

# **SEMI-ANNUAL REPORT** (OCTOBER 2023-MARCH 2024)



**CEREAL SYSTEMS INITIATIVE FOR SOUTH ASIA-MECHANIZATION AND EXTENSION ACTIVITY** (CSISA-MEA)





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Chief of Party: Owen Duncan Calvert

**Title**: Chief of Party, Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity (CSISA–MEA)

Mobile phone: +880-1730799775

Email: o.calvert@cgiar.org

Mailing address: CIMMYT International, House 10/B. Road 53. Gulshan-2. Dhaka, 1213, Bangladesh

**Contributors**: PVL Bharathi, Zaheedul Islam Chowdhury, Jonathan Colton, Hera Lal Nath, Khandakar Shafiqul Islam, Moksedul Alam Arafat, Zakaria Hasan, Nur-A-Mahajabin Khan, Kafil Uddin, Saiful Islam, Faruk-Ul-Islam, Owen Calvert, Timothy Krupnik, Timothy Russell

Editor: Frances Hunt

Cover design: Asmaul Husna

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## **Table of Contents**

Acronyms and abbreviations	5
Executive Summary	6
Introduction	9
Area of operations	9
Activity staffing	11
Visitors to CSISA-MEA activities	12
Intermediate Result 1: Competitiveness and efficiency of domestic and private sector-led agricultural machinery manufacturing boosted	14
Developing the manufacturing capacity of small- and medium-scale agriculture-bas	sed
light engineering enterprises	14
Second stage ABLE enterprises	16
Support for ABLE enterprises	17
Facilitate business linkages between ABLE enterprises and agricultural machinery market actor	s 17
Value of sales resulting from CSISA–MEA support Supporting ABLE enterprises access services	18
ABLE Engagement for Stage 2 support	20
Promoting new business through online publicity material	20
Investments in factory layout and capital machinery	21
Facilitating the development testing and marketing of new agricultural machinery technology	21
Metal hardness testing and heat treatment	27
Technical support for Activity engineers	28
Research at Georgia Institute of Technology	30
Developing financial services for ABLE enterprises, dealers and MSPs	30
Facilitating access to finance for ABLE enterprises	30
Intermediate result 2: Enhanced institutional capacity for agricultural	22
	32
Technical skill training for ABLE company staff and management	32
ABLE enterprise training in the Zone of Influence and Bogura	33
Workforce training in machining skills Training provided to the foundry workforce by foundries	33
Providing women with training to improve their skills and working conditions	37
Zone of Resilience	
Machining skills training for ABLE enterprise staff	38
Training for ABLE enterprises provided by BRRI	38
Raising awareness of the need to protect the environment	39
Advanced technical and business-related training to ABLE enterprise management	40
Gender Equality and Social Inclusion International Women's Day	<b>44</b> 44
Intermediate Result 3: Enhance farmer access to mechanization and other crop	
production and marketing services with particular emphasis on remote and	
underserved markets	45
Agricultural machinery sales to machinery service providers	45
	3

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

Supporting MSPs to maintain and develop their agricultural machinery businesses47
Supporting machinery companies dealers and MSPs expand their business networks in the ZOI 47
Supporting machinery companies dealers and MSPs expand their business networks in the ZOR 48
Capacity building training for mechanics to strengthen aftersales service in rural areas
Rice transplanter business development activities52
Collaboration with Kellanova:53
Developing young women- and young men-owned commission agent businesses54
<b>Developing digital platforms56</b> Building the capacity of MSPs to promote their businesses through digital platforms
Communications outreach
Challenges and lessons learned
Challenges
Lessons learned
Annex 1: Detailed information about Activity implementing partners
Annex 2: Summary of SWOC analysis of 42 second-stage ABLE enterprises and areas of request for collaboration61

### List of Tables

Table 1: Activity staffing.	11
Table 2: Number of ABLE enterprises supported by CSISA-MEA since the start of the Activity in	
2019	15
Table 3: Summary of SWOC identified by second-stage ABLE enterprises.	16
Table 4: Value of sales (in USD) by ABLE enterprises facilitated by CSISA-MEA.	18
Table 5: Total value of investments made by ABLE enterprises facilitated by CSISA-MEA	21
Table 6: New agricultural mechanization technology developed by ABLE enterprises with CSISA-	
MEA support	23
Table 7: Total finance obtained by ABLE enterprises, dealers, and MSPs from FSIs, facilitated by	
CSISA–MEA.	30
Table 8: Interest rates charged on loans given to ABLE enterprises by FSIs.	31
Table 9: No. of ABLE enterprise workforce members trained	33
Table 10: Number and value of machines sold to MSPs between October 2023 and March 20244	45
Table 11: No. of machines sold, by gender	46
Table 12: No. of farmers buying agricultural machinery services disaggregated by gender	47

### List of figures

Figure 1: Maps showing location and size of ABLE SME hubs where CSISA-MEA and the	USAID
ZOI and ZOR are located	10
Figure 2: Workshop layout for Total Engineering Workshop, Bogura	22
$\partial$	

### Acronyms and abbreviations

ABLE	agriculture-based light engineering
ADO	Agriculture Development Officer
BARI	Bangladesh Agricultural Research Institute
BEIOA	Bangladesh Engineering Industry Owners Association
BISA	Borlaug Institute for South Asia
BITAC	Bangladesh Industrial Technical Assistance Center
BJRI	Bangladesh Jute Research Institute
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BSP	business service provider
CSISA–MEA	Cereal Systems Initiative in South Asia – Mechanization and Extension Activity
CIMMYT	The International Maize and Wheat Improvement Center
CNC	computer numerical control
DAE	Department of Agriculture Extension
EOI	Expression of Interest
FDMN	forcibly displaced Myanmar nationals
FSI	financial services institution
Georgia Tech	Georgia Institute of Technology
GESI	Gender Equality and Social Inclusion
GUK	Gram Unnavan Karma (Village Development Karma)
GBV	gender-based violence
iDE	International Development Enterprises
IDLC	Industrial Development Leasing Company
iDOA	Internal Data Quality Assessment
IFPRI	International Food Policy Research Institute
IR	Intermediate Result
IT	information technology
IVA	ioint venture agreement
LAN	Livestock and Nutrition Activity
MFI	micro finance institution
MEL	monitoring evaluation and learning
MDO	Machinery Development Officer
MSP	machinery service provider
NARS	National Agricultural Research Station
NBR	National Board of Revenue
NGO	non-governmental organization
OHS	Occupational Health and Safety
OMD	Officer Market Development
PAC	Practical Action Consulting
PTOS	nower tiller-operated seeder
RRF	Rural Reconstruction Foundation
SAAO	Sub Assistant Agriculture Officer
SME	small and medium enterprise
TML	The Metal (Pvt ) Limited
TSP	training service provider
US	United States
USA	United States of America
USAID	United States Agency for International Development
USD	United States dollar
VPKA	Voluntary Pariyar Kalyan Association
ZOI	Zone of Influence
ZOR	Zone of Resilience
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**Executive Summary** 



This report covers the period from October 1, 2023 to March 31, 2024.

The United States Agency for International Development (USAID) Feed the Future Bangladesh Cereal Systems Initiative for South Asia – Mechanization and Extension Activity (CSISA–MEA) operates in the Feed the Future Zone of Influence (ZOI) in south-west Bangladesh and the Feed the Future Zone of Resilience (ZOR) in the Rohingya refugee crisis-impacted Cox's Bazar region in south-east Bangladesh. It also operates in north-west Bangladesh in Bogura, a major producer of and market for agricultural machine parts and agricultural machines that are

used or made nationally including in the ZOI and ZOR.

CSISA–MEA focuses on supporting farmers to reduce costs and time spent on arduous manual labor by facilitating access to new labor-saving technology, either directly or through businesses that provide farmers with machinery services. This is done by developing the capacity of the private sector to develop, manufacture, and market innovative, climate-smart technologies and then make them available to farmers through machinery service providers (MSPs) enabling the country's farmers to mechanize their agricultural production and increase their resilience to climate change.

The core objective is to enhance agricultural resilience through the development of agriculture-based light engineering (ABLE) small and medium enterprises (SMEs) and develop a youth and gender-inclusive workforce with a special emphasis on crisis-affected areas of Bangladesh. This core objective will be achieved through three intermediate results.

## Intermediate result 1: Competitiveness and efficiency of domestic and private sector-led agricultural machinery manufacturing boosted.

During the reporting period the Activity signed agreements with 140 new partner ABLE enterprises. Through these partnerships it has facilitated training for staff and managers in metal-working and management skills, and linked them to new markets and finance through meetings with dealers, MSPs, and financial service institutes (FSIs). This brings the number of ABLE enterprises the Activity has supported since its start in October 2019 to 647. Cost-sharing agreements were also signed with 43 of the 311 ABLE enterprises the Activity supported in Year 4, bringing to 107 the number of businesses that CSISA–MEA has provided detailed support to since its start. These agreements facilitated analyses of the business needs of enterprises, which identified the main areas of collaboration needed to develop these light engineering firms. The analyses showed that areas of collaboration should include facilitating access of entrepreneurs to drawing, designing, and internet-based marketing skills, as well as to new markets through business expansion into new regions and dealerships, new machinery manufacturing technology, and credit facilities for the finance of business operations.

ABLE enterprises partnering with the Activity made sales in the six months of this reporting period worth a total of USD 2,013,785. These were achieved in part as a result of new markets accessed through marketing events attended by lead firms, dealers, and MSPs, during which ABLE enterprise partners were supported to display their machines and parts by the Activity. ABLE enterprises were also able to gain access to markets through marketing materials developed with Activity support and uploaded on to social media platforms. Meetings facilitated by CSISA–MEA of ABLE enterprises, dealers, and MSPs with FSIs resulted in the provision of loans worth USD 819,415.

Technical support provided by CSISA–MEA, particularly when in collaboration with Bangladesh Agricultural Research Institute (BARI), resulted in the development and marketing of 25 new types of agricultural machine since the start of the Activity. One of the most successful of these is the onion blower that pulls air through bulk-stored onions, reducing storage losses caused by fungal diseases and

dehydration. ABLE enterprises have already sold 80 of these machines since marketing began in January 2024.

## Intermediate result 2: Institutional capacity for agricultural mechanization through the development of a skilled and youth workforce enhanced.

Between October 2023 and March 2024, 170 workforce staff, of which 52 percent were youth under 30 years and 12 percent were women, were provided with training in metal-working skills. This brings the total number trained in metal-working skills since CSISA–MEA's start to 2,399. Of those trained in this reporting period, 145 received training in machining skills and 80 in foundry skills.

Training was provided by Gram Unnayan Karma (GUK) in Bogura and Rural Reconstruction Foundation (RRF) in Jashore and Kushtia Engineering Works in Faridpur/Kushtia. Bangladesh Industrial Technical Assistance Center (BITAC), a Ministry of Industry institution, provided training in both the ZOI and ZOR. These training service providers (TSPs) conducted training at leading ABLE workshops and foundries where practical sessions were given and the experience and skills of ABLE enterprise staff were accessed. The TSPs also utilized specialists from universities, such as BUET and Jashore University of Science and Technology (JUST). All training included sessions on gender equality and social inclusion (GESI) and, for the first time, the awareness of climate change and environmental issues.

Specialist training was given to business managers in the use of software for inventory management, in training in engineering design and drawing, and the use of a welding simulator produced by Lincoln Electric, a USA company that produces welding equipment.

Collaboration with the Bangladesh Rice Research Institute (BRRI)-implemented SFMRA project resulted in the training by BRRI staff of 56 staff from five ZOR ABLE enterprises in the manufacture of the BRRI-designed rice thresher.

The GESI training provided in Year 4 of the Activity is now beginning to produce positive impacts on the working conditions for women. To date, 36 ABLE enterprises have made infrastructure changes such as providing toilets and rest areas for women, and many are now employing women in skilled work such as lathe and metal drilling.

## Intermediate result 3: Access for farmers to agricultural machinery, production, and marketing services improved.

Marketing events facilitated by the Activity have in part resulted in the sale to 218 CSISA–MEAsupported MSPs of machinery and spare parts worth USD 1,022,823. Combine harvester (59 units) sales accounted for 84.5% of these funds spent. Eight percent of the machines sold were purchased by women.

During this reporting period, 37,235 farmers bought machinery services worth a total of USD 933,360 from 1,818 MSPs. Since the start of the Activity, of the 226,957 farmers who bought agricultural machinery services from MSPs, 11 percent were women. In this reporting period, of those buying mechanization services, 2 percent were women and 12 percent were youth under 30 years.

Experience-sharing workshops, during which market information is shared between dealers, MSPs and commission agents, proved an effective method of supporting MSPs to expand their business networks and provide more farmers with machinery services. These events also supported lead firms and dealers to find new markets. To complement the workshops and machinery demonstrations, the Activity is exploring the possibility of using smartphone applications ('apps') to provide information about machinery and how to obtain services from MSPs.

