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SEMI-ANNUAL REPORT 2016-2017

Cereal Systems Initiative for South Asia Phase III in Bangladesh & Nepal

Cereal Systems Initiative for South Asia Phase III: Bangladesh and Nepal

Semi-Annual Report
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Acronyms and Abbreviations

Acronym	Full Name
2WT	Two-wheel tractor
4WT	Four-wheel tractor
AAS	Agricultural Advisory Services
AIRN	Agricultural Input Retailer Network
BARI	Bangladesh Agriculture Research Institute
BRRI	Bangladesh Rice Research Institute
BSMRAU	Bangabandhu Sheikh Mujibur Rahman Agricultural University
CIMMYT	International Maize and Wheat Improvement Center
CSISA	Cereal Systems Initiative for South Asia
CSISA-BD	Cereal Systems Initiative for South Asia in Bangladesh
CSISA-MI	Cereal Systems Initiative for South Asia-Mechanization and Irrigation
CSRD	Climate Services for Resilient Development
DADO	District Agriculture Development Offices
DAE	Department of Agricultural Extension
DSR	Direct-seeded rice
FtF	Feed the Future
GFSA	Global Food Security Act
iDE	International Development Enterprises
IFPRI	International Food Policy Research Institute
INGENAES	Integrating Gender and Nutrition within Agricultural Extension Services
IRRI	International Rice Research Institute
IWM	Integrated weed management
KISAN	Knowledge-based Integrated Sustainable Agriculture and Nutrition
NAMEA	Nepal Agricultural Machinery Entrepreneurs' Association
NARC	Nepal Agricultural Research Council
NARES	National Agriculture Research and Extension System
NGO	Non-governmental organization
PERSUAP	Programmatic Pesticide Evaluation Report and Safer Use Action Plan
PMAMP	Prime Minister Agriculture Modernization Project
PNM	Precision nutrient management
PQR	Premium quality rice
RVC	Rice value chain
ToT	Training of trainers
USAID	United States Agency for International Development
WRC	Wheat Research Center
ZT	Zero tillage

CSISA PHASE III

Context

After a decade of stagnation, staple crop yields in South Asia have shown signs of growth in the last five years, albeit at rates that are insufficient to meet forecasted demands and with significant geographic heterogeneity. At the same time, issues of resource degradation, declining labor availability, and climate variability (e.g., erratic rainfall, heat) pose considerable threats to the goals of achieving sustainably intensified cereal-based farming systems that improve food security and rural livelihoods while buffering against risks that can preclude transformative opportunities for private investments in productivity-enhancing technologies and markets. These challenges are particularly acute in areas where both public and private support services for agriculture are weak and exposure and vulnerability to climate extremes are high, as they are in Bangladesh and Nepal.

Approach

With support from the Bill & Melinda Gates Foundation and U.S. Agency for International Development, the Cereal Systems Initiative for South Asia (CSISA) has worked as an eco-regional initiative to support agricultural development in South Asia since 2009. **CSISA's aim is to use sustainable intensification technologies and management practices to enhance the productivity of cereal-based cropping systems, increase farm incomes, and reduce agriculture's environmental footprint**. As a science-driven and impacts-oriented initiative, we reside at the intersection of a diverse set of partners in the public and private sectors, occupying the 'messy middle' where research meets development.

To address the challenges currently facing cereal-based systems in South Asia, CSISA III pursues six overall goals: (1) Reduce risk for sustainable intensification, (2) Add value to extension and agro-advisory systems, (3) Promote inclusive growth around commercial pockets and neglected niches, (4) Undertake participatory science and technology evaluations, (5) Grow the input and service economy, and (6) Manage risk by coping with climate extremes.

Theory of Change and Linkages with the U.S. Global Food Security Strategy

CSISA's activities, objectives, and vision of success fully align with and support the U.S. Global Food Security Results Framework. To contribute to **Objective 1: inclusive and sustainable agriculture-led growth**, CSISA (1) builds precision nutrient management approaches around scaling pathways, (2) deploys better-bet agronomic messaging through input dealer networks and development partners, (3) increases the capacity of NARES to conduct participatory science and technology evaluations, (4) utilizes integrated weed management to facilitate sustainable intensification transitions in rice, (5) generates income through maize production in neglected hill and plateau ecologies, (6) develops rice fallows, (7) expands premium quality rice, and (8) facilitates the commercial expansion of scale-appropriate reapers and seeders. For **Objective 2: strengthening resilience among people and systems**, CSISA, (8) facilitates directly sown rice to address labor and energy constraints to precision rice establishment, (9) disseminates agronomic and variety recommendations to reduce the threat of wheat blast, (10) facilitates zero-till wheat to tackle energy & economic constraints and to enhance crop productivity, (11) promotes early wheat sowing for combatting heat stress, and (12) helps farmers cope with a weak and variable monsoon in order to avoid *kharif* fallows. Finally, To support **Objective 3: a well-nourished population, especially women and children**, CSISA (13) facilitates intensified livestock feeding strategies to enhance milk production, increase incomes for women, and ensure better nutritional outcomes, and (14) promotes diversified and more remunerative cropping systems to enhance dietary nutrition.

Some CSISA activities contribute to multiple GFSA Objectives, which are denoted accordingly in the headers as appropriate.

