry Limited
SAAO	Sub-Assistant Agriculture Officer
SDC	Society Development Committee
SKS	Shombhabbo Kreta Somabesh
SME	Small and Medium Enterprises
SOP	Standard Operating Procedures
SWOT	Strengths, Weaknesses, Opportunities and Threats
TMSS	Thengamara Mohila Sabuj Sangha
USAID	United States Agency for International Development
USD	United States dollar
USG	United States government
WEA	Women's Empowerment Activity
WEP	Women's Empowerment Program
WT	Wheeled Tractor

EXECUTIVE SUMMARY

CSISA-MI is a 5-year project led by the International Maize and Wheat Improvement Center (CIMMYT), in partnership with iDE under the Feed the Future (FtF) Initiative. It is transforming agriculture in southern Bangladesh by unlocking potential productivity through irrigation, small-scale agricultural machinery and agricultural services provision. The project developed and trained local agricultural service providers (LSPs), created an agricultural mechanization value chain and scaled-out agricultural machinery services across the FtF zone. Through private sector dealers and manufacturers, Axial Flow Pumps (AFP), Power Tiller Operated multi-crop Seeders (PTOS) and harvesters were introduced. Farmers receive these mechanized services cheaply, for higher yields.

The CSISA MI team re-visited its implementation plan, methodology and interventions in year 4, to rectify and adapt to farmer and value chain actors, through; re-engineering, business development training, tight focus on potential markets, mechanisation pilots and alternate agronomic solutions, which appears to have addressed earlier concerns on meeting year 5 targets.

5th year results strongly indicate that the project is well on-track and strategic decisions made under difficult financial constraints at the end of year 4 were warranted and necessary to meet scaling expectations. Sales of 597 power tiller operated direct seeders (PTOSs), and 360 multi-crop reapers by CSISA MI's private sector partners are indicative of the increased mechanisation development in the last implementation year. Contributing factors to CSISA MI's overall success in the reporting term include: the improved availability of agriculture machinery and spare parts, facilitating financial services from MFIs and the increasing presence of highly trained LSPs. Additionally, geo-specific targeting has enabled us to focus on areas of greater potential, with a view to eclipse the theoretical tipping point well before the project end date.

Against a training target of 10,040 individuals, the project has trained 9,417 farmers, among them 26% were women (6% more than last year). The project has intensively extended training to 550 private sector actors and 20 participants from civil society. In the last year, 85 LSPs received USD 50,545 for 85 machines, which was a 106% achievement against the annual target, of this; eight women LSPs received USD 4,146, which was four times the number of women in year 4 and eight times larger in the amount of credit given. Against a target of 125,963 farmers that are utilizing or applying new agricultural technologies, the overall achievement for this indicator was 86% at 108,649. Against a target of 43,518 ha of land under improved technologies or management practices, CSISA MI achieved 51,154 ha, which was 2.5 times larger than that of last year's annual achievement, bringing the project total to 101 thousand Ha. The project technically assisted 1,019 informal firms (LSPs) and 30 formal firms, (mainly agro-machinery dealers), against a target of 865 firms for Year 5. At the end of this period a total of 2,867 LSPs, classified as informal firms, were developed. In the reporting year, private sector investment achieved USD 3.7 million. The largest investment was in harvesting and post harvesting technology at USD 3.4 million. Combined private sector investment of USD 8 million, within and outside the project, gives a strong indication that the promoted technology is being scaled across the FtF area and broadly across the country.

To support machinery commercialization more effectively in Year 5, CSISA MI refocused on areas where activities would have the greatest impact. CIMMYT and iDE M&E teams gathered sales and intervention data and conducted a mapping exercise to reduce number of *upazilas* from 105 to 69 in 19 districts. This re-targeting of effort resulted in significant project wide improvements over the last year. Improved impact was achieved through a surgical approach and a synergy of partnerships to increase sustainable productivity.

TML (Pvt.) Ltd (TML), Janata Engineering, and RK Metal remain key private sector partners in year 5 as the project re-engineers existing machinery, improves quality and imports new machines for piloting. Janata Engineering closely collaborates with CSISA MI and continues to expand its business and range of agricultural products especially after several trips to China. RK-Metal, with close technical support from CSISA MI engineers, developed the Jute reaper, modified the 4WT ZT drill and 2WT strip-till seeder and numerous other small works, in support of mechanisation generally in Faridpur. TML has assisted CSISA MI to import reaper binders and medium sized multi-crop combine harvesters for piloting in the FtF Zone. Other projects with TML include; the ride on sulky for reapers, SOP for AFP manufacturing, collaboration with Hello Tractor for fleet management and spatial econometrics, and

the development of QR Cash; a digital financial solution for agricultural input purchases and credit using mobile technology. Other PS collaborators have supplied the project with; modified and improved seed meter components, calibration keys and seed grading tools. However, beyond engineering, our private sector partners had a lead role in developing the market system of the selected technologies and CSISA MI continues to build bridging capital in market development with the private sector. Consequently, the private sector, for the most part, has been driving the marketing activities by themselves in 2018. As part of this initiative, the project has signed local level agreements with 12 local level dealers to facilitate their capacity to engage sub-dealers and commission agents to expand their market, better distribution of products, and provide faster after sales service to LSPs.

iDE continues to drive innovation in A2F by collaborating with STEPS to digitised financial transactions to determine LSP and farmer credit worthiness. A credit history will help facilitate formal lending by commercial banks to these newly "bankable" LSPs, and provide them the opportunity to avail the agent banking services. Other initiatives include asset mapping i.e. the searchable "database of market actors", and the LSP network. The concept of LSP networking exists in a few upazilas and will expand to other areas over the next six months. On a similar note, the CSISA MI management information systems database is a daily management tool database that has several geo-specific reporting facilities like Q-GIS, Google earth and Bing Map, which provides historical map generation to resolve and display implementation strategies. The desktop-based app, linked to the online database, generates near to real time reports, with which one can see the achievement against the yearly FtF target, facilitating prioritization of activities and time to complete.

CSISA MI's gender focus has been ramped up in year five, resulting in 75 women LSPs up from 25 last year. International women's day took on special significance in the regional offices of CSISA MI during which champion women discussed challenges and successes. A study on the impact of mechanizing harvesting services on women's daily time distribution in harvesting season emphasised that time for leisure, childcare and sleep increased, whereas cooking time decreased significantly from 12% to 5%. The project has engaged with Winrock's Women Empowerment Project and CFNA's AIRN project from where it can reach around 1,200 women entrepreneurs of whom at least 30% are already engaged in agriculture related businesses.

CSISA MI continues to be at the forefront of Bangladeshi agricultural engineering innovation, improving machine management, operation, longevity, utility and demand. The innovations include log books, machine tracking and management systems, 4WT ZT drill furrow closing devices, seed metering systems for large and small grains and calibration tools, 2WT strip tillage rotor and blade design, jute reaper, axial flow pump manufacturing, setup and operations and self-propelled reaper ride-on sulky. In collaboration with TML, the project has introduced a Medium Multi-Crop Combine Harvester (MMCCH), which is a full feed version quite dissimilar to the half-feed rice/wheat mini combine harvesters entering the market through ACI and Alim Industries. The MMCCH can harvest wheat, rice, maize, rapeseed and soya bean etc., at greater than 3 ha per day. Rice harvesting at BADC this year was only successfully undertaken by this machine, where all other machine types were unable to cope with the wet and muddy conditions.

Cultivation practice trials to enhance maize yield, such as planting pattern, row spacing, and plant population were conducted across three hubs. Crop management (fertilizer, irrigation, weeding) was the same for all treatments and sites. In these replicated trials alternate narrow wide planting with high plant populations, yield was much improved by ~12%. The results have spurred the team on to determine the impact of other simple agronomic better-bet management practices to better adapt maize to the wet southern Bangladesh conditions.

All training manuals have been under review for wider publication and the new "train the trainer manuals" for conservation agriculture, farmer field day, MMCCH and reaper binder are nearing completion.

CSISA MI continues to work with and engage with AIP, AEP, WEP, and RDC projects funded by USAID, as well as World Vision, Blue Gold, Practical Action, SAARC, Appropriate Scale Mechanization Innovation Hub (ASMIH), Post-Harvest Loss Reduction Innovation Lab (PHLIL)-Bangladesh and others. Other collaborative efforts include working with the wheat blast team, BARI on cost sharing engineering support, Alim Industries on training the trainer, USAID Gender working group for inclusive mechanisation development and Blue Gold on machine training and mung bean cultivation in Patuakhali, south central Bangladesh.

Under the guidance of the CSISA MI management team, coordination and cooperation between all project partners in the field offices were stepped up enormously by largely refocussing on SWOT analysis outcomes. Newly introduced, rotating bi-monthly learning workshops at the field office level has increased interaction among field level staff, GoB agencies, PNGOs, specialists and private partners which have been extremely effective in adapting, by providing feedback, discussion challenges, taking opportunities, strategizing and developing staff capacity. Filling vacancies resulting from the "funding-uncertainty", remain a challenge, as the shortened tenure is not attractive to good candidates. At this crucial juncture, we have employed two communications interns in support of the final year workload and a training officer to finalise training manuals for conservation agriculture, medium multi-crop harvesters, and reaper binder, trained the trainer for farmer field days and others. To further combat the shortfall, sub grants to BARI for ag-engineering support and to PNGOS for field training support are in place.

Successes: Key to CSISA MI's success has been the evolution of farmers into entrepreneurial LSPs, some of which are now machinery and spare parts dealers. Over one quarter of all new LSPs now learn from others and so far, the project has developed 2,867 LSPs of which 2.6% are women, with the exception of the garment industry, this is a common women participation rate in Bangladesh. The development of dealers (123), engineering workshops, and local repair workshops and mechanics (762) and pivotally, spare parts shops (79) have ensured after sales service, and last mile sustainability. What is very apparent is that technology adoption tipping points was achieved in 33 of 48 upazila (analogous to USA state county), which among other successes, demonstrated that the private sector is motivated to invest on agri-machinery and comprehends market potential. The Government also recognizes CSISA MIs mechanization initiatives and are popularizing agriculture mechanization in concert with the project. From an agronomic sustainable intensification stand point and in the interest of creating mechanization demand, we have unlocked potential production on fallow land by introducing annual triple cropping such as rice maize-wheat/mung bean-jute, as well as other vegetable commodities in rotation.

Challenges: CSISA MI, as with other programs in Bangladesh, has found it difficult to involve women in machine-related activities, as this is a non-traditional profession for women, however we have risen to the challenge and tripled participation in this last year. Related to this, is limited access to finance for many value chain actors (especially women), due to their inability to comply to credit worthiness criteria, as agriculture and related service sectors are not viewed as viable businesses by the formal banking sector. Agricultural mechanization in Bangladesh is decades behind developed nations, which in part can be contributed to inadequate machine quality (domestic and imported), untrained operators, limited manufacturing capacity, cultural norms, and climate and agronomic complexities. These complexities, such as inclement weather, negatively impacts Bangladesh's low-lying terrain and restricts adoption of cropping practices and related mechanization.

Lessons Learned: Agricultural machinery and its employment needs to be adapted to women users and should include business development skills to develop entrepreneurism in a very conservative society. Entrepreneurism is not restricted to marginalized groups as a way forward, mechanic recruitment and training is critical, as well as the creation of spare-parts shops to connect the value chain and create a functional after-sales service environment to ensure sustainability. Acute scarcity of agriculture labor and rising input costs were important drivers for the implementation of CSISA MI and they remain important motivators for farmers to mechanize through affordable agricultural service provision. However, mechanization for mechanization sake should be tempered with appropriate and tested machinery. Most harvesting machinery is not designed for waterlogged (muddy conditions) found in Bangladesh. Imported reapers and seeders need considerable modification and Combine Harvester type (size) and capability selection, is critical. To that and other ends, CSISA MI must remain nimble, adaptable and be able to pivot with the private sector and the changing mechanization landscape.

1 INTRODUCTION

1.1 Background

The Cereal Systems Initiative for South Asia – Mechanization and Irrigation (CSISA MI) is a five-year (July 2013 – September 2018) project funded by USAID under its Feed the Future (FtF) initiative. The project is operational in the Feed the Future (FtF) zone of Southern Bangladesh. CSISA MI has been transforming agriculture in rural Bangladesh by unlocking its potential productivity through increased adoption of agriculture mechanization technologies and services. By augmenting the local service provider network for machinery services it considerably strengthens agriculture systems to be more productive and profitable, increasing employment and entrepreneurship in the value chain. The International Maize and Wheat Improvement Centre (CIMMYT) leads this project in partnership with the International Development Enterprise (iDE).

CSISA MI Core Program Activities

- Promote innovative technologies
- Develop and strengthen local service provider network
- Leverage private sector investments to commercialize and scale agricultural technologies
- National Research entities and private sector engagement

CSISA MI focuses on commercial pathways and technical issues to achieve sustainable and scalable results. The dynamic project drives change by working with private sector actors and in collaboration with the Government of Bangladesh (GOB), primarily the Bangladesh Agricultural Research Institute (BARI) and the Department of Agricultural Extension (DAE).

CSISA MI adopts a collaborative learning and adaptive management approach in order to stay nimble and effective as the market for agricultural machinery evolves. In Year 5, CSISA MI has capitalised on reflection and adaption and continues to over-achieve in sales (*Table 1*) and adoption against targets for each of the technologies.

In Year 5, CSISA MI management refocused on areas where cropping intensity and sales potential were considerable for all three technologies. During DIP and SWOT meetings in year 4, iDE and CIMMYT determine the final operational areas for the fifth year of the project. Streamlining the geographical coverage to focus on 49 upazilas (rather than the previous 105) in 16 districts (Annex 1) that had immediate and significant potential for mechanization development across the 3 field offices of Jashore, Faridpur and Barishal. The increase in sales of agricultural equipment and the willingness of the Joint Venture Agreement (JVA) partners (and others) to enhance imports and manufactured equipment locally, is a major indication of achievement of this project. This indicates that all market actors with direct and indirect project connections see the potential of these agriculture machines and technologies introduced by CSISA MI. Sales of agricultural machinery are increasing broadly through "crowding-in" and opportunities for LSPs to provide services to farmers are expanding. This signifies that the technologies introduced by CSISA MI are effective, generally profitable and gaining popularity, largely through a boost in crop production, especially during the winter season, when many farmers' fields are usually kept fallow.

Table 1: Sales of Agricultural Technology by Project Year

Technology	Year 1	Year 2	Year 3	Year 4	Year 5
AFP	134	168	434	152	118
PTOS	72	101	233	410	597
Reaper	28	27	75	218	360
Total	234	296	742	780	1075

1.2 Project Objectives and Operational Area

CSISA MI increases sustainable productivity by unlocking agricultural potential in Southern Bangladesh (**Error! Reference source not found.**) through increased adoption of improved irrigation and agriculture mechanization technologies and practices, delivered by an augmented local service provider network for machinery services. This is realized through three broad objectives:

Strategic Objective 1: To sustainably intensify and diversify agricultural production in Southern Bangladesh through surface water irrigation to increase household income.

CSISA MI promotes Axial Flow Pumps (AFPs), as well as other efficient surface water irrigation and conveyance machinery, and works to integrate them into local markets by building public private partnerships that address key components of the supply chain.

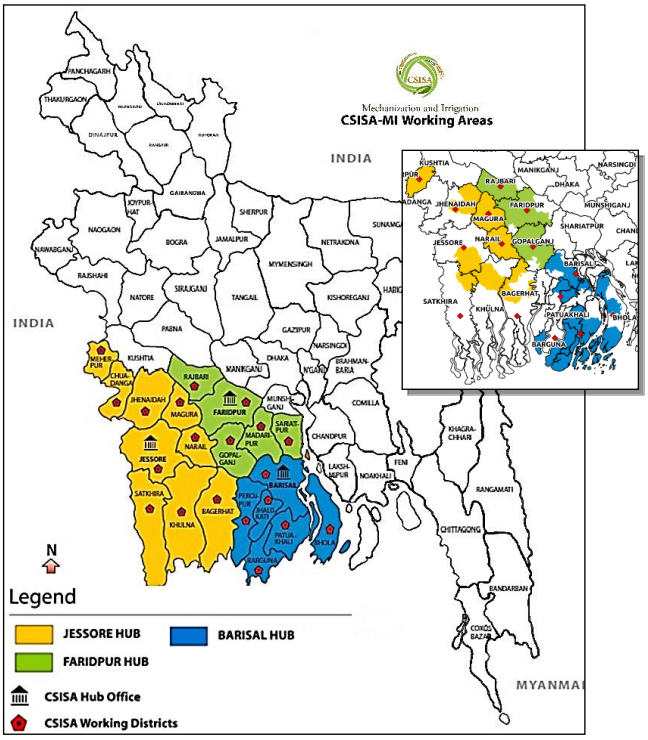


Figure 1: CSISA MI Geographical Coverage (inset: YR 5 coverage area)

Strategic Objective 2: To sustainably transform agriculture in Southern Bangladesh through broad-based access to agricultural mechanization services.

Following the same comprehensive supply chain approach as in Strategic Objective 1, CSISA MI strategically collaborates with the private sector to introduce efficient technologies that enable farmers to cultivate successful dry season crops. CSISA MI further supports the supply chain for agricultural mechanization products by facilitating the development of targeted financial services.

Strategic Objective 3: To develop new models for public and private institutions to support irrigation and agricultural mechanization in Southern Bangladesh.

To assure the durability of strategic objectives 1 and 2, and to increase employment and entrepreneurship, CSISA MI works with public and private sector partners to promote their familiarity with machinery engineering, manufacturing, sales, distribution, and their use in the field. CSISA MI works closely with the key government stakeholders such as the Bangladesh Agricultural Research Institute (BARI), the Bangladesh Agricultural Development Corporation (BADC) and the Department of Agricultural Extension (DAE). The project was largely designed to build bridging capital in a way that Private Sector Partners (PSP) will play a key role to carry forward the learning by the project and it's been evident that PSPs i.e. TML (Pvt) Ltd. have been playing a significant role, by operating CSISA MI style field office in selected sectors of the FtF Zone. Other PSPs like ACI, RFL, Janata Engineering, RK Metal, Alim Industries etc. work closely with the project to promote similar technologies and implement skill development.

1.3 Project Management Approach

1.3.1 Project Management

The CSISA MI project falls under the umbrella of the larger multi-national CSISA program. Through increased use of adaptive management, CSISA MI has also been able to implement project activities effectively and efficiently. This is based on USAID's adaptive management approach[1], which is reflected as continuous and iterative and measured under the monitoring and results management (MRM) system. Using this approach, CSISA MI has stepped up coordination and communication between technical and field teams among CIMMYT and iDE. As a result, the scope of sharing observations and feedback from the field team to technical team is regular and simultaneously enables CSISA MI to promptly generate consensus and speed the decision-making process. The internal feedback together with the MEL system (section 4.2.6), Salesforce and Dashboards reports, feeds updated and tangible information to the CSISA MI team, providing informed decisions on required and prioritised adaptive measures.

[1]USAID KDMD Project. 2013. "Learning about Learning: Lessons on Implementing a KM and Learning Project from the USAID KDMD Project: Adaptive Management," p. 2. USAID Learning Lab.

CSISA MI operates three remote field offices under the leadership of a Field Office Coordinator (FOC) as the local CIMMYT representative. Early career scientists designated as Agricultural Development Officer (ADO) work directly with the farmers and LSPs by advising on agronomy and implementation of conservation agriculture. Agricultural Engineers designated as Machinery Development Officers (MDO) in each field office support both LSPs and Mechanics in machine operations and maintenance. The implementing partner organization iDE operates from the same field office structure through Field Coordinators who guide/manage market development activities locally. Farmers, LSP, Mechanics, input suppliers and machinery dealers are supported by Officers-Business Facilitation (OBF) and Business Development Manager (BDM) in each field office, in agriculture machinery business development, micro financing and awareness raising.

Partner NGOs (4 NGOs in 3 field offices) work under CIMMYT FOC to assist in implementation of all project activities at the field level. Technical Facilitators (TF) with Diplomas in Agriculture, facilitate various trainings, farmers' field day etc. The PNGOs assigned a CSISA MI Coordinator to guide the relevant TFs and coordinate day-to-day activities in the field and project planning phases. Due to the uncertainty on fund disbursement in Year 5, CSISA MI terminated the contract with the 4 PNGOs mi-year. As the PNGO staff remained involved in the field during the peak seasons prior to mid-year, the field activities were successfully completed on time.

1.3.2 Basis of CSISA MI's Project Approach

CSISA MI's theory of change is partly built on Roger Everett's diffusion of innovation theory, which is based on the premise that innovation is communicated to market actors through the process of diffusion over time and that the adoption of a given technology is influenced by the innovation itself, communication channels, time and the social system.

Figure 2 shows a segmented bell curve and accompanying cumulative adoption distribution where the different categories of adopters are illustrated. Following an initial effort to build markets, as more people adopt the innovation, the total number of adopters increases at an exponential rate, producing an "s-curve" of adoption. There is a "tipping point" between the 15 and 20 % adoption rate, after which, diffusion of innovations is expected to spread independently or with less effort.

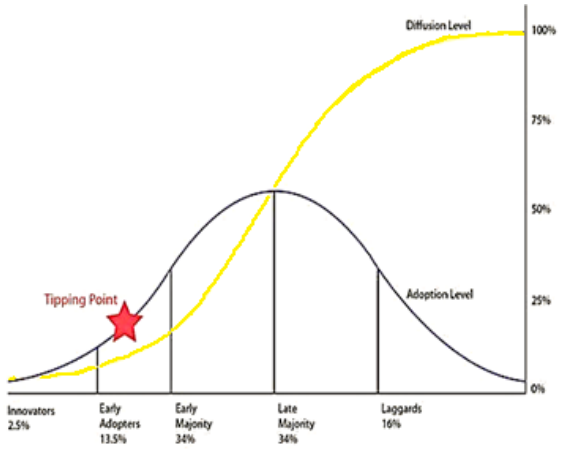


Figure 2: The distribution of innovation adoption patterns

CSISA MI project interventions strive to reach this tipping point and "crowding-in" during year 5 appears to indicate that it has been achieved. CSISA MI recognizes that the tipping point requires qualitative changes to ensure the quantitative achievements, and that the tipping point may change with evolving market circumstances. Indications of qualitative changes include copying project activities by non-associated companies and service providers, "crowding-in" of these actors, and spontaneous adaptation and expansion of the business models that underlie the project's theory of change. These indications appear evident and demonstrate the project is successfully contributing to an environment that is scale-friendly. CSISA MI has reviewed MRM evidence and has a number of post year 5 surveys planned, though initial indications suggest that the tipping point has been surpassed in selected districts.