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CSISA–MEA continues to facilitate lead firms to train MSPs, and mechanics to operate and maintain the machines they sell and to conduct pre-season maintenance campaigns. To support this process, the Activity facilitates, the development of a combine harvester driving simulator in partnership with two lead firms, Abedin Engineering and Metal Agritech This software is being developed by two IT companies, Battery Low Interactive Ltd. and TechnoMagic Ltd., and will support new MSPs to learn how to drive and operate combine harvesters before the harvesting season starts.

Increasing the availability of rice transplanter services continues to be a key activity of CSISA–MEA. A major part of achieving this is the support it provides to the Government of Bangladesh's Department of Agriculture Extension (DAE) and lead firms to demonstrate the machines, as well as to train farmers and MSPs in how to raise seedlings for use with rice transplanters.

#### Visitors

A USAID team led by USAID Asia Deputy Assistant Administrator Anjali Kaur visited SMR Agro Engineering, Kanaitala, Jashore on October 22, 2023.

On February 4, 2024, representatives from USAID-Bangladesh and the Government of Bangladesh, Ministry of Finance visited SMR Agro Engineering to observe the manufacture of agricultural machinery and spare parts, and Vatpara, Jashore Sadar, to see rice transplanters planting out rice seedlings.

Sarah Michelle Fernandes, Communications Manager, CIMMYT HQ, Mexico and Nur-A-Mahajabin Khan, Communications Manager, CIMMYT Bangladesh visited Jashore on February 29, 2024 to meet MSPs providing farmers with rice transplanter and combine harvester services. They also visited Activity partner SMR Agro Engineering to meet the owner and workshop staff.

#### Challenges and lessons learnt

**Challenges**. Foreign currency restrictions, inflation, the declining value of the Bangladesh *taka*, and the general elections in January 2024 were the main challenges for the Activity.

**Lessons learned**. The primary lessons learned include the value of linking ABLE enterprises with markets through meetings with dealers and MSPs, the value of facilitating public–private sector collaboration for the development and dissemination of new agricultural machinery technology, the superior approach of delivering specific, targeted (rather than all) skills in training programs, the ability to change the light engineering sector in the ZOR through intense focus in the region, and the value of GESI training in improving working conditions for women.

#### Introduction

This semi-annual report covers the six months from October 1, 2023 to March 31, 2024.

The USAID Feed the Future Bangladesh Cereal Systems Initiatives for South Asia – Mechanization Extension Activity (CSISA–MEA) is a five-year development Activity, which started in October 2019. It is implemented by The International Maize and Wheat Improvement Center (CIMMYT) in partnership with International Development Enterprises (iDE) and Georgia Institute of Technology (Georgia Tech). Information about the Activity's partners is provided in Annex 1.

CSISA–MEA focuses on supporting farmers to reduce costs and time spent on arduous manual labor by facilitating access to new labor-saving technology, either directly or through businesses that provide farmers with machinery services. This is accomplished by developing the capacity of the private sector to develop, manufacture and market innovative, climate-smart technologies and then providing them to farmers through MSPs. This enables farmers to mechanize their agricultural production and increase their resilience to climate change.

Therefore, the core objective of the Activity is to enhance agricultural resilience through the development of agriculture-based light engineering (ABLE) enterprises and of a youth and gender-inclusive workforce, with a special focus on the Rohingya refugee crisis-affected areas of Cox's Bazar and Bandarban districts. This will be achieved through three intermediate results:

- **Intermediate result 1**: Boost the competitiveness and efficiency of domestic and private sector-led agricultural machinery manufacturing.
- **Intermediate result 2**: Enhance the institutional capacity for agricultural mechanization through the development of a skilled and youth workforce.
- **Intermediate result 3**: Improve access for farmers to agricultural machinery, production and marketing services.

By achieving these results, the Activity will, by the end of its term in 2024, have enabled at least 200,000 farmers to gain access to new agricultural mechanization technology, encouraged agriculture-related businesses to make at least USD 7.7 million worth of new investments, facilitated the provision of at least USD 3.0 million worth of finance to actors along the agricultural mechanization value chain, and raised the skills of at least 2,000 members of the country's light engineering workforce.

**Private sector engagement** is the principal means used to deliver these results. To address constraints to the smooth functioning of agricultural machinery market systems, the Activity engages in partnerships between actors in the agricultural machinery value chain. It does not engage directly in interventions but rather assumes a market facilitating role by funding activities, facilitating linkages to other organizations such as the Department of Agriculture Extension (DAE) and national research institutions and universities, and by the provision of technical expertise. Interventions implemented by the private sector with CSISA–MEA support should be innovative, new and readily scalable. Costs and activities are rationally shared between partners and, wherever possible, confined to the provision of technical support. As such, the Activity takes a market systems approach, building systemic change that will continue even after the Activity ends.

#### Area of operations

CSISA–MEA maintains field offices in locations across Bangladesh, crucial to USAID's activities and the light engineering and agricultural machinery manufacturing industry.

*Khulna and Dhaka divisions (greater Jashore and greater Faridpur regions)*. These are the locations of the main light engineering hubs in the Feed the Future Zone of Interest (ZOI).

*Bogura district*. This is the main light engineering center outside of Dhaka and is a major producer of and market for agricultural machine parts and agricultural machines that are used or made nationally including in the ZOI and ZOR.

*Cox's Bazar and Bandarban districts*. These districts are close to the Rohingya refugee camps and make up the USAID Zone of Resilience (ZOR). Being remote from the major commercial centers in northern and central Bangladesh, they have not attracted significant commercial interest in terms of the manufacture and marketing of agricultural machinery.



\* FDMN - forcibly displaced Myanmar nationals

Figure 1: Maps showing location and size of ABLE SME hubs where CSISA-MEA and the USAID ZOI and ZOR are located

### Activity staffing

CSISA–MEA currently employs 74 staff (CIMMYT 50 plus iDE 24); 19 are based in the Dhaka offices, 53 in field offices, and two are home-based report-writing and editing consultants.

Georgia Institute of Technology (Georgia Tech) provides Professor Dr. Jonathan Colton as technical lead on the technical and engineering aspects of the Activity. Prof. Colton supervises Georgia Tech postgraduate engineering students who design machinery and conduct studies for the Activity as part of their thesis research.

The largest group of technical experts employed by the Activity are 15 engineers (Machinery Development Officers, or MDOs), followed by 12 marketing experts (Officers, Market Development, or OMDs) and 10 agronomists (Agriculture Development Officers, or ADOs).

### Table I: Activity staffing.

СІММҮТ	No. of posts	iDE	No. of posts				
Dhaka Office							
Project Leader*	1	Team Leader	1				
Project Manager (currently vacant)	1	Project Manager	1				
Training Manager*	1	Senior Technical Specialist (currently vacant)	1				
Training Assistant	1	Expert – MERL	1				
Locally recruited consultant – training <sup>@</sup>	1	Technical Specialist	2				
Market System Development Coordinator	1	Technology Advisor	1				
Project Assistant	1	Technology Advisor	1				
Communications Manager <sup>@</sup>	1	Program Assistant	1				
Communication Analyst	1						
MEL Manager <sup>@</sup>	1						
M&E Officer <sup>@</sup>	1						
Total Dhaka office	11	Total Dhaka office	8				
Consultant – report writing *	1						
Consultant – editor*	1						
Field Offices (Jashore, Fa	ridpur, C	ox's Bazar and Bogura)	-				
Field Team Manager <sup>@</sup>	4	Field Coordinator	4				
Agriculture Development Officer	10	Officer Market Development	12				
Machinery Development Officer (engineer)	13						
Machinery Development Assistant (diploma-level engineers)	2						
MEL Officer <sup>@</sup>	3						
Locally recruited consultant – MEL Officer	1						
Administration & Finance Officer <sup>@</sup>	4						
Total field offices	37	Total field offices	16				
Total employed by CIMMYT	50	Total employed by iDE	24				

\*internationally recruited staff.

<sup>@</sup>position shared with other CIMMYT projects.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

Zamara Chisti joined the Activity in January 2024 as Project Assistant.

Administration and financial management support for the Activity is provided by a pool of staff, which also supports all the programs implemented by CIMMYT and iDE.

#### Visitors to CSISA–MEA activities

#### USAID visit CSISA-MEA-facilitated activities at SMR Agro Engineering, Kanaitala, Jashore

A USAID team led by USAID Asia Deputy Assistant Administrator Anjali Kaur visited SMR Agro Engineering, Kanaitala, Jashore on October 22, 2023. They were shown the foundry and workshop by the owner, Mr. S. K. Mahfuzur Rahman. He described how CSISA-MEA facilitated his access to finance, engineering and marketing support, enabling him to develop a modern workshop that manufactures quality agricultural machinery and spare parts. Delegates also viewed combine harvesters, reapers, rice transplanters, PTOS, axial flow pumps and fodder choppers, and met MSPs who use these machines to provide farmers with labor- and cost-saving services.



USAID delegates meeting the SMR Agro Engineering owner and workforce. Jashore, October 22, 2023. Photo: Md. Khalekuzzaman, OMD, Jashore

#### USAID and senior Government of Bangladesh officials visit CSISA–MEA-facilitated machinery manufacturing and machinery service provision activities,



USAID and senior government officials visiting MSPs rice transplanter service provision activities in Vatpara, Jashore Sadar. February 4, 2024. Photo: A. N. M. Arifur Rahman MDO, Jashore

## Vatpara, Jashore

On February 4, 2024, representatives from USAID Bangladesh and the Government of Bangladesh, Ministry of Finance and Ministry of Agriculture visited Jashore district to observe the manufacture of agricultural machinery and spare parts at ABLE enterprise SMR Agro Engineering, and to meet rice transplanters MSPs to observe a demonstration of the machine, planting rice. At SMR Engineering, the visitors viewed solar dryers, mango juice extractors, spice grinders, and maize grinders, some of the latest machinery to have been developed with support facilitated by CSISA–MEA. The USAID team was led by Mr. Muhammad Khan, Director, Economic Growth Office, and the government representatives included Mr. Tofazzal Hossain, Joint Secretary, America Desk, ERD, Ministry of Finance and Ms. Binita Rani, Deputy Secretary, Ministry of Agriculture.

#### CIMMYT Communications team from HQ, Mexico and Dhaka Bangladesh visit CIMMYT Jashore Field Office

To collect information about CSISA-MEA activities for communications material Sarah Fernandes, Communications Manager, CIMMYT HQ, Mexico, and Nur-A-Mahajabin Khan, Communications Manager, CIMMYT Bangladesh met MSPs who, as a result of their collaboration with CSISA– MEA, are providing farmers with rice transplanter and combine harvester services. They also visited SMR Agro Engineering and met the business owner and workshop staff.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Sarah Michelle Fernandes (seated, center) interviewing farmers who have access to rice transplanting and combine harvester services at competitive rates as a result of CSISA–MEA support. Jashore Sadar. February 29, 2024 Photo: Ykrar Liton, CSISA graduate trainee and MSP, Jashore

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The following sections of this report describe the progress made on implementing activities outlined in the USAID-approved work plan. Activities are presented under each of the three Intermediate Results.

## Intermediate Result 1: Competitiveness and efficiency of domestic and private sector-led agricultural machinery manufacturing boosted

The rapidly rising cost, and at times scarcity, of farm labor has started to drive farmers to seek machines that will reduce costs, provide a substitute for labor when it is not readily available, and reduce the drudgery of planting and harvesting. Importantly, allowing crops to be planted and harvested rapidly and on time helps farmers avoid adverse weather events at planting and harvesting times. In some cases, it also allows them to add an extra crop to their cropping cycle, providing an additional harvest and increasing their income and the provision of food to the population thereby increasing food security. CSISA–MEA therefore focuses on supporting farmers to reduce costs and increase productivity by facilitating access to new labor-saving technology, either directly or through businesses which provide farmers with machinery services.

Anecdotal evidence from farmers suggests that obtaining imported spare parts for their machines can take many weeks compared with just days when manufactured locally. This means that machines needed by farmers for planting or harvesting sometimes lie idle for weeks, waiting to be fixed. In 2021, a study conducted by CSISA–MEA found that the current market size for spare parts for five agricultural machines (power tiller, combine harvester, power tiller-operated seeder, rice transplanter, thresher) was USD 262 million, of which 84 percent was imported. Clearly, if the ABLE sub-sector can compete with imported machines and parts in both price and quality, then these enterprises would be able to access a new and very large market.

When the Activity began in 2019, this ambition was constrained by low levels of workforce skill and the use of old and inefficient manufacturing equipment. Since then, significant progress has been made through the training of ABLE enterprise workforce and managers and by encouraging enterprises to adopt new manufacturing technology and to construct environmentally- and worker-friendly workshops. This is leading to the manufacture of higher quality machines and parts and to higher levels of worker productivity, thereby improving the ABLE sector's ability to compete with imported machines and parts. However, there is still considerable work to be done to raise the sector to a standard that can compete with companies of other nations on international markets.

Therefore, a major focus of the Activity is to develop the capacity of the ABLE sector to manufacture and market agricultural machinery and spare parts.