CSISA Phase III and the U.S. Global Food Security Strategy Results Framework

U.S. Global Food Security Act Goal: Sustainably reduce global hunger, malnutrition, and poverty

GFSA Objective 1
Inclusive and sustainable agricultural-led economic growth

- Building **precision nutrient management** approaches around scaling pathways
- Deployment of **better-bet agronomic messaging** through input dealer networks and development partners
- **Increasing the capacity of NARES** to conduct participatory science and tech evaluations
- **Integrated weed management** to facilitate sustainable intensification transitions in rice
- **Income-generating maize production** in neglected hill and plateau ecologies
- **Rice-fallows development**
- **High-value premium quality rice** expansion
- Commercial expansion of **scale-appropriate reapers and seeders**

GFSA Objective 2
Strengthened resilience among people and systems

- **Directly sown rice** to address labor and energy constraints to precision rice establishment
- Agronomic and variety recommendations to reduce the threat of **wheat blast**
- **Zero-till wheat** to tackle energy & economic constraints and to enhance crop productivity
- **Early wheat** for combatting heat stress
- **Coping with a weak and variable monsoon** and avoiding kharif fallows
- **Rice-fallows development**
- Commercial expansion of **scale-appropriate reapers and seeders**

GFSA Objective 3
Well-nourished population, Esp. women and children

- **Intensified livestock feeding strategies** to enhance milk production, increase income for women, and ensure better nutritional outcomes
- **Diversified** (pulse and intercrop integration) **and more remunerative** (commercial maize, PQR) **staple crop production systems** for nutritious diets, especially for women and children

← Cereal Systems Initiative for South Asia (CSISA) Phase III Interventions ←

CSISA Phase III activities also map against the following GFSA Intermediate Results:

- **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable
- **IR 2:** Strengthened and expanded access to markets and trade
- **IR 3:** Increased employment and entrepreneurship
- **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches
- **IR 5:** Improved proactive risk reduction, mitigation and management
- **IR 6:** Improved adaptation to and recovery from shocks and stresses
- **IR 7:** Increased consumption of nutritious and safe diets

As well as these GFSA Cross-Cutting Intermediate Results:

- **CC IR 3:** Increased gender equality and female empowerment
- **CC IR 4:** Increased youth empowerment and livelihoods
- **CC IR 5:** More effective governance, policy and institutions

FY17 Semi-annual Indicators of Progress

At the mid-way point through the project year, CSISA Phase III in Bangladesh and Nepal is on track to meet its annual targets. More detailed indicator data are presented in Appendix 3.

- The number of farmers who **applied improved technologies** during the reporting period was 43,609 on 13,931 hectares, including 5,008 women farmers. Disaggregated by technology type (i) 6,846 farmers planted new crop genetics on 1,813 hectares, (ii) 23,381 used advanced cultural practices such as zero tillage on 7,156 hectares; (iii) 1,159 applied precise and more remunerative soil fertility practices on 384 hectares, and (iv) 14,000 better coped with climate variability by adopting new technologies on 4,576 hectares.
- CSISA **trained** 1,958 individuals through short-term courses during the reporting period, including 153 lead farmers, 645 representatives from government organizations, 1,032 representatives from the private sector, and 128 representatives from community-based organizations. These individuals are either important 'influencers' who help shape opinion of the performance and merit of new technologies, or 'intermediaries' who, by their actions, directly reach many farmers through provision of advice or other types of services.
- **Business mentoring** was provided to 149 firms, including 15 formal companies and 134 sole entrepreneurs (e.g., service providers and agro-retailers). All are new to CSISA III this year.

Major Activities and Accomplishments by Country

Bangladesh

- CSISA's commitment to scaling-out science-led interventions is bearing fruit in Bangladesh. In total, **33,335 farmers on 9,986 hectares** have taken up or are testing new technologies and crop management practices that strengthen cereal production systems, that are profitable, and that confer improved potential for resilience and employment opportunities.
- In particular, 8,419 farmers on 2,778 hectares responded to CSISA's **better-bet agronomy media campaigns** by purchasing seedlings from rural entrepreneurs or adopting healthy rice seedling practices by growing them in community nurseries in which women play a crucial role. Working through development partners to scale-out training information, farmer's use of improved legume production practices has also grown considerably.
- CSISA continued to play a catalytic market facilitation role in 2016 and early 2017, which resulted in 6,845 farmers growing **premium quality rice** varieties that fetch high market prices on 1,831 new hectares.
- **Wheat blast** disease appeared again in 2017, though at lighter infection levels than in 2016. CSISA partnered with BARI and a number of advanced research institutes to train 40 national research scientists from Bangladesh, Nepal and India, and to conduct South Asia's first ever wheat blast surveillance campaign in 25 districts of Bangladesh.
- The emergence of wheat blast disease in South Asia threatens the resilience of the region's second most widely consumed crop. Working with the Bangladesh Agricultural Research Institute, early wheat sowing was confirmed as an actionable technique farmers can use to **mitigate wheat blast infection**. Two low-cost and low-environmental risk fungicides have also been effective in controlling light levels of infection. These studies will be repeated in 2017/18 to confirm the results before scaling-out recommendations to farmers, although initial results are promising. (Note: CSISA in

Bangladesh follows the country-wide Programmatic Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for all non-research and on-farm activities.)

- Opportunities for rural and youth entrepreneurship have been boosted through CSISA-led efforts to develop joint venture agreements and access to finance for companies and farmers entering into **agricultural machinery service markets** in northern Bangladesh.
- Although farmers faced challenges sowing wheat early (a practice that increases yields), a result of unseasonable rains in November of 2016 and extension advisories to avoid wheat because of the risk of blast in some regions, CSISA's media campaigns were successful in **spurring earlier sowing** on 4,576 hectares by nearly 14,000 farmers.
- CSISA is currently conducting surveys to examine new opportunities for **crop-livestock integration** to boost farmers' incomes and household nutrition through maize-dairy milk production systems, and through improved legume management and maize-leafy vegetable intercrops.
- Non-availability of data constrains the ability of policy makers to improve the enabling environment for sustainable intensification in CSISA's target geographies. To this end, CSISA launched a pilot program to evaluate the use of a smartphone application for the collection of **high-frequency and crowd-sourced data** via a 'microtasks-for-micropayments' mechanism.