2 RESULTS AND ACHIEVEMENTS

2.1 Overview

CSISA MI continues to achieve set targets for the fifth year (Oct'17-Sept'18). During the reporting period, special initiatives were undertaken well ahead to forecast the achievement against the target. Achieving the sales target at the beginning of the season and following-up the low performing LSPs during the season, helped to surpass 5th year targets. Analysing the overall achievement, it would appear that service from PTOS is heading toward sustainable scaling, while the use of AFP for dewatering the large fish ponds (ghers) to cultivate rice during winter, are also increasing day by day. The use of the reaper is moderate, but expanding, due to limited scope of operation under lesser cropping intensity this year, and in some cases due to cost and adaptability.

Contributing factors to overall success in the reporting term include; the improved availability of agriculture machinery and spare parts, facilitating financial services from MFIs and the increasing presence of highly trained LSPs. Additionally, geo-specific targeting has enabled us to focus on areas of greater potential for implementing the project, with a view to eclipse the theoretical tipping point well before the project end date. The "big wins" or tangible effort that builds the successes of CSISA MI are; our pre-existing experience with Bangladesh cropping systems, unlocking fallow land (double and triple cropping), developing machinery dealers from local machinery agricultural service providers and developing bridging capital through involvement and expansion of the private agricultural machinery sectors in the value chain (Figure 3).

Figure 3. The big wins underpinning the success of CSISA MI

CSISA MI's online database is now fully operational, which consistently supports the project through effective and efficient automated reporting (from near to real time data input). It also reveals scale and effectiveness to the management team through links to power map technology and GIS display, ensuring high quality graphic data and detailed tabulated reports. The data base quality is fully supported by the project MEL team inputs from continuous field monitoring and stringent validation protocols. The database is explained in detail in section 4.3.

2.2 CSISA MI framework and USAID's FtF Indicators

The flow diagram (**Error! Reference source not found.**) shows the logical sequence of the three strategic objectives described under section 1.2 and the associated intermediate results (IRs) based on USAID's FtF indicators. To achieve the IRs of increased on-farm productivity, CSISA MI has identified five major sub-IRs as stated above and shown in Figure 4. To achieve the results, based on the five Sub-IRs, CSISA MI reports on five FtF Indicators from USAID's indicator handbook, which are:

EG.3.2-1 Number of individuals who have received USG supported short-term agricultural sector productivity or food security training (Sub-IR1.1)

EG.3.2-3 Number of micro, small, and medium enterprises (MSMEs), including farmers, receiving agricultural-related credit as a result of USG assistance (Sub-IR 2.4) (newly included)

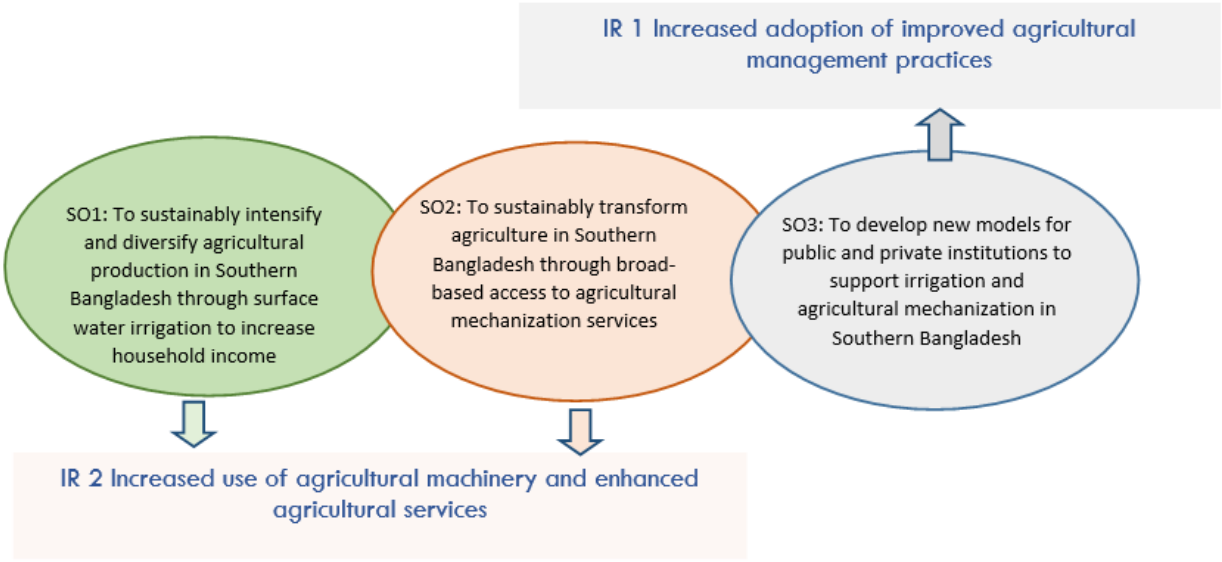


Figure 4: CSISA MI's strategic objectives and associated FtF's Intermediate Results

EG.3.2-17 Number of farmers and others who have applied new technologies or management practices as a result of USG assistance (Sub-IR1.1)

EG.3.2-18 Number of hectares under improved technologies or management practices as a result of USG assistance (Sub-IR1.2)

EG.5.2-1: Number of firms receiving USG-funded technical assistance for improving business performance **(O)**

In addition to these five indicators, CSISA MI also reports against one 'Custom' indicator: Value of private sector investment in agricultural machinery and equipment resulting from project intervention (IR 3), which deal with MSME and related interventions. The value of private sector investment is calculated from the sum of the total investment incurred by LSPs, machinery dealers, manufacturers and importers within a given reporting period.

The strategic objectives and the associated indicators shown in the diagram (Figure 5).

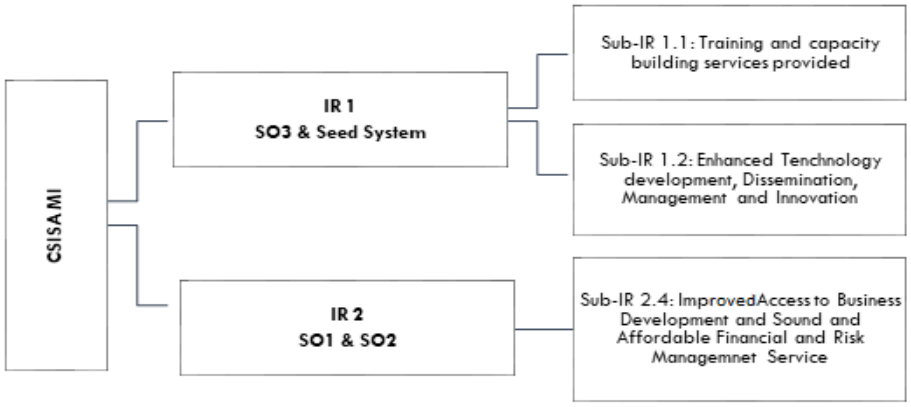


Figure 5: CSISA MI Intermediate Results (IR) and Sub-IRs

Project progress is mapped according to project target indicators based on the Feed the Future (FtF) indicators. Overall results are also based on the CSISA MI project-monitoring plan that was approved by USAID in December 2015 and further revised on April 2017. The two main outputs of CSISA MI's results framework include; (i) inclusive and sustainable agriculture-led economic growth and (ii) Increased employment and entrepreneurship.

Table 2: Summary of CSISA MI's results by FtF Indicator

	Core Indicator	Description	Year-1	Year-2	Year-3	Year 4	Year 5	Year 5 Target	%
SO 3 Sub-IR 1.1	New indicator number EG.3.2-1 Number of individuals who have received USG supported short-term agricultural sector productivity or food security training	Producer	4,765	693	10,053	9,070	8,847	8,715	102
		Government Staff	16	128	275	91			
		Private sector	889	1,285	1,689	968	550	1,125	49
		Civil society[2]	139	87	351	149	20	200	10
		Total	**5,809**	**2,193**	**12,368**	**10,278**	**9,417**	**10,040**	**94**
SO 1 SO 2 Sub-IR 2.4	EG.3.2-3 Number of micro, small, and medium enterprises (MSMEs), including farmers, receiving agricultural-related credit as a result of USG assistance	Number				91	85	80	106
SO 1 & SO 2 Sub-IR 1.1	EG.3.2-17 Number of farmers and others who have applied new technologies or management practices as a result of USG assistance	Irrigation (Water Conveyance)	9,073	12,939	39,975	9,201	12,231	40,331	30
		Others (Land Preparation and Planting & Harvesting and Post Harvesting)				33,836	96,418	85,632	113
		Total	**9,073**	**12,939**	**39,975**	**43,037**	**108,649**	**125,963**	**86**
SO 1 & SO 2 Sub-IR 1.2	EG.3.2-18 Number of hectares under improved technologies or management practices as a result of USG assistance	Irrigation	3,584	5,726	19,287	7,192.65	13,573	14,428	94
		Others				14,005.5	37,581	29,090	129
		Total	**3,584**	**5,726**	**19,287**	**21,198**	**51,154**	**43,518**	**118**
SO 1 & SO 2 Sub-IR 2.4	EG.5.2-1: Number of firms receiving USG-funded technical assistance to improve business performance (O)	Formal (Dealer)	45	43	32	31	30	65	46
		Informal (LSPs)	229	256	707	673	1,019	800	127
		Medium Enterprises (Importer/Manufacturer)	2	3	5				
		Total	**276**	**302**	**744**	**704**	**1,049**	**865**	**121**
SO 1 & SO 2 IR 3	Custom: Value of private sector investment in agricultural machinery and equipment resulting from project interventions (USD[3])	Water Conveyance	327,975	80,861	83,375	29,126	10,921	472,500	2
		Land Preparation and Planting	252,902	95,830	124,530	225,863	248,659	332,740	75
		Harvesting and Post Harvesting	229,191	42,815	373,565	502,275	3,430,732	332,740	1031
		Total	**835,934**	**264,988**	**701,482**	**757,968**	**3,690,312**	**1,137,980**	**324**

The fourth year results highlighted CSISA MI's private sector engagement, which was boosted due to the increase in demand for innovative agricultural machinery services, which is also indicative of the current scaling success in year 5 and the potential to scale-out further in the FtF zone, as evidenced by the increased rate of scaling during in year 5. In general, with the exception of irrigation related indicators, the high achievement at the half-year mark (Table2), suggest the project was progressing very well and on target. The detail FtF indicator results are given in section 2.1 and in Annex 6.

[2] NGO representative, Local Elite, CBOs, CSOs, Research organizations' representative and School teacher are considered as civil Society

[3] 1 USD= BDT 82

2.3 Progress by Indicator

2.3.1 Indicator EG.3.2-1

Number of individuals who have received USG supported short-term, agricultural sector productivity or food security training (Sub-IR1.1)

94%

Targeted persons trained

CSISA MI provides business management training, operation-maintenance and troubleshooting training to LSPs and mechanics' skill development training to increase the skill of local technicians. This ensures adequate repairing and troubleshooting services within LSP service areas. While farmers, GoB staff and civil society also receive appropriate training according to their needs, training remains key to knowledge transfer for CSISA MI across the working area. Field Days have significant role in communities and groups to promote conservation agriculture and demonstrate the new technologies. Project has provided training to 9,417 individuals (94% of target) in reporting year and more than 40 thousand individuals against 34,543 target for its entire tenure. The training achievement against target is well above expectations. The activities under this indicator outlined previously, contribute to increased awareness, enhanced business and technical skills as required by the various market actors in the agricultural machinery value chain. Increasing numbers of farmers who live adjacent to the project demonstrations have pro-actively joined mechanized sowing, irrigation, and harvesting training events this year. Among the training recipients of 9,417 individuals (single individual counts) 26% were women. Technology promotion and demonstration training organized at rural level found that farmers enthusiastically participated, and usually when disaggregated, males were 90% and female 10%, but this year we observed the participation by females had increased significantly.

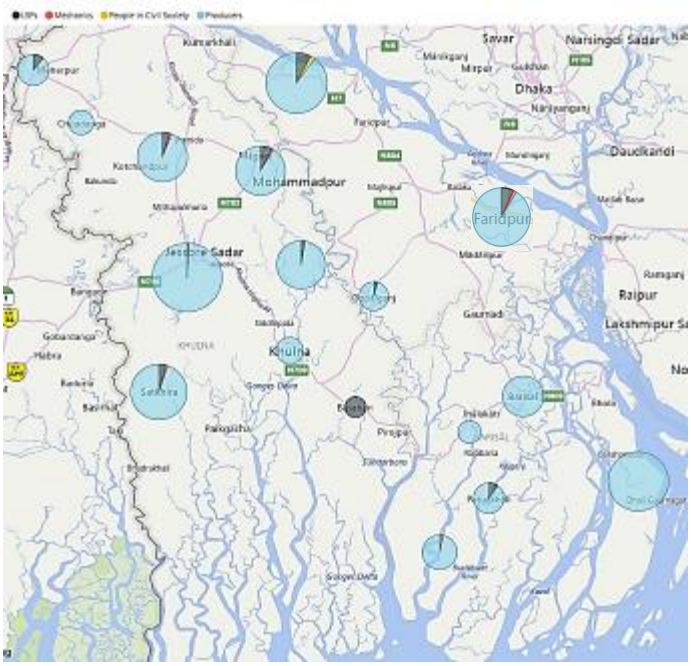


Figure 6: CSISA MI training activities

Due to the enhanced interest in the use of mechanised land preparation, irrigation and harvesting by farmers' broadly, CSISA MI, in response, has increased training for private sector partners, so that they can meet demand. In fact, the private sector (Alim Industries in particular) have requested CSISA MI to conduct training sessions for potential trainers. In addition, all training modules are currently under revision in preparation for publishing for an international audience. The project has intensively extended training to 550 private sector actors i.e. LSPs, mechanics etc. against target of 1,125. In addition, training of 20 participants from civil society against the target 200 and 8,847 farmers against 8,715 targeted, giving an overall target achievement of 94% for Year 5.

Training is stimulating uptake and utilisation of new agricultural technologies. In the reporting period, the project trained around nine thousand farmers (26% women) across an extensive geographical area. The year 5 training targets focused on delivering Conservation Agriculture (CA) to LSPs and farmers so that the LSPs can advance these cultural practices to farmers and they in turn were able to understand the benefits of CA. These efforts increased and aggregated demand for machinery services and positioned LSPs to capture additional business, which appears well balanced across the operational area (equivalent numbers from each field office).

2.3.2 Indicator EG.3.2-3

Number of micro, small, and medium enterprises (MSMEs), including farmers, receiving agricultural-related credit as a result of USG assistance (Sub-IR 2.4)

106%

Targeted MSME received credit

This indicator was newly included in year 4 to address those LSPs who received credit that was facilitated by project initiatives through the MFIs. Based on the experience and MFI service modality, 80 LSPs expected to take loans to purchase agriculture machinery this year. Availability of credit at the time of machine purchase was crucial to LSPs seeking financial support. The Project established linkages between LSPs and MFIs to ensure availability of appropriate financial services. In the reporting year, a total 85 LSPs received USD[4] 50,545 for 85 machines against a yearly target of 80, which was 106.25% of the annual target, of these; eight women LSPs received USD 4,146 during the reporting period. PTOS service providers received the major part of the credit (54%); reaper LSPs received 43% of the total reported credit amount from MFIs, while only 3% of the amount was received by AFP LSPs. As there were no subsidies for PTOS, the LSPs often seek credit support for machinery purchases. The GoB offer subsidized reaping machines, but not for all subsidy applications, so those who did not get a subsidy or were not eligible for that facility, sought credit support. However, as the AFP is a low cost machine compared to other two technologies, LSPs are less inclined to use credit. Ten national and local MFIs provide financial services to the LSPs, among them ASA was the single highest credit distributor, provided USD 15,268 credit to 29 LSPs. Among the rest, Society Development Committee (SDC), BRAC, TMSS and Wave Foundation were also notable providers. Among the partner NGOs, 56 LSPs received credit from; SDC USD 11,866, BRAC USD 7,512, JCF USD 3,598, TMSS USD 2,744 and Grameen Bank USD 2,195. In this reporting year, three LSPs received loan form formal financial institutes; among those, Karmashangsthan Bank provided USD 1,829, Sonali Bank USD 1,341and Islami Bank provided USD 350 for Ag-machinery, this indicates that the ag-machinery business is being considering by the formal financial sector for credit support.

CSISA MI's Access to Finance (A2F) activities facilitate access to credit and the processes by orientating MFI staff to the project and by enhancing their capacity to support value chain actors. Through "Krishi Machine Porichiti (KMP)" and "Sombhabbo Kreta Somabesh (SKS)" activities, the project identifies and enrols potential LSPs who are seeking financial services with the MFIs and links them to the Partner NGO MFI who initiate the formal line of credit process. LSPs were provided with Business Development Training and financial planning to support their use of credit. Linkage meetings in the presence of Dealers, MFIs and LSPs smooth this process.

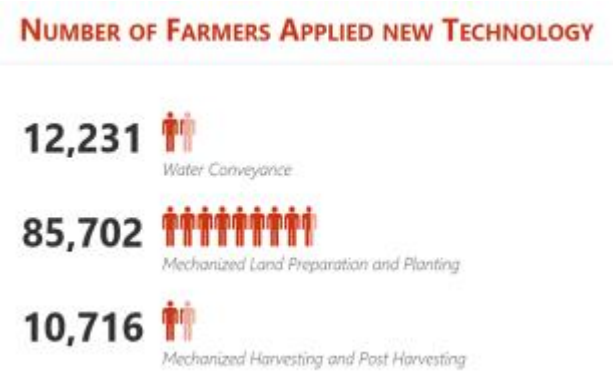


Figure 7: Number of farmers applies new technology

2.3.3 Indicator EG.3.2-17

Number of farmers and others who have applied new technologies or management practices as a result of USG assistance (Sub-IR1.1)

86%

Targeted farmers applied new technology

Despite heavy rain at the beginning of the winter season and prolonged rainfall in monsoon, farmer outreach and results was satisfactory. The overall achievement of this indicator was 108,649 (86%) against the total annual target of 125,963 farmers (Figure 7). Due to a refocussed gender initiative, more than 2,300 female farmers used technology from the project. Among the farmers, 20% were aged 15 to 29 and the remaining 80% were more

[4] 1 USD= BDT 82

than 30 years old. Since the beginning of the project, more than 213,000 farmers applied CSISA MI mechanised initiatives in their field. The high price of onions motivated farmers to grow more onions this year, using a PTOS effectively and efficiently; as a result, farmer coverage under this technology increased by almost three times on last year. During the field visits, farmers expressed their satisfaction using a PTOS service, as they were saving nearly half of their tillage costs spent in previous years. However, use of the complete PTOS service with seeding option under all cropping is not always the case, because LSPs have less interest to seed with their machine as it takes more time to complete the task, nevertheless line sowing (strip tillage) is expanding and machine calibrations is now simpler thanks to CSISA MI ag-engineer ingenuity.

The area serviced by irrigation increased, but reaching the target was challenging. This, as in past years, was due to the large gher (water body for aquaculture) owners finding an economic benefit in the AFP when dewatering their ghers. Fuel efficiencies and time benefits resulted in more land under this technology, but fewer farmers are involved. In Faridpur and Jashore field offices, more than 46,000 and around 39,000 farmers respectively, reported the application of PTOS services in their fields; while 9,000 farmers applied AFP services in Barishal.

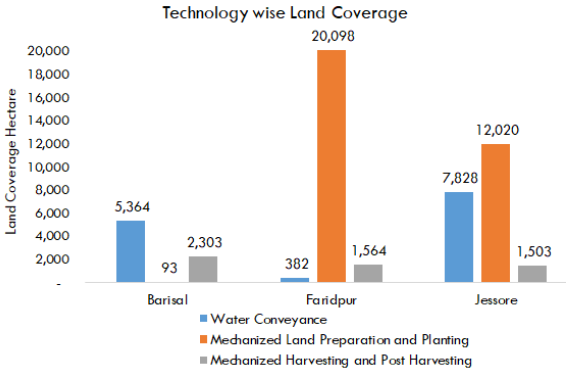


Figure 8: Technology wise land coverage

In the previous year, the overall achievement against this indicator was 50%, however in this final year the achievement was 86.25%. This was the result of several phone census and surveys to develop solutions to scaling limitations. CSISA MI management analysed previous year on year trends and the existing machine numbers with their average output, to forecast this year's result and found that individual LSP performance was severely lacking in the number of farmers and ha engaged. Several crucial decisions were taken to increase sales prior to the season, including identification of the active and inactive LSP and categorize them for monitoring and performance enhancement. The refocusing on bottlenecks to LSP performance effectively expanded services across the working area. After five year of implementation project has so far more than 213,000 farmers.

2.3.4 Indicator 3.2-18

Number of hectares under improved technologies or management practices as a result of USG assistance (Sub-IR 1.2)

New technology applied on

118%

Targeted land

CSISA MI researched and developed suitable agricultural machinery, which were introduced and marketed in the southern part of Bangladesh. These include the fuel-efficient axial flow pump (AFP) for conveyancing surface water, PTOS suitable for mechanized land preparation, sowing and basal fertilizing, and a multi-crop Reaper (and newly introduced mini and medium multi-crop combine harvesters) for mechanized harvesting.

Against annual target area of 43,518 ha, more than 51,000 ha were brought under improved technologies or management practices. This result was 2.5 times larger than that of last year's annual achievement. Despite heavy rainfall in the beginning of the season, the project exceeded the target in the reporting year. Land coverage under irrigation was 13,573 ha, mechanical land preparation 32,210 ha and mechanical harvesting 5,370 ha. Since inception, around 101,000 ha was covered by project initiated mechanized technologies. Among the three field offices, irrigation land coverage was largest in Jashore at more than 7,800 ha and mechanized land preparation in Faridpur was more than 20,000 ha (Figure 8). The end of year survey shows, 20% of the total land was occupied by the 15-

29 years age group, while the remaining 80% of the land was occupied by farmers in the 30+ age group.

The AFPs were mainly used for dewatering of more than 6,000 ha and irrigation for around 5,000 ha land to grow rice. Onion was the major crop reported under applied mechanized land preparation in more than 20,000 ha, which was nearly three times larger than the same time last year. Beside this, mechanized land preparation was applied to wheat, garlic, lentil, maize and some winter vegetable crops. The project also demonstrated PTOS seeding for wheat, maize, lentil, mung bean and mustard to promote the use of line sowing and strip tillage services among the farmers.