## Developing the manufacturing capacity of small- and medium-scale agriculture-based light engineering enterprises

Two key lessons learned in the first years of the Activity is that it is difficult to provide all ABLE enterprises with the detailed support they needed, and that not all of them wanted this level of support. As a result, the support to ABLE enterprises has been divided into two stages.

During the first stage, technical assistance focused on raising the knowledge and skills of the workforce. In Stage 1, ABLE enterprises start by signing a consent letter with CSISA–MEA, confirming their commitment to receiving general technical support.

In the Stage II, those ABLE enterprises showing a willingness and capacity to invest in changes in manufacturing equipment and methods, sign a cost-sharing Joint Venture Agreement (JVA) with the Activity, which supports them by:

- 1. conducting a detailed analysis of selected ABLE enterprises' capacity and commitment,
- 2. preparing a program of support that will stimulate the growth of the enterprise,

- 3. providing technical assistance for the identification and implementation of appropriate investments in new equipment, improved factory layout, new markets and access to finance, and
- 4. providing training in key business skills such as inventory control, keeping financial records, customer relations, marketing, and human resource management.

#### *First-stage ABLE enterprises*

Since the beginning of the Activity, CSISA–MEA has supported 647 ABLE enterprises to develop and expand their businesses. This has been achieved through the provision of training for staff, technical advice, and access to finance. In this six-month reporting period, out of 141 who responded to a call for Expressions of Interest (EOIs) published in national and regional newspapers and other media, 140 ABLE enterprises joined the program.

# Table 2: Number of ABLE enterprises supported by CSISA–MEA since the start of the Activity in 2019.

		Activity year				
Field offices	2019–20	2020–21	2021–22	2022–23	Oct 23– Mar 24	Total
Bogura	22	29	41	55	40	187
Jashore	15	13	24	87	35	174
Faridpur/Kustia		5	5	60	25	95
Cox's Bazar			42	109	40	191
Total	37	47	112	311	140	647

During the reporting year, CSISA–MEA field office teams organized seven kickoff meetings (two in Bogura, two in Faridpur/Kushtia, and one in Jashore in the ZOI, and two in the ZOR) to present to the selected ABLE enterprises the activities designed to support them in expanding their business. The meetings also provide the enterprises an opportunity to share the challenges they face and their ideas for strengthening the light engineering sector.



Twenty-four new ABLE enterprise partners attended a kick-off meeting facilitated by CSISA–MEA, orientated by Activity staff and the GUK Bogura team lead, Dr. Mahbub Alam (center). Bogura, January 24, 2024.

Photo: Md. Rokonnuzzaman Rokon, MDO, Bogura

#### Second stage ABLE enterprises

Of the 311 ABLE enterprises that partnered with the Activity in Y4, in this reporting period 43 of them (nine from Bogura, 12 from Jashore, 10 from Faridpur/Kushtia in the ZOI, and 10 from the ZOR) have signed cost-sharing agreements with CSISA–MEA to support them develop their businesses. This is in addition to the 53 who signed agreements with the Activity in 2023 and the 11 who signed agreements in 2022, and brings the total second-stage ABLE enterprises to 107.

As part of the agreement development process, each of these 43 enterprises met with CSISA–MEA staff to identify what they needed to develop as a business. To support the process, the Activity used the Strengths, Weaknesses, Opportunities and Challenges (SWOC) participatory tool. Although not a sample survey conducted by independent enumerators, the data collected from these exercises provided an insight into the wide range of issues impacting the ABLE sector as a whole. A number of issues were repeatedly raised, and these are presented in Annex 2 and summarized below.

Table 3: Summary	of SWOC	identified by	second-stage	<b>ABLE</b> enter	rprises.
					P

Strengths	Weaknesses
ABLE enterprises have:	There is a lack of:
• an experienced workforce, skilled in	• knowledge or access to metal testing and
what they do now	heat treatment facilities
<ul> <li>capital machinery</li> </ul>	<ul> <li>drawing and design skills</li> </ul>
• a market network and good reputation	<ul> <li>digital online marketing skills</li> </ul>
<ul> <li>their own workshop/foundry</li> </ul>	• market links with dealers outside current
• drive and eagerness to invest in and	zones of influence
install new machinery and techniques	• workshop skills and machinery for new
	parts and machines
	• working capital – lack good credit
	facilities that allow them to maintain
	operations while waiting for income
	<ul> <li>management skills</li> </ul>
Opportunities	Challenges
Thoro is:	
There is.	These Include:
• huge market demand and low competition,	<ul> <li>Establishing links with markets and providing</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through internet advertising</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by competitors</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through internet advertising</li> <li>potential to gain quality improvements</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by competitors</li> <li>competition with low-cost, low quality</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through internet advertising</li> <li>potential to gain quality improvements through metal testing and heat treatment</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by competitors</li> <li>competition with low-cost, low quality imported parts</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through internet advertising</li> <li>potential to gain quality improvements through metal testing and heat treatment</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by competitors</li> <li>competition with low-cost, low quality imported parts</li> <li>high staff turnover</li> </ul>
<ul> <li>huge market demand and low competition, particularly for the new machines and parts they want to make</li> <li>potential for market expansion by marketing in more distant districts</li> <li>huge potential for market access through internet advertising</li> <li>potential to gain quality improvements through metal testing and heat treatment</li> </ul>	<ul> <li>Establishing links with markets and providing after-sales services in remote districts</li> <li>high and fluctuating cost of raw material</li> <li>accessing working capital – credit facilities</li> <li>recovering loans</li> <li>illicit copying of parts and machines by competitors</li> <li>competition with low-cost, low quality imported parts</li> <li>high staff turnover</li> <li>accessing testing facilities</li> </ul>

From this, the main required areas of collaboration identified were:

- online marketing skills
- drawing and design skills
- linkages with dealers and in some cases lead firms and DAE
- dice (dies)- and pattern-making skills
- access to heat treatment and testing services
- skills in manufacturing parts, particularly those that are new to the enterprise
- capital machinery purchase and technical advice.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

Interestingly, lack of access to finance to purchase machinery or make infrastructure investments did not appear as a major constraint, although difficulties with accessing working capital were frequently raised. This was despite ABLE enterprises often quoting as a strength good relationships with and easy access to banks and MFIs.

#### Support for ABLE enterprises

#### Facilitate business linkages between ABLE enterprises and agricultural machinery market actors

The SWOC exercise revealed that ABLE enterprises face difficulty linking with new customers outside their current market network. Indeed, the Activity's experience from previous years proved that facilitating meetings which connect the enterprises with principal customers (dealers, lead firms, MSPs) is a very effective way of expanding their market networks. In response to the SWOC results therefore, the Activity organized 12 meetings between individual ABLE enterprises and dealers, two workshops where the enterprises displayed their products to dealers, lead firms and MSPs, and two exchange visits where groups of dealers in the ZOI (Khulna and Jashore) and the ZOR (Cox's Bazar) visited machinery workshops and foundries in Bogura.



An ABLE enterprise owner delivering a sales pitch at a dealer-ABLE enterprise linkage workshop, facilitated by CSISA-MEA to support partners to extend their business network. Jashore, January 23, 2024. Photo: Rowshon Anis, OMD, Jashore

Dealers from the ZOR visiting Rahmania engineering workshop, Bogura. February 2, 2024. Photo: Fazlul Karim, MDO, Bogura

The Activity continues the work initiated in previous years to support ABLE enterprises to make parts for machines which are either imported or manufactured by lead firms. During this reporting period Ripon Engineering Workshop, Jhenaidah, Mukti Engineering Workshop, and Mim Engineering Workshop, from Chuadanga delivered fodder choppers, maize shellers, and an auto GI (galvanized iron) net machine (a machine that makes chain-link fence) to lead firms Janata Engineering, Chuadanga, and Khan Engineering Workshop, Jashore. They also delivered 25 combine harvester sprockets to Abedin Equipment Ltd (part of the Group QA). The total value of the machines and spare parts was USD 21,960.

Agreements between lead firms and ABLE enterprises in Bogura, Faridpur/Kushtia and the ZOR have been developed and are due to be signed in the second half of Year 5.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

#### Value of sales resulting from CSISA–MEA support

In Year 4 of the Activity, meetings which facilitated business links between dealers and ABLE enterprises in the ZOI and the ZOR resulted in sales worth USD 2,305,174. In the first six months of Year 5, sales were USD 2,013,785 bringing the total sales facilitated by CSISA–MEA since the start of Activity to USD 5,288,330.

Field offices	2019–20	2020–21	2021–22	2022–23	Oct 23– Mar 24	Total
Bogura	-	-	508,554	1,062,397	488,168	2,059,119
Cox's Bazar	-	-	-	411,130	480,076	891,206
Faridpur	-	-	-	680,026	402,238	1,082,264
Jashore		-	460,817	151,621	643,303	1,255,741
Total	-	-	969,371	2,305,174	2,013,785	5,288,330

### Table 4: Value of sales (in USD) by ABLE enterprises facilitated by CSISA-MEA.

Supporting ABLE enterprises access services

#### Access to quality raw materials

A study commissioned by the Activity from consulting company Inspira in 2022 showed that due to the high import taxes and duties on imported metals, the bulk of metal raw materials used by the light engineering industry in Bangladesh is obtained from ship-breaking operations in Chattogram. A major problem with this is that at the point of purchase the composition of this metal is unknown, and this can lead to the manufacture of low quality parts. The report also showed that if ABLE enterprises are able to buy metals directly from Chattogram ship-breaking companies in large volumes, then they would negotiate better prices and obtain higher quality metals than those supplied by intermediate metal dealers.

In response to this study, the CSISA–MEA Jashore team identified six scrap metal suppliers and organized a meeting between them and ABLE enterprises in Jashore. Similarly, in the ZOR eight ABLE enterprises from Cox's Bazar district visited scrap metal suppliers in Chattogram and established good business links with them. In both cases, it is anticipated that this will result in the direct bulk supply of metals of known composition to these enterprises at competitive prices.



Cox's Bazar ABLE enterprises visiting Chattogram scrap metal dealers to negotiate a supply of metals directly to the enterprises from the dealers, facilitated by the Activity. Chattogram, March 21, 2024.

Photo: Md. Nahidul Islam, OMD, Cox's Bazar

### Taxation study and policy level workshops

As mentioned above, the current Government of Bangladesh taxation policy appears to make it cheaper to import finished machines than to import metal and make the same machines in Bangladesh. To determine if this assessment is correct and whether there are other taxation policy issues that could be modified to support the light engineering sector, the Activity has commissioned a study of taxation issues impacting the functioning of the agricultural mechanization market system. This study will be completed by July 2024.

#### Establishing specialist manufacturing service centers

In Year 4, CSISA–MEA facilitated a visit for 10 ABLE enterprises from Jashore and 4 from Kushtia to BITAC and Haque Engineering in Dhaka to observe and negotiate use of the metal heat treatment, hardness, and chemical composition testing facilities, and to observe computer numerical control (CNC) milling and lathe machines. The visit provided a clear understanding of the potential of the machines and facilities to improve the quality of the machines and parts they produce.

Because BITAC and Haque Engineering are quite remote from the main light engineering hubs in Bogura and Jashore, the Activity has sought out smaller light engineering businesses in the hubs that either have these facilities and CNC equipment or would be interested in obtaining and developing them. This would allow the many small enterprises in these hubs who would find it difficult to justify investment in this equipment to gain access to metal testing and heat treatment facilities and CNC equipment. SMR Agro in Jashore, GSM Engineering in Kushtia, and Reza Engineers in Bogura have been identified as businesses who either already have these facilities or are interested in investing in them, and would be interested in offering these services to other ABLE enterprises. Through JVAs signed with these three enterprises, the Activity will support them to establish services to manufacture molds using induction furnaces, and to provide laser welding, laser cutting, plasma cutting, CNC lathe, and laser printing services. Initial meetings between ABLE enterprises in Faridpur, Kustia and Jashore with GSM Engineering have been conducted.

# Strengthening local branches of Bangladesh Engineering Industry Owners Association (BEIOA) in Jashore and Kushtia

During meetings with the Jashore and Kushtia branches of BEIOA it was agreed that the Activity would support the Association to:

- 1. hire a liaison officer
- 2. conduct visits for members to meet metal dealers
- 3. hold a regional machinery fair to enable members to display and market the parts and machines they produce.
- 4. hold upazila-level meetings of association members
- 5. hold bi-monthly coordination meetings.

### **ABLE Engagement for Stage 2 support**

#### Promoting new business through online publicity material

Following training provided in Year 4 by the online media marketing company SemiColon 10, ABLE enterprises from Bogura have begun selling all of their products on social media platforms, and using high-quality packaging and leaflets.