Nepal

- During the reporting period CSISA's interventions led to **10,274 farmers** applying new technologies or management practices **on 3,900 hectares** in Nepal.
- CSISA continued to develop output markets as a critical '**pull' factor for spurring crop intensification and system diversification**. For example, 350 hectares of spring maize were cultivated for the first time under contract farming arrangements with feed mills in the Feed the Future zone. Diversification is also drawing in new sustainable intensification technologies with two-thirds of the new maize area sown by precision seed drills – the largest such pocket in Nepal.
- The key to scaling sustainable intensification technologies is to jumpstart the service economy. CSISA continues to mobilize and support partners across the **machinery value chain** by verifying technologies with government partners, helping to organize and draw investment into the importing and retailing system, and by training new and emerging service providers. Through this integrated approach, CSISA has facilitated the private sector sales of **1,074 reapers (> 400 units this period) and 150 seeders (50 this period)** with accelerating sales trends for both technologies.
- Although zero tillage (ZT) for wheat has been championed as a profitable and sustainable production technology for wheat in Nepal for more than 15 years, very little adoption has occurred due to low levels of machinery availability. CSISA's market facilitation role for machinery is starting to change this scenario, with **more than 900 household adopting ZT** in the reporting period through mechanized service providers.
- Nepali rice farmers are particularly vulnerable to monsoon variability because fewer farmers have access to assured irrigation than in any other country or region in South Asia. CSISA has worked to identify and develop markets for short-duration rice hybrids that preserve yield potential but also increase resilience by avoiding late-season stress when the monsoon withdrawal is premature. As a result, more than 40 agro retailers across the Terai districts of the FtF zone sold **20 MT of hybrid rice seed in 2016, enough to preserve yield potential and increase resilience on about 1,000 ha.**

- **Directly sown rice (DSR) holds tremendous promise** for decreasing water requirements for rice establishment and thereby reducing early-season vulnerability to weak or late-arriving monsoon rains. Nevertheless, DSR comes with its own set of production risks that have constrained adoption including vulnerability to early inundation and weed competition. Reducing production risks is the essential first steps towards making DSR viable at scale. CSISA conducted on-farm evaluations of DSR using 'dust mulching', a simple management adjustment that uses pre-sowing irrigation followed by shallow tillage to better control weeds and permit earlier planting by limiting irrigation requirements. Results showed that **dust mulching significantly increased yield (20%) and decreased early weed pressure (25%)** compared to post-sowing irrigation in DSR**.**
- Production practice surveys of more than 1,000 households that were implemented in coordination with the Ministry of Agricultural Development revealed that farmers who irrigated three or four times had rice yields that averaged approximately 4.5 t/ha, whereas farmers who did not irrigate achieved yield of 3.0 t/ha, indicating that **water stress in even a 'good' monsoon year reduces rice yield potential by 33%**.
- CSISA has initiated new diagnostic research to characterize **decision processes for irrigation use in** r**ice**. Several factors contribute to insufficient irrigation in the Nepal Terai, including: knowledge deficiencies about crop water requirements, issues with coordination for use of shared infrastructure, and cash liquidity constraints that make farmers reluctant to invest in pumping.
- New research collaborations are being formed with Heifer International and the Livestock Innovation Lab to capitalize on the role of **cropping intensification for enhancing milk production** in maize-livestock systems.

Objective 1: Inclusive and sustainable agricultural-led growth

Building precision nutrient management approaches around scaling pathways

Jui of Sadhuhati in Jhenaidah district displaying her family's freshly harvested maize. Photo: Farzana

As a high-yielding and profitable crop, maize requires precise and cost-efficient management guidelines fine-tuned for the different types of fields and environments it is grown on. To this end, research has continued towards the development of precision nutrient management (PNM) systems in rice-maize crop rotations in Bangladesh. **Nutrient omission plot trial experiments** are ongoing in **80 farmers' fields** to predict spatial heterogeneity of the soil's indigenous nutrient supply capacity – information that is crucial for fine-tuning precise fertilizer management.

Soils sampled from 400 fields are also under analysis with mid-infrared (MIR) spectroscopy in **partnership with Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)** as an alternative to costly and time-consuming wet chemistry methods. With CSISA's leadership, this is the **first time that MIR spectroscopy has been used for agricultural research in Bangladesh**. As maize is currently being harvested at the time of reporting, results from these experiments will be reported in the 2017 annual report.

CSISA will continue to explore policy reform solutions to support soil fertility management in Bangladesh. The Government of Bangladesh has been actively pursuing policy solutions to encourage a more balanced application of chemical fertilizers by introducing large subsidies on non-urea fertilizers while allowing the price of urea to increase. While there is evidence that consumption of non-urea fertilizers has increased because of these policy changes, there is still a sizeable gap between the recommended rates of these fertilizers and their actual application, and there are some suggestions that an important factor underlying these gaps is that farmers are insufficiently informed regarding nutrient recommendations. Moving forward, CSISA will work proactively with the Department of Agricultural Extension to ensure that the new policy-based incentives for balanced and efficient fertilizer use are realized at the farm level.

CSISA's precision nutrient management work contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, and **IR 5:** Improved proactive risk reduction, mitigation and management.