The CSISA MI team re-visited its implementation plan, methodology and interventions, via SWOT analysis prior to and scaling shortfalls during this year, to rectify and adapt to farmer and value chain actors, through; re-engineering, business development training, tight focus on potential markets, mechanisation pilots and alternate agronomic solutions. Both CIMMYT and iDE conducted various events i.e. video presentations, farmers' field days, demonstrations, trainings, publications etc., to motivate and encourage more farmers to utilise agricultural services from CSISA MI-trained LSP for land preparation, irrigation and harvesting. Concurrently, CSISA MI facilitated an increased supply of machines through LSPs, and spare parts through dealers and outlets, so that farmers could more easily avail themselves of reliable agricultural services. Land coverage of female farmer remains lower than the targeted, as land ownership is mainly held by male partners, however by the end of the year this number increased significantly as LSPs are providing machinery services broadly in southern part of the country (Figure 9).

Table 3: field office wise LSP and Machine Number Year

2.3.5 Indicator EG.5.2-1

Number of firms receiving USG-funded technical assistance for improving business performance (Sub-IR 2.4)

121%

Targeted firms received technical assistance for improving business

The project has supported 1,049 firms in year 5 by technically assisting 1,024 informal firms (LSPs) and 30 formal companies, the latter are mainly agro-machinery dealers. Since inception, the project has developed and provided training to 2,867 LSPs and facilitated the purchase of agricultural machinery, who then serviced their clients (farmers). To support and ensure the availability of machinery, the project engaged agro-machinery dealers and importers &/or manufacturers classified as formal firms in the agricultural value chain. CSISA MI conducted in excess of 83 local level market events, e.g. Krishi Machine Porichiti (KMP) to increase awareness about the introduced machinery, which was followed up with Shombhabbo Kreta Somabesh (SKS) to persuade potential buyers (LSPs).

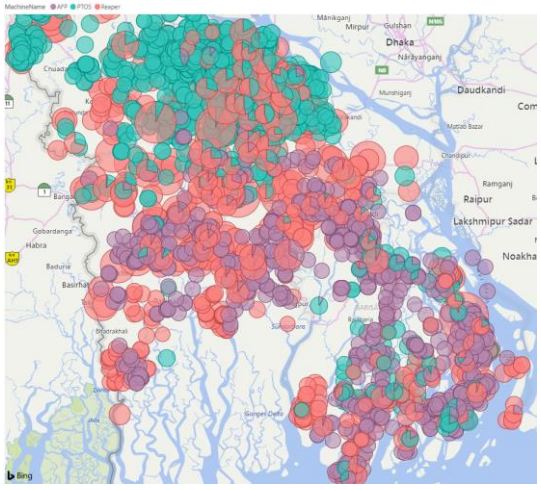


Figure 9: Machine location across the FtF zone

In addition to these events, CSISA MI conducted a range of other activities (visits, meetings, demonstrations, and training, FFD etc.) in order to popularize agricultural machinery and create demand. It attracted potential buyers and created awareness of USG funded CSISA MI promoted agriculture machinery among various market actors, the intervention strategy resulted in exceeding the annual target by 5% and considerable number of machinery sales, which also exceeded those sales for this time last year, especially for the PTOS.

The 83 KMP and SKS events attracted more than 1300 participants, among which 8% were female. To encourage more women to engage, and in the interest of gender inclusivity, four LSP selection meetings for women were held, at which 65 women participated.

The size and distribution pattern of sales across all field offices was dependent on crop type, seasonal activity and geographical location. The AFP for example is generally restricted to Barishal in the southern sector, where water conveyancing is the main activity. Whereas, the PTOS is popular in the northern sector, across the Faridpur and Jashore field offices. During this reporting period, the project developed 1,019 LSPs across the three technologies who purchased 1,075 machines. Jashore field office developed 449 LSPs, 337 at Faridpur and Barishal field office 238 LSPs. Among the three technologies, PTOS sales were the highest selling technology at 600, followed by 360 Reapers and 118 AFPs.

Table 3: field office wise LSP and Machine Number Year

Hub	LSP Number	Machine Number			
		AFP	PTOS	Reaper	Total
Barisal	808	575	102	202	879
Faridpur	968	57	786	179	1022
Jessore	1,091	374	525	327	1226
Total	**2,867**	**1,006**	**1,413**	**708**	**3,127**

Since inception, the project has developed 2,867 LSPs with 3,127 machines across the three field offices (detailed in table field office Wise LSP & Machine Number Year1-Year5). Although, in earlier years the AFP was the top selling product, but it has declined due to poor quality and availability issues. The PTOS is rapidly exceeding expectations however; our private sector partners and other companies are investing more into mini, medium and large combine harvesters.

2.3.6 Custom Indicator

Value of private sector investment in agricultural machinery and equipment resulting from project interventions

Private sector investment is key to assessing the impact and potential post-project sustainability of CSISA MI, which stands at USD 3.7 million. Despite variability in market demand for agricultural machinery, private sector investment continues because of CSISA MI's transformative efforts. Overall, progress towards this indicator shows that that the project has been able to motivate and engage private sector partners through financial investment, resulting in the expanded use of CSISA-MI supported scale-appropriate machinery. For the reporting period, private sector investment achieved around 3.7 million USD.

Private Sector invested

324%

of year 5 target for agricultural machinery

The largest investment was in harvesting and post-harvesting technology at around USD 3.4 million. The majority of which came from ACI Motors, who invested USD 1.8 million in FtF zone and more than USD 3.4 million across the rest of the country (Figure 10) shown in Private Sector' Investment FtF Zone vs Non FtF Impact Zone). Similarly, Alim Industries invested USD 580 thousand in FtF zone while more than USD 565 thousand outside the FtF area (Figure 10). TML limited is one of our closest partners, and most of their investments applied to the FtF Zone at near USD 951,000. The USD 3.4 million of private sector investment gives a strong indication that the promoted technology is being scaled across the FtF zone and is spreading further across the country.

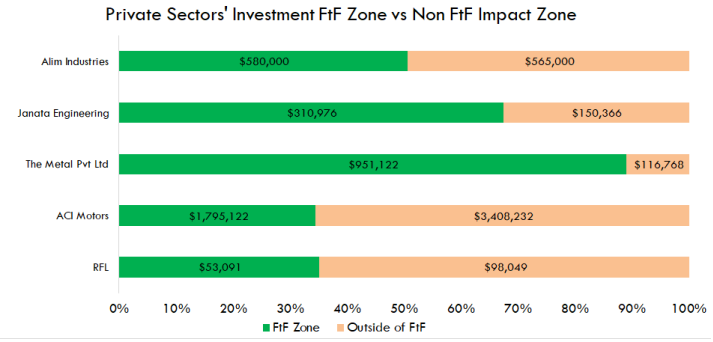


Figure10: Private sectors' investment FtF zone vs non FtF impact zone

Unfortunately, investment in water conveyance technology (AFP) was only USD 11,000, which was one third of last year's investment. CSISA MI, local industry and other USAID implementing partners are addressing the local manufacturing quality issues. The project is supporting this new domestic industry and local workshops, like RK Metal, are manufacturing AFPs but at a limited scale. However, sourcing

quality raw materials is the greatest challenge for this fledgling AFP production. Although, the AFP service recipients and LSPs are very happy with the cost effectiveness and performance of the machine, quality and longevity is still a major concern for them.

CSISA MI has instituted training for pump setup procedures and maintenance, and resolved most spare-parts issues with a view to stimulate sales and services from the AFP, however uptake by farmers for cropping in the normally fallow land, is very limited. During year 5, CSISA MI LSPs invested over USD 618,000 to purchase 1,075 machines (Figure 11). For example, AFP sales predominate in the coastal area of Barishal, while PTOS and Reaper sales are associated with the grain cropping areas of Faridpur field office PTOS are very popular in Rajbari and Faridpur districts, where farmers regularly use it to plant rice, maize, wheat, jute, lentil, mustard, canola, onion etc. LSPs recognised the benefits in "line-sowing" especially in jute fields and high value cropping.

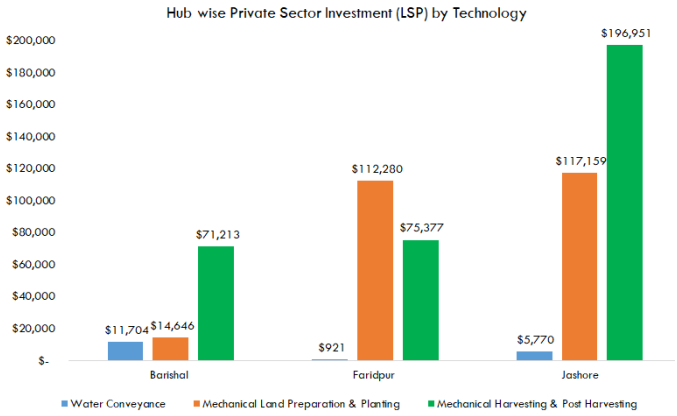


Figure 11: field office wise private sector investment (LSP) by technology

Private sector investment also indicates that the multi-crop technologies remain beneficial and the private sector continues to accept the financial risk associated with promoting scaling. The project facilitated financial services (A2F) with MFIs to ensure smooth and future investment. Thus, our scaling efforts are driving mechanised cropping, hence boosting private sector investment. CSISA MI works closely with importers, dealers on the supply and demand side to ensure quality products are entering the production system. Moreover, the project is also facilitating and ensuring after sales services for LSPs, as well as making spare parts available and repair services created in and around the "last mile".

Although CSISA MI's activities to increase employment and entrepreneurship have dramatically increased reaper sales since year two, further efforts (re-engineering, re-purposing, and operator accessories) during reporting period and continuing to the end of year 5, will ensure that reapers are more appealing, marketable and efficient. Increasing ownership reduced harvesting costs to farmers and removing small grain crops faster with less effort will now include jute. Apart from the issues surrounding the AFP, the other investments on PTOS and reaper, were well aligned with the targets and will continue to accelerate, as we develop the products further and strengthen the market. The private sectors appear interested in importing medium multi-crop harvesters in this reporting year, which has demand at farmers' level and for fleet service provision by LSPs. This machinery is affordable, saves time and can increase cropping options, especially when rain and storms are a major problem during harvesting.

CSISA MI, in collaboration with the Bangladesh's government, celebrated the International Women's Day on 8th March, 2018. Women farmers and the agricultural machinery service providers (LSP) in 20 districts in the Feed the Future (FtF) zone in southern Bangladesh gathered together with great enthusiasm without regard to their divisions, ethnic, religious, cultural or economic platforms.

The celebration began with a rally and shortly afterwards, the women participants were welcomed with flowers and later shared their success stories on becoming LSPs.

Photo: Salahuddin/CSISA MI

3 PROJECT MANAGEMENT

CSISA MI project management has continued to utilize an adaptive management approach by rotating staff, stepping-up communication among CIMMYT and iDE, reviewing and streamlining geographical coverage, drafting future project implementation plans and implementing internal learning workshops.

3.1 CIMMYT-iDE Coordination

CSISA MI project activities are jointly implemented by CIMMYT and partner iDE in all the working areas as defined in the Detailed Implementation Plan (DIP). All the operational areas were selected based on joint review, SWOT analysis and scaling plan across the field offices during Q4 of 2017. Under the guidance of CSISA MI management team, the coordination and cooperation between all project partners in the field offices has been stepped up enormously, which has created a positive boost in activity and stakeholder engagement. Newly introduced rotating bi-monthly learning workshops at the field office level have increased interaction among field level staff, GoB agencies, PNGOs, specialists and private partners. Bi-monthly meetings are held at alternate field offices, and have been extremely effective in adapting by providing feedback, discussion challenges, taking opportunities, strategizing and developing staff capacity.

Fortnightly coordination meetings between iDE, USAID AOR and CSISA MI continue to be effective in maintaining relationships, continuity, and addressing challenges. This has improved project delivery a considerable amount and such interaction has proved useful to address issues as they arise and strategize. This is especially important in recent times with the funding uncertainty. Due to fund uncertainty, significant adjustments were made in project management and implementation to meet deliverables, maintain staff and secure partnerships, since September '17.

3.2 Staffing

Dr D. B. Pandit took over the responsibility of Faridpur field office, whilst remaining as an advisor to CSISA III. More recently he was replaced by Md. Moksedul Alam Arafat, a senior ADO, after a period of mentoring by his predecessor. Three Machinery Development Officers have left CIMMYT for permanent positions with Government Institutions. The Barishal and Jashore MEL Officers have also left to pursue their careers with local and international NGOs respectively. The remaining MEL staff in Faridpur and Dhaka are overseeing work at the field offices. As CSISA MI enters its 6th and final year, we anticipated that an increasing number of staff would be looking for alternative employment. Filling vacancies remain a challenge as the remaining short tenure is not attractive for good candidates. At this crucial juncture, we have employed extra communications interns to support the final year workload. A senior training officer was on-boarded to finalise training manuals for conservation agriculture, medium multi-crop harvesters, and reaper binder, train the trainer for farmer field days and others. Additionally, the project is managed staff retention through the period of funding constraints by sharing staff across other projects.

Well-organized, yet simplified financial bookkeeping emerged as a daunting challenge, for most local machinery service providers (LSP) in south-west Bangladesh.

To alleviate LSPs' predicament, CSISA MI initiated logbooks, a record keeping manual that would support LSPs to track their daily financial activity and machine use. However, much to their dismay, the issued logbooks were initially A4 landscape size, too detailed and hence too cumbersome to maintain.

Limited follow-up on its benefit and use, paired with difficult maintenance, meant the issued logbooks met with disinterest and an unproductive start. Nevertheless, CSISA MI did not back down in the face of these hurdles. Resolute in its pursuit of improving livelihoods, it kept on improving the logbooks based on feedback they received, until it was portable enough and simple to use. Frequent supportive follow-ups and inclusive household training by project staff, ensured the LSPs began using their logbooks.
Photo by Hussen/CSISA MI

Dr Abdul Matin was seconded to CIMMYT from BARI for a number of years during which time he made valuable contributions to the CSISA MI project, including development of the strip tiller, maize seeder kit, AFP installation and testing, seed metering systems, 4 Wheel tractor Seeder testing and modifications and more. Unfortunately, his secondment could not be renewed between CIMMYT and BARI and he returned to his post at Gazipur. However, he does remain in close contact with CIMMYT and he and BARI are providing support and advice through a new sub grant.

Although some key staff have left to pursue careers elsewhere, CSISA MI remains active in recruiting with a dual view of current activities and possible new directions in future programming. This will add pressure on the existing staff, but necessary to offer job security to those that remain and upskilling for new and existing staff.

3.3 Geography and Coverage

To support machinery commercialization more effectively in Year 5, CSISA MI refocused to areas where activities would have the greatest impact. This re-targeting of effort resulted in significant change in the results achieved in the last 6 months. CSISA MI has continued to revise the geographical targeting to strengthen inclusive agriculture systems around the FtF zone. Improved impact was achieved through a surgical approach and a synergy of efforts to increase sustainable productivity. During the DIP preparatory work during year 4, CIMMYT and iDE M&E teams gathered sales and intervention data from the MRM system and utilising "CSISA MI M&E Database" by conducting a mapping exercise where the number of *upazilas* were logically reduced from 105 to 69 in 19 districts.

The mapping exercise was based on iDE market studies and field officer experience to select working areas that had the most potential and those that could be better coordinated through 2017-18. The exercise looked at existing working areas, considered the market size for specific machines, sales data from the previous 4 years, and existence of dealer points, availability of mechanical services, cropping intensity and type and qualitative information from the staff in each field office. Considering all of these, the project further streamlined activities to 16 districts and 49 upazilas for implementation activities in year 5, especially under the period of financial constraints.

3.4 Detailed Implementation Plan (DIP)

The "Detailed Implementation Plan (DIP)" planning for Year 5 (2018) was conducted through series of participatory workshops and planning meetings, whereas in previous years it was completed through a top down approach over a 3-day workshop. The management consider this approach limited creative thinking and was not inclusive of those that interacted with beneficiaries. The planning series commenced with a project wide SWOT workshop, conducted on 8th June 2017 to identify core activities that would achieve year 5 targets. The analysis of the project's key activities, brainstorming canvas exercises clearly identify challenges and mapped a vision, and with a consecutive series of stakeholder consultations and internal workshops with project staff, CSISA MI developed the strategy for Y5. The primary areas of focus of this year's DIP were:

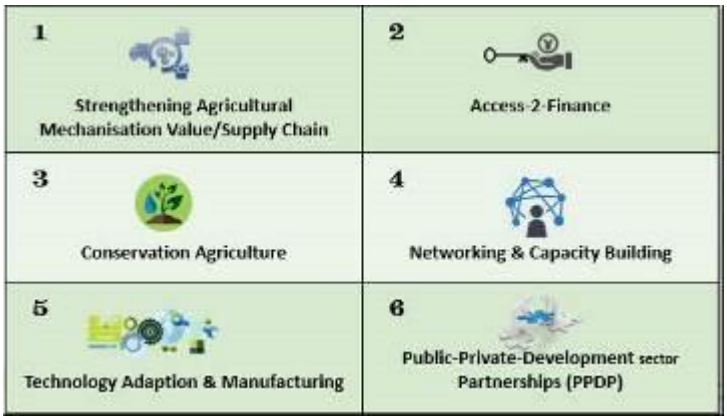


Figure 12: The Big 6 intervention pathways for implementation and focusing on demand creation

- Exit strategy and sustainability beyond the project;
- Fully transferring the responsibility for generating sales over to the private sector;
- Promoting availability of commercial service provision for the farmers; ensuring the availability of machines in project working areas;
- Improved manufacturing and distribution channels across the project areas;
- Capacity building strategy for LSPs and market actors

A final round of DIP Finalization meetings held on 24-26 September 2017 completed the activities schedule and budgets, which was declared as very successful. The inclusive participatory approach with staff from all levels, including the partners and GoB invoked ownership of the intervention activities and instilled enthusiasm for the initiatives for year 5.

This DIP included six intervention pathways, nominated as the big six (**Error! Reference source not found.**):

- Intervention Area 1: Strengthening Value/Supply Chain for Agriculture machinery
- Intervention Area 2: Access to Finance
- Intervention Area 3: Conservation Agriculture
- Intervention Area 4: Networking and Capacity Building
- Intervention Area 5: Technology Adaption and Manufacturing
- Intervention Area 6: Public-Private Development Partnership

4 PUBLIC-PRIVATE SECTOR ENGAGEMENT

The proper alignment of incentives can create a virtuous cycle that has a positive spiral effect between supply and demand. With this incentive in mind, and an eye on the constraints and opportunities within the market, CSISA MI continued to facilitate development within the private, public, and development sectors and support services that were connected to the agricultural machinery market. To understand how the market was evolving, CSISA MI utilized a monitoring and results measurement (MRM) system to analyse spatial and temporal scaling and impact. The market systems development approach used by CSISA MI considered incentive structures within a system:

- For the private sector companies and their dealers, profit and brand value should increase as a result of target machinery sales;
- For the local services providers (LSPs), profit and social capital should increase as a result of buying the target machinery and using it to provide services to farmers as a business;
- For the farmers, the purchase of mechanization services from LSPs should decrease the cost of farming, increase productivity, and/or provide other agronomic benefits;
- For the government, public value – such as food security and the economy - should grow as the market system for agricultural machinery develops.

The following subsections describe CSISA MI's private sector engagement, public sector engagement, supporting services work, and MRM system over the past year.

4.1 Public Sector Engagement

CSISA MI works broadly with government agencies to 1) endorse, promote and technically advice appropriate technologies in agricultural machinery to the farmers and 2) conduct research to evaluate and develop machinery suitable to the project area.
There are three main approaches to working with the government of Bangladesh (GoB):

At the field level, CSISA MI conducts training for Sub-Assistant Agricultural Officers (SAAOs) of the Department of Agricultural Extension (DAE). The SAAOs are the front line farm advisors on agricultural machinery. SAAOs also visit farmers' fields in the project areas and provide suggestions on crops, cultivation and project promoted technologies, including practices around conservation agriculture.

At the field office level, i.e. upazila and district level, CSISA MI engages key DAE officials (Deputy Directors, District Training Officers and Upazila Agriculture Officers) to participate in various activities, such as project stakeholder workshops, Farmer Field Days (FFD), farmers/LSPs training, demonstrations, as well as awareness and demand creation events and linkage meetings with MSMEs. This has helped the project gain a better understanding and endorsement from GoB officials. CSISA MI in turn has actively participated in agriculture fairs at Upazila and District levels organized by DAE and have received awards based on the performance demonstrated by CSISA MI technologies. CSISA MI is also

closely working with DAE's Farm Mechanization Project, which enhances the promotion of agricultural machinery in the project areas.

At the national level, CSISA MI advocates a project collaborative approach and clear objectives with key government departments and ministries, including but not restricted to; Bangladesh Agriculture Research Institute (BARI), Department of Agriculture Extension (DAE), Ministry of Agriculture (MoA), Bangladesh Agriculture Research Council (BARC), Bangladesh Agricultural Development Corporation (BADC), the Bangladesh Wheat and Maize Research Institute (BWMRI), Bangladesh Rice Research Institute (BRRI) and the South Asia Agricultural Research Council (SAARC).

Examples include discussions with Dr Barma Director of BWMRI on the benefits of conservation agriculture and controlled traffic farming in October 17. Other notable events included the BARC agricultural exhibition in December '17 where CSISA MI displayed its technology to Ministers and undersecretaries as well as significant regional meetings with SAARC to develop regional policy and dialogues on mechanisation and conservation agriculture.

Hon. Minister LGRD&C, Engr. Khandker Mosharraf Hossain and Hon. Minister for Agriculture Begum Matia Chowdhury visited CSISA MI stall in National Farm Machinery Fair, organized by the Farm Mechanization Project of DAE.
Photo: Uttam Barman/CIMMYT

CSISA MI has a long standing working relationship with BARI where pump benchmark testing has been carried out at their facility. BARI staff have also come to our assistance to conduct rigorous comparative tests on available 2-wheel-tractor seeders, in which the CSISA MI strip-till seeder was the best performer. BARI staff also took an active role in intensive training on Chinese built medium multi-crop combine harvesters and reaper binders.

A new subgrant was developed between CSISA MI and BARI that will provide mechanical and senior engineering service to the project. However due to the funding delay it has been placed on hold for an indefinite period. Despite this setback, support is often just an email away.

4.2 Private Sector Engagement

Product Flows: The team continually questions beneficiaries to understand sources of various agricultural machinery products and information and how this has changed over the course of CSISA MI for value chain actors. Understanding how the PSPs are investing time and money in business maintenance compared to only growth and how the PSP are building operational capacity of staff in the project has provided the project with clear direction on scale and impact.