Examples of the publicity materials produced by ABLE enterprises with CSISA–MEA support. (*Left*): Al-Medina Metal Works; (*right*) Sarker Agro Engineering & Multiple Works. Photo: Rokonuzzaman Rokon, ODM, Bogura

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

#### Investments in factory layout and capital machinery

Modern capital machinery, factory designs and machinery layout, and business management methods make it much easier and faster to manufacture quality spare parts or machines, thereby improving business productivity and competitiveness with imported machines and parts. To support and motivate partner ABLE enterprises to access these machinery and facilities, in Year 3 CSISA–MEA organized trips to factories in Bangladesh, and in Year 4 to factories in India, enabling the visitors to see for themselves the advantages of investing in modern factory layouts, management systems, and machinery. For those interested in making these investments, the Activity organized meetings with suppliers of capital machinery, facilitated the design of new factory premises, and provided training in business and human resource management. It has also facilitated access to finance for those wanting to buy new machinery and factory premises and to training in operating the new machines.

In this reporting period, this has resulted in investments by ABLE enterprises partnering with CSISA–MEA of USD 861,250, much of which was financed by loans facilitated by the Activity from financial service institutions (FSIs).

## Table 5: Total value of investments made by ABLE enterprises facilitated by CSISA-MEA.

		Activity year				
	2019–20	2020–21	2021–22	2022–23	Oct 23– Mar 24	Total
Amount (USD)	NA	558,506	1,095,213	3,528,351	861,250	6,043,320
No. of ABLE enterprises	NA	13	36	43	16	108

### Climate-smart factories

### Improving production efficiency through improved factory design

With guidance from Prof. Jonathan Colton of Georgia Tech, in 2023 the Activity engaged Bangla Bari architects to develop factory designs for 16 ABLE enterprises. These include a number of innovative features:

- improved wall insulation, natural lighting and natural ventilation to reduce energy requirements
- ergonomically designed factory layouts to improve the efficiency and safety of operating machinery
- staff-friendly features such as separate restrooms for women and men.

M/S L. Krishi Parts and Engineering, Jhenaidah was one the enterprises to complete their new factory building during this reporting period. This is a modification of an existing building, involving increasing the wall height (and hence roof height) to accommodate larger equipment, installing transparent panels in the roof to admit natural lighting and reduce electricity usage, and adding more ventilation to reduce temperatures within the building and allow the discharge of exhaust fumes.

Also in this reporting period, the Activity supported Tota Engineering in Bogura to prepare a plan for a new factory, with a focus on improving Occupational Health and Safety (OHS) standards and providing safe drinking water facilities for workers.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Figure 2: Workshop layout for Total Engineering Workshop, Bogura

### Installation of solar panels

In 2023, the Activity engaged Solar EPC Ltd. to study 12 ABLE enterprises who expressed an interest in installing roof-top solar panel systems. Solar EPC provided studies of the potential amount of solar energy available at each factory, the number of panels required, the necessary electrical systems, and the cost of installation. In some cases, new stronger roofs will have to be built to support the panels. To date, three Bogura-based enterprises have installed solar panels.

### Facilitating the development, testing and marketing of new agricultural machinery technology

Over the last year, collaboration between ABLE enterprises and Activity engineers and marketing specialists resulted in the development and marketing of a diverse range of machines (see table below). All are relatively simple and made in response to a market opportunity that has arisen from demands made by dealers, MSPs and farmers. Many have been made from machines designed by BARI or BRRI, and as a result many have been further developed and manufactured by ABLE enterprises with technical support from BARI or BRRI, facilitated by CSISA–MEA staff.

Table 6: New agricultural mechanization technology developed by ABL	E enterprises
with CSISA–MEA support.	

Operation	Machine	Collaborator	# ABLE enterprise
Land	mini power tiller	BARI	Jashore 6, Faridpur 3, Bogura 2, ZOR 1
preparation	farmyard manure crusher		Faridpur 2 Bogura 2
	manual maize planter		Jashore 1 ZOR 1
Sowing/planting	onion transplanter	BARI	Jashore 1
	garlic clove planter	BARI	Jashore 1
	rice seed tray sower	BRRI	Faridpur 1
Waading	line crop weed and earthing up		Jashore 1, Faridpur 3 Bogura 2, ZOR 1
weeding	mung bean weeder		Jashore 1 Faridpur 2
	onion stem cutter	GUK–SEP, PKSF	Bogura 2
TT /	jute decorticator	BARI	Jashore 1, Faridpur 2 Bogura 2
Harvesting	groundnut pod stripper		Faridpur 1
	rice head feed thresher	BARI	Jashore 2 Bogura 1, ZOR 1
	fruit picker	BARI	ZOR 1
	mung bean decorticator	BARI	Jashore 1 Bogura 1
	fodder & grain chopper/crusher		Jashore 28, Faridpur 8 Bogura 2, ZOR 2
	livestock feed pellet maker		Jashore 2 Bogura 1
	spice grader		Jashore 3
	mustard grader		Faridpur 1 Bogura 2, ZOR 1
Crop processing	potato grader	BARI	Jashore 1, Faridpur 1 Bogura 1
	onion grader	GUK–SEP, PKSF, BWDB	Bogura 2
	solar food dryer		Jashore 1, Faridpur1 Bogura 1, ZOR 1
	mango juice extractor		Jashore 1
	sugar cane juice extractor		Jashore 1
	Candy floss maker		Jashore 2
Crop storage	onion blower	BARI	Faridpur 6

*Machinery under development in collaborations between BARI and ABLE enterprises* The Activity provides funding for the development of new machinery in collaboration between BARI

and local manufacturers (as sustainable public private engagement) facilitated by CSISA-MEA.



Dr. Arshadul Haque (in the white cap), Senior Scientific Officer, BARI, advising Mawa Engineering Workshop, on how to improve the mung bean dehuller, developed jointly by BARI and Mawa Engineering with CSISA–MEA support. Jhenaidah, Jashore. March 20, 2024. Photo: A. N. M. Arifur Rahman, MDO, Jashore

#### *Jute fiber extracting machine (Aashkol)*

The Activity facilitated partnerships between BARI, RK Metal, and Kamal Machine Tools to further improve upon the original design and to manufacture and market the Aashkol jute fiber machine. During the jute harvesting season in August 2023, 25 Aashkol machines were sold.

#### Onion seedling and garlic clove planters

Prototype garlic clove planting machines developed by the Activity in 2022 and 2023 are currently being further tested and modified in a partnership between BARI and Mayer Doa in Bogura, Janata Engineering in Chuadanga, and RK Metal in Faridpur. Prototypes of onion seedling planters are being developed in a partnership between BARI and Janata Engineering in Chuadanga and GSM in Kushtia. It is anticipated that these models will be ready for commercial production later this year.

#### Mung bean

Based on a portable mung bean dehuller machine developed by Australian Aid consultant Dr. Neogi and further developed by BARI with CSISA–MEA support, Mawa Engineering, Jhenaidah, and Haque Metal Works, Bogura, have collaborated with BARI to develop a 4 hp diesel engine-powered mung bean dehuller that can be transported by a power tiller. The Activity facilitated a marketing event delivered by Mawa Engineering workshop to publicize the dehuller, which was attended by 23 farmers and resulted in the sale of four machines.



The owner of Bogra-based Haque Metal Works testing the quality of dehulled mung bean produced from the mung bean dehuller he developed in a collaboration facilitated by CSISA–MEA between BARI and Haque Metal Works, Bogura. November 26, 2023. Photo: Rokonuzzaman Rokon OMD, Bogura

#### Groundnuts

During the reporting period, the Activity facilitated a collaboration between Al-Helal Engineering workshop in Kustia and BARI scientists to develop and manufacture a machine that strips groundnut plants of their groundnuts after harvest.

#### Onion blowers

Onion blowers are based on a design by BARI and further developed by the Activity's ABLE enterprises to suit farmers' specified needs. The blower sucks air through a tube positioned in bulk-stored onions. This creates a draft, drawing air through the onions, which reduces fungal disease infections and weight loss caused by dehydration. The Faridpur region is the largest producer of onions in Bangladesh, and it is here where CSISA–MEA is supporting six ABLE enterprises to manufacture and market the onion blowers. To date, 112 machines have been made and 80 sold.



Advertising by RK Metal of Faridpur for its onion blower, designed with technical support from CSISA–MEA. Photo: Rowshon Anis OMD, Faridpur

#### Mango juice

With the Activity's support, SMR Agro Engineering held a marketing event to promote a BARI designed mango juice extractor. The event was attended by 14 farmers and resulted in the sale of one machine.

Solar food dryers

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

A new venture for CSISA–MEA initiated during this reporting period is the development and testing of solar food dryers. These facilitate the quick and efficient drying and storage of fruits and vegetables, thereby reducing post-harvest losses, providing farming households with new markets, and improving their nutrition. To support CSISA–MEA engineers to facilitate the development of the dryer and its testing by interested ABLE enterprises, Georgia Tech provided technical guidance and several relevant documents. These include <u>Solar drying of fruits – a comprehensive review</u> and <u>Chimney Solar Drying Manual</u>.



SMR Engineering proprietor S. K. Mahfuzur Rahman (left), with a solar food dryer manufactured by his enterprise with technical advice provided by CSISA–MEA engineer A. N. M. Arifur Rahman (right). Jashore, October 2, 2023. Photo: Md Askik, Manager, SMR Engineering

### Fodder choppers

During the reporting period, as a result of modifications made with technical support provided by CSISA–MEA engineers to meet customers' needs, and market development facilitated by the Activity, at least 25 ABLE enterprises manufactured fodder choppers and have sold a total of at least 146.



CSISA-MEA engineer Shihab Shahabuddin (second from left) explaining the design of a fodder chopper for manufacture at Joy Engineering, Ukhiya, Cox's Bazar. December 7, 2023. Photo: Md. Rafiqul Islam, MEL Officer, Cox's Bazar

#### Other machines developed with CSISA–MEA support

During the last six months, ABLE enterprises supported by CSISA–MEA have developed potato graders to separate large and small potatoes, manually operated mungbean weeders, and maize seed sowers.

#### Metal hardness testing and heat treatment

Activity engineers have been supporting ABLE enterprises to access metal heat treatment services such as those provided by BITAC in Khulna and Chattogram, and Jashore University of Science and Technology (JUST). In Bogura, the engineers supported Shoron Engineering to install their own heat treatment equipment and were able to show using hardness testing equipment procured by the Activity that the metal hardness after heat treatment now met the required level. The engineers have continued to use this Activity-procured hardness testing equipment to test the metal hardness of parts made by ABLE enterprises.



CSISA-MEA engineer A. N. M. Arifur Rahman, using a metal hardness meter to measure the hardness of a tractor shaft made by Bhai Bhai Engineering Workshop, Jashore. February, 2024 Photo: Ikram Hossain, OMD, Jashore.

#### Technical support for Activity engineers

#### Efficiency testing of agricultural equipment and machinery

To support ABLE enterprises and Activity MSPs to produce and utilize equipment that is more efficient in terms of time, labor, and energy, Georgia Tech provided CSISA–MEA engineers with <u>FAO</u> <u>Agricultural Services Bulletin 110: Testing and evaluation of agricultural machinery and equipment</u> and <u>ANTAM Standard Code for Testing of Power Tillers</u>. This will allow the engineers to compare the efficiency of diesel- to electric engine-powered tillers and crop sprayers.

#### Spare parts catalog and specifications

Based on a request from the Cox's Bazar field team, Georgia Tech developed and shared the requirements for a parts catalog, including photos of the parts, properly dimensioned drawings, alloy types, and mechanical and material properties. With this catalog, ABLE enterprises will not have to measure and compare exemplar parts to the ones that they are fabricating. This will reduce time, labor, and other costs, thereby increasing productivity, and at the same time improve quality.

#### CAD/CAM training of CSISA-MEA engineers

To develop the technical skills of the CSISA–MEA engineers and their ability to support the ABLE enterprises, the Activity purchased CAD stations and CAD/CAM software and provided two weeks training in their use. Georgia Tech selected the computer equipment and software and developed the training curriculum.

#### Return on Investment/payback period determination for agricultural machinery

Georgia Tech developed a set of spreadsheet-based tools to calculate the gross margin on the income earned from the use of agricultural machinery. These make it possible to determine the return on investments and payback period for equipment/spare parts manufactured by ABLE enterprises.

#### No more tears for onion growers



Onion farmer Shahida Begum (left) and husband with their onion harvest and newly installed blue onion blowers (located to the rear of the onion bins). Photo: Rowshon Anis, OMD, Faridpur

Bangladesh is the fourth largest producer of onions globally (USA is fifth), with Faridpur district in the ZOI producing the most onions in the country. Onion prices in Bangladesh increase by over 50 percent between harvesting in April and peak price in November. Storing onions until at least November therefore has considerable financial advantages for onion growers. However, farmers can lose up to 30 percent of the stored crop due to fungal rotting diseases and dehydration. An onion blower is one of the

most recent additions to the inventory of the Activity's agricultural machines. This is a simple device that sucks air up through bulk-stored onions, and can considerably reduce losses by reducing fungal disease infections and drying of onions.