Deployment of better-bet agronomic messaging through input dealer networks and development partners

CSISA works to increase agricultural productivity by deploying recommendations for simple to implement, inexpensive (and hence inclusive) agronomic management practices for smallholder farmers. CSISA relies on our vast assortment of private and public sector partners to scale-out information. Key activities in the 2016/17 dry cropping season focused on healthy rice seedlings to boost yields in Bangladesh's primary staple crop and on improving mungbean cultivation practices. As a rapidly expanding, profitable and nutritious legume crop, farmers are increasingly replacing fallow land with mungbean in CSISA's working areas in Barisal Hub in the Feed the Future (FtF) Zone.

Farmers in Barisal district are now growing healthy rice seedlings to increase rice crop productivity. Photo: Deb Kumar Nath.

***Healthy Rice Seedlings*:** Most Bangladeshi farmers transplant rice seedlings into flooded fields, but the quality of the seedlings varies considerably. The use of healthy rice seedlings can result in improved crop establishment and early vigorous growth that can **increase yields by 7–10%.** Most farmers however use poor quality seedlings, or are unaware of the simple methods that can be used to raise healthy rice seedlings for transplanting. Responding to these problems with opportunities for boosting rice productivity, CSISA completed the following activities in 2016 and early 2017:

(1) A short **farmer-friendly instructional video** on healthy rice seedlings was developed in Bangla. The video was shown in 498 open-air markets, community centers, and markets. A total of **37,117 registered viewers** in Faridpur and Jessore Hub saw the video, which was combined with interactive Q&A sessions led by CSISA's partner, Agricultural Advisory Society (AAS), before the start of seedbed preparation the dry *boro* 2016–17 rice season. Combined with unregistered audiences, total viewership was estimated at 89,780 people. Follow-up surveys showed that **62% of the registered viewers adopted at least one recommended healthy rice seedling practice**. For reporting purposes, however we conservatively considered only **farmers adopting three or more practices – 8,419 people – culminating in a healthy rice seedling adoption figure of 2,778 hectares** (exceeding targets by 139%).

(2) CSISA is the only program providing **training for trainers** employed by development partners in Bangladesh. Six hundred twelve Department of Agricultural Extension (DAE) block/village level extension personnel and 80 NGO field workers were trained in the first half of the 2016/17 reporting year. These activities resulted in 8,419 farmers (10% women) further adopting healthy rice seedlings practices on 2,778 hectares.

(3) CSISA also distributed informational booklets to all **1,500 master trainers** from the DAE and NGOs. An additional 32,000 healthy rice seedling leaflets were delivered to master trainers and Agricultural Retailer Input Network dealers to distribute to farmers, 25,858 of which were distributed to farmers at the time of writing.

(4) Forty-one farmers were given advanced agronomic and business training to develop and improve **healthy rice seedling entrepreneurial enterprises**. Six new entrepreneurs (3 male, 3 female) received healthy rice seedling training, the remainder of participants having run rice seedling businesses for at least two years, but who were looking to increase their skills and profitability. Following the interactive training, focus group discussions indicated they began to prepare seedbeds at the correct time, while using the correct seed rate, treating seeds, and better managing water and nutrient inputs to improve seedling quality. Additional studies are underway to examine which business models are most successful and can be adopted by more farmers.

(5) CSISA's NGO and DAE partners assisted **1,092 farmers** in establishing **95 community-managed seedbeds** in Jessore (62), Barisal (19) and Faridpur (14) hubs. An alternative to purchasing seedlings, community seedbeds reduce costs for resource-poor farmers and increase the ease of managing seedbeds for higher yields.

***Better-bet management of mungbean*:** Turning research results into impact, 4,100 training booklets collaboratively developed by CSISA and the **Bangladesh Agricultural Research Institute (BARI)** on how to improve mungbean cultivation were used to support farmer trainings deployed through CSISA's partners in the DAE and the **USAID Agricultural Extension Support Activity**. CSISA also brokered a new partnership with **Grameen Euglena Ltd.**, a social business joint venture between Grameen Krishi Foundation and Euglena of Japan, to use the booklet for training contract mungbean farmers. As a result, **3,592 farmers (19.2% women)** on **611 hectares** have begun using CSISA- and BARI- recommended management practices to boost mungbean yield and profits.

CSISA's better-bet agronomy interventions contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship, **CC IR 3:** Increased gender equality and female empowerment, and **CC IR 3:** Increased gender equality and female empowerment and **CC IR 4:** Increased youth empowerment and livelihoods.

CSISA's work on mungbean contributes to **Objective 3**: A well-nourished population, especially women and children.

Increasing the capacity of NARES to conduct participatory science and technology evaluations

Strenthening of national agricultural research and extension system (NARES) partners' capacity to deploy advanced and participatory science and technology evaluations is core to CSISA's strategy for long-term and sustainable impact in South Asia's cereal production systems. Working closely with BARI's Wheat Research Center, Cornell University's Delivering Genetic Gains in Wheat project, and the CIMMYT-led, USAID/Bangladesh funded CSISA-Mechanization and Irrigation (CSISA-MI) initiative, and with programming supported by the Australian Center for International Agriculture Research, CSISA helped organize a training program for scientists from Bangladesh, India, and Nepal.

Wheat blast training participants learning about disease surveillance and electronic data collection using mobile phones and tablets. Photo: T. Krupnik

First sighted in Brazil in 1985, blast is widespread in the warmer and humid regions of South America. A severe outbreak of blast in Bangladesh's FtF zone in early 2016 – the first of its kind outside South America – **reduced yields in some fields by up to 100%** and has undermined the resilience of the region's wheat production systems. South Asia is home to **300 million undernourished people** and **consumes over 100 million tons of wheat** per year. The intensive two-week training event – the first ever in South Asia – is part of global efforts to mitigate blast effects and control its spread.