Changes in Business Model: These understandings have provided the project insights to adaptation of business models across different aspects of the businesses including: services offered, processes, and marketing. Consequently, CSISA MI activities are reflected in changes to PSP business models.

Proposed collaboration with Hello Tractor and TML: Hello Tractor is an agricultural technology company that works across the tractor service value chain to ensure farmers, tractor contractors, and tractor dealers are successful. Under the proposed partnership, CSISA MI and TML will pilot Hello Tractor's remote monitoring systems in Bangladesh and access Hello Tractor's technical and business expertise to begin collecting data on machinery usage patterns. Hello Tractor will rely on the project's technical expertise in tractor/relevant mechanization tech in Bangladesh, as well as its network of demand and supply side market actors in the agricultural production and mechanization space.

To do so, Hello Tractor will support TML, a CSISA MI private sector partner, to install its GPS monitoring devices on 100 tractors (75 4WT and 25 2WT) sold by TML and being operated by LSPs. Under the agreement, Hello Tractor will provide anonymized, aggregated data on the LSPs. Hello Tractor will treat LSP information as confidential and safeguard such information from unauthorized use and disclosure. TML, iDE, and CIMMYT can access the LSPs' data via the customers' platform to access data gathered by these devices. iDE and TML will ensure and document that the LSPs have provided

"informed consent" to use and share their data prior to bringing the trackers online. The partners will then conduct remote monitoring of the 100 selected tractors for the next several 2018 agricultural cycles. Following completion of this remote monitoring period, the partners will assess the data collected and determine whether there is scope or feasibility to introduce additional functionality into the Bangladesh service provision environment, including but not limited to: maintenance support, job booking, or the market booster strategy employed by Hello Tractor in its existing markets.

Overall, this partnership will allow the local service providers of the project to track important details about their machines, such as hectare coverage and fuel consumption, and adapt their business strategies in order to make more profit. By tracking specific parameters, LSPs can better manage and plan for maintenance of the machines. For example, the system can send an early notification to change repair or fix any component of the machine. As TML provides financing to its clients, the GPS devices will bring down the risk of providing loans as the machines will now be trackable and could be repossessed later in case of default. This will serve as a catalyst for TML to facilitate more vendor finance, allowing more local service providers to avail loans and purchase their desired machines.

Proposed collaboration with SDC's QR Cash and TML, a digital financial solution:
CSISA MI's local partner NGOs (PNGO) namely, SDC and TML act as MFIs, provide financial support to farmers and entrepreneurs for agricultural inputs and mechanization development. A large cohort of farmers adopted mechanized agriculture services from Local Service Providers (LSP) developed by CIMMYT/iDE team. However, access to finance (A2F), cash flow and financial transaction processes, in remote and rural Bangladesh often constrain farmers in the timely purchase of agricultural inputs and agricultural services, while the LSP are likewise constrained in purchasing machinery, components, and payment for services at the point of sale (field). The "A Card" initiative from another USAID Project has been operating through 2017 with SDC as an implementing partner. However, based on limitations of the "A Card", SDC and TML wish to streamline and broaden digital financial services (DFS). Quick & Ready Cash (QR-Cash) through QR Codes and mobile phone technology, is under development to serve farmers and LSPs more extensively, simply and with considerably less transaction costs and greater ROI. This particular DFS will not be dependent on the formal banking sector (unlike the A card from Bank Asia in the AESA project) and expensive non-mobile hardware. It will effectively reduce the number of unbanked people, who are the potential customer base of TML waiting to enter the formal economy. QR-Cash will push the economy to new heights through household empowerment and it will reduce leakage in spending and create new jobs across the agricultural value chain.

TML is a key private sector partner of CSISA MI; by investing, supplying, manufacturing and importing appropriate agriculture machinery for the project. This year (2018), TML plans to import around 6,000 tractors and sold through their in-house credit facilities. As described previously, a joint venture with CSISA MI and iDE, the sales of large and small tractors will be supported by the "Hello Tractor" application and GPS hardware to manage agricultural equipment and its use, as well as provide an "Uber" style call system for Ag services. Thus, TML has initiated the concept of linking the QR-Cash solution to transform financial transactions and track equipment. The initiatives will ensure total and timely pay back of the tractor cost as well as improve sales of their other agricultural inputs. TML and SDC, through the software and database, will be able to track loan disbursement, cash flow, agricultural input sales, service provider activity and timely collection of the repayment of instalments for the tractors and equipment in any location. SDC will provide the technical and financial solution of the DFS through the QR-Cash system, while TML will implement and promote its use across all retail transactions in the company.

"I am working for Bangladesh's agricultural machinery development which is a big thing, in my small workshop, and that makes me happy" *said Milon, Proprietor, MIM Engineering Workshop in Sorojganj Bazar, Chuadanga. CSISA MI develops and trains mechanics like Milon; a number of whom have become entrepreneurs establishing their own workshops contributing to employment growth in Bangladesh.*

CSISA MI as a key partner of both TML and SDC, will bridge both organizations as technical facilitator, coordinator of local service providers, trainer, and in monitoring and evaluation. SDC will implement the QR-Cash pilot solution through selected clients in consultation with CSISA MI and TML and from its database. SDC will be the service provider to TML, which will provide financial and technical support to the system. In principle, TML and CSISA MI will bear some of the implementation cost. The detailed budget for the implementation of the QR-Cash solution as a 3 to 6 month pilot and initially it will be limited to the Greater Faridpur Region (GFR).

Proposed engagement with Bengal Meats

Bengal Meat is a for profit organization, the largest modernized company for meat marketing in Bangladesh. Their plant is at Bera Upazila near Pabna District. They collect cattle & small ruminants from local farmers directly from the market to ensure continuous supply chain for production. To ensure profitable farming by the farmers, Bengal Meat arranges skill development training on livestock raring and fodder production.

Reaper Delivery From Dealer Point in Faridpur Sadar. Photo: Rowshan Anis/CSISA MI

Rice straw is the main source of livestock food, which has its limitations to live weight gain and during straw shortages farmers pay high prices, which makes livestock production business (and at the household) less profitable and inefficient. Bengal Meat on the other hand produces silage fodder from young maize plants (at 50-60 days old) grown on their own 12 ha of land to optimize live weight gain and animal nutrition. CSISA MI is introducing opportunities for entrepreneurism in the FtF zone (SW Bangladesh), and it sees mechanised fodder production as another pathway to income generation and food security among poor farmers. Therefore, sharing knowledge will be helpful to improve fodder supply system for sustainable cattle production at Bengal Meats, and raise livelihoods in the FtF zone. A visit to Bengal Meat plant will identify a) possible contribution by FtF farmers to their cropping system, b) likelihood of introduction of conservative agriculture and mechanization in existing agricultural practices and c) identify suitable cropping practices and mechanisation for small livestock producers in the FtF based on Bengali Meats cropping practices.

4.2.1 Public Private Partnerships

CSISA MI facilitates public-private partnerships in order to improve the extension services for farmers. Such partnerships have become in-built in most of the project activities at the field level.

DAE's Farm Mechanization Project organized the National Farm Machinery Fair that took place over three days in February to promote the use of agricultural machinery in Bangladesh. CSISA MI attended a well-represented fair whose theme was about saving money, labour, and time with mechanization. At CSISA MI's stall, visitors learnt about the project's work through large banners and handouts. These explained how the project was expanding access to advanced agricultural machinery to farmers. More than 20 public and private organizations - including many of CSISA MI's partners - took part in the fair displaying their own technologies and that promoted by CSISA MI. The fair was another strong indication of the government's emphasis on agricultural mechanization and the "crowding-in" effect caused by the projects interventions in partner organisations. The organizers recognized CSISA MI's contribution to agriculture and participation at the fair by awarding them a crest.

Other partnerships of significance facilitated by the project are between BARI and Janata Engineering, RK Metal, TML, Alam Industries, Syngenta foundation, and Bangladesh Agricultural University. The work under these partnerships included; development of the jute reaper, seeder calibration keys, maize seeder metering plates, maize seed grader, reaper ride on sulky, AFP SOP development, press wheel for 4 and 2 wheel tractor seeders and comparative testing of 2 Wheel tractor seeders.

4.2.2 Local Manufacturing Capacity Building Assessment for AFP

The PSPs involved in the manufacturing of AFPs are facing various challenges related to quality control, mostly around maintaining uniformity in manufacturing of the pumps. To address these issues, the project and BARI worked with two private companies, TML and R.K. Metal developed a set of Standard Operating Procedures (SOP) for adoption and implementation at their manufacturing

facilities. TML workers were trained on following the SOP. Once it is translated into Bangla R.K. Metal workers will be trained. However, without a production line for AFPs, the execution of the SOP remains a challenge and demand to implement the protocol was low. Therefore, ad hoc on-the-floor production will continue for the time being. Until such practices are addressed, quality will remain low and thus demand will not increase and scaling of AFP will be limited.

4.2.3 Local-level Market Facilitation

CSISA MI is engaged in various market system facilitation activities at the local level the results of which were displayed in section 2. The major categories of facilitation include persuasion events, linkage meetings between dealers and sub dealers, method demonstrations for potential LSPs, and interested farmers wanting to follow conservation agriculture fundamentals, and exploring opportunities to introduce a fleet service model. Forty-four persuasion events took place across all the field offices, with a combined total attendance of close to 700 people. The aforementioned method demonstration brought together 30 interested LSPs and farmers. There were 11 linkage meetings in the three field offices, which were attended by more than one hundred people and who were introduced to the sub dealer model.

4.2.4 Market Strategies

As part of the exit strategy, CSISA MI's focus for Y5 in developing the market system of the selected technologies was to have private sector partners lead all the activities. The demand creation and awareness activities for buying agricultural machinery was previously led by the project team. After providing the sales catalyst, the project is stepping back from that role, even though CSISA MI continues to build capacity in market development with the private sector, so that they may take the lead in successful sustainable technology adoption, the private sector, for the most part, has been driving the marketing activities by themselves in 2017. For example, TML have built networks with other market actors; i.e. dealers, commission agents, spare parts retailers, MFIs and mechanics. They have also developed an outreach training centre and machinery hub, along the lines of CSISA MI for the development of LSPs and maintenance services.

Reaper Delivery from Dealer point in Faridpur Sadar. Photo: Rowshan Anis/CSISA MI

The project developed a tool to monitor Joint Venture Agreements (JVAs) with PSPs, which facilitates an opportunity to track changes in downstream market actors and on the wider market system. Indicators that are tracked to monitor these changes in the wider market system include:

- PSP investment in project nominated technologies and also other agricultural machines,
- Number of activities carried by private sector to promote agricultural machines, and
- PSPs' investment, promotional activities and sales in the areas beyond where project intervened.

4.2.5 Business expansion through engagement with different value chain actors

CSISIA MI developed and signed local level agreements with 12 agricultural machinery dealers who sell agricultural equipment and machines from different importers. Under the agreements, the dealers received an incentive to engage with commissioning agents to expand their market and mechanics for ensuring timely after-sales services. The project worked with the dealers to strengthen their capacity to market their products to the targeted customers. District and upazila-level dealers play a vital role in making the machinery available at the rural level by creating sub-dealers in various locations. The project has been working to facilitate linkages between dealers and sub-dealers to catalyze sales in the remote areas. As part of this initiative, the project has signed LLA (local level agreement) with 12 local level dealers to facilitate their capacity to engage sub-dealers and commission agents to expand their market, better distribution of products, and provide faster after sales service to LSPs.

Usually the Rabi season, (October-March) is the peak period for machinery sales as 90% of the total sales in a year occur during this time. This year, the sales of the project-affiliated machines have been considerably higher than other years, because:

- There are an ample number of early adopters in the field. Other LSPs (the early majority) and farmers now see the benefit of using machinery. They can also interact with the early adopters and take informed decisions on purchasing new machines. As per the Diffusion of Innovation Theory, more early adopters and early majority will purchase the technologies in the coming seasons.
- The private sector recognizes the potential of the agricultural machinery market and are offering incentives to drive it further. Competition among private companies has led to better product and services for their customers. As a result, Janata Engineering offered one knapsack sprayer free with each PTOS purchased. ACI provided free pre-season maintenance service to the reaper LSPs, and RFL provided free settings service for PTOS.
- Dealers have played a vital role in promoting these technologies. There are clear financial incentives from the private sector, and they have more "pull" than "push" sales, so they are motivated to promote CSISA MI technologies and have contributed to the higher sales. The combined sales of all three technologies have achieved 102% of the target.

However, as mentioned previously, the AFP sales have been below target due to substandard product and higher price point over its competitor i.e. centrifugal pump. There is a perception that AFPs are not durable and not reliable, as they require frequent maintenance and repair. This is generally a result of attempting run the pumps 24/7, as they do for LLP, for which the AFP was never designed to do. CSISA MI has and will continue to advise on correct operating procedure to increase pump longevity, but major breakthroughs in changed practice will take time achieve. The prolonged downtime of the machine due to breakdown and maintenance puts people off from buying them; however, this is alleviated by running them in pairs and alternating between the pair to allow for maintenance and adjustments. The operators use this tandem practice in relation to the Chinese diesel motors when dewatering ghers, so this practice needs to be transferred to the pump itself. Due to low sales in the past and the inconvenience of transporting it (devices are too long to be carried on rickshaws), private companies are less keen on fully embracing the technology into their core businesses.

4.2.6 Access to finance

iDE instituted JVAs with four MFIs - WAVE Foundation, TMSS, Society Development Committee (SDC), and Grameen Jano Unnayan Sangstha (GJUS) - to continue their partnership from the previous year. In Y3 and Y4, the JVAs with FSPs involved iDE providing 'zero interest' and 'half-interest' promotion respectively to the borrowers. The project had subsidized loan interest as a promotional offer to early adopters and to provide incentives to MFIs, who were not involved in offering loans for agricultural machinery. After buying down the risk for the last two years and testing the business viability, the JVAs this year no longer include a provision for interest rate subsidies. Subsidies for FSP staff salaries were also significantly reduced in this year's JVAs. The JVA orientation workshops for SDC, GJUS, and WAVE Foundation were held in December. The theme of the workshops was to orient participating FSPs staff on the objectives of the JVAs, the project and the mechanization technologies, as well as share the broader elements of this year's strategy with the wider team. This was especially helpful for new staff who are working with CSISA MI for the first time. Following the orientation, the staff took part in a group exercise to finalize the branch-wise targets for their respective organization for the fifth year of the project. The project is also tracking the loans given by other MFIs for the purpose of buying project-affiliated technologies. Similar to PSP JVAs, a monitoring tool was developed to track the partnership progress with FSPs and capture wider systemic changes in the financial sector.

In addition to the project's work with the MFIs, iDE drafted a collaboration agreement with STEPs, an association of NGOs working at the intersection of technology and finance. One of the principal activities under these JVAs will be to digitize the financial information of LSPs and facilitate access to formal financial services and products with selected MFIs for those who cannot meet the selection criteria of the commercial banks. The digitization will be done through a data collection process, which is then used to translate the financial records into credit ratings for lenders through a sophisticated algorithmic digital platform dubbed "i-SME". The credit history will help facilitate formal lending by commercial banks to these newly "bankable" LSPs, and provide them the opportunity to avail the

agent banking services through STEPs' partnership with Bank Asia. All these facilities will be available at their SME centres in Khulna's Fultola and Jashore's Keshobpur sub-districts. The objective of this pilot collaboration will be to learn about the effectiveness of the i-SME platform on LSPs and determine the creditworthiness assessment impact. In a concurrent pilot with QR Cash for digital cash transactions at the point of sale (field, farm gate or retail store), a credit history can also be determined as mentioned previously in section 4.2.

4.2.7 Others

Database of market actors: CSISA MI has been collecting and compiling information on market stakeholders since the beginning of the project. The purpose of developing this database has been to keep a record of the ever-growing list of market actors involved in the agricultural mechanization value chain in the CSISA MI working areas. The project team for analysis, information sharing, planning and decision-making, uses this data. The project's field teams continually update the database based on the interactions and involvement with various stakeholders and involvement in the local markets. The Innovation and Quality (iQ) team at iDE compiles the data and performs the quality checks. This Excel spreadsheet database is shared with CIMMYT's CSISA MI monitoring and evaluation lead and the management team. A weekly dashboard update is regularly shared with the wider team. In addition, the project has developed a stakeholder map (https://tinyurl.com/csisa-map) that includes the updated list of:

1. LSPs, dealers, mechanics, spare parts shops, and workshops down to the upazila level
2. Contact information (as available) for all the above
3. Search field by stakeholder name, location (district/upazila), and contact number

LSP Networking: Development of informal LSP networks (LSPN) is a new project initiative and is a key activity in the detailed implementation plan of the fifth year. LSP networks will be key in achieving sustainability and further scalability of the model. The LSPN is a non-political platform for agriculture mechanization service providers that will be formed with aims and objectives for the growth development and progress of Local Service Providers in the agriculture sector. The platform works to encourage, motivate, entrepreneurs (with an emphasis on women and youth) to engage in agriculture mechanization. The networks bring local service providers under an umbrella for better effective agriculture mechanization service provision approach to achieve their common goal for their business growth, development and progress of different categories of mechanization service provider under agriculture sector.

Women LSPs during a training.
Photo: Rowshan/CSISA MI

The platform provides information and assistance to the existing and potential LSPs to get the opportunities provided by private, public and financial sector in various areas and play vital role for searching new market for their services. The network will strive to give high priority and monitor issues concerning the governance to improve service delivery mechanisms and redress of grievances of the agriculture mechanization service sector in close coordination with the local government to encourage young entrepreneurs, self-employed individuals in agriculture sector. The LSPN will cooperate with other Micro & Small Medium Enterprises Associations in rural Bangladesh with an intention to further the objectives of the LSPN and to that end will be affiliated with various groups and bodies. The network exists in a few upazila and will expand to other areas over the next six months.

The benefits of such a network are many, as LSPs are often scattered and barely connected to their peers, which was brought out by a Social Network Analysis conducted by CIMMYT and KIT (Netherlands) earlier last year. This will serve as an opportunity to exchange knowledge and information with one another and gain insights on how others are managing their businesses and responding to challenges. For instance, members are notified of upcoming training offered by the Department of Agriculture Extension under the Ministry of Agriculture. The platform will also be a way to expand their services to more farmers. For any technical issues, the newer LSPs can get help from

the skilled ones. The LSPs can harmonize their demand through the network. The cropping calendar is not same across upazila and districts.

During peak times, network members can work together to provide efficient services and move to the next area to cover a greater number of clients. In terms of geographic coverage, the project will initially start by forming networks in places where there is a high density of LSPs. It will not be limited to the LSPs developed within the CSISA MI project. It is open to other existing LSPs who own power tillers and four-wheel tractors. From the perspective of smallholder farmers, they will have greater availability and access to machinery services. In some places, while tilling services are commonly available, there is not enough access to seeding services. The network will mitigate this by ensuring a better distribution of services. Farmers sometimes become victims of overpricing by LSPs. The network will provide more options to farmers, thereby ensuring they are able to have access more affordable services. Going forward, LSP networks can form horizontal linkages with other LSP networks to extend their services to neighbouring upazila networks.

The formation of the LSP network followed a four-step process:

- Dreaming and motivation: This involves gathering the LSPs and initially presenting the idea of a network. The pitch for the network explains to them how a collaborative platform would maximize mutual gains for everyone.
- Organizing and mobilization: Once the LSPs are on board with the idea, the project goes deeper by involving them with a SWOT analysis process and forming ad hoc committees and discussing the various operational issues at hand. It defines the specific roles of the committee members and begins the preparation of the guideline for the network along with chalking out an activity plan. In this stage, the project will help them generate business development ideas and facilitate capacity development initiative so that they will have some action-oriented activities.
- Growth and Governance: The aforementioned guideline will be the foundation of the governance of the network. The committee members will have their defined roles and responsibilities and adhere to the rules and norms. There will be informal membership drive events to attract more people to join the network.
- Institutionalization: The final step is to accelerate towards formalizing the network. This involves preparing all necessary legal documents to secure the licensing and registration of the network under the relevant regulatory body.

Dealer's Capacity Building: In part of sales, dealers play key roles for product availability, enhance sales and ensure quick after sales service at local level. New dealer creation, as well as link with private company, was another initiative taken from project side, which created excellent result for achieving project target using their existing network. In 5th year Jashore field office involved 20 new dealer, sub dealer in ag-machinery business. However, they do not have enough knowledge and skills on ag-machinery sector. Part of capacity building of the dealer, Jashore field office organized a learning visit in Jhenaidah district, where dealers had excellent results in year-5. The main objectives of this visit was to learn about marketing strategy, how to involve commission agents for more sales and ensure sales service etc. During this visit, the 8 dealer and sub dealer group visited Janata Engineering at Sorojgonj to learn about business linkages with the company, marketing strategy, new dealership processes and company products.

4.3 Lessons from Monitoring, Evaluation & Learning

4.3.1 CSISA MI MIS System

CSISA MI Database- Turning it into a daily management tool

Development phase

The project started with a MS Excel based database, but it was not smart enough to meet all management needs. In search of a smarter solution in 2016, the project recruited a database consultant to develop a Share-point database solution. This approach would improve database efficiency, ensure donor compliances and to support the management with a strategic tool for decision-making. Power-bi and QGIS are integral parts of this database, which provide a visual dimension to project outputs. The project management team utilises the geo-specific data to strategize and adapt.