Onion farmer Shahida Begum became one of the first farmers to adopt this technology with a purchase of three blowers from Maa Metal Engineering of Faridpur. Maa Metal pioneered the manufacture of these machines with CSISA–MEA engineering and marketing support. Shahida can store 10–20 tons of onion and reports the blowers almost eliminate storage losses. This means that with 20 tons of stored onions, if losses were previously 30 percent of the crop, then, at a market price of USD 600/t, blower use can save up to USD 3,600 per harvest.

After Maa Metal's initial marketing success, six other light engineering companies in Faridpur have started to manufacture onion blowers, with 80 sold in the reporting period.



A CSISA-MEA engineer, Alamgir Hossain, (left) assisting Maa Metal owner (right) with the onion blower design. Photo: Rowshon Anis, OMD, Faridpur

Research at Georgia Institute of Technology

As part of their Master's degree thesis, Georgia Tech post-graduate students Laura Rundquist and Garrett Mesmer, supervised by Professor Jonathan Colton, conducted analyses of the fabrication of four fast-moving spare parts: tiller blades, rice transplanter forks, threshing teeth, and combine harvester cutter blades. The results of their work will provide guidance to ABLE enterprises on the machinery, dies and processes that will improve the productivity of their manufacturing operations, leading to better parts and greater profitability. Their work has been published as two YouTube videos, which have also been



loaded to the CSISA–MEA YouTube channel: <u>Manufacturing Process for Rice Transplanter Forks</u> and <u>Manufacturing Process for Tiller Blade</u>.

#### Developing financial services for ABLE enterprises, dealers and MSPs

The total value of loans facilitated for ABLE enterprises, dealers, and MSPs in this reporting period was USD 819,415, The loans were secured from 16 different FSIs for a total of 16 ABLE enterprises, 3 dealers, and 12 MSPs. The value of loans facilitated since the start of the Activity now totals USD 3,757,781.

		2019–20	2020–21	2021–22	2022–23	Oct 23– Mar 24	Total
		-		ABLE Enterj	prises		
Number of A	BLEs		12	30	39	16	97
Value of loan (USD)			462,941	874,118	1,134,094	575,455	3,046,608
				Dealers			
Number of de	ealers		2	3	7	3	15
Value of loar	n (USD)		23,529	49,412	303,809	206,364	583,114
MSPs							
Number of M	ISPs	12	6	20	33	12	83
Value of loar	n (USD)	7,810	20,667	15,239	46,747	37,596	128,059

## Table 7: Total finance obtained by ABLE enterprises, dealers, and MSPs from FSIs, facilitated by CSISA-MEA.

Facilitating access to finance for ABLE enterprises

#### Meetings to link ABLE enterprises with FSIs

Access to credit for the 15 ABLE enterprises in the table below was facilitated through a series of one-to-one meetings, and events such as workshops and factory tours.

The table presents the amounts ABLE enterprises were able to access through loans as a result of CSISA–MEA facilitation. The considerable variation in interest rates applied to the loans is because interest rates vary according to the FSI offering the loan, its duration, and its purpose, as well as the degree of flexibility and room for negotiation the FSI provides.

ABLE enterprise	District	Bank, NBFI, MFI	Interest rate (%)	Loan amount (USD)	
Tohomilur Engineering Workshop	Bogura	Prime Bank	10.1	13,636	
Surob Iron Store	Bogura	BRAC Bank	11	22,727	
Anowar Engineering Workshop	Jashore	United Finance	9	10,909	
Abdur Rahman Foundry	Jashore	RRF SME Division	13	45,455	
Abdur Rahman Foundry	Jashore	Lanka Bangla	4	27,273	
Islam Engineering works	Kushtia	Mutual Trust Bank	11	27,273	
Islam Engineering Works	Kushtia	IDLC	8	22,727	
SMR Agro Engineering	Jashore	Lanka Bangla	7	22,727	
M/S Ripon Engineering Workshop	Jhenaidah	Bank Asia	6	3,636	
Naimun Metal & Eng. Workshop	Jashore	Agrani Bank	9	I 50,000	
Arafat Machineries	Kushtia	Sonali Bank	9	45,455	
New Borsha Machineries	Bogura	Uttara Finance	7	27,273	
Raja Foundry and Distribution	Bogura	IDLC	7	45,455	
Zihad Engineering Workshop	Bogura	BRAC Bank	10.2	9,091	
Ria Engineering Workshop	Bogura	GUK	4	5,455	
Ria Engineering Workshop	Bogura	BRAC Bank	7	10,000	
Sattar Moulding and Engineering	Cox's Bazar	BRAC Bank		13,636	
Shah Jalal Engineering Workshop	Cox's Bazar	IDLC		18,182	
Total Ioan amount					

### Table 8: Interest rates charged on loans given to ABLE enterprises by FSIs.

### Financing the construction of climate-smart factory premises and installing solar panels

The Activity facilitated meetings for Kushtia-based Islam Engineering between it and Mutual Trust Bank and Industrial Development Leasing Company (IDLC). This resulted in Islam Engineering securing a loan of USD 81,000 to install rooftop solar panels.

The Activity also held discussions with Bangladesh Bank, IDLC, Bank Asia, BRAC Bank, and City Bank to explore the possibility of ABLE enterprises accessing through them finance from the government Green Financing initiative.

Intermediate result 2: Enhanced institutional capacity for agricultural mechanization through the development of skilled and youth workforces



Foundry skills trainees and trainers, Raja Foundry Bogura, March 15, 2024. Photo: Rashid Islam, Machinery Development Assistant, Bogura Technical skill training for ABLE company staff and management

The light engineering sector in Bangladesh is largely composed of many thousands of small workshops that employ a workforce of mainly young men who have learned their skills from older workers in the same workplace. Poor practices and skills are passed from generation to generation, resulting in low quality work and making it difficult for the light engineering sector to compete with imported parts and machines. To address this issue, a major focus of the Activity has been on improving workforce skills for ABLE enterprise partners.

From the start of the Activity in October 2019 to the end of March in 2024 in Year 5, the Activity has facilitated the training of a total of 2,399 workforce staff from 604 ABLE enterprises. This is 40 percent of the estimated 1,500 agricultural machinery and spare parts manufacturing workshops and foundries in Bangladesh.<sup>1</sup> Of the workforce trained so far, 397 are women and 1,335 are youth under 30 years. Between October 2023 and March 2024, the Activity delivered training to 170 members of the ABLE workforce.

<sup>&</sup>lt;sup>1</sup> Alam, M. M., Khan M. I. N., Saha C. K., Rahman A., Bhuyian M. G. K. Manufacturing of agricultural machinery in Bangladesh: Opportunities and Constraints, AgricEngInt: CIGR Journal. Open access at: <u>http://www.cigrjournal.org</u>, Vol. 19, No. 1. June, 2017.

CSISA field		Total				
office	2019–20	2020–21	2021–22	2022–23	2023-24 (6 months)	
Bogura	-	312	475	440	60	1,287
Jashore	-	200	160	180	30	570
Faridpur	-	-	20	162	40	222
Cox's Bazar	-	-	100	180	40	320
Total	-	512	755	962	170	2,399

#### Table 9: No. of ABLE enterprise workforce members trained.

Some of the lessons learned from implementation of the training program so far this year are as follows:

- 1. *Utilization of training knowledge*. Workshop staff specialize in specific tasks such as welding or machining on lathes. However, the current exhaustive training covers all tasks and operations of all the commonly used machinery, meaning that the workforce only uses a small portion of what they learn. Therefore, offering a range of courses focused on the use of the primary machines used in a workshop might be a more efficient way of delivering training.
- 2. Introduction of advanced technologies through training and visits. Investing in orientation or training on advanced technologies may not yield immediate results, but the knowledge and training acquired today will prove invaluable in the future. Visits to facilities with advanced machinery and processes provide ABLE enterprises with aspirations for improving their factories.

### ABLE enterprise training in the Zone of Influence and Bogura

#### Workforce training in machining skills

In the reporting period, CSISA–MEA extended its contracts with NGO training providers Gram Unnayan Karma (GUK) in Bogura and Rural Reconstruction Foundation (RRF) in Jashore.

In a new development, the growing partnership with Bangladesh Industrial Technical Assistance Center (BITAC), a Ministry of Industry institution, was extended to include BITAC's Khulna branch. This has enabled the Activity to begin training employees from Khulna and districts in coastal Bangladesh for the first time, with the engineering skills and facilities of BITAC Khulna used to train 40 workforce staff. In Faridpur, the Activity collaborated with light engineering enterprise, Kushtia Engineering Works and used a 72-hour training curriculum to train Faridpurbased ABLE enterprises. Training in the ZOI and Bogura included practical sessions conducted by business experts and senior skilled technicians from partnering ABLE enterprises. Classes in the theory of manufacturing were mostly delivered by experts from government polytechnic institutes and BITAC. The Activity supported the two training service providers by helping them to source expertise from across these institutes.

From January to March 2024, the Activity trained a total of 105 workers from 69 ABLEs in Bogura, and in Jashore, Faridpur, Kushtia and Khulna within the ZOI. Of these, 54 percent were youth under 30. After training, participants were able to manufacture agricultural machine spare parts including chains, pinions, and bevel sticks for PTOS, and the lock spindle and straight pinion for fodder choppers.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Workforce staff from some of the 19 ABLE enterprises from the greater Khulna region taking part in machining skills training, delivered by BITAC Khulna using high quality modern machinery. Khulna, March 2024. Photo: A. N. M. Arifur Rahman, MDO, Jashore

**Machining skills training outcomes**. To determine the success of the training, participant knowledge was assessed before and after, using a multiple-choice questionnaire. Before training they were unable to answer more than 12 out of 20 questions correctly but after training all could answer at least 13 out of 20 questions correctly.



**Small things can make a big difference**. Md. Najmul Hossain pointing to the indexing chart provided by the Activity. The chart enables him to make the gear he is holding without supervision.

Employed by Lipon Engineering Workshop, Khulna, in Year 4 of the Activity, Najmul received machining skills training facilitated by CSISA–MEA at BITAC, Khulna. His foreman used to set up the indexing plate on Najmul's milling machine, leaving him with little to do except operate it. During training, Najmul learned how to index the plate, which meant he could carry out the calculations needed to make gears and pinions. CSISA–MEA engineers also provided him with an indexing chart, so he can select the correct settings on his machine to make any type of gears and pinions. The CSISA–MEA training means Najmul has new skills and is now able to assume greater responsibilities at work that enhances his employability. Photo: A. N. M. Arifur Rahman, MDO Jashore

#### Occupation health and safety training

All the above training included a session on OHS. Each participant learned how to operate a fire extinguisher, the importance of personal protective equipment and clothing and how to use it, and how to respond to emergencies in the workplace.



Md. Rabbi Hasan, a CSISA–MEA Year 4 training graduate, employed by Khokhon Engineering Workshop and operating a lathe. Employees in ABLE enterprises working in machining workshops and foundries now routinely use safety gear – here, protective gloves, earmuffs and goggles – which was seldom the case before CSISA–MEA initiated its training. Bogura, January, 2024. Photo: Jannatul Ferdous Asha, MDO Bogura

### Training provided to the foundry workforce by foundries

GUK Bogura in partnership with leading foundry enterprises trained 40 foundry workers in Bogura in advanced foundry skills. The support provided by CSISA–MEA empowered both GUK and the enterprises to emerge as vocational training providers, and will enable GUK and foundries to sustain training for the light engineering sector as a business venture.



Foundry workers learning new techniques to make molds used in casting agricultural machine parts. Bogura, February 23, 2024. Photo: Jannatul Ferdous Asha, MDO Bogura

### Providing women with training to improve their skills and working conditions

Continuing the training support provided to women in previous years, between January and March 2024 the Activity facilitated training for 25 women in foundry skills, including painting, grinding, and fettling



Women participating in training in foundry skills facilitated by the Activity. During practical session shown in the photograph they are learning skills in sand molding and core making. Their training also included sessions on GESI and the environment. The training was held at Rosy Metal Works, Bogura, on March 23, 2024.

Photo: Jannatul Ferdous Asha, MDO, Bogura

#### Zone of Resilience

#### Machining skills training for ABLE enterprise staff



Activity trainees in the ZOR learning new skills at the BITAC training center, Chattogram. February 18, 2024. Photo: Shahabuddin Shihab, MDO, Cox's Bazar From January–March 2024, a total of 40 workforce staff from 26 ABLE enterprises in Cox's Bazar and Bandarban districts were provided 48 hours of basic skills training by BITAC in Chattogram in two batches of 20 trainees each. The residential training took place over 10 days.

**Machining skills training outcomes**. To determine how successful the training had been, trainees were tested at the start and finish, through a set of 25 multiple-choice questions. Before training, none of the trainees could answer 15 questions correctly; afterwards, they all got more than 15 questions right.

#### Training for ABLE enterprises provided by BRRI

With support from CSISA–MEA staff, Dr. Saiful Islam Project Director of the BRRI-implemented SFMRA project, made two visits to the ZOR to assess the market potential and training needs of ABLE enterprises. This resulted in the implementation of two training programs in the manufacture of the BRRI-

designed engine-driven rice thresher. In learning how to make the rice thresher, participants acquired many basic manufacturing skills and learned the importance of using technical drawings and accurate measurements.