Chief Scientific Officer of BARI, Dr. P. K. Malaker, showing trainees how to identify wheat blast in the lab. Photo: S. H. Khan.

Forty wheat pathologists, breeders and agronomists from Bangladesh, India and Nepal participated in the training, which included remote lectures by scientists from Kansas State University. Participants learned about wheat blast epidemiology and participated in **field surveillance exercises in 25 districts throughout Bangladesh**, collecting 1,680 wheat and more than 1,000 alternative host weed samples from over 800 fields.

Visible wheat blast symptoms were found in nine of the sampled districts. Sample analysis is ongoing at BARI-WRC and training participants are now empowered to coordinate disease surveillance programs in their home institutes and countries.

CSISA's NARES capacity work contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, **IR 5:** Improved proactive risk reduction, mitigation and management, **IR 6:** Improved adaptation to and recovery from shocks and stresses, and **CC IR 3:** Increased gender equality and female empowerment.

Integrated weed management to facilitate sustainable intensification transitions in rice

In addition to receiving information from the DAE, many farmers in Bangladesh receive agronomic management advice from input dealers. These dealers however do not always have the technical skills to advise farmers effectively. Between 2017 and early 2018, CSISA partnered with Agricultural Input Retailer Network (AIRN) to extend integrated weed management (IWM) practices through input dealers. Making use of CSISA's Integrated Weed Management training modules, **818 dealers in the FtF zone were trained on the principles and practices of IWM.** Now that much of the dry *boro* rice season is nearly complete, follow-up surveys are now under way to determine the extent of farmer IWM adoption resulting from improved advice given by dealers. These results will appear in the 2017 CSISA Annual Report.

Rice-fallows development in coastal Bangladesh (also serves Obj 2)

Estimates suggest that 120,000 hectares in the FtF zone of Bangladesh are regularly fallowed or are under rainfed production during the dry season. In support of government objectives advocating increased cropping intensity and irrigation in this region, CSISA conducts policy-relevant research to identify pathways for the sustainable intensification of these otherwise marginal lands. Key to this objective is an improved understanding of the long-term trajectories of change for the region's farming systems. Surveys of over 500 farmers have shown that farming systems in part of coastal Bangladesh are simplifying from rice–livestock integrated farm types to more homogenous types with fewer livestock and increased pursuit off-farm income generating activities. While many farmers are transitioning to the production of legumes after rice, preliminary evidence indicates a reduction in household dietary diversity and per capita calorie intake 20–30% lower than urban households.

Among the pathways to boost socioeconomic resilience among farmers, CSISA's research indicates that (1) a reduction of fallow land through strategic cultivation of legumes and inclusion of high-value irrigated crops (e.g., watermelon, vegetables, etc.) may be promising; (2) continued policy support for investments in small-scale irrigation development, alongside rehabilitation and maintenance of existing irrigation canals and water flow control structures are needed; (3) strategic alignment of NGO and government extension and development activities are needed in Barisal and Patuakhali districts in order to avoid creation of a 'development dependency syndrome' among poorer households; and (4) increased extension support to boost farmers' knowledge of high-value, nutritious crop options for the dry season; and lastly, (5) increased market linkages will be necessary for inputs and outputs. Playing an information sharing and facilitating role, CSISA plans to hold

roundtable discussions on these issues with donors, government and development partners to discuss options for policy alignment on these issues in August of 2017.

CSISA's fallows intensification efforts contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship, **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, **IR 7:** Increased consumption of nutritious and safe diets, as well as **CC IR 5:** More effective governance, policy and institutions.

High-value, premium quality rice expansion Bangladesh (also serves Obj 3)

Grown by nearly all farmers, rice is Bangladesh's core staple food. Rice is therefore likely to remain the 'backbone' of most rural income-generating activities throughout the country, although increasing labor and water prices make dry season rice cultivation generally less profitable. CSISA is responding to these challenges by developing markets for specialized premium quality rice (PRQ) varieties that fetch above-average market prices, and by working to educate farmers on how to improve their yields through more precise agronomic management. **PQR can boost incomes up to US$ 200 per hectare** as compared to conventional varieties. Additional income is also important for enabling households to purchase new food products and to diversify their diets.

Marching towards profits: Workers in a rice mill in Jhenidah District spread premium quality rice for sun drying. Photo: T. Krupnik

CSISA plays a catalytic market facilitation role to increase incomes in areas where PQR is not widely grown. Major interventions include increasing farmers' awareness of PQR varieties and their economic benefits, scaling-out awareness of PRQ-specific agronomic practices through public and private sector partners, and linking farmers' groups to rice traders and millers through collection points, and efforts to improve PQR processing by linking farmers directly to semi-auto and auto rice mills. CSISA staff also the **trained 612 DAE agents** who communicated better-bet agronomy of PQR to farmers. **6.6 tons of BRRI 50 and 63 PQR seeds were also distributed** to farmers to kick-start markets in new areas. In total, **1,813 new hectares in the FtF zone were established with PRQ varieties** in the 2016/17 dry *boro* rice season as a result of CSISA activities, with **6,846 farmers opting for PQR**. Further details on training impact and production increases are being catalogued in a currently ongoing set of monitoring surveys, the results of which will be shared in the 2017 Annual Report.

CSISA's work on PQR contributes to USAID's intermediate results, **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship, **IR 7:** Increased consumption of nutritious and safe diets (through PQR varieties high in Zinc concentration), and **CC IR 4:** Increased youth empowerment and livelihoods.

The ability to generate more income from PQR means that this activity also contributes to Objective 3: A well-nourished population, especially women and children.