Technical highlight

Database System: Databases have simple, interactive and user-friendly interfaces in order to manage and maintain the collected data from the field level. It has customized features to help monitor the progress made against the set targets and to generate reports in tabular and graphical forms. CSISA MI has two deployment environments: The Web Application (Cloud App Model) and the client-server (desktop) solutions. Users of web app can view, edit, and delete data directly from their web browser,

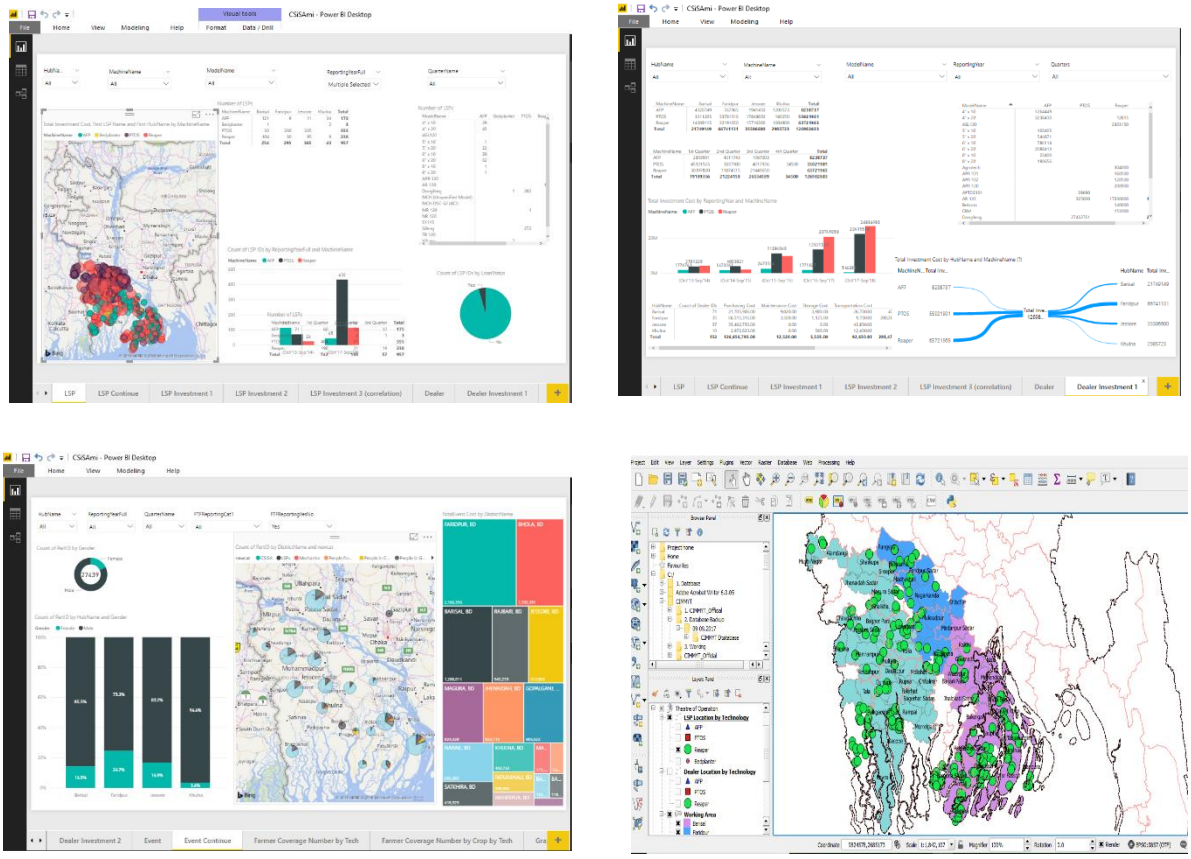


Figure 13: Snapshot of Database outputs

and can generate reports. On the other hand, the client-server solution designed for Monitoring Officers and the other users to facilitate data quality control and generating detail reports.

Web App: Web App was developed in Access 2013 with Access Services on Microsoft's Office 365 Premise and can be run on a server with SharePoint 2013, Access Services, and SQL Server 2012. Recently Microsoft has limited their online free-access service, so, the project is searching for alternate hosting for the database.

How database works

Data entry: Data entry clerks enter data online with appropriate user access from three remote field office. For internal users with their official user accounts but subject to licensing agreement and for external users with a Microsoft account (e.g. Hotmail, Live mail) through any internet browser. This platform is also usable on mobile phones or tabs.

Storage and security: Data stored in the SQL Azure database on Microsoft Cloud (1 GB limit for a single database). Therefore, Microsoft backup is used on a regular basis. Along with this facility, data-admin backs-up every day, or as many times as required from the desktop database, which is connected to cloud database. Access to data is restricted in several ways (geographical area wise and user wise i.e. only the owner of a record can modify that record). A complex security plan was implemented, such as, who created the record, who modify the record and when (date and time stamp), etc.

Database Outputs and Strategic support

During the DIP preparation, the database supported all through its outputs. The database has several geo-specific reporting facilities like Q-GIS, Google earth and Bing Map (**Error! Reference source not found.**3), which provides historical map generation and allowed management to resolve the implementation strategy. The desktop-based app linked to the online database, generates real time reports, in support of the implementing team and their progress. The database output is a refocusing tool, with which one can see the achievement against the yearly FtF target, facilitating prioritization of activities and time to complete.

Data Quality Control

Generating unique identifying numbers and prevention of double counting is challenging for database integrity. Hence, a complex method is followed to generate unique identifiers and prevent duplication. Firstly, α–numeric combination of name, address and cell phone number and secondly, name, father's name and cell phone number. Moreover, the database has a prediction facility, if any cell phone number is inserted; it predicts if the name has been entered into the system before. This potentially removes and reduces the chance of duplication and promotes spelling consistency. Beside this system, MEL team has a standard protocol to check data that is entered into the database. To limit errors, (beside the system generated safeguards), MEL team frequently field validates and checks hardcopies against softcopies for transcription errors. MEL team checks 5-10% of all entered data to ensure the credibility of the report. While conducting any survey, all the data enumerators are well oriented on survey tools and randomize sampling techniques used for data consistency. Then the collected data is checked, and verified and finally entered into the database.

Field verification of data
Photo: Farzana/CSISA MI

Future of the Database

After shifting the database onto a new server, MEL team will work to generate a document where the entire project achievements along with graphs and historical maps will archive. This will create an institutional memory of the project as well as it will support in future project designing.

5 LEARNING, INNOVATING AND ADAPTING

5.1 Study on Impact of Mechanizing Harvesting Service on Woman Daily Time Distribution in Harvesting Season

Rural women in Bangladesh are traditionally indirectly involved with agricultural production and harvesting related activities. During harvesting, their workload becomes immeasurable, as they need to supply and cook extra food for field labourers, sometimes supply accommodation and follow up on availability of requirements and other logistics. This results in less time allocation for childcare, other household duties and adversely affects their personal (sleep) and leisure time. To assess the changes in daily life of rural women pre and post the use of mechanical harvesting service in recent winter season, CSISA MI designed a study of 30 families. During manual harvesting, a woman could allocate 1.6 hours for childcare, but after adopting mechanical harvesting they were allocating 2.42 hours to look after the children. Cooking time for labourers was significantly reduced from 12% to 5%. Personal and leisure time increased significantly, indicating better social and family life (**Error! Reference source not found.**4). At the same time, they can spare additional time for their livestock & poultry husbandry and other income generating activities.

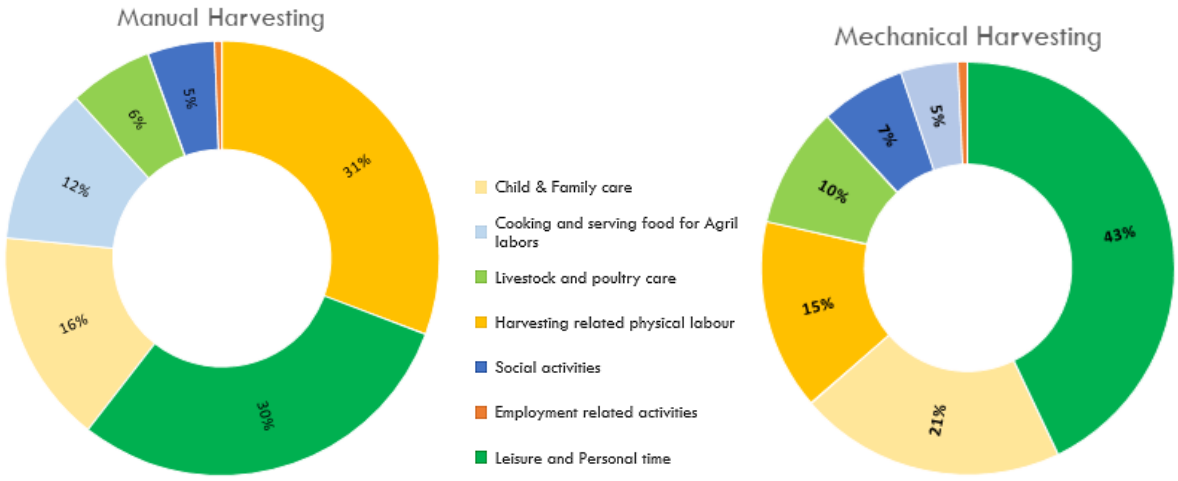


Figure 14: Rural woman Time Allocation in Average Harvesting Day- Manual vs Mechanical Harvesting

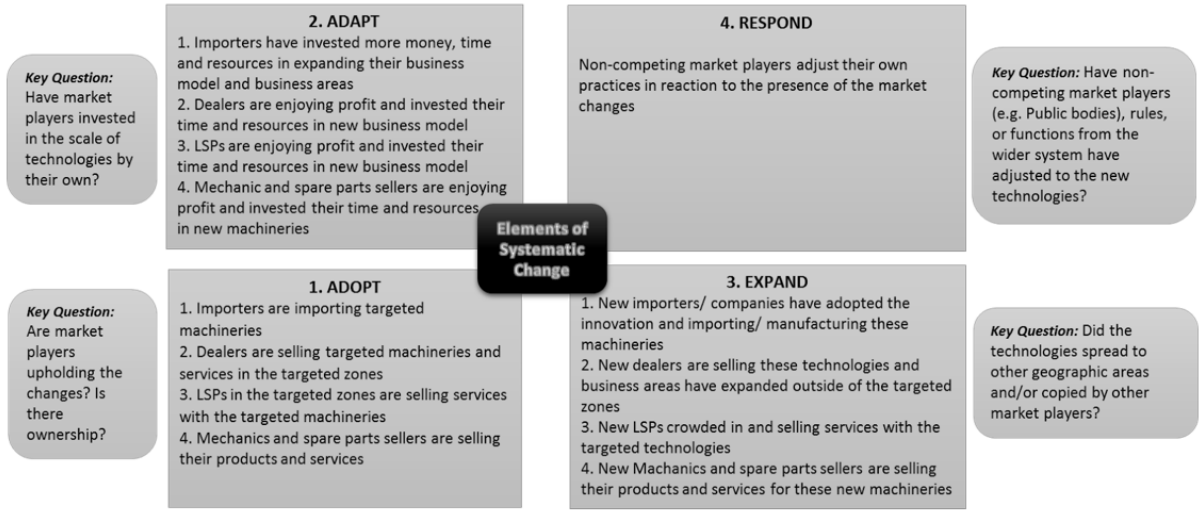
5.2 Systemic Changes

As a market development program, CSISA MI seeks to create "systemic change". This is change in systems, such as markets, government or civil society, which can have a greater impact than direct assistance, as it will benefit people who have had no contact with the program and may continue to multiply after the project is completed.

Systemic change occurs in the following ways:

Crowding in: Enterprises copying behaviors that those affected by program activities have adopted or entering a sector or value chain as a result of improved incentives and environment created (at least partly) by the program and there appears to be substantial evidence of this occurring. This term also applies to government agencies or civil society organizations, who are not directly involved in the program, copying behaviors of those who are directly involved in the program, or who change their behavior as a result of improved incentives or environment created (at least partly) by the program. This applies to the DAE and their machinery hubs or village models, which are used with the CSISA MI technology to pursue ag-mechanization.

Copying in: Like the farmers who derive benefits from direct project intervention, other farmers who are independent of intervention impact copy behavior of these project beneficiaries and avail similar products/services.



For CSISA MI, at Adopt level the project expects the private sectors to introduce new machinery. Here the term Private sector covers wide range of actors like Importers, Companies, Manufacturers, Mechanics, Spare Parts fabricators (workshops), Spare Parts Importers and Sellers and LSPs. With support from the project, the importers, manufacturers and companies are introducing the machinery while Dealers are selling these machinery to the LSPs who are buying these machinery and providing agriculture machinery services to the farmers. While selling the services to farmers, the Mechanics and spare parts sellers are selling the new parts and mechanic services to the LSPs. While all these are happening with direct project support at Adopt level, at Adapt level project is expecting the private sector to invest more in this business. The data collected over the last year would suggest that new machinery is being introduced and considerable funds have be leveraged from CSISA MI activities.

If these happen successfully then the other market-actors are expected to sense the changes and profits and they will come forward to copy the business model and the new business model will become a market norm. Then the systemic change will enter the Expand level. When other non-competing market actors find this new market norm they will also modify their business in response to these new changes. Government and its supporting bodies are also expected to change their practices to cater these changes in the market and farm practice.

The MRM system informs project leadership about project implementation activities and changes within the market system. It tries to fuse the "s-curve" of scaling with The Donor Committee for Enterprise Development (DCED) principles and real-time data to enable adaptive management. It has built-in feedback loops to enable project management to make better informed decisions about both short-term, tactical interventions and long-term, strategic interventions. The second wave of the panel study took place in October and November to understand changes in the wider market system. The study looked at business relationships that exist between each market actor with a special attention on supply chain constraints, product/service quality and availability, required additional services in the core value chain, and the business-enabling environment. There was also an added emphasis on capturing systemic changes and information on crowding and copying in of different market actors. A number of recommendations were provided, framed under technology and market linkages, after-sales services, and financial support and training. The final report on the panel study was finalized and submitted in December. These were some of the key recommendations:

Technology and Linkages

- Because the demand for machinery service does not start at the same time in an area (upazila), linkages among LSPs can be effective to harmonize the demand in adjacent areas. Through LSPNs Low-cost maize harvesters were piloted in the project areas, as there is demand for this technology in broader maize growing areas.

Financial support

- A systemized credit mechanism (formal vendor financing) is used LSP-Dealer-Manufacturer transaction which can be developed further under A2F activities, as only quarter of dealer transactions at both ends is done on credit.
- The FSP staff at all levels working with the project need to be orientated not only on financial products offered, but also project-promoted technology, agronomic goals, the business model, and support services to enable LSPs to run smoothly.

After-sales service, Training and other aspects

- Facilitate linkage between private sector field staff and dealers for spare parts of reaper.
- Operations and business plan training can be organized for the operators and owners of mini and medium multi-crop combine harvesters
- Organize refresher training for the local mechanics who received training in year 3
- Focus on increasing the usage of PTOS seed box especially for jute, wheat, and lentil seed sowing, i.e. conservation agriculture via strip tillage (line sowing)

5.3 CSISA MI Training Programs

CSISA MI has very successfully provided a high standard of scientifically based technical and business training service among the farmers, LSP, Mechanics, private and public sector members, to build their technical capacity to provide machinery' based quality service among the farmers' community in the project areas. CSISA MI took the initiative to review and finalize the one-day training (Bangla) module for service providers' and mechanics, in the various topics such as - Axial and Mixed Flow Pump for LSP, Axial and Mixed Flow Pumps Troubleshooting for Mechanics, Power Tiller Operated Seeder for Two-Wheel Tractor for LSP, Self-Propelled Multi-Crop Reaper for LSP, Self-Propelled Multi-Crop Reaper Troubleshooting for Mechanics.

CSISA MI took the initiative to prepare a Conservation Agriculture (CA) cartoon book in simple Bangla which will prove very useful for existing farmers, young farm families, local service provider, NGO & Company field staff as well as the SAAO, DAE. This cartoon book is designed for farming families to learn about CA techniques to cultivate Maize, Wheat and other crops like Millet, Beans, even Rice. In this book there are two characters i.e. one progressive farmer and a local service provider have a Q&A on conservation agriculture and the local technical service provider tries to convince the farmer to practice CA on a small piece of land in his agricultural crop field. The Bangla language and technical words and the pictures are easy to understand for the farmers and local service provider.

Ultimately, the farmers will be motivated or convinced to start CA practices in their small fields and will be encouraged by their community neighbours.

The medium multi crop combine harvester (MMCCH) was introduced this year following the recognition of farmers and regional needs. Supported by TML two machines were demonstrated in Chuadanga and Faridpur to provide better service among the farmers. However, farmers' identified the main issue was the price of the machine and lack of information on the credit system. Most farmers recognised the vital advantage of MMCCH over its competitors, such as reduced labour requirement, less crop loss and its floatation ability in wet fields. The LSPs expressed their need for MMCCH support and mentioned agricultural credit with easy terms and conditions, and a subsidy for buying MMCCH. Applying a fair market price and providing support to farmers to harvest their crops is high on their list of concerns.

CSISA MI was very successful in providing high quality, standardised, scientifically based, technical training on various agricultural mechanization and agronomic aspects such as; CA, PTOS, AFP, Self-propelled multi-crop Reaper, Medium Multi-Crop Combine Harvester to Producers, DAE staff, Local Service Providers, Mechanics. In 2018, CSISA MI & iDE staff invited specialist Chinese trainers to orientate and train the project team on the Chinese built MMCCH. The training included on farm

demonstrations of wheat and maize harvesting, whilst we trained operators. The villagers, farmers and staff were impressed with what they saw, and interest in future sales was piqued. The 5th year of CSISA MI (01 October 2017 – 30 September 2018) was significant in training achievement with 101.51% of producer level and 48.89 % of private sector targets were met as these are closely associated with agriculture. However, training of the civil society, only reached 10% of the target as they are not necessarily engaged in the targeted value chain. The project focused on technical training in machinery operations and the rudiments of business development for machinery entrepreneurs and many other actors in the value chain. Thus through the collaborative partnering with iDE, the project created an environment in which machinery service provision is coupled with maintenance, repairs and spare parts sectors, who also benefitted from enhanced technical and business development training. Training also extended to raise awareness and adoption to increase the use of agricultural machinery at the farmers level, through their active participation in Farmers' Field Day and specific awareness raising events i.e. SKS.

5.4 Innovation in Mechanisation and Agronomy

Logbook: CSISA MI has developed a pocket sized logbook, which was redesigned through an iterative interactive process with LSPs. Often with the help of family members, the LSP tracks daily machine activities, clients and financials. The redesign was a collaborative effort of the IP, donors, LSPs and on ground staff who worked tirelessly to turn an abject situation into a resounding success. Driven by the need for greater insight into spatial-econometrics of targeted technologies, project staff monitor, support and encourage LSPs to keep these records. However constraints still exist, such as; workload (timeliness) and educational level of LSP, despite this, due to "workarounds" we are expecting the LSPs will use the Logbook and find it a useful tool for themselves, and for the project as well. As the project is heading into its 6th year the "Hello Tractor" tracking and monitoring tool will be deployed on selected machines.

New machinery: Project has introduced MMCCH, which is a full feed harvester, quite dissimilar to the half feed rice/wheat mini combine harvesters which entered the market in 2017. The MMCCH can harvest multi crops i.e. wheat, rice, maize, rapeseed, soybean etc. Along with the newly imported reaper binder, these machines have been in great demand from both the farmers and the LSPs. To demonstrate the efficiency and use of machine the project, TML and Chinese manufacturing company K-BOS jointly organized the importation and training with the presence of LSPs, Government and project staffs. The participatory field based training activity explored a new dimension in mechanized harvesting system in Bangladesh. The MMCCH was the only machine capable of harvesting aman rice in the wet and muddy conditions at BADC earlier in 2018.

Derrick Brown, the new Mission Director of USAID Bangladesh, recently visited CSISA MI's sites in Chuadanga. He also enthusiastically talked to some of the female LSPs and Mr. Olee, the owner of Janata Engineering, a local manufacturing company. CSISA MI Project Leader, Allen David McHugh briefed him on CSISA's activities in Bangladesh.

Photo: M. Shahidul Haque Khan/CSISA MI

Machine Management and spatial econometrics: The project has introduced electronic tracking and monitoring applications and hardware such as, "Hello Tractor", as mentioned previously. The hardware was imported in September 2018 and will be fitted to machines in late 2018. Data analytics, will offer a way forward in understanding and monitoring machine operations and management in the FtF zone, as well as a means of tracking its location for credit payments recovery and credit worthiness creation for LSPs. Additionally and in relation to, the introduction of digital financial services (piloting by CSISA MI and SDC as QR-Cash) may provide an alternative method of monitoring service provision activities, both of which can be a means of establishment of credit worthiness for future loans and expansion of the service provision models.

Four Wheel Tractor Zero-till drills: Mung bean, introduced in the southern Bangladesh a few years back, has now become a popular cash crop in this area. Mung bean is now a major *rabi* crop grown in the southern districts with the highest acreage in Patuakhali. Mung bean is grown traditionally by tilling lands 3–4 times before hand broadcasting mung bean seeds. Along with a number of other crops CIMMYT has been promoting CA based mechanized seeding technologies such as zero-tillage, strip tillage and line sowing that minimizes soil disturbance, reduces time, input costs, and increases crop yields and profit margin.

During 2016 and 2017, CIMMYT field validated the performance of an Indian 4WT (four-wheel tractor) operated multi-crop zero-till drill for sowing mung bean in these southern districts. Unfortunately, due to heavy clay soil and high soil moisture at seeding the seed, furrows created by the seeder were not covered with soil (backfilled) leaving most of the seeds exposed and prone to bird damage and seedling desiccation within 2–4 weeks of their germination.

It was evident the planter should be fitted with specifically designed press wheels to fill and cover the seed furrows. Since such press wheels were not available from the manufacturer, CSISA MI team designed a set of press wheels for the 11-row planter. About 1.4 ha of mung bean was sown in three farmers' fields using the drill in January 2018 at Sadar and Dhumki upazilas in Patuakhali. Farmers liked the seeder, as it had a high field capacity and saved money, (Zero tillage). Early results indicated that the press wheels could cover the seed furrows by about 80%, leaving some room for further improvement. Better seed germination, compared to the previous two years, was observed. However, crop growth, when compared with that in plots with full tillage or strip-tillage, was slower in the 4WT seeder plots due to inadequate seed depth control and poor soil health. This would require a ground following furrow opener and press wheel designs (to ensure seed coverage even at a shallower sowing depth) and a comprehensive program of lands preparation practices (CA) to improve soil health.

Calibration Key: Making Seeder Calibration Easy!

With the growing demand for mechanized cultivation and seeding in Bangladesh, LSPs business opportunities are also growing. However, setting up a PTOS for mechanized cultivation (tillage) is easy, but its setting and calibration for seeding of multiple crops (often in one day) requires advanced skills. The LSPs need to go through a time consuming and resource demanding calibration process, which requires a 2WT, about 20 m long free space, seeds, a fine weighing balance and some mathematical skills, to come up with the seed meter setting that can deliver the required seed rate for each crop to be planted. The LSPs who have received training on the calibration still find it difficult and cumbersome, which reduces their interest in providing mechanized seeding services. Another criticism of the current practice is that it is often conducted on a road or farmers' courtyard (no vibrations due to rotary tilling) and thus the seed rate is quite different during actual field operations, and even so, the settings need to be checked periodically and changed for different crops, which could be a number of times per day.