From November 28–30, 2023, training was delivered to the agricultural machinery manufacturing workforce at M. M. Engineering, Ramu in the ZOR on agricultural machinery manufacturing, OHS, and the work environment.



M. M. Engineering staff, in training delivered by BRRI staff. The Additional Secretary, Ministry of Planning, and Professor of the Farm Power Mechanization department, BAU, observed the training which was led by Dr. Saiful Islam (back row, fourth from right), Project Director of the BRRI-implemented SFMRA project. Ramu, November 30, 2023. Photo: Shihab Shahabuddin, MDO, Cox's Bazar

From March 13–17, 2024, training on how to make the BRRI-designed rice thresher was delivered to a total of 16 staff from four workshops in the ZOR (Bai Bai Engineering Workshop, Ramu, Meheraj bin Miraj Engineering, Lama, Proshad Engineering, Cox's Bazar, and Riaz Engineering, Ukhiya). As part of the training, participants constructed two rice power threshers.



Raihan Uddin, owner of Bai Bai Engineering Workshop, in the BRRI-implemented rice thresher manufacturing training, with one of the two machines made by participants. He told the Activity that the training gave him the hands-on skills that he needed to manufacture the rice thresher using proper measurements, alignments and raw materials, and that as a young workshop owner he was delighted to have participated in the training. Ramu, March, 2024. Photo: Shihab Shahabuddin, MDO, Cox's Bazar

#### Raising awareness of the need to protect the environment

In Year 5 of the Activity, the workforce training curriculum introduced a new session entitled "Environmental Awareness". The module covers types of pollution and how to prevent them, including pollution created by the light engineering industry and how to reduce it.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Foundry skills trainees and trainers planting mango trees around Raja Foundry as part of their contribution to reducing the impact of climate change on their environment. Bogura, March 15, 2024.

Photo: Rashid Islam, Machinery Development Assistant, Bogura

Advanced technical and business-related training to ABLE enterprise management

#### Training on inventory management software

To increase the efficiency with which ABLE enterprises manage their stocks of raw material, parts and products, the Activity contracted Semicolon IT Solutions, a company that sells software it has developed for managing stock inventories. Semicolon provided two days of training on the use of its software to staff from two Activity lead firms and 49 ABLE enterprises. This was delivered in five locations: Bogura, Jashore, Faridpur, Kushtia and Cox's Bazar. Afterwards, 15 ABLE enterprises expressed interest in subscribing to the App that provides access to the Semicolon inventory management software.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Activity ABLE partners receiving training from Semicolon II Solutions in the use of its inventory management software. Participants included Kamila Kanta, a female employee of Kamal Machines Tools, Bogura. February 20, 2024. Photo: Jannatul Ferdous Asha, MDO, Bogura

#### Photo: Jannatul Ferdous Asna, MDO, Bogura

#### Training in engineering design and drawing:

A major issue identified by the Activity has been the limited ability of ABLE enterprise staff and management to interpret and comprehend technical drawings. The result is that they copy existing parts to produce parts, meaning that many fail to meet the precise technical specifications required. Enabling ABLE firms to produce specific parts directly from drawings and to use accurate measuring tools is therefore regarded as an important training requirement by both the Activity and the enterprises (see IR1, Table 2). To initiate this process, the Activity published a call for EOIs on the bdjobs website, to identify a firm that can provide training and services in engineering design and drawing. As a result, a contract was signed with Involute Tech, a private business led by graduates from Bangladesh University of Engineering and Technology (BUET). One-day training sessions were delivered to a total of 32 ABLE enterprises and two lead firms in Jashore, Faridpur, and Cox's Bazar, in February 2024.



The owner of SMR Engineering of Jashore practices making technical engineering drawings during the one-day training program delivered by Involute Tech. Lead firm Metal Agri Tech secured an advertising opportunity by providing t-shirts and caps for course participants. Photo: A. N. M. Arifur Rahman, MDO Jashore

### Training in using the Lincoln Electric welding simulator at BITAC

Welding is an important process for the ABLE enterprises that the Activity supports. CSISA-MEA purchased a VRTEX® virtual reality welding trainer from the USA-based welding equipment manufacturer, Lincoln Electric. This portable, computerbased device facilitates safe training for welders and is more cost-efficient than using actual welding equipment, because it does not need expendables such as welding rods, wires and gas. After its travel and demonstration by CSISA–MEA regional offices around Bangladesh, it is being moved to a permanent home BITAC at Chattogram. This allows more students more time to practice, saves BITAC materials costs, reduces the supervision necessary by BITAC staff, and increases the competency of the trainees.



Lincoln Electric's virtual reality welding trainer device, being used to train BITAC staff in Chattogram. BITAC is CSISA–MEA's principal training provider. Chattogram, March 19, 2024. Photo: Shihab Shahabuddin, MDO, Cox's Bazar

From the manager's office to the workshop floor: women leading in light engineering



Asma Akter and daughter Tasin Fahariya, owners of Belal Engineering Workshop, discussing parts manufacture with their machine operator. Bogura, March 28, 2024. Photo: Jannatul Ferdous Asha, MDO, Bogura



Halima Khatum, owner of Scale Engineering Workshop, using accounting skills learned through CSISA–MEA-facilitated training. Bogura, March 12, 2024 Photo: Rokonuzzaman Rokon, MDO, Bogura

The light engineering industry is often perceived as being dominated by men, with working conditions not conducive to women. However, women have demonstrated equal capacity to work in the industry as men, both in the workshop and at management level. For them to achieve this, a key factor is often access to training that gives them the skills they need to compete with men for higher paid jobs or to manage a business.

Asma Akter and Halima Khatun are graduates of CSISA–MEA business training. Both women inherited light engineering workshops and faced considerable challenges in maintaining the belief of their employees and customers in their ability to manage a business. CSISA–MEA provided them with

business and financial management training, and technical, finance and marketing support, enabling them not just to maintain the businesses but also to expand them to embrace new ventures and markets. Asma Akter works closely with her digitally savvy daughter Tasin Fahariya, who participated in Activity-facilitated courses in financial management, digital marketing, and drawing and design skills, and applied them to the successful management of her mother's business.

Women are also increasingly visible as leaders in the workshop, where training is providing them with the skills needed to make quality products. Since the start of the Activity, CSISA–MEA has provided 397 women with foundry skills, including mold-making, fettling and painting, and workshop skills such as drilling and shaping.

RF Tota Engineering, Bogura is typical of a number of ABLE enterprises which, following CSISA–MEA-facilitated training including sessions on Gender Equality and Social Inclusion (GESI), has begun to employ women in skilled jobs rather than cleaning work. In March 2024, RF Tota trained and employed five women to operate lathes and drills and to paint and package parts, work previously considered only suitable for male members of the workforce.



A female member of the workforce operating a lathe at RF Tota Engineering, Bogura. Note her protective clothing, seldom used in Bangladesh small enterprises before CSISA– MEA training. Photo: Rokonuzzaman Rokon, MDO, Bogura March 25, 2024

### **Gender Equality and Social Inclusion**

The Activity has continued to deliver GESI and gender-based violence (GBV) sessions as part of every batch of workforce training. The training service providers engaged gender experts to cover content such as gender roles, equity, importance of gender equity, and gender-based violence and how to avoid it, both in and outside the workplace.



Following GESI training, 12 ABLE enterprises in Jashore and Faridpur and 24 in Bogura have made infrastructural changes such as providing toilets and rest areas for women, to facilitate a more GESI-friendly work environment.

As an example of the type infrastructural changes that ABLE enterprises have made is this photograph that shows an area reserved for women at SMR Engineering in Jashore.

## Photo: A. N. M. Arifur Rahman, MDO Jashore

### International Women's Day

In March 2024, CSISA–MEA participated in International Women's Day, marking the ongoing struggle for gender equality and women's rights. In collaboration with Kellanova, a US-based multinational food processing company, the Activity organized an event attended by 80 women farmers to celebrate the contribution women make to food production.



Women marking International Women's Day, participating in the rally organized by Kellanova and CSISA–MEA. Jashore, March 8, 2024. Photo: A. N. M. Arifur Rahman, MDO, Jashore

Intermediate Result 3: Enhance farmer access to mechanization and other crop production and marketing services with particular emphasis on remote and underserved markets



A rice transplanter and rice seedlings being transported by boat in Pekua, Cox's Bazar. Feb 21, 2024.

Photo: Masud Karim, ADO, Chakaria, Cox's Bazar

Agricultural machinery sales to machinery service providers

In the reporting period, the Activity facilitated sales to 218 MSPs of agricultural machinery and spare parts worth a total of USD 1,022,823<sup>2</sup>. This was achieved through partnerships with ten nationally operating companies that market agricultural machinery and 33 ABLE enterprises. These companies organized a wide range of machinery promotion events where machines were marketed through demonstrations and multimedia publicity.

Table	10: Number	and value o	f machines	sold to	<b>MSPs</b> betw	veen Octob	per 2023 and
March	2024.						

CSISA field office	Fodder chopper	Combine harvester	PTOS	Reaper	Rice trans- planter	Total
Faridpur	0	23	65	1	6	95
Jashore	5	18	42	3	1	69
Cox's Bazar	4	18	0	8	24	54
Total	9	59	106	12	31	218
Value of sales (USD)	2,022	864,610	69,481	14,439	72,271	1,022,823

Of the USD 1,022,823 of machinery sales, 84.5 percent was spent on combine harvesters.

 $<sup>^{2}</sup>$  This figure is not the true value of the machines sold but their value after government subsidies have been deducted from their price.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

Gender	Combine harvester	PTOS	Reaper	Rice trans- planter	Total	Total machine purchases (%)
Female	4	8	1	4	17	8
Male	55	98	11	27	191	92
Total	59	106	12	31	208	

#### Table 11: No. of machines sold, by gender.

Overall, only 8 percent of machines sold were purchased by women. However, women are much more likely to buy small, low-cost machines which have a significant and direct impact on their workload, such as fodder choppers. Data collected by the Activity in Year 4 showed that 50 percent of fodder choppers sold were purchased by women.

#### Machinery purchase financing

Purchases of combine harvesters, rice transplanters, PTOS, and reapers attract a 50 percent government subsidy (increased to 70 percent in designated coastal districts and locations such as Bandarban Hill Tracts and Cox's Bazar region). CSISA–MEA facilitates access to subsidies for MSPs by supporting meetings held by DAE with machinery marketing companies. These raise awareness of the value of mechanizing agricultural operations and the means by which farmers access machines and machinery services, as well as the subsidies available.

Most farmers purchasing machines, particularly combine harvesters, need finance in addition to the subsidies. During this reporting period, in the remote coastal district of Satkhira and in Magura district the CSISA–MEA Jashore team organized two meetings between farmers and FSIs, which in Satkhira were local MFI Satkhira Unnayan Sangstha (SUS) and United Commercial Bank (UCB) and in Magura were local MFI Wave Foundation and UCB. These meetings resulted in 10 women securing loans to purchase machinery.

In Faridpur, two meetings between MSPs and MFI VPKA resulted in the provision of fiveloans with a total value of USD 5,000: four for the purchase of PTOS and one for the purchase of a combine harvester.

In the ZOR, meetings facilitated by the Activity between MSPs, MFIs and banks resulted in the provision of loans to 10 MSPs (eight by WeGro, one by Sonali Bank, and one by Buro Bangladesh) worth a total of USD 57,276. These loans were used to purchase rice transplanters, combine harvesters, reaper binders, and four-wheel tractors.

### **Provision of machinery services**

During this reporting period, 37,235 farmers bought machinery services worth a total of USD 933,360 from 1,818 MSPs. Since the start of the Activity, of the 226,957 farmers who have bought agricultural machinery services from MSPs, 11 percent were women. In this reporting period only two percent were women and 12 percent were youth under 29 years.

Gender				Total			
of farmer	2019–20	2020–21	2021–22	2022–23	Oct 23– Mar 24	Total	(%)
Male	33,459	35,873	42,535	53,741	36,608	202,216	89
Female	9,552	5,275	8,304	983	627	24,741	11
Total	43,011	41,148	50,839	54,724	37,235	226,957	

 Table 12: No. of farmers buying agricultural machinery services disaggregated by gender.

#### Supporting MSPs to maintain and develop their agricultural machinery businesses

#### Experience-sharing and business development workshops

Recognizing that much can be learned from sharing experiences and using those to provide advice on further business development, the Activity, with the DAE and private sector partners, facilitated a number of "experience sharing" meetings.

The CSISA–MEA Jashore team held meetings in Jhenaidah, Magura, and Satkhira for 59 PTOS MSPs and five DAO staff to share their experience and increase their record-keeping skills. During these meetings, the MSPs prepared business plans for the next season.