Commercial expansion of scale-appropriate machinery and associated service provision models for reapers and seeders (also serves Obj 2)

This intervention focuses on expanding the impact generated in CSISA's complementary investment made by the USAID/Bangladesh Mission on small-scale and appropriate agricultural mechanization (CSISA-MI). USAID/Bangladesh Mission guidelines constrain CSISA-MI to working in the FtF zone exclusively. CSISA's northern Dinajpur hub conversely offers considerable market opportunities expanding the commercial availability of multi-crop reapers and two-wheel tractor mechanized seeders to smallholder farmers. When machinery owners offer sowing and harvesting to farmers on a fee-for-service basis, small-scale mechanization represents a significant opportunity for youth employment and rural entrepreneurship. As such, this intervention integrates CIMMYT's core partner in CSISA-MI, International Development Enterprises (iDE) to develop value chains and an enabling environment to expand the commercial availability of affordable and efficient machinery in northern Bangladesh. This intervention also supports USAID's second objective 'Strengthened resilience among people and systems' by enabling farmers to reduce costs while efficiently establishing or harvesting crops. More rapid sowing and harvesting also decreases time between crops, aiding farmers to achieve timely field operations that can increase productivity.

Machinery entrepreneurs harvesting wheat and establishing directly sown rice immediately after on the same field in Jessore Hub. These machinery options reduce turn-around time between crops and allow farmers to establish crops earlier, saving time, costs, and boosting yields while reducing production risks. Photo: T. Krupnik

To this end, CSISA has established **joint venture agreements** with partner companies including ACI and Metal (Pvt.) Ltd. to expand markets in Dinajpur. Additional agreements have been reached with the NGO partner TMSS to provide financial support (discount assistance) to farmers interested in machinery purchase. A database of machinery mechanics and spare parts sellers has also been created to assist the integrated expansion of the market. Development of an enabling environment for high-capital investment products like agricultural machinery takes time because market actors', customers', and farmers' incentives must be aligned alongside strong efforts to expand and intensify demand for crop sowing and harvesting services. As a result, the full outcomes of this first year's efforts to establish a functioning market system will be reported in the 2017 Annual report. CSISA has nonetheless been successful in training **86 farmers into machinery service entrepreneurs** through partnerships with BARI, whose technicians have led trainings. Initial study during this reporting period indicates that so far 474 farmers on 207 hectares have received services reaper and seeder services.

In response to CSISA's overall focus on mechanical reapers, two-wheel tractors, and associated implements in Bangladesh, the CSISA policy component focuses its work on developing a more analytical and actionable understanding of the demand for these technologies and the policy constraints to the widespread uptake of specialized, resource-conserving machinery. Moving ahead, we plan to integrate the ongoing policy work with an assessment of the pros, cons, and implementation challenges associated with targeting public subsidies to local service providers and expanding the local commercial markets for such services and machinery. Developing a better understanding of the incentives and feasibility constraints of local service providers will better position CSISA to transmit information to policymakers in Bangladesh.

CSISA's work on commercial scale-appropriate machinery expansion contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship, **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, and **CC IR 4:** Increased youth empowerment and livelihoods.

Objective 2: Strengthened resilience among people and systems

Directly sown rice to address labor and energy constraints to precision rice establishment

While transplanting remains the predominant method of rice establishment in Bangladesh, CSISA is also investigating the potential for large-scale adoption of directly sown rice (DSR) to alleviate labor and energy constraints to production that are expected to intensify in the future. Less labor- and energy-intensive methods to establish the rice crop are likely to be prerequisite to increasing the resilience of Bangladesh's rice production systems to fluctuations in labor and fuel market prices. DSR is however not likely to be appropriate in all rice production seasons in Bangladesh, due to risks of seedling cold-injury in the dry season, or problems with excess water in the monsoon season, both of which can damage directly sown crops. CSISA is therefore focusing on the *aus* pre-monsoon season. Partnering with the **Bangladesh Rice Research Institute (BRRI),** DSR trials focused on improving crop establishment and weed control are currently being established in Jessore district.

In addition to field experimentation, 70 **agricultural machinery entrepreneurs** from six districts attended an interactive meeting also attended by DAE and BRRI staff sharing experiences with DSR. Following the meeting, CSISA and its partners have selected 33 advanced entrepreneurs and CSISA is now working with them to build their skills to successfully and profitably establish DSR crops. These entrepreneurs will be leveraged in future seasons to assist in training larger numbers of DSR service providers, which are targeted to be 25% of machine seed drill owners in Jessore hub. The results from these activities will be presented in the 2017 annual report.

DSR interventions contribute to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 3:** Increased employment and entrepreneurship, **IR 5:** Improved proactive risk reduction, mitigation and management, and **CC IR 4:** Increased youth empowerment and livelihoods.

Agronomic and variety recommendations to reduce the threat of wheat blast

The 2016 outbreak of wheat blast had a significant and negative impact on wheat production in southern Bangladesh in 2017. Wheat area shrunk from roughly 62,763 hectares in 2016 to just 14,238 hectares in 7 affected districts in 2017, as the government discouraged farmers from growing

wheat in these areas. Although wheat area was reduced, blast symptoms were found in 9 districts including two new ones (Faridpur and Rajshahi (one field) in 2017. The severity of infection was very light, a result of unusually low precipitation, and yield losses are expected to be minimal in 2017, although there is still significant risk of future outbreaks.

CSISA has responded by supporting applied research with BARI to identify actionable agronomic methods to mitigate wheat blast appropriate for South Asia's farmers. Activities and preliminary results include the following:

Children in Dinajpur eating wheat roti. Wheat is Bangladesh's second most widely consumed food, and is now threatened by wheat blast disease. Photo: CIMMYT.