Figure 15: The Stainless steel Calibration Keys for adjusting seed rate for fluted roller seed meters for wheat, lentil, mung bean and jute

The mechanization Innovations team at CIMMYT-Bangladesh developed a simple tool called the 'Calibration Key' which replaces the existing time consuming seed calibration process for all seeders The tool (Key) is easy to use (Figure 16), and allows fast and accurate adjustment of fluted seed metering rollers for common crop seed rates. The keys are marked individually with the crop type and seed rate. Using the Key, calibration can be completed in the field in a couple of minutes, so that the LPSs can quickly adjust the seed meter between crops and thus easily sow multiple crops in a single day. Initially, the Calibration Key set can be used for wheat, mung bean, lentil, sesame, and jute. Keys for mustard, amaranth, coriander, rice and others can be added to the bunch or other seed meter sizes. Figure 15 and 16 show the Keys in use. The keys are commercially produced by an industry partner using metal cutting dies for precision. A high quality stainless steel set of keys (for five major crops) costs about USD 2.

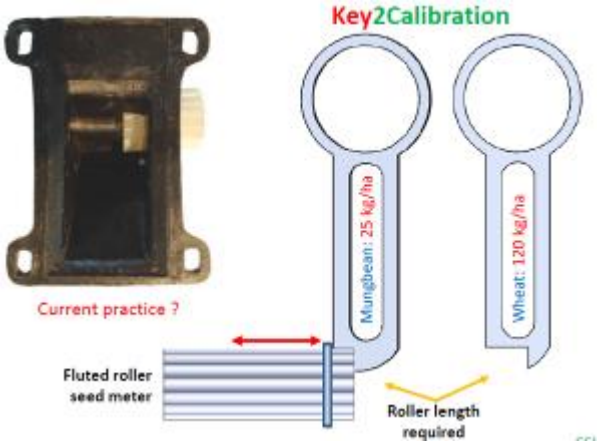


Figure 16: Use of the key to set seed rate of a fluted roller seed metering device, by inserting the key inside the seed box and measuring the length of the exposed roller

Modification of brush type PTOS

Fluted roller type seed metering devices are usually fitted with a brush (Figure 17a) to remove excess seed; however, these are often ineffective resulting in increased seed rate. The project PTOS used in small grain crops are retrofitted with a metal tongue replacing brush (Figure 17).

Figure 17: The existing nylon brush inside the seed box (a) is replaced a metal tongue (b) to correctly meter the seed as per calibration

Improved Maize kit seed metering

Readily available and cheap maize seed in southern Bangladesh, is not size graded, thus using uniform seed plates in inclined-plate seed meters causes misses, double ups and blockages in seed delivery. This has consequences for in-row spacing, seed loss and crop establishment. To improve seed metering and crop establishment CSISA MI had developed an inexpensive grading device to sort seed into large and small lots (Figure 18 a). The maize kit is now fitted with two CSISA MI plates for seeding maize in two rows, one for large seed and one for small (Figure 18 b). Using the grader and differently sized plates in combination, improved seeding operations so that missing plants or double-ups within a row did not occur, reducing the need to manually replant or thin out plants. Although this is ideal for the PTOS 2 row maize seeding kit, the same modifications can be applied to the multi row 4WT ZT seed drill.

Figure 18: a. Grading treated maize seed in to large and small seed lots, and b. the modified inclined metering plate for large and small seeds

Improved Strip-tillage drill

Strip tillage in moist clays in southern Bangladesh caused the seeding slot to remain open (Figure 19a). As explained previously this leads to predation and seedling desiccation. The CSISA MI engineering team modified the tine, the blades, rotor and arrangement on the PTOS to reduce vibration, wear and ensure back fill in the seeding slot. In addition, the rough surface of zero-till fields requires individual press wheels to ensure soil-seed contact. The single roller was replaced with independent press wheels, which reduces time to emergence, seed loss, increases plant stand and yield.

Figure 19: (a) Exposed seed in the furrow due to poor backfill, (b) Redesigned rotor and straight blades, (c) Modified openers to reduce slot width and depth control, (d) individual press wheels to follow soil terrain and provided soil seed contact

In a recent trial of all available seeders in the 2 Wheel tractor range in Bangladesh, the modified CSISA MI PTOS with strip till kit was the best performer in seed coverage, backfill, variation in planting depth and days to emergence, (i.e. 67% of seeds emerged in one day 6 days after planting) (Figure 19). Machines tested were the Versatile multi-crop planter (VMP) CIMMYT Strip till Kit (STK), BARI Zero till drill (BZTD), CIMMYT Zero till drill (CZTD), BARI Seeder (BS), Conventional Planter i.e. Broadcast and tillage (CP).

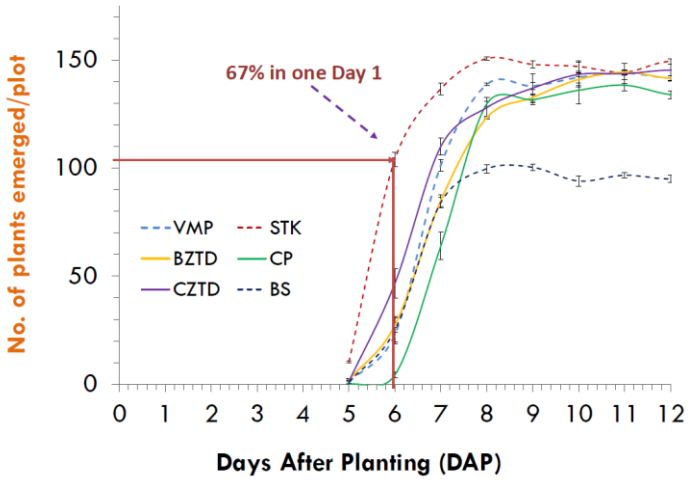


Figure 20: Number of plants emerged days after planting as a result of seeder type

Modification of 2WT reaper for Jute

In partnership with RK metal, CSISA MI Engineering team has modified the 2WT-attached reaper to harvest jute by extending the reaper frame (Figure 21), fitting iron wheels, lowering the cutter bar and changing the cutter bar speed. Although the cutter bar should be lower to ensure maximum length of Jute, this may not be achievable due to soil surface roughness and immovable components under the machine. Therefore, some farmers at the demonstration were not satisfied with leaving 2 inches of stem in the field. However, the harvest demonstration was a success and completed at high speed. Next step is to demonstrate it at the Bangladesh Jute Research Institute (BJRI) and reduce cutting height, however Janata engineering (copying in) has also developed their version and is demonstrating it to BJRI.

Figure 21: Modifications to the 2WT attached reaper to harvest jute

Development of the Sulky

A Master's student from BAU under the direction of the CSISA MI engineering team successfully completed the sulky for Self-propelled reaper and other 2WT devices.

The device reduced tiredness, speeds harvesting process as well as being novel and eye catching. The concept is to boost reaper utility, attract young entrepreneurs and promote scaling of the reaper service.

Figure 22: Newly developed Sulky wheel for self-propelled reaper transportation. Photo: Belal/ CSISA MI

Promoting CIMMYT's Training Modules

CIMMYT's training methods, materials are becoming very well known, and a number private and public sector partners are seeking our CSISA MI staff to train their trainers. Most of the requests are for machinery operations and agronomy and thus a number have been conducted in this reporting period and will continue into the future, thereby building sustainability into the mechanisation value chain. Trainings include;

- Alim Industries -1200 LPSs during Feb –May'18
- Concurrently DAE, BARI, BRRI, Metal, ACI, etc. are conducting their own machinery training based on our system and with our support.
- Future CIMMYT training includes DAE (2 batches), BARI + BRRI (1 batch) and one Manufacturer + NGOs (1 batch)

Innovation in maize cultivation for greater yield

In the Jashore and Faridpur field offices small trials were established where maize cultivation techniques were modified as per those applied by Mexican commercial growers and Chinese researchers, who routinely achieve 17-22 tons per ha depending on location and climate. Admittedly, these are long season temperate maize hybrids, and in arid regions are irrigated, but the underlying basic agronomic concepts need to be assessed in Bangladesh. Seeds were planted at precise depths, in alternating narrow and wide rows to take advantage of the edge effect. Seeds in adjacent rows were also staggered for the same reason. A plant population of 95,000 plants per hectare was targeted. 3 Replications were established and each had three treatments there i.e. T1) Farmer's practice (L-L=60cm, S-S=20cm); T2) Pair row but tri-angle (Pair- pair=80cm, Line-Line in pair=40cm, Seed-Seed=20cm); T3) Pair row but tri-angle (Pair- pair =80cm, Line-Line in pair=40cm, Seed-Seed=18cm). Granular fertiliser was split over three applications at important times for crop growth, although the Chinese method calls for four applications of foliar applied fertiliser. Overall in these pilot trials the T3 treatments yielded around 1 extra ton/ha (+13%), further exploration under CSISA III will probably be undertaken in 2019 Season.

6 COLLABORATION WITH OTHER PROJECTS AND VISITS

6.1 Collaboration

CSISA MI continues to work with and engage AEP, WEP, RDC and DFAP projects funded by USAID. AEP has been working with the project through which DAE-AIS has made it possible for a range of CSISA MI videos and other communications materials to be uploaded onto website. CSISA MI assesses the earlier 25 trained women of Women's Empowerment Project (WEP), to understand their ability & interest. The project has started the process to engage 1200 women entrepreneurs in the WEA database as agricultural machinery service providers. The project is also working jointly in the project areas to identify potential women LSP and facilitate them to purchase agricultural machinery. Over the last few months the CSISA team and CSISA MI Project Leader have had a number of important interactions with RDC to seek out potential options for collaboration and alignment of activities, such as Hello Tractor and QR-Cash. Working groups have been established, but at this early stage progress

has been limited to establishing a dialogue and limited verbal reviews of prospective activities. CSISA MI is also looking forward to sustainable options of collaboration with Development Food Assistance Program (DFAP) as well as, Appropriate Scale Mechanization Innovation Hub (ASMIH), Post-Harvest Loss Reduction Innovation Lab (PHLIL)-Bangladesh.

6.2 Visits and Exchanges

During the reporting period, key visits by high-level representatives from the government, donor and CIMMYT included:

- Derrick Brown, the new Mission Director of USAID Bangladesh along with Roy Fenn, Economic Officer and Marian Persons, EG Officer recently visited CSISA MI's sites in Chuadanga. Derrick Brown enthusiastically talked to some of the female LSPs and Mr. Olee, the owner of Janata Engineering, a local manufacturing company. CSISA MI Project Leader, Allen David McHugh briefed him on CSISA's activities in Bangladesh.
- A team from Chinese agricultural machinery company, Lu'An Agricultural Machinery Import-Export Co. ltd and the General Manger, Bridge Dong, visited Amjhupy, Meherpur Sadar, Meherpur on November 29, 2017 to observe the performance of the recently imported PTOS by CSISA MI at the field level. LSP, Habibur Rahman provided constructive feedback, suggesting the PTOS needed some modifications at the factory level for proper seeding and tillage operations to reduce seed loss. The team also visited nearby full tillage maize field established by PTOS, strip tillage maize seeding plots and full tillage lentil fields.
- Prosanto Kumar Shaha, Deputy Director (DD), Department of Agricultural Extension (DAE), Bhola and six Upazila Agriculture Officers from six upazilas of the same district visited CSISA MI activities in Alinagar village under Sadar Upazila in Bhola on November 29, 2017.

Deputy Director, DAE, Borguna Md. Shainur Azim Khan observed mini combine harvester activities in Amtoli. Photo: Shahidul/CSISA MI

- On December 03, 2017, Md. Shainur Azim Khan, Deputy Director (DD), DAE, Borguna and Upazila Agriculture Officer visited a farmer's field day on mini combine harvester in Amtoli upazila under Borguna district.
- First Secretary of Netherland embassy and the Blue Gold project leader visited the CSISA MI stall in the Agricultural Technology Fair, organized by DAE-Blue Gold at Gojendrapur village under
- Dumuria Upazila of Khulna district on 17-19 December 2017. 'Reaper machine is very useful and profitable for the farmers' stated the impressed Secretary. During the fair, CSISA MI team had distributed different leaflets, booklet, posters and folders and described the project activities to the visitors.
- Krishibid Kingkar Chandra Das, Additional Director, DAE, Faridpur Region and Dr. Md. Mohi Uddin, PSO, OFRD, BARI, Krishibid Kartik Chandra Chakraborti, Deputy Director, Faridpur attended a Farmer's Field Day (FFD) at Maheswardi, Hamirdi, Bhanga, and Faridpur on February 14, 2018. Md. Shafiqul Islam khan, DD (CG), BADC, Faridpur & Md. Waheduzzaman, Upazila Agriculture Officer, Bhanga, Faridpur were also present at the event. The performance of line sown wheat blast resistant varieties by Strip and PTOS tillage was very interesting for the visitors.

Deputy Director, DAE, Ridoashor Datto observing Mung bean plantation by PTOS in Patuakhali. Photo: Mabud/CSISA MI

- Mr. Ridoashor Datto, Deputy Director, DAE, Patuakhali visited a Mung bean field established by PTOS on February 19, 2018 at Basbunia village at Galachipa Upazila under Patuakhali district.
- IDE Global Country Representative Deepak Dhoj Khadka and the complete CSISA MI Dhaka Management team visited numerous LSP sites under the Jashore field office on December 12 2017.
- A team from a Chinese agricultural machinery company, Deyang Jinxing Agricultural machinery manufacturing company in Chengdu visited Dhaka and Faridpur to observe the performance and train staff on the recently imported medium multi-crop combine harvester by CSISA MI at the field level.
- A team from Chinese agricultural machinery company, Jiangsu World Agricultural Machinery Company and the Director of Overseas sales James Zhao, visited Dhaka to discuss importation of maize Combine Harvesters by TML Limited and CSISA MI.

7. CHALLENGES

CSISA MI, as with other programs in Bangladesh, has found it difficult to involve women in machine-related activities, as this is a non-traditional profession for women, however we have risen to the challenge and tripled participation in this last year. Related to this, is limited access to finance for many value chain actors (especially women), due to their inability to comply to credit worthiness criteria, as agriculture and related service sectors are not viewed as viable businesses by the formal banking sector. Agricultural mechanization in Bangladesh is decades behind developed nations, which in part can be contributed to inadequate machine quality (domestic and imported), untrained operators, limited manufacturing capacity, cultural norms, and climate and agronomic complexities. These complexities, such as inclement weather, negatively impacts Bangladesh's low-lying terrain and restricts adoption of cropping practices and related mechanization.

7.1 Delay in funding

Funding for year 5 was delayed significantly. However, based on prior notice of the delay, the project refocussed the annual implementation strategy so that it could run smoothly and effectively until March '18; the revised implementation strategy was largely based on adjusting geographical coverage, to areas where the project could achieve much more with less effort. This also ensured that fewer demonstration and training activities would take place. The strategy worked very well as is evidenced by the achievements in year 5. In case of both land (ha) and farmer (#) coverage, CSISA MI achieved significantly against targets, i.e. for land 118% and farmer 86%. The numbers trained was also very acceptable level at 94%. Of course this uncertainty around funding delays led to early staff exits which may have contributed to the slight reduction in deliverables. There were a number of cost cutting measures put in place to prevent staff losses, including stopping all activities, restricting travel, and implementation of other collaborative activities. Unfortunately, in this hibernation mode, Partner NGO sub-grants were necessarily terminated and implementation of others postponed, as funds were not available to pay such grants. Based on discussion between the AOR and CSISA MI leadership the sub-grants and other activities are currently under re-activation.

7.2 Plans and Partnerships for Adapting to Wheat Blast

Wheat is very important crop for the success of CSISA MI as both PTOS and reapers are used for seeding and reaping the crop. After the 2016 outbreak of wheat blast, it became a considerable issue for the project. Fortuitously the adoption of appropriate wheat crop management and variety recommendation packages given through factsheets and different awareness raising activities conducted by CSISA MI, project developed LSPs and other related GO-NGO partners' blast infection reduced remarkably in 2017. Affected areas was reduced from 1500 ha in 2016 to 22 ha in 2017. Before starting wheat season of 2017-18, factsheets (Version 2) were distributed and awareness-raising activities were continued by the project and others, which resulted in lower, but sporadic blast infection in previously affected districts. However, the low incidence and severity was mainly in late planted crops. This year's blast affected area is yet to be declared, but visually its incidence and

severity appeared considerable lower than even 2017. Reduced rainfall during crop flowering stage helped reducing blast spread. Due to high rainfall in pre-seeding and seeding period in the wheat area, farmers shifted to other crops i.e. boro rice, maize, onion, etc. Average rainfall in October to December 2017 in major wheat growing areas was 314 mm, which had some negative impact on PTOS coverage, but almost no rain in the harvesting period increased the use of reapers.

CSISA has continued working with BARI with adaptive research in 2017-18 to reconfirm the results of previous year and to develop blast resistant varieties and management technologies appropriate for Bangladesh farmers to mitigate wheat blast. Collaborative research with BMDA, DAE and BARI to develop a forecasting model for wheat blast in Bangladesh will also provide a significant tool to CSISA MI. A blast resistant Zn fortified high yielding heat tolerant variety BARI Gom 33 was released last year and CSISA MI demonstrated this variety and other tolerant varieties like BARI Gom 30, BARI Gom 32 etc. in the farmers' fields. CSISA MI leadership highly commended the work of all partners in delivering solutions and leading the world in the combat against heat blast. These demonstrations were seeded by PTOS machine and reaped by thresher, including medium multi-crop combined harvester. Project LSPs also gave services in seeding and reaping of farmers' wheat, rice, lentil, onion etc. Awareness raising activities such as field days, training, consultation meetings, with farmers, LSPs, DAE, etc. were also organized to spread the use and linkages with CSISA MI technologies. CIMMYT and BARI will continue to collaborate with international partners including the USDA on breeding and screening programs for new varieties. Blast tolerance has been found on a preliminary basis in advance lines BAW 1272, BAW 1280, BAW 1286 and Borlaug 100, are waiting for release. Two foliar spray fungicides Amistar Top and Nativo and four seed treating fungicides Provax 200 WP (Carboxin 37.5% + Thiram 37.5%), Vitaflo 200 FF (Carboxin 17.5% + Thiram 17.5%), Rovral 50 WP (Iprodione 50%) and Goldman 80 WP (Mancozeb 80%) were found more effective in controlling wheat blast this year. These are widely available in Bangladesh and less costly and are acceptable under the USAID PERSUAP.

7.3 Engaging Women as Entrepreneurs

CSISA MI, since its inception has found it difficult to involve women in machine-related activities as this is a non-traditional profession for women. Usually men operate and own agricultural machines in Bangladesh. Women and their families prefer women to engage in work that is near the home, a result of deep social prohibitions on engaging women in alternative activities. To become an LSP would also require travel to different farmer fields and extended stays outside the home. However, this has not deterred the team and it has become a primary focus in year 5. CSISA MI has started working closely with the Winrock's Women Empowerment Project from where it can reach around 1,200 women entrepreneurs of whom at least 30% are already engaged in agriculture related businesses.

Moreover, WEP data base of around 30,000 potential entrepreneurs will be targeted through CSISA MI's the popular activities i.e. "Krishi Machine Porichiti" (KMP which means to introduce new technology to the potential buyer group) and "Shombhabbo Kreta Somabesh" (SKS which means to organize a group of potential buyers of specific machinery). WEP's sub-list of champion entrepreneurs has been filtered by CSISA MI MEL team to those who have invested in the market and who might be eligible to be a part of the CSISA MI's market value chain, through involvement in agri-machinery dealerships. An engagement protocol is under development for the field offices to implement in 2018-2019 period

The CSISA MI team continues to engage with AIRN women to build their capacity and opportunities to become agricultural machinery entrepreneurs. International Women's day was an opportunity at which the regional field offices took advantage by hero-ing women entrepreneur and agricultural champions at various events. To that end of the total 2867 LSPs, 75 are women, 50 of which were recruited in last year, which evidences the renewed focus on women and the ratified the change in strategy for this 5th year.

7.4 GoB Subsidies

GoB is providing subsidies for selected agricultural machinery in selected areas through DAE. The subsidies for the selected machinery were 50% for most of the country. GOB-DAE increased subsidies from 50-70% for selected coastal districts and for particular machine types, but the number of subsidies remain limited. This has created significant enthusiasm amongst importers, dealers and farmers, which it is anticipated to accelerate growth of the agricultural machinery market in

Bangladesh. The boost in sales of mini combine harvesters, in particular, has been largely driven by the provision of GOB subsidies. ACI has taken considerable advantage of the subsidies, but so to have DAE by setting up a number of mechanisation villages with heavily subsidised machinery. CSISA MI has also taken advantage of these villages by working closely with the associated farmers IPM clubs and others to build their capacity in machine operations, business development and mechanised agronomic service provision.