The Faridpur team held three experience-sharing meetings for PTOS MSPs in Rajbari and Faridpur Sadar. Participants discussed their successes, challenges, and requested business management training, operator training including calibration procedures, and support with conducting PTOS service awareness-raising initiatives to attract clients. In response, CSISA–MEA provided the MSPs training in calibrating the PTOS seed-sowing mechanism, enabling them to sow crops more accurately, thereby improving acceptance of and demand among farmers for PTOS services. It also created a seasonal plan for providing a PTOS service to 469 farmers on 158 hectares of land in Rajbari, and 475 farmers on 148 hectares in Faridpur.

The Activity also facilitated meetings between rice transplanter MSPs, seedling growers, dealers, mechanics, and farmers in Satkhira and Jashore districts to develop plans for seedling production and mechanical rice transplanting.

#### Supporting machinery companies dealers and MSPs expand their business networks in the ZOI

The Activity has signed agreements with 10 machinery manufacturing and marketing firms, to support dealers, mechanics, and MSPs to access agricultural machinery and spare parts. The agreements will support the firms to create dealer networks, promote their products, and build the capacity of the dealers mechanics and MSPs.

The CSISA–MEA Faridpur based team organized two meetings in Faridpur and Rajbari, and three meetings in Patuakhali and Barguna, with private sector partner BanglaMark to facilitate dealership expansion and improved access to machines and parts for MSPs and mechanics. The meetings were attended by mechanics, commission agents, dealers, sub-dealers, and farmers. BanglaMark demonstrated the use of rice transplanters, combine harvesters, PTOS and axial flow pumps. Dealers, mechanics, sub-dealers and commission agents negotiate commissions with dealers and lead firms from the sale of machines and spare parts. As a result of these meetings, BanglaMark sold three combine harvesters, eight rice transplanters and one axial flow pump.

The Activity also supported two rice transplanter MSPs (1 each in Kushtia and Jashore districts) and two combine harvester MSPs (in Jashore district) to expand their market by arranging for them to meet commission agents whose job is to identify farmers seeking MSP services and link them with

farmers groups seeking machinery services. This resulted in new business for the MSPs worth USD 5,710 and benefitted 185 farmers.

To support machinery dealers selling spare parts to expand their market, the Activity facilitated linkage meetings in Jashore between the dealers and combine harvester MSPs, which at the same time improved access for the MSPs to spare parts and mechanics services. As a result, 12 combine harvester MSPs placed orders for spare parts worth a total of USD 2,100. Similarly, the CSISA–MEA Jashore team supported two dealers (one in Satkhira, one in Magura) to organize promotional events where they presented to MSPs, mechanics, and farmers the goods they had for sale.

Supporting machinery companies dealers and MSPs expand their business networks in the ZOR



CSISA-MEA MSPs, proud owners of new rice transplanters delivered by BanglaMark in the presence of senior DAE staff and BanglaMark's Executive Director. Securing subsidies from DAE and purchasing the transplanters was facilitated by CSISA-MEA. Ukhia, Cox's Bazaar. December 5, 2023.

Photo: Mosharaf Hossain Shanto, OMD, Cox's Bazar

During the reporting period, the Activity facilitated seven information-sharing sessions with DAE, representatives from ACI Motors, Abedin Equipment and BanglaMark, and prospective buyers of machinery. The primary goal of this meeting was to inform potential customers about the government's machinery subsidy program and for companies to describe their offers, after-sales service, delivery methods and business strategy

To support MSPs to expand their businesses, in collaboration with DAE the Activity in Cox's Bazar facilitated two combine harvester and one reaper demonstration. In Bandarban district, through DAE and MSPs, the Activity facilitated two reaper demonstrations.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



A reaper MSP demonstrating to 20 farmers and DAE representatives rice harvesting using a reaper. This was the first time farmers in this remote part of Bangladesh had observed mechanical harvesting. Raisa, Bandarban hill tracts. December 10, 2023. Photo: Masud Bau, ADO, Chakaria, ZOR

#### Machinery maintenance

To keep machines operating, MSPs need to be trained to maintain them in good working order. They also need to be able to buy spare parts easily and to access mechanics trained in their repair. If a machine breaks down because an MSP has not been shown how to use or maintain it or because they do not have access to the services of a mechanic and a supply of spare parts, it will lie idle instead of providing farmers with the mechanization services they require. This intervention aims to support lead firms and MSPs to address this issue.

The CSISA–MEA Jashore team conducted an after sales service planning meeting at Jhenaidah involving 13 combine harvester MSPs, two sales agents from Abedin Equipment, two from ACI Motors, two from Metal Agri Tech, and one DAE representative. During the meeting the machinery companies devised an after-sales service campaign plan for different areas in Jhenaidah to provide all the MSPs with preseason machine servicing.



Before the start of the *aman* rice harvesting season, lead firm Abedin Equipment with CSISA–MEA facilitation, organized the maintenance of 15 of their Kubota (a Japanese brand) combine harvesters. In the photograph mechanics delve into the heart of this complex machine. Barguna district, Barishal, November 8, 2023.

Photo: Rowshon Anis, OMD, Faridpur

#### Capacity building training for mechanics to strengthen aftersales service in rural areas

Through a partnership agreement with CSISA–MEA, Janata Engineering delivered training to 10 mechanics from the northern Jashore region in rice transplanter, reaper, and maize sheller maintenance at Sorjgong, and to 10 mechanics at Salta, Faridpur, in rice transplanter, reaper, and fodder chopper maintenance. Janata Engineering provided each participant with a toolbox, as well as promotional caps and t-shirts.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



As part of a two-day operator training program on combine harvester maintenance and operation, CSISA–MEA engineer Shihab Shahabuddin explained how the power transmission systems work, including adjustment of v-belts, chains, rubber track/crawler wheels. Ramu, Cox's Bazar. December 12–13, 2023.

Photo: Abdur Razzak, ADO, Cox's Bazar

**Combine harvester simulators**. Since 2019, CSISA–MEA has supported lead firms to train 1,160 MSPs in combine harvester use. As the rice and wheat harvesting season is very short at ~60 days a year, operators/MSPs are anxious to start using the combine harvester as soon as the season starts and cannot afford to lose income by spending time learning how to operate the machine. To address this, MSPs often learn how to use their combine harvester in a yard rather than in a field harvesting crops. The knowledge from off-season training remains at basic level and increases the risks of machine damage in the field or when driving on roads, creating a poor impression among farmers of the value of the machines. As an alternative first step, drivers are able to practice using a combine in the company office – in the same way that new pilots learn to fly airplanes: on a combine harvester driver simulator.



The simulator will train operators/MSPs before they test drive or operate the machine in the field, minimizing costs to the private sector. Simulator training is expected to provide operators/MSPs safely with at least 50–60 percent of the knowledge required to operate a combine harvester before actually driving it. Two Activity partners selling combine harvesters, Abedin Equipment Ltd. and Metal Agri Tech Ltd., are keen on using this concept as part of their sales pitch. CSISA–MEA has identified two IT companies, Battery Low Interactive Ltd. and TechnoMagic Ltd., which can develop the simulators and which are now working with the lead firms to design and test the simulators.

#### Rice transplanter business development activities

Every year in Bangladesh, approximately 11 million hectares of rice are transplanted by hand. This labor-intensive process takes time, delays crop establishment, and absorbs family and hired labor that could perhaps be used more productively in other income-generating activities. One solution is to sow rice seed directly into the field instead of raising seedlings in a nursery; however, the long monsoon season and the need to sow before the heavy rains start make this option challenging. An alternative is to use mechanical rice transplanters. These transplant seedlings are raised as a 'mat' on soil-covered recycled plastic sheets or in plastic trays made from recycled plastic. Rice transplanters have been shown to save farmers costs in terms of time, money, and effort. However, the raising of seedlings, which requires training and coordination between farmers and MSPs, remains a challenge.



Farmers participating in training delivered by CSISA–MEA technical staff, after expressing interest in starting a business raising rice seedlings for use with rice transplanters. The Activity demonstrated how to prepare soil for rice seedling trays and use the BRRI-designed rice seed sowing machine, Boalmari, Faridpur. December 18 2023 Photo: K. M. Zasim Uddin, ADO, Faridpur

On December 11, 2023, in collaboration with DAE, the CSISA–MEA Kushtia team organized two linkage meetings at Kumarkhali *upazila* and Gungoli, Chandpur *upazila* to promote rice transplanter MSPs through the DAE-synchronized farming initiative. As a result, MSPs transplanted 20 hectares and earned a total of USD 1,630.

The Activity also provided training to farmers interested in raising seedlings for use with rice transplanters and the winter-irrigated *boro* rice season crop, transplanted in January. In November and December 2023, the CIMMYT Jashore team provided four training sessions, the Faridpur team provided two sessions and the Cox's Bazar provided seven sessions.



From February 25–27, 2023, BRRI facilitated training for farmers in mechanized rice production. This was led by Dr. Saiful Islam, Project Director of the BRRI-implemented SFMRA project, and supported by CSISA–MEA. It was attended by the Additional Secretary, Farjana Momtaj, Joint Secretary, Dr. K M Kamrujjaman, and Deputy Secretary, Sayedur Rahman, Ministry of Agriculture. The training featured the use of the BRRI-designed seed tray sower, weeder and insect light traps, how to raise seedlings for transplanting using a rice transplanter, and how to operate a rice transplanter.

#### Collaboration with Kellanova:

The USA multinational company Kellanova has worked for a number of years with potato growers in northern and south-western Bangladesh to produce potatoes suitable for its potato chips product. Although it had some success with introducing appropriate varieties and forming farmer groups, it needed support to introduce mechanized potato production technology. Working in collaboration with BARI and SEBA Agrotech (a Kellanova partner, based in north-western Bangladesh), CSISA–MEA facilitated meetings with 20 lead farmers from Rangpur, Joypurhat, Gaibanda, and Bogura districts and, in four meetings with 100 women farmers from two villages in Jashore Sadar *upazila* to present them with options for mechanical potato production, harvesting and processing.

The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024



Women farmers participating in an orientation on mechanized potato farming. Jashore Sadar, March 7, 2024.

Photo: Arifur Rahman, MDO, Jashore

Dr. Rajiul Hassan Mondol, Senior Scientific Officer, Tuber Crops Research Center, BARI, Bogura, delivered a comprehensive presentation covering cultivation techniques, management practices, disease and pesticide management, and the potential of mechanized potato cultivation in Bangladesh. The sessions included demonstrations of potato planters, weeder-cum-earthing up machines, single-wheel powered sprayers, potato harvesters, and potato graders. Farmers in Bogura expressed keen interest in adopting advanced agricultural machinery, especially potato harvesters and graders, in anticipation of significant reductions in production costs. After the event, seven farmers committed to buying nine machines, currently being manufactured by the Activity's ABLE enterprises in Bogura.

Developing young women- and young men-owned commission agent businesses

CSISA–MEA supported lead firms Janata Engineering, Metal Agri Tech and Uttaron Engineering to develop and train MSPs, ideally young women and young men from the youth demographic aged 15–29, to expand their services to farmers. Janata Engineering organized five business meetings with sales commissioning agents for machinery and spare parts business acceleration in the Jashore and Jhenaidah areas.

In Jashore, the Activity also facilitated two business meetings between three combine harvester and three rice transplanter MSPs, 19 young women and men wishing to develop businesses as commission agents, and 26 farmers in need of planting and harvesting services

#### Chamta Nari Unnoyon MSP Network – machinery services driven by women

Machinery service provision in Bangladesh is predominantly provided by businesses owned by men – there are very few female MSPs. However, a group of women in Faridpur are showing that this need not always be the case.

The Chamta Nari Unnoyon ('Women's Development') MSP network was established in 2023 by a group of 30 women who own and operate small machines including power tillers, PTOS, irrigation pumps, fodder choppers, oil expellers, and rice transplanters. As individuals, they found it difficult to find customers for their services, making it difficult to make money from the machines. The women were brought together through MSP business development meetings, facilitated by CSISA–MEA, where they shared information about farmers wanting agricultural machinery services. They formed the Chamta Nari Unnoyon MSP network, and decided to purchase, as a group, a maize sheller, rice seed sower, rice transplanter, and combine harvester. This was financed through loans secured from financial

service providers, paid for from members' BDT 100 monthly contributions. For the largest of these machines, the combine harvester, each member contributed BDT 7,000 to raise the down-payment of BDT 210,000.

Management of the combine harvester and coordination of its use is overseen by a management committee chaired by the female group president, Promila Mondal. The committee seeks out customers and handles transactions and Ms. Mondal deals with customer calls, scheduling, and financial record-keeping. All contribute to members customer acquisition through their networks of neighbors and relatives, directing potential clients to the management committee. CSISA-MEA also facilitates business linkage meetings with potential customers.

The group's savings are currently managed by the president and the management committee, although efforts are underway to open a group bank account.

The Chamta Nari Unnoyon MSP network demonstrates that women can be in the driving seat of agricultural mechanization and not just observers.