***Efficacy of foliar fungicides*:** Tests were conducted to identify low-cost and effective fungicides for wheat blast under highly controlled research station conditions, with all fungicide application managed by trained professionals. The following fungicide combinations appear to be inexpensive and good candidates for reducing light levels of blast infection (Table 1).

Table 1: Preliminary results of foliar applied fungicides on wheat blast control in southern Bangladesh.

Trade name	Common name	Infection level or severity (%)			PERSUAP status[1]
		Infected heads	Head area	Severity	
Nativo 75 WG	Tebuconazole 50% + Trifloxystrobin 25%	4	37	1.3	Tebuconazole restricted, Trifloxystrobin unrestricted
Trooper 75 WP	Tricyclazole 75%	5	40	1.9	Banned
Folicur 250 EC	Tebuconazole 25%	2	30	0.8	Restricted
Tilt 250 EC	Propiconazole 25%	6	37	2.6	Restricted
Azcor 30.5 SC	Azoxystrobin + Difenoconazole	7	40	2.8	Unrestricted
Amistar Top 325 SC	Azoxystrobin 20% + Difenoconazole 12.5%	3	33	1.1	Unrestricted
Control	Unsprayed	24	60	14.6	

[1]. CSISA in Bangladesh follows the country-wide Programmatic Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for all non-research and on-farm activities.

Two candidate fungicides that are commercially available in Bangladesh, Azcor 30.5 SC and Amistar Top 325 SC, are not PERSUAP restricted and have low mammalian toxicity. They may therefore be promising for disease mitigation, though evaluation under higher infection levels is needed. Any extension advisories for farmers regarding these fungicides must also be accompanied by personal and environmental safety messaging.

***Sowing date and varietal screening trials*:** The benefits of timely wheat sowing were initially confirmed in this trial, which indicated increasing levels of blast infection for late sowing dates compared to early or optimum sowing times (Nov. 10, Nov. 20, Nov. 30). Out of 100 varieties evaluated, one candidate (BAW 1260) was almost free from infection. Others showed low levels (<10%), though further confirmation is needed before recommendations can be extended to farmers.

***Efficacy of seed treating fungicides*:** Laboratory tests showed that Provax 200 WP (Carboxin 37.5% + Thiram 37.5%), Vitaflo 200 FF (Carboxin 17.5% + Thiram 17.5%) and Rovral 50 WP (Iprodione 50%) were effective in controlling seed infection with improved germination, though none of these chemicals are banned PERSUAP products. Further research on approved options is now underway.

Innovative data sourcing and approaches to risk management: Building on work initiated during CSISA I and II, CSISA has been exploring the use of existing messaging services with input dealers and development partners to convey 'better-bet' agronomic information to advise on varietal choice, planting dates, and other actionable items for farmers. This approach has taken on particular urgency in light of the recent incidence of wheat blast in Bangladesh, which affected nearly 20 percent of wheat area during the Rabi season in 2016. Strategic efforts to manage the outbreak have been limited by the inadequate use of fungicides and an overall lack of data on the geographic locality of incidences. Building on the aforementioned pilot, we aim to address this knowledge gap by expanding the partnerships with ICT service providers to collect near-real-time data directly from farmers, extension agents, and other key actors in the seed system to build a highly localized, variety-specific messaging system to combat crop diseases and encourage adoption of CSISA-supported cultivars and other technologies.

Farmers in Bangladesh can achieve higher yields and escaped the risk of crop heat stress through earlier wheat sowing in the 2016/17 season. Photo: Ranak Martin.

Continuing work initiated during CSISA II, CSISA has been evaluating the effectiveness of various risk management strategies to enable more intensive agricultural production and improve farmers' resilience. While overall demand for insurance has repeatedly been found to be price-sensitive, experimental results from Bangladesh point towards positive impacts of index insurance in the *ex ante* use of modern agricultural inputs, providing insights about change in farmer behavior and perceptions with the additional financial cushion of products such as index insurance. There are also unique opportunities for leveraging new technologies in the design of insurance products. In particular, going forward we will be exploring the potential for introducing a photo-based insurance product that could be used to address production risks related to wheat blast, which has recently emerged as an important area of investment for CSISA.

CSISA supported research on wheat blast management contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable**, IR 5:** Improved proactive risk reduction, mitigation and management, and **IR 6:** Improved adaptation to and recovery from shocks and stresses.

Early wheat for combatting heat stress

Wheat is a temperature-sensitive crop. When temperatures exceed 30°C, wheat photosynthesis can be disrupted, resulting in reduced grain filling and lower yields. Temperatures in excess of 32°C during flowering can be even more damaging. Late seeded wheat is also more susceptible to major diseases like leaf blight, rust, and blast. These constraints make it imperative to sow the wheat crop during November, in order to increase resilience and adaptability in the face of climate change, and to avoid tropical heat as the crop matures in the early spring.

CSISA has responded to these issues by raising farmers' awareness of the importance and benefits of timely sowing through mass media campaigns, through advisories administered through government and development NGO partners, and by tackling the logistical constraints to early sowing. Some of the media promotion activities conducted prior to the 2016/17 wheat season included: (1) production and distribution of 208,000 leaflets developed by BARI and CSISA on early wheat sowing through DPs and DAE; (2) instillation of 385 awareness-raising banners near public markets and community centers; (3) loudspeaker broadcasts (>100 hours) of early wheat sowing 'jingles' in marketplaces and in sib-districts known for excessive sowing delays; and (4) training and orientation of 660 DAE field agents and 80 NGO partner staff on how to communicate the importance of early

sowing to farmers. This strategy is particularly important as partner staff were leveraged to scale-out advisory messaging for earlier sowing. In addition, (5) NGO partners distributed 43,340 leaflets to farmers. Finally, (6) an additional 33,000 leaflets were distributed by 540 input dealers (66% of the trained AIRN Dealers) to farmer clients. At this point in time, CSISA is the only project actively promoting earlier sowing for increased resilience of wheat farmers in Bangladesh.