8. Upcoming Activities for Next Year

The no cost extension has been approved to September 30 2019. Below is the list of activities that were included in the extension application. These key items were taken from the recently completed larger DIP workshop in Sep 2018. CSISA MI will concentrate on short term, big impact activities, and especially those that are incomplete. i.e. AFP, women LSPs, Mechanisation. Major interventions and the key activities as per the detailed implementation plan (DIP) for Year 6 under CSISA MI will be as follows:

Strengthening value chain

- Asset and community resource mapping
- WEA - Women LSPs development (consider a range of machinery, including Janata's jute ribboner) and electric starter for PTOS
- Develop sales service strategy i.e. Hello Tractor
- Strengthen spare parts supply chain (business planning, book keeping, upstream and downstream linkages)

Access to finance

- Creditworthiness profiling (STEPS)
- Digital Financial Solutions for the ag-mechanisation value chain
- Engage formal banking sector and link to MI
- Focus on scaling gap under finance availability

Sustainable intensification with Conservation Agriculture (CA)

- Finalise CA modules and materials
- Disseminate agronomic techniques for higher yields (Maize)
- Strategic field demonstrations (triple cropping, ZT, Strip till, line sowing)
- Value chain training in CA

Networking and capacity building

- Strengthen LSP networks
- Value chain business development training (Spare parts, workshops, mechanics)
- Finalise Yellow-Pages of service provision
- Focus on scaling issues

Technology adaption and manufacturing

- Focus on AFP challenges (Quality, setup (automation), spare parts, conduct survey (uses, locations, agronomy & crops, solar power, sensors, variable costs)
- Demonstrate multi-crop harvester, Zero tillage planters, Reaper binder
- Finalise machinery modifications (design sprint) BARI sub grant

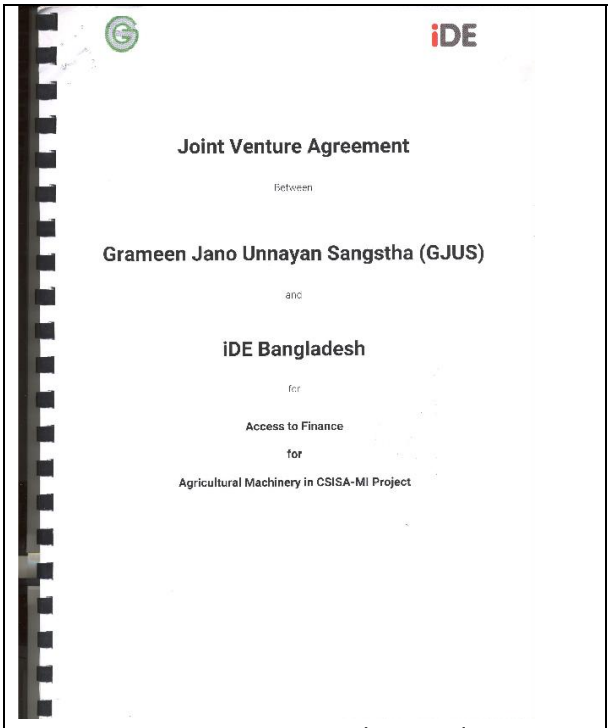
Public private partner-shipping

- Link LSPs with private sector
- Annual stakeholder workshop
- Build linkages with DAE and public sector
- Final reporting and workshop, close out

ANNEX 1: CSISA MI Year 5 Working Area

Hub	District	Upazila
Jessore	Jessore	Keshobpur
		Monirumpur
	Jhenaidah	Jhenaidah Sadar
		Shailkupa
	Magura	Magura Sadar
		Sreepur
		Mohammedpur
		Shalikha
	Bagerhat	Farirhat
		Kachua
		Mollarhat
		Rampal
	Khulna	Batiagata
		Dumuria
	Sathkhira	Tala
	Meherpur	Meherpur Sadar
		Mujibnagar
	Narail	Kalia
		Lohagara
		Narail Sadar
Barisal	Bhola	Bhola Sadar
		Burhanuddin
		Charfasson
	Jhalokati	Jhalokati Sadar
		Nalchity
	Barisal	Barisal Sadar
		Wazirpur
		Agailjhara
		Babuganj
	Patuakhali	Dashmina
		Galachipa
		Kalapara
		Patuakhali Sadar
	Barguna	Amtali
		Patharghata
Faridpur Hub	Faridpur	Bhanga
		Boalmari
		Faridpur Sadar
		Madhukhali
		Nagarkanda
		Saltha
	Rajbari	Kalukhali
		Pangsha
		Rajbari Sadar
		Baliakandi
	Gopalganj	Kashiani
		Gopalganj Sadar
		Kotalipara
		Muksudpur

ANNEX 2: JVA



Joint Venture Agreement

Between

Grameen Jano Unnayan Sangstha (GJUS)

and

iDE Bangladesh

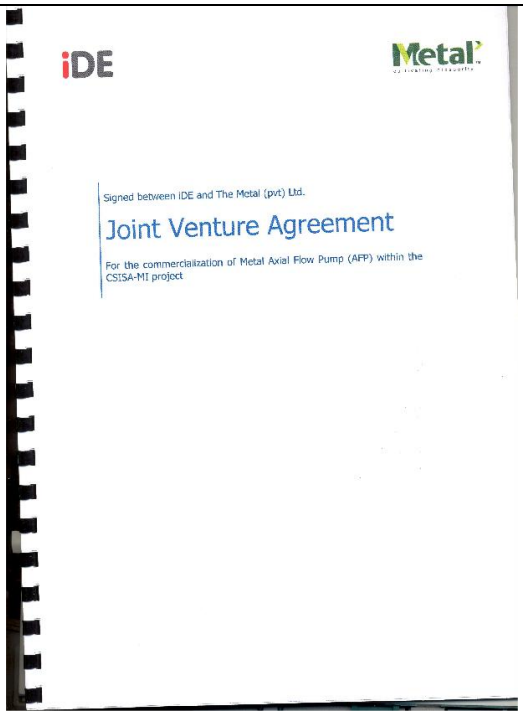
for

Access to Finance

for

Agricultural Machinery in CSISA-MI Project

Joint Venture Agreement with GJUS during 2017-2018

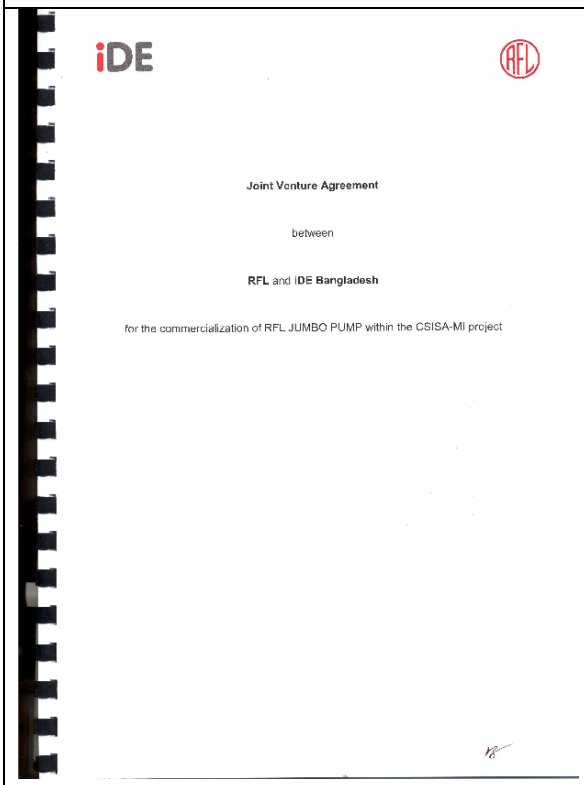


Signed between iDE and The Metal (pvt) Ltd.

Joint Venture Agreement

For the commercialization of Metal Axial Flow Pump (AFP) within the CSISA-MI project

Joint Venture Agreement with The Metal (Pvt.) Ltd. during 2017-2018



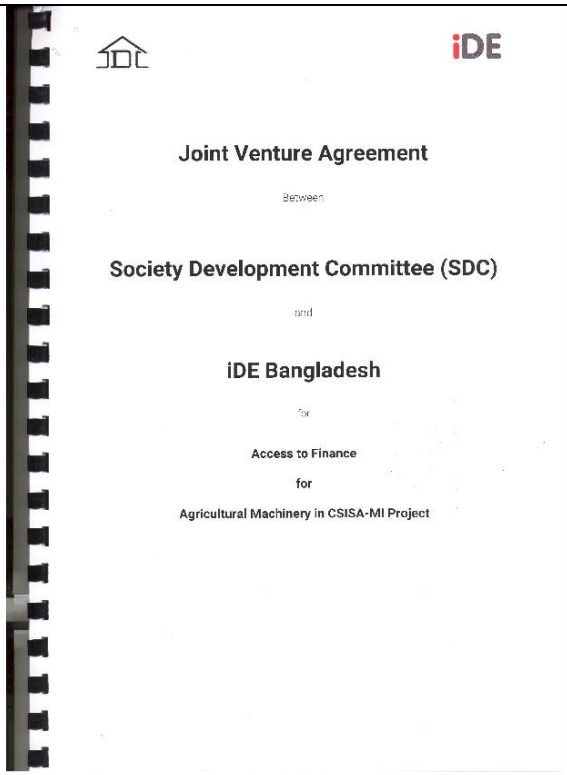
Joint Venture Agreement

between

RFL and iDE Bangladesh

for the commercialization of RFL JUMBO PUMP within the CSISA-MI project

Joint Venture Agreement with RFL during 2017-2018



Joint Venture Agreement

Between

Society Development Committee (SDC)

and

iDE Bangladesh

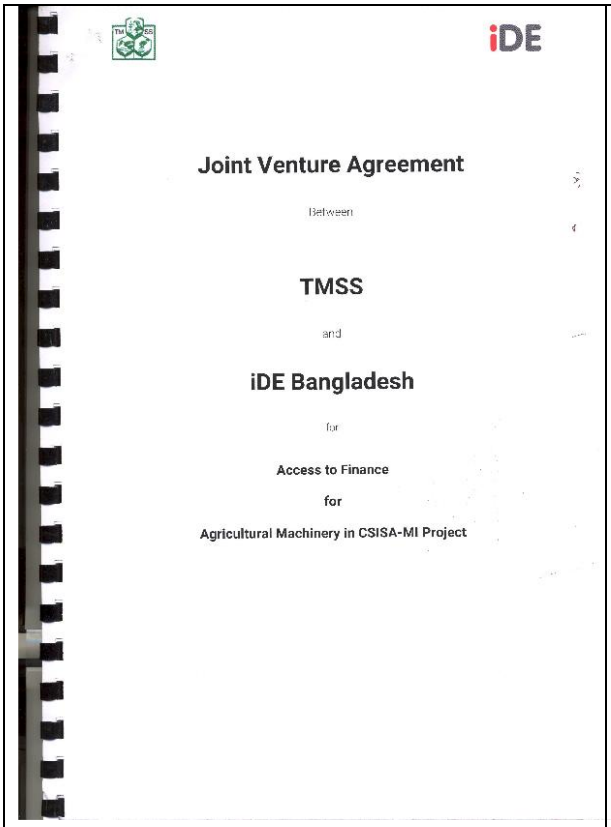
for

Access to Finance

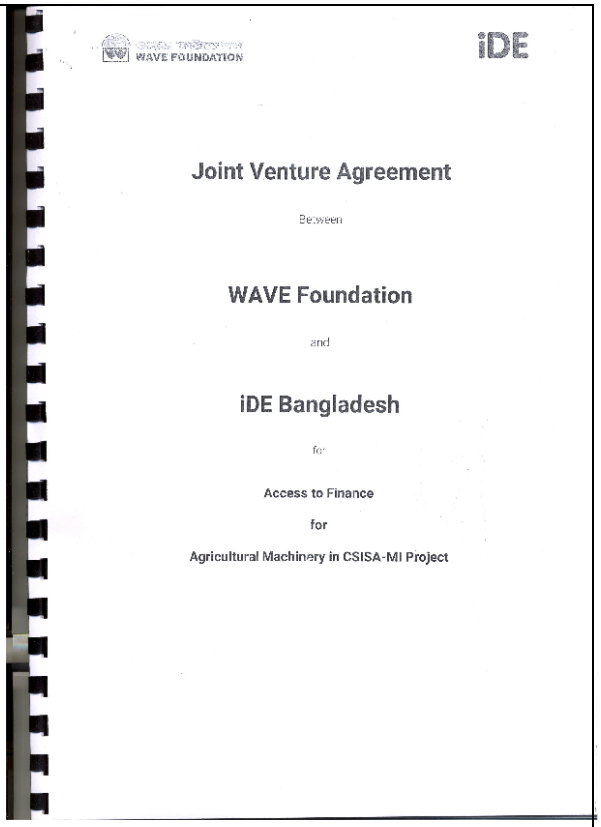
for

Agricultural Machinery in CSISA-MI Project

Joint Venture Agreement with Society Development Committee during 2017-2018



Joint Venture Agreement with TMSS during 2017-2018



Joint Venture Agreement with WAVE Foundation during 2017-2018

ANNEX 3: Media coverage during Oct'17-Sep'18

Sl	Name	Date	Type
1	Channel i	12.02.18	National TV channel
2	ABNews24.com	15.02.18	Local online
3	Daily Songbad	17.02.18	National Daily
4	Dainik Manchitro	24.02.18	Local daily
5	Daily Jessore	24.02.18	Local daily
6	Barisal Somoy	07.03.18	Local daily
7	Dakshinanchol	07.03.18	Local daily
8	Motobad	07.03.18	Local daily
9	Bangladesh Betar	08.03.18	National Radio Station
10	Ajker Bhola	09.03.18	Local daily
11	Banglar Kontho	09.03.18	Local daily
12	Dakshiner Mukh	09.03.18	Local daily
13	Motobad	09.03.18	Local daily
14	Bholar Bani	09.03.18	Local daily

ANNEX 4: Success Stories during Oct'17-Sep'18

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SUCCESS STORY

Survey updates mechanization scaling

CSISA-MI project responds to socioeconomic survey on scaling of small scale agricultural machinery in Bangladesh

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A socio-economic study of 438 local agricultural service providers strengthened CSISA-MI's interventions by providing context to adoption of scale-appropriate mechanization. The study determined the factors constraining adoption and scaling of small-scale farm mechanization technologies at the local agricultural service provider (LSP) and farmer level.

This internal study led CSISA MI to pivot and implement its recommendations through refocused intervention strategies. Challenges of spare parts availability, installation and transportation of irrigation pumps (AFP), machinery multi-crop use and lack of information of services were among the farmer's major concerns for seeders (PTOS), irrigation pumps (AFP) and reapers.

With refocused interventions, the project supported dealers and mechanics to stock more spare parts. After sales service was enhanced with three key machinery dealers, who are currently setting up dealer service hubs in the region. An additional 22 spare-parts shops have been developed by CSISA MI to cater for the demand in the FtF zone, arising from 628 mechanics and 2859 LSPs trained by the project.

Challenges of PTOS operations

2,000 AFP installation booklets were distributed, along with advanced training in late 2017. Additionally, plans are in place to develop AFP transportation aids suited to flat-bed rickshaws.

The 2017 CSISA-MI Seeder (PTOS) "design-sprint" assures reliable, effective and precise, multi-crop seeding capacity, so that the seeders can be used all year round. Crops now include; maize, wheat, rice, jute, sesame, onion, mustard and many more.

The reaper was designed to harvest winter and summer rice and wheat, but was recently modified to harvest jute and broaden annual use. CSISA MI's instructional leaflets were distributed to support operators. Reapers with binders and ride-on accessories will improve reaper utility and use in 2018.

To raise farmer awareness of agricultural service provision, a searchable database for agricultural service provision is under construction. Considerable efforts are also being employed to utilize other networks such as, Agricultural Inputs Rural Network (AIRN) and to develop synergies with similar projects under World Vision, ACDI-VOCA, Blue Gold and the Department of Agricultural Extension's mechanization villages.

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SUCCESS STORY
New workshops promote employment

CSISA-MI project develops and trains mechanics; a number of whom have become entrepreneurs establishing their own workshops contributing to employment growth in Bangladesh.

Photo: KAWRA/CIMMYT

"I am working for Bangladesh's agricultural machinery development which is a big thing, in my small workshop, and that makes me happy"

- *Milon, Proprietor, MIM Engineering Workshop in Sorojganj Bazar, Chuadanga.*

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A few years back, after gaining experience working at an engineering workshop and with encouragement from the Cereal Systems Initiative for South Asia - Mechanization and Irrigation (CSISA MI) project, Milon (27), a young entrepreneur, established "MIM Engineering Workshops" in Sorojganj Bazar, Chuadanga. He now provides employment and apprenticeships to eleven mechanics in his business producing and repairing agricultural machinery. Milon trains them in machinery troubleshooting, producing small agricultural machines and manufacturing spare parts. In his workshop he produces maize, rice and wheat threshers and rice winnowers, as well as repairing 2-wheel tractor attachments, like the tiller and seeders initially introduced to local service providers by CSISA MI.

MIM has built a close working relationship with agricultural research and development organizations through innovation and quality workmanship. His workshop's popularity is increasing and spreading further day by day and thus Milon and his employees are earning good money these days.

For three years prior to 2012, Milon worked as a mechanic for CSISA MI's collaborator, Janata Engineering in Jhenaidah, where he learnt his trade and the business of agricultural engineering. While working there, he was well known to engineers from the International Maize and Wheat Improvement Center (CIMMYT), Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) and competent with the machinery they were introducing to Bangladesh's Feed the Future (FtF) zone.

The USAID-funded CSISA-MI project is commercializing agri-machinery technologies, through partnerships with the public and private sector in the FtF Zone. CIMMYT is leading the implementation of the project in partnership with iDE Global.

Central to the project is development and training of young local agricultural service providers (currently numbering over 2849) and local manufacturing workshops like Milon's "MIM", which is one of 9 recently established engineering workshops, making spare parts and repairing machinery. Besides this, the project has trained 150 mechanics, developed 52 spare part shops and strengthen 5 private sector engineering partners (Janata, RK Metal, ACI, RFL and Metal Ltd). Strengthening and supporting the agricultural mechanisation value chain in this way boosts agricultural productivity and rural employment, which leads to an increase in household income and reduction in rural migration.

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SUCCESS STORY

Rina, a champion for women empowerment

Rina Begum's path to empowerment through agri-business is exemplary and she is the embodiment of hope for other women in her neighbourhood and beyond.

Photo: SALAHUDDIN/CSISA-MI

"With my own money, I renovated this house and this makes me confident."
– Rina Begum, female LSP

Cultivating a knack for agricultural services business, Rina Begum (35), a housewife in Dhutrahati village in Nagarkanda, Faridpur, embarked on what would be a life changing venture. Her initial access to credit from a local micro finance institute, aided by the Cereal Systems Initiative for South Asia – Mechanization & Irrigation (CSISA-MI) project, enabled her to purchase a new seeder attachment for the family's power tiller.

Soon after the purchase of the power tiller operated seeder (PTOS), she played a pivotal role in establishing their business that offers planting services to other farmers. She enthusiastically communicated with her client farmers, collected payments and tracked incomes and expenditures, whilst her husband, Firoz Molla (45), a seasoned machinery technician and CSISA-MI trained PTOS operator, operated the machine in the field. Additionally, at various social gatherings, she actively motivated others to become an entrepreneur just like her.

In 2017, Rina's profit was tk. 50,000 (US $ 595), which enabled her to pay for her second daughter's marriage, an investment that left her immensely gratified. This year's profit of tk. 40,000 (US $ 476) was invested in renovating her house, purchasing new furniture and installing a tube-well for safer drinking water.

Now her 3rd daughter Zannatul (10) and the youngest son Riadul (9) can afford to go to school, which makes her very happy. She said, "having proper education they should break the curse of poverty. They are our hope."

Apart from tending to her family and the business, she also accompanies her husband to the field, while he provides agricultural services. Their teamwork and linkages to a gender sensitive CSISA-MI, was instrumental in growing their thriving business. With her new found confidence and perceptive field observations, she plans to purchase a CSISA-MI promoted reaper to expand her business venture into harvesting, for more profit. Rina passionately believes that more women should be involved in agri-business, because it's a huge window of opportunity for women empowerment and for breaking the poverty cycle in southern Bangladesh.

The USAID funded CSISA-MI project has accelerated 64 female service providers like Rina Begum, in very conservative cultural conditions of southern Bangladesh. CSISA-MI is a five-year project led by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with the iDE Global.

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SUCCESS STORY

Logbooks creating better businesses

Well-organized, yet simplified financial bookkeeping emerged as a daunting challenge, for most local machinery service providers in south-west Bangladesh.

Photo: HUSSEN/CSIA-MI

LSP Shadhon in Narail, collecting charge for his reaping service from a farmer and taking notes in his log book.

"I can now efficiently calculate my profits and loss, which can signal necessary change in my business plans."
– Abdur Rahman, an LSP in Jhikorgachha, Jessore

Three years ago Abdur Rahman, a committed and progressive farmer in Jhikargachha, Jessore, purchased a Power Tiller Operator Seeder (PTOS). Despite investing in technology in the pursuit of enhanced crop productivity and improved livelihood, the purchase soon appeared to be almost unrewarding for Abdur.

He struggled to maintain his broad farmer client base who used his machinery service. Jotting transactions on a wall or a piece of paper or any random surface compounded frequent memory lapses and it began to hinder the sustainability of his Agri-business.

To alleviate his and other local agricultural service provider's (LSP's) predicament, the Cereal Systems Initiative in South Asia – Mechanization and Irrigation project (CSISA-MI) initiated logbooks, a record keeping manual that would support LSPs such as Abdur to track their daily financial activity and machine use. However, much to Abdur's dismay, the issued logbooks were initially A4 landscape size, too detailed and hence too cumbersome to maintain.

"It was a large book which was inconvenient to manage, especially in field locations," said the LSP. Limited follow-up on its benefit and use, paired with difficult maintenance, meant the issued logbooks met with disinterest and an unproductive start. Nevertheless, CSISA-MI did not back down in the face of these hurdles. Resolute in its pursuit of improving livelihoods, it kept on improving the logbooks based on feedback they received, until it was portable enough and simple to use. Frequent supportive follow-ups and inclusive household training by project staff, ensured Abdur and other LSPs began using their logbooks.

Abdur soon realized he could track farmers who owed him money. He was able to retain and manage his customers for future work through their phone numbers and location details. He says, "I can now efficiently calculate my profit and loss, which can signal necessary change in my business plans."

Many more LSPs like Abdur, who were once struggling, gradually began to see the full merits of the logbook, an initiative that ceaselessly pushed through its initial limitations and significantly facilitated LSPs to overcome its earlier less promising days.

CSISA-MI is a five-year project led by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with the iDE Global.

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SUCCESS STORY

Women's Day celebration: Pledge for Equity

CSISA-MI, in collaboration with the Bangladesh government, celebrated International Women's Day where women agricultural machinery service providers in 20 districts gathered together and shared their stories of success.

Photo: SALAHUDDIN/CSISA-MI

"Through the activities and support of the CSISA-MI project, I have created a women farmers' group and I have become extremely self-sufficient."

– Monowara Begum, a progressive LSP in Jessore

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USAID funded Cereal Systems Initiative for South Asia – Mechanization and Irrigation (CSISA-MI) project, in collaboration with Bangladesh's government, celebrated International Women's Day on 8th March, 2018. Women farmers and the agricultural machinery service providers (LSPs) in 20 districts in the Feed the Future (FtF) zone in southern Bangladesh gathered together with great enthusiasm no matter their ethnic, religious, cultural or economic status. The multiple celebrations began with rallies, welcoming with flowers and sharing of success stories on becoming LSPs.

In Faridpur, Rina Begum and Dipty Rahman shared how attending a CIMMYT (International Maize and Wheat Improvement Center) wheat demonstration field day motivated them to believe in providing services to small-holder farmers to enhance their livelihood. Soon, their clients enjoyed lower production costs and rising profit margins. Dr. D. B. Pandit, CIMMYT-Faridpur Hub Coordinator said, "Women are genetically superior to men with the exception of physical strength, however due to the project their unfavorable social environment has begun to change for the better."

In Jessore, the CIMMYT hub coordinator distributed planting machine calibration keys to the champion LSPs and handed over agricultural machinery logbooks for operating better businesses. Monowara Begum, a progressive LSP said, "Through the activities and support of the CSISA-MI project, I have created a woman farmers' group and I have become extremely self-sufficient."

Barisal's rally and march led by CSISA-MIs team and women LSPs aroused a lot of enthusiasm, attracting a diverse cohort of school students, local elites including the Member of Parliament, Advocate Tipu Sultan, and Upazila Chairman.