Chamta Nari Unnoyon president Promila Mondal, harvesting wheat using the group-owned combine harvester, in Faridpur. March 22, 2024. Photo: Prottoi Mondal, son of MSP Promila Mondal

#### **Developing digital platforms**

#### Building the capacity of MSPs to promote their businesses through digital platforms

In Jashore and Jhenaidah in the ZOI, Jashore-based Bangla Traders provided training for 39 combine harvester and rice transplanter MSPs to equip them to market their services using YouTube and Facebook. The training was facilitated by CSISA–MEA. Sixty MSPs also formed a Messenger group chat to promote the growth of their service businesses.

An increasing number of farmers use digital devices, providing an opportunity to engage them in disseminating information about the labor- and cost-saving potential of mechanized agricultural production, and how to obtain machines and services from MSPs. CSISA–MEA has created a partnership with Dotline, a provider of country-wide rural Wi-Fi services, to disseminate agricultural machinery information through promotional videos and to collect user data. In a pilot program, 10,862 users with free internet and 3,500 without, accessed information posted on 150 Dotline Wi-Fi *haat* receiving sites in Jhenaidah, Kustia and Cox's Bazar.



A shopkeeper connects with the Dotline Wi-Fi *Haat* App to access information about agricultural mechanization services, in Sarutiya, Jhenaidah. December 5, 2023. Photo: Abdul Kader, ADO, Jashore

#### **Communications outreach**

CSISA–MEA has used social media, blogs, and newspapers to share its activities and achievements with a large audience. The semi-annual results for Year 5 are as follows:

• Three blog posts on the CSISA website and Agrilinks have been published, highlighting women's involvement in agriculture: Progressive development: preparing women for

employment in agriculture-based light engineering, Mawa Engineering Workshop: empowering agriculture through innovative machinery, Transforming Change: Women's Diverse Roles in Bangladesh's Agrimachinery Sector

- CSISA-MEA published 10 posts on X (formerly Twitter), sharing stories about the project's • impact.
- The CIMMYT website featured two stories: one about an exposure visit to India and another about a grinding machine operator: Breaking ground and redefining roles in the agri engineering sector: Anjuara Begum, Exposing the potential of agricultural mechanization in India and Bangladesh
- Four stories were posted on the official Facebook pages of USAID Bangladesh and Feed the . Future: Sonia's journey from farmer to machinery service provider shows how technology, training, and financial support can transform agriculture and uplift community livelihoods through one person's determination.

Mahafuzur Rahman, the visionary at SMR Agro, has seen his journey transformed by USAID's support, as we foster agricultural innovation through training and financial resources for entrepreneurs like him.

Anjuara Begum, a grinding operator in Bangladesh, is defying gender norms. Learn how she went from being a young widow to earning the same as her male counterparts at the workshop.

The stories of CSISA-MEA have been covered in Bangladesh's national newspaper, The **Business Standard.** 



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Sonia's journey from a regular farmer to a successful machinery service provider highlights the transformative power of technology, training, and financial support. It demonstrates how one individual's vision and determination can drive positive change in communities through enhancing their livelihoods and agricultural practices.



A USAID face book page featuring one of the CSISA-MEA partner MSPs.

#### **Challenges and lessons learned**

#### Challenges

- *Foreign currency restrictions*. Obtaining foreign currency in Bangladesh is very difficult for many companies. In the case of the ABLE sector, this has constrained their ability to import new manufacturing machinery and the raw materials needed to manufacture machines. Machinery importing companies and dealers have also found it difficult to obtain the foreign currency needed to import the agricultural machines and spare parts that farmers require. These difficulties not only constrain the ability of ABLE enterprises to implement the lessons they have learned from the Activity through training and technical support, but also the ability of the agricultural machinery sector to support and provide farmers with services.
- *Inflation and declining exchange rates.* The rising cost of living driven by increasing global food and fuel prices, and the rising cost of producing food driven by higher energy and fertilizer costs, all constrain the ability of ABLE enterprises and MSPs to offer affordable machines, parts, and services to farmers
- *General election.* Although this was largely held without serious civil disturbance, movement was restricted before and after the election, restricting the ability of the Activity to implement its work plan.

#### Lessons learned

- *Linkage meetings*. Linking many small ABLE businesses with new markets, through meetings attended by large groups of regionally operating dealers, MSPs and FSIs, is a more effective way of supporting ABLE enterprises to expand their businesses than by linking them with a small number of nationally operating lead firms.
- Increase impact by focussing on enterprises seeking change. Concentrating on supporting smaller groups of leading ABLE enterprises through cost-sharing agreements is an efficient way for the Activity to introduce new technology and practices to businesses with the energy and interest to implement them, which are then copied by other enterprises.
- Supporting collaboration between public and private entities. The facilitation of government entities (e.g., DAE, BARI, and BRRI) to partner with private sector entities (e.g., ABLE enterprises and MSPs) has accelerated the development and dissemination of new agricultural mechanization technology in a sustainable manner.
- *Importance of credit facilities*. For ABLE enterprises, credit from FSIs to finance operating costs is more difficult to obtain than finance for new investments. MSPs have less collateral than ABLE enterprises and therefore find it more difficult to secure large loans to purchase machinery than small loans to finance business operating expenses.
- 1. Utilization of training knowledge. Workshop staff specialize in specific tasks such as welding or machining on lathes. However, the current exhaustive training covers all tasks and operation of all the commonly used machinery, meaning that the workforce only uses a small portion of what they learn. Therefore, offering a range of courses focused on the use of the primary machines used in a workshop is a more efficient way of delivering training.
- Introduction of advanced technologies through training and visits. Investing in orientation or training in advanced technologies may not yield immediate results, but the knowledge and training acquired today will prove invaluable in the future. Visits to facilities with advanced machinery and processes provide ABLE enterprises with aspirations for improving their factories.
- A specific focus on the development of the ZOR. A focus on the ZOR, a part of Bangladesh where there has been little investment in the engineering industry and agriculture, has resulted in the rapid transformation of small light engineering businesses from only being capable of minor repairs to being able to make complex machines. It has also led to the rapid introduction of technology for the mechanization of laborious tasks such as planting and harvesting rice, chopping fodder for livestock production.

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

• Women in the agricultural mechanization value chain. Appropriate training and a supportive environment equip women to work in management, metal-working, and as MSPs. Specifically, the inclusion of GESI training for managers and workers has resulted in them accepting and encouraging women to take key roles in the workshop, in management, and the workforce.

#### Annex 1: Detailed information about Activity implementing partners



The International Maize and Wheat Improvement Center (also known as Centro Internacional de Mejoramiento de Maíz y Trigo, or CIMMYT by its Spanish acronym) is the Activity's prime. In addition to being responsible for the overall administration and financial management of the Activity, responsible for employing field staff with agricultural development and engineering skills. CIMMYT is also responsible for reporting to the donor on the progress of the Activity, lessons learned through its implementation, and its impact. For this it employs a Monitoring, Evaluation and Learning (MEL) team that collects monitoring data, conducts surveys to evaluate Activity progress and conducts internal data quality assessments (iDQAs) to ensure the data reported to USAID are accurate. CIMMYT is also responsible for maintaining and administering field offices (see below for their locations). From these offices, CIMMYT and iDE field staff design, implement and supervise the training and technical support given to lead firms, finance institutions, ABLE enterprises, machinery dealers, research institutions, MSPs and to the farmers. This work is done in partnership with the Government of Bangladesh and the private sector.

iDE

**International Development Enterprises (iDE)** was a partner in the implementation of the CSISA–MI Activity and is a key implementation partner for CSISA–MEA, where its responsibility is to design and implement market-driven interventions in partnership with private sector firms. Within this CSISA–MEA, iDE plays a pivotal role in facilitating partnerships between SMEs and larger firms for process, technology and market improvements, and in leading the financial inclusion component with a range of national and international partners.



**Georgia Institute of Technology (Georgia Tech)** is CSISA–MEA's core engineering adviser and educational partner. Located in the USA, Georgia Tech provides a technologically focused education to undergraduate and postgraduate students in fields ranging from engineering, computing and sciences to business, design, and the liberal arts. Within CSISA–MEA, Georgia Tech is leading efforts in the mechanization and industrialization activities and in the design and implementation of the apprenticeship program, as well as anchoring US-based industry collaborations.

#### Annex 2: Summary of SWOC analysis of 42 second-stage ABLE enterprises and areas of request for collaboration

Listed in order of frequency of issue raised or type of collaboration requested

	Jashore	Faridpur	Bogura	Cox's Bazar						
		Areas of co	llaboration							
1 2 3 4 5 6	<ul> <li>heat treatment/testing services</li> <li>modern capital machinery purchase</li> <li>linkages with dealers/lead firms</li> <li>drawing &amp; design skills</li> <li>pattern/dice (dies) development</li> <li>product branding</li> </ul>	<ol> <li>ABLE enterprises require CSIS.</li> <li>pattern/dice (dies) development</li> <li>obtaining modern capital machinery</li> <li>workforce training</li> <li>online video content for marketing</li> <li>promotion/business linkages for developing/marketing climate- smart machinery</li> </ol>	1.drawing and design skills/knowledge for targeted new manufacturing prototypes field test, market promotion of targeted machinery	<ol> <li>skill development in drawing and design, record-keeping, investment planning, digital marketing platforms</li> <li>links to DAE, dealers, and farmers</li> <li>capacity to promote products through social media channels</li> </ol>						
	Strengths									
1 2 3 4	<ul> <li>capital machinery</li> <li>existing market networks/market reputation</li> <li>skilled, experience workforce</li> <li>willingness to improve product quality</li> </ul>	<ol> <li>skilled, experience workforce/technical expertise</li> <li>existing market networks</li> <li>suitable workshop location &amp; space</li> <li>huge demand</li> <li>financial strength</li> </ol>	<ol> <li>1.skilled, experience workforce</li> <li>2.capital machinery</li> <li>3.own workshop/foundry</li> <li>4.capacity to invest in new products manufacturing</li> <li>5.ability and willingness to install new machines for manufacture of new products</li> </ol>	<ol> <li>suitable workshop location/space</li> <li>ability and willingness to install new machines for manufacture of new products</li> <li>skilled, experience workforce</li> <li>capital machinery</li> <li>some workforce already trained</li> </ol>						
	Weaknesses ABLE enterprises lack:									
	<ol> <li>testing/heat treatment knowledge</li> <li>online marketing skills</li> <li>capacity to meet demand</li> <li>running capital</li> </ol>	<ol> <li>adequate capital machinery</li> <li>online marketing skills</li> <li>staff for market promotion</li> <li>business relation with dealers and commission agents</li> </ol>	<ol> <li>1.drawing and design skills for new parts</li> <li>2.product promotion &amp; branding skills</li> <li>3.workforce skills for new parts</li> <li>4.management capacity</li> </ol>	<ol> <li>workforce with skills to manufacture new machines</li> <li>skills in product promotion and branding</li> <li>business management skills</li> </ol>						

#### The Feed the Future Bangladesh Cereal Systems Initiative for South Asia Mechanization and Extension Activity Semi-Annual Report, October 2023 – March 2024

Jashore	Faridpur	Bogura	Cox's Bazar
<ol> <li>5. digitals tools for controlling quality of output</li> <li>6. digital inventory</li> <li>7. capital machinery</li> </ol>	5. running capital/link with FSI/financial reserves		4. skills to make the pattern & dice needed to make prototypes of new machines
	There are opportun	ities as a result of:	
<ol> <li>increase production by installing modern capital machinery</li> <li>access to markets through online advertising</li> <li>market for spare parts with dealer/lead firm</li> <li>quality improvement through heat treatment/testing</li> <li>market for new agro machinery &amp; spare parts product lines</li> </ol>	<ol> <li>markets in other districts and new dealerships</li> <li>access to bank/MFI finance</li> <li>huge market for spare parts</li> <li>market for new machines</li> <li>availability of people to employ</li> </ol>	<ol> <li>market demand for new machines</li> <li>raw materials available locally</li> <li>low market competition for new machines</li> </ol>	<ol> <li>large market for machines to be manufactured</li> <li>little competition for the machines targeted for manufacture</li> </ol>
	There are cha	llenges with:	
<ol> <li>linking with markets in remote districts</li> <li>high price of raw materials</li> <li>obtaining running capital</li> <li>obtaining orders</li> <li>accessing testing facilities</li> <li>low quality of parts for dealers and lead firms</li> </ol>	<ol> <li>poor electrical wiring</li> <li>high workforce drop-out rate</li> <li>high competition in the market</li> <li>political unrest</li> <li>difficulties recovering credit from dealers and customers</li> </ol>	<ol> <li>high raw material prices and variable quality</li> <li>competition from imported low- cost, low quality machines</li> <li>providing after sales services in remote areas</li> <li>copying of products without permission</li> </ol>	<ol> <li>copying of products without permission</li> <li>lack of the machines/services required to manufacture new targeted machines</li> <li>fluctuating raw material prices</li> <li>manufacturing machines at competitive prices</li> <li>providing after sales services in remote areas</li> </ol>