These activities showed considerable impact. According to crop monitoring statistics provided by DAE, wheat sowing advanced by at least 10 days on 10%, 9% and 6% of all wheat area in Dinajpur, Jessore, and Faridpur hubs, respectively. Triangulating these data with 30 farmer focus group discussions and estimates of CSISA attribution[1], in total **sowing was advanced on 4,576 hectares by nearly 14,000 farmers** as a result of CSISA's efforts. This was however only 76% of the targeted area. Lower than expected achievement resulted from unseasonable rains in November of 2016 that delayed sowing in some areas, in addition to farmers' reluctance to grow wheat the year following wheat blast outbreak.

CSISA supported efforts to increase farmers' use of early wheat sowing practices contributes to USAID intermediate outcomes **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable**, IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, **IR 5:** Improved proactive risk reduction, mitigation and management, and **IR 6:** Improved adaptation to and recovery from shocks and stresses**.**

Objective 3: Well-nourished population, especially of women and children

Intensified livestock feeding strategies to enhance milk production, increase income for women, and ensure better nutritional outcomes

Farmers carrying maize leaves to feed cattle in Mymensingh. Photo: D. B. Pandit.

In addition to growing rice, a considerable number of farmers in CSISA's Jessore and Dinajpur hubs grow maize and keep livestock for household and market milk production. Consumption of milk at the household level is particularly important for the prevention of stunting and other nutritional disorders affecting children. Most dairy cows in Bangladesh are however fed predominantly rice straw residues, which are sub-optimal in terms of animal nutrition and contribute to reduced milk production. Maize is an excellent livestock feed, though the high cost of hybrid seed and farmers' interest in selling maize into expanding poultry feed markets limits farmers' interest in silage production. Green maize leaves can be stripped from plants before maturity and fed to dairy cows. This practice is already used by farmers in some parts of Bangladesh, but is only in its infancy in CSISA's working areas. The effects of these practices on maize and milk yields, and potential trade-offs between the two, are however poorly understood. Reductions in income from reduced maize yield might be compensated through increased milk sales or milk consumption, though best-bet agronomic practices for this emerging crop-livestock system have not yet been studied in Bangladesh.

Surveys are currently being planned to better understand how and why farmers make use of these practices, and to identify entry points for agronomic improvement. CSISA anticipates working in partnership with the **Bangladesh Livestock Research Institute** to conduct crop and livestock feeding trials to develop win-win methods to maintain maize yields while increasing the flow of nutritious

[1] Attribution to CSISA's media campaign was approximately 40% in Dinajpur and Faridpur and 80% in Jessore hubs.

fodder to dairy cows, with changes in milk productivity monitored. If promising results are found, scaling pathways will be charted out for extension efforts in 2018.

This work stream contributes to USAID intermediate outcomes **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable and **IR 7:** Increased consumption of nutritious and safe diets.

Diversified and more remunerative staple crop production systems for nutritious diets, especially for women and children

CSISA's work in Bangladesh is not limited to cereals alone; substantial income generating and nutritionally beneficial opportunities are also being seized through work on legumes. Legume crops such as lentil and mungbean are high in protein and can contribute to household nutrition, but are usually grown as an 'opportunity' crop with little attention, poor management, and inefficient use of inputs. Focusing on mungbean, agronomic training materials and management recommendations developed by CSISA and BARI but deployed through strategic development partnerships are now being used by 3,592 farmers on 611 hectares (see 'better-bet agronomy'). Surveys are now underway to preliminarily estimate the quantity of newly produced mungbean consumed by farm households compared to that sold into the market, and if sold, to track the ways in which income generated may or may not be used to boost nutritious food consumption for women and children. Results will be reported in the 2017 Annual Report.

Lastly, research conducted in the USAID/Mission funded CSISA-Bangladesh expansion project in 2014–15 indicated strong economic potential for maize grown with leafy vegetables intercropped in the spaces between maize rows. Surveys are now underway to analyze how trial participating farmers have continued these practices and adapted them over time. Analyzing these data, CSISA plans to design additional studies to assess the micro-nutrient and vitamin production potential of different combinations of maize-leafy green intercrops, and to expand farmer awareness of the potential nutritional value of these cropping systems. Intercrops are also expected to confer resilience advantages by diversifying farmers' production portfolios. Results of the current surveys of previous maize intercrop adopting farmers will be reported in the 2017 annual report.

Work on legumes and leafy vegetable intercrops contribute to USAID intermediate outcomes **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, and **IR 7:** Increased consumption of nutritious and safe diets.

Upcoming activities and events for April–September 2017

Moving into mid-2017, CSISA's efforts are focusing on creating awareness of the potential benefits of DSR in pre-monsoon *aus* rice season, and evaluating DSR's scaling potential. During the monsoon, further campaigns on healthy rice seedlings and premium quality rice will be conducted, the latter including increased efforts to link farmers to rice mills offering premium processing. Laboratory work at BSMRAU and BARI will continue, for soil mid-infrared spectroscopy and wheat blast, respectively, as will farmer surveys to better understand opportunities for crop-livestock interventions. A policy round-table dialogue on the potential to intensify cropping on dry seasoned fallow land in the FtF zone is also planned for August.

Objective 1: Inclusive and sustainable agricultural-led growth

Deployment