The events in CSISA-MIs' three innovation hubs highlighted the merits of government subsidies for women entrepreneurs and the gender sensitivity and inclusivity of the project as it; builds after sales services, improves access to microfinance, conducts agricultural training, as key components in facilitating women to start businesses in a male dominated society.

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SUCCESS STORY

Agricultural transformation in Jogoddol

From very humble beginnings, Moslem Hawladar became a lead farmer and an agricultural machinery service provider and transformed agriculture by introducing mechanization to his small isolated village, Jogoddol, NE of Barisal, Bangladesh.

Photo: AMINUR/CSISA-MI

LSP Moslem (extreme right) in Jogoddol, Barisal is explaining the PTOS machine and the service to other farmers.

"I dealt with axial flow pump (AFP), power tiller operated seeder (PTOS) and Maize Shellers and trained my fellow farmers in the community about the full merits of the returns".

– Moslem Hawladar, an LSP in Jogoddol, Barisal

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Moslem, once a struggling small holder farmer is now cultivating a diverse range of crops, such as maize, wheat, vegetables, mung-beans and soybeans with his power tiller operated seeder (PTOS) on 25 hectares of land. In his locality, he is at the forefront of igniting productive agribusinesses, which has boosted the livelihoods in the isolated village of Jogoddol. Through his efforts, supported by CSISA-MI (Cereal Systems Initiative for South Asia- Mechanization & Irrigation), his neighboring farmers are widely engaged in mechanized cultivation and have substantially improved economically and increased their personal standing in the society.

Southern Bangladesh is widely known for its green-land canopy and its reservoir of agricultural potential. Jogoddol, the village in northeast Barisal is isolated by rivers and the immediate surrounds have significant agricultural prospects. But due to its isolation, accessible only by small boats, mechanization was limited and the villagers were mostly engaged in fishing and minor household cropping. Moslem Hawladar, a farmer's son, was pivotal in steering the wheels of change by introducing mechanization in the area and consequently, boosting agricultural productivity.

Moslem struggled to find a living through his early days. He tried his luck by going abroad in search of good fortune. Underpaid for his services and utterly dissatisfied with the experience, despairingly he returned to Bangladesh, only to discover he had lost most of his father's inheritable land. Shortly after, "things began to turn around when I invested my meagre savings in a power tiller", says Moslem.

His expertise in operating the machine elevated his farming profile which was noticed by CSISA MI at an awareness raising field day. Moslem was given CSISA MI training on a power tiller operated seeder (PTOS). His hard labor and expertise with a newly purchased PTOS, and with CSISA MI business development training, saw him evolve into a local agricultural machinery service provider (LSP). These days, as an expert LSP, he is training other farmers in entrepreneurism, mechanization, and conservation agriculture. He recently bought a maize-sheller and an axial flow pump (AFP) to boost his LSP business, which earns an annual profit of US$ 4,167.

Due to the reach and scaling efforts of CSISA-MI across the Feed the Future zone in southern Bangladesh, Moslem came from very humble beginnings to become a uniquely qualified agricultural leader and trainer in a very isolated part of Bangladesh.

The USAID funded CSISA-MI is a five-year project led by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with the iDE Global.

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SUCCESS STORY

Intercropping transforms the color of farming

CSISA-MI's intercropping demonstration has rejuvenated the farming community of Tipna, Khulna and acted as guiding light to many farmers who struggle under bleak prospects of traditional mono-crop farming.

Photo: SHAHIDUL/CSISA-MI

LSP Anisur in his field in Tipna, Khulna.

"Intercropping maize earns more money and reduces my cultivation cost and in the process, gives me a unique edge over other farmers."

– Anisur Rahman, an LSP in Tipna, Khulna

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Anisur Rahman, a diligent, forward looking farmer from Tipna village, near Khulna, is leading agricultural transformation from traditional farming to intercropping. Anisur is one of 191,000 farmers reached by CSISA MI, and his success is teaching his neighbouring farmers how to opt out of their traditional mono-cropping practices through mechanised intercropping.

Anisur knew the local farmland was operating below its capacity through non-intensive and unsustainable cropping patterns. Distraught from low returns and a faltering agribusiness, he began seeking avenues to rejuvenate his land and raise his income.

Anisur's fate was transformed by CSISA-MI's agronomic advisors and the use of Power Tiller Operator Seeder (PTOS), to prepare the land without ploughing and simultaneously sow seeds, under a maize and red amaranth intercropping system.

Once he adopted intercropping, Anisur discovered the significant merits, which considerably augmented his profits as well. It ensured biological diversity and production stability, lowered weed infestation, and preserved soil moisture, thereby decreasing input costs. The nutritional benefits of red amaranth also spilled over to his family, who were overwhelmed with the positive impact of this initiative.

In past years, Anisur solely cultivated maize in his 0.11 hectares of land which produced ~800kg of maize. This year, he intercropped 450 kg of red amaranth with maize and increased his net income by USD 64. Inspired by Anisur's developments, five neighboring farmers are intercropping maize with red amaranth in 0.53 ha land. CSISA-MI actively promotes intercropping, where relevant, across this community and on 92,000 ha in the FtF zone already under improved technologies, through training and awareness programs.

Previously Anisur's community engaged in high-cost, degradative conventional farming methods with limited returns. Through the endeavors of CSISA-MI, Anisur is also one of 2727 Local Service Providers who are guiding lights for farmers and who provide sustainable intensification options with a PTOS and resource-conserving practices such as strip tillage and intercropping. The new color in the maize fields has brightened the future for households, and remarkably enlightened the farmers' lives in the small village of Tipna.

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SUCCESS STORY

A beacon of hope in Basudebpur village

Liajur is beacon of hope, as his vision to support his fellow smallholder farmers was the force behind sustainable and affordable irrigation.

Photo: SOKOT/CIMMYT

"CSISA MI training was invaluable in making me the commercial farmer I am today. Gone are the days of fatigue and hardship from subsistence farming. I'm living and earning well, and feel like a well-respected member of the community."

– *Liajur, AFP service provider in Basudebpur, Muksedpur, Gopalganj*

Farmers in the small village of Basudebpur in Gopalganj district in the eastern FtF zone were facing hard times. The lack of water resources and water for everyday use had become a serious issue. The dwindling water supply and the considerable costs of irrigation meant that crops grew poorly and yielded well below their potential. Md. Liajur Loshkar (32), a hardworking farmer, with some small alternative income from pond fishing and pigeon raising, recognized what his less fortunate fellow farmers were going through.

Liajur saw an abandoned irrigation project, initiated by a previous farmer, as a beacon of hope for his village. Encouraged by others in his neighbourhood, Liajur planned to restart and govern the once abandoned project.

Initially daunted by the prospect of modernising the water supply to his village, a local Dealer and district CSISA MI Agricultural Development Officer inspired him to purchase an Axial Flow Pump (AFP). CSISA MI provided Liajur with business training as a local service provider (LSP) and in the setup and use of the pump, which was instrumental in implementing the revival of the old irrigation project.

Irrigation services from Liajur's AFP unit transformed the lives of smallholder farmers in Basudebpur by significantly increasing the rate of water flow into the village and using 50 percent less fuel than the alternative centrifugal water pumps. Liajur received a lot of appreciation from his rejuvenation of the irrigation project. He also became a new landholder, following his purchase of 1 hectare of arable land with the earnings from his AFP. After saving a little more money from his business activities, he plans to purchase another AFP and expand his irrigation service provision business.

Liajur is one of 881 irrigation LSPs developed by CSISA MI who saw an opportunity to invest in and develop an irrigation business that would benefit a great many others in his local community. Total private sector investment by LSP and firms in the FtF zone under the CSISA MI program exceeds USD 3 million.

The USAID funded CSISA MI is a five-year project led by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with the iDE Global. The project developed 2,818 LSPs and more than 700 mechanics so far. Being a market development project, CSISA MI has already been successful in introducing 6 national manufacturers/importers in agricultural mechanization marketing system through 163 dealers.

This story is made possible through support provided by the United States Agency for International Development (USAID). The contents and opinions expressed herein are those of the project and do not necessarily reflect the views of the USAID or the United States Government.

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USAID
FROM THE AMERICAN PEOPLE

SUCCESS STORY

Emancipation through entrepreneurism

The emergence of women entrepreneurs in agriculture is increasing the number of self- sustaining individuals required to propel the development of the rural economy.

Photo: ROWSHON ARA BIDE

"The overwhelming feeling of taking charge and making a valuable contribution speaks volumes for my personal growth and economic standing."

– Dipty Roy, local mechanized agricultural service provider in Taltola, Rajbari

"There is something magnificent about running one's own business" said Dipty Roy, an agricultural machinery owner and local service provider (LSP) in the Rajbari District of Bangladesh. According to her, the overwhelming feeling of taking charge and making a valuable contribution, speaks volumes for her personal growth. The channeling of resources, endeavors, hopes and optimism towards the development of women entrepreneurs appears an obvious choice for the future growth of the Bangladeshi rural economy.

However, in many parts of Bangladesh, because of social stigma regarding gender working roles, women are largely expected to remain at home, raising the family and doing other household chores, instead of working outside or taking responsibilities in household decision-making or entrepreneurship. Those that do attain work in other industries or in the nearby fields, often remain at the bottom of the workforce, working long hours, in poor conditions for very basic wages.

Before the arrival of mechanized planters, such as the power tiller operated seeder (PTOS), seeding jute, an important fiber crop, had been a daunting venture, full of drudgery for women in Dipty's area. The fatiguing and dirty tasks of land preparation and sowing seeds by manually digging soil and simultaneously sowing was "women's work", which posed a nearly insurmountable challenge for them. Thankfully, today, female LSPs from Taltola village in Rajbari operate their PTOSs to effortlessly sow jute seeds in one pass, using strip tillage.

The Cereal Systems Initiative for South Asia – Mechanization & Irrigation project (CSISA-MI) have transformed 75 other rural women into LSPs, just like Dipty. These women, upon gaining PTOS training from CSISA-MI, often leap into business ownership, and not just machinery operators. Under the projects specialized training, they purchase machinery, employ others and provide machinery operation training to employees. Following business development training these women now run viable businesses in the Feed the Future (FtF) zone.

As successful LSPs, these 75 women with high hopes and ambition, largely aspire to building their businesses and client base, where they employ and train youth in machinery operations to make a larger contribution to agriculture development in Bangladesh.

As they move closer to shattering the once impenetrable glass ceiling – they are leading the way for a new generation of women LSPs, who actively seek emancipation through independent entrepreneurial roles in Bangladeshi agriculture.

In collaboration with International Development Enterprises (iDE), the International Maize and Wheat Improvement Center (CIMMYT) leads CSISA-MI, which is funded by the United States Agency for International Development (USAID).

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CIMMYT

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ANNEX 5: Quarterly Reports submitted by the partners to CIMMYT

USAID

2nd Quarter Progress Report
(January 2018 to March 2018)

Cereal Systems Initiative for South Asia-Mechanization and Irrigation (CSISA-MI)

Submitted To :
Dr. Allen David MCHUGH
Team Leader and Senior Scientist
Sustainable Intensification Program
CIMMYT- Bangladesh
Bangladesh Office
Dhaka-1213.

Faithfully Submitted by:
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Date of Submission: 3 April 2018

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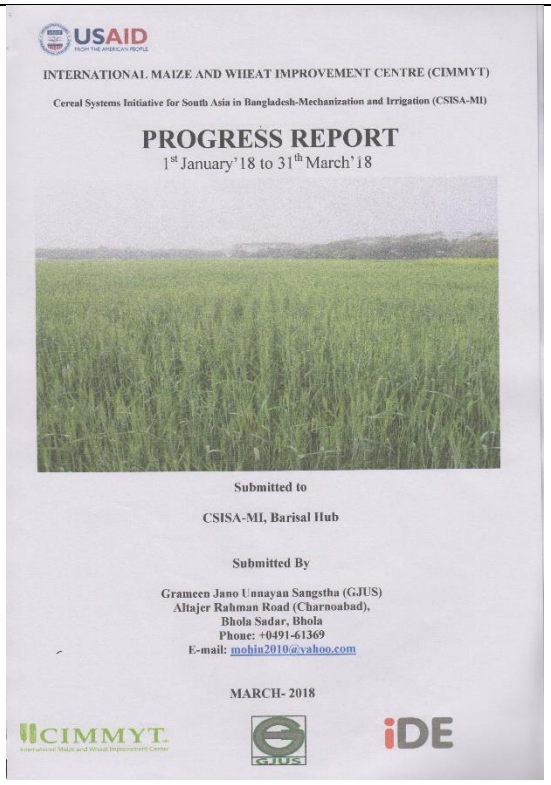

USAID

INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTRE (CIMMYT)

Cereal Systems Initiative for South Asia in Bangladesh-Mechanization and Irrigation (CSISA-MI)

PROGRESS REPORT
1st January'18 to 31th March'18

Submitted to

CSISA-MI, Barisal Hub

Submitted By

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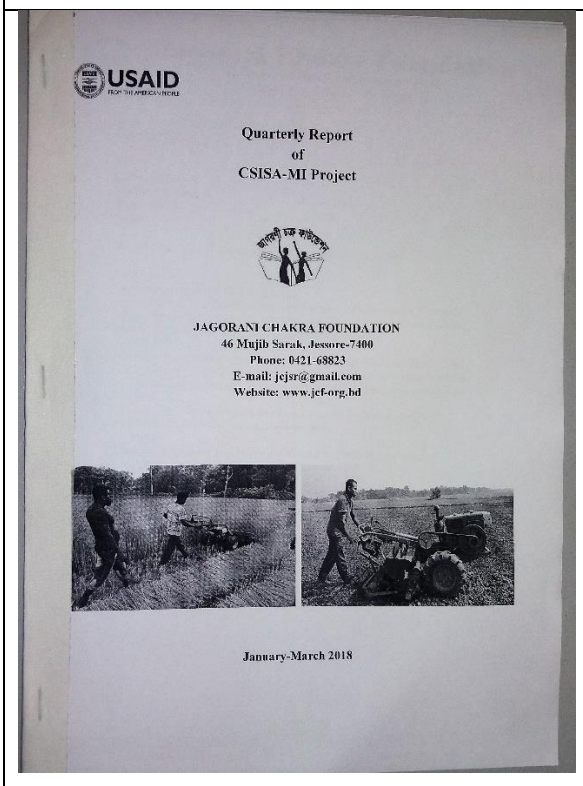
MARCH- 2018

CIMMYT GJUS iDE



USAID

Quarterly Report
of
CSISA-MI Project

JAGORANI CHAKRA FOUNDATION
46 Mujib Sarak, Jessore-7400
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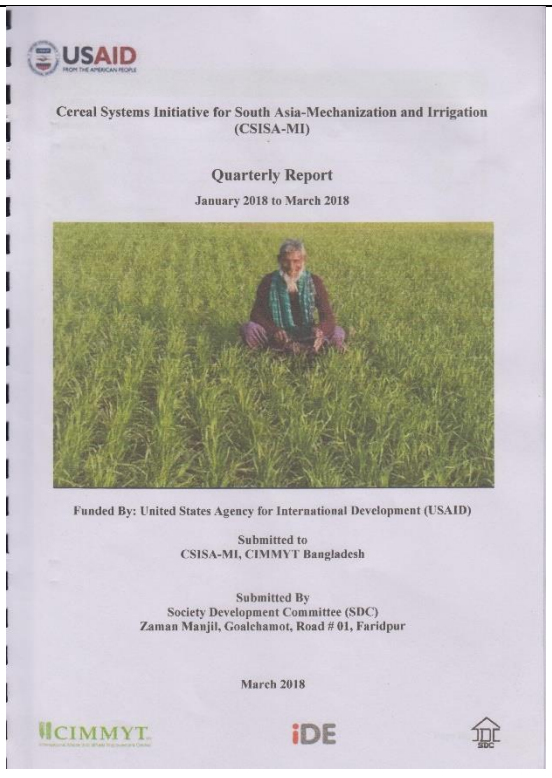
January-March 2018



USAID

Cereal Systems Initiative for South Asia-Mechanization and Irrigation (CSISA-MI)

Quarterly Report

January 2018 to March 2018

Funded By: United States Agency for International Development (USAID)

Submitted to
CSISA-MI, CIMMYT Bangladesh

Submitted By
Society Development Committee (SDC)
Zaman Manjil, Goalchamot, Road # 01, Faridpur

March 2018

CIMMYT iDE SDC

ANNEX 6: FtF Indicator Progress Report Oct'17-Sep'18

EG.3.2-1 Number of individuals who have received USG supported short-term agricultural sector productivity or food security training

Hub: All Hubs **Reporting Year:** (Oct'17-Sep'18)

Disaggregate Group	Disaggregate	Unit	Semi Annual 1 (Oct-Mar)	Semi Annual 2 (Apr-Sep)	Yearly (Oct-Sep)	Yearly Target	% of Achievement
Sex	Male	Number	6178	751	6929	9036	76.68
	Female	Number	2112	372	2484	1004	247.41
	Sub Total	**Number**	**8290**	**1123**	**9413**	**10040**	**93.75**
People in civil society	Male	Number	17	0	17	180	9.44
	Female	Number	3	0	3	20	15.00
	Sub Total	**Number**	**20**	**0**	**20**	**200**	**10.00**
People in Government	Male	Number			0	0	Target Not Set
	Female	Number			0	0	Target Not Set
	Sub Total	**Number**			**0**	**0**	**Target Not Set**
People in Private sector firm	Male	Number	411	126	537	1013	53.01
	Female	Number	7	6	13	112	11.61
	Sub Total	**Number**	**418**	**132**	**550**	**1125**	**48.89**
Producers	Male	Number	5754	625	6379	7844	81.32
	Female	Number	2102	366	2468	871	283.35
	Sub Total	**Number**	**7856**	**991**	**8847**	**8715**	**101.51**

EG.3.2-3 Number of micro, small, and medium enterprises (MSMEs), including farmers, receiving agricultural-related credit as a result of USG assistance

Hub: All Hubs **Reporting Year:** (Oct'17-Sep'18)

Disaggregate Group	Disaggregate	Unit	Semi Annual 1 (Oct-Mar)	Semi Annual 2 (Apr-Sep)	Yearly (Oct-Sep)	Yearly Target	% of Achievement
Disaggregate Group	Male	Number	55	22	77	72	106.94
	Female	Number	5	3	8	8	100.00
	Sub Total	Number	60	25	85	80	106.25
	Micro	Number	60	25	85	80	106.25
	Sub Total	Number	60	25	85	80	106.25

EG.3.2-17 Number of farmers and others who have applied new technologies or management practices as a result of USG assistance

Hub: All Hubs **Reporting Year:** (Oct'17-Sep'18)

Disaggregate Group		Disaggregate	Unit	Semi Annual 1 (Oct-Mar)	Semi Annual 2 (Apr-Sep)	Yearly (Oct-Sep)	Yearly Target	% of Achievement
Sex		Male	Number	84234	22067	106301	113367	93.77
		Female	Number	2019	329	2348	12596	18.64
		Sub Total	**Number**	**86253**	**22396**	**108649**	**125963**	**86.25**
Technology Type	AFP	Irrigation	Number	11923	308	12231	40331	30.33
	PTOS	Others	Number	70237	15395	85632	58610	146.10
	Zero-Till-Drill		Number	41	0	41	16530	0.25
	Reaper		Number	4023	6661	10684	10492	101.83
	Thresher		Number	0	32	32	0	Target Not Set
	Bed Planter		Number	29	0	29	0	Target Not Set
	Other Technology		Number	0	0	0	0	Target Not Set
	Total W/one or More Improved technology		**Number**	**86253**	**22396**	**108649**	**125963**	**86.25**
Commodity	Rice		Number	14137	5996	20133	45922	43.84
	Wheat		Number	7792	1338	9130	10350	88.21
	Pulse		Number	8846	31	8877	11215	79.16
	Maize		Number	411	46	456	3307	13.80
	Other		Number	88012	15260	103272	55170	187.19
	Sub total		**Number**	**119198**	**22670**	**141868**	**125964**	**112.63**

EG.3.2-18 Number of hectares under improved technologies or management practices as a result of USG assistance

Hub: All Hubs **Reporting Year:** (Oct'17-Sep'18)

Disaggregate Group		Disaggregate	Unit	Semi Annual 1 (Oct-Mar)	Semi Annual 2 (Apr-Sep)	Yearly (Oct-Sep)	Yearly Target	% of Achievement
Sex		Male	Hectares	41450.23	9036.17	50486.39	39166	128.90
		Female	Hectares	563.46	109.26	672.72	4352	15.46
		Sub Total	**Hectares**	**42013.69**	**9145.43**	**51159.12**	**43518**	**117.56**
Technology Type	AFP	Irrigation	Hectares	13471.11	102.00	13573.11	14428	94.07
	PTOS	Others	Hectares	26162.14	6037.60	32199.74	20276	158.81
	Zero-Till-Drill		Hectares	7.52	0.00	7.52	0	Target Not Set
	Reaper		Hectares	2369.43	3000.39	5369.83	8814	60.92
	Thresher		Hectares	0.00	5.44	5.44	0	Target Not Set
	Bed Planter		Hectares	3.47	0.00	3.47	0	Target Not Set
	Other Technology		Hectares	0.00	0.00	0.00	0	Target Not Set
	Total W/one or More Improved technology		**Hectares**	**42013.69**	**9145.43**	**51159.12**	**43518**	**117.56**
Commodity	Rice		Hectares	7696.71	2911.21	10607.91	13701	77.42
	Wheat		Hectares	1069.83	293.70	1363.53	3750	36.36
	Pulse		Hectares	1641.55	8.39	1649.93	3801	43.41
	Maize		Hectares	81.34	12.57	93.91	1272	7.38
	Other		Hectares	31524.27	5919.57	37443.84	20994	178.35
	Sub total		**Hectares**	**42013.69**	**9145.43**	**51159.12**	**43518**	**117.56**

EG.5.2-1 Number of firms receiving United States Government-funded technical assistance for improving business performance

Hub: All Hubs **Reporting Year:** (Oct'17-Sep'18)

Disaggregate Group	Disaggregate	Unit	Semi Annual 1 (Oct-Mar)	Semi Annual 2 (Apr-Sep)	Yearly (Oct-Sep)	Yearly Target	% of Achievement
Type of firm	Formal	Number	27	3	30	65	46.15
	Informal	Number	894	125	1019	800	127.38
	Sub Total	**Number**	**921**	**128**	**1049**	865	121.27
Duration	New	Number	921	128	1049	865	121.27
	Continue	Number	60	7	67	0	Target Not Set
	Sub Total	**Number**	**981**	**135**	**1116**	865	129.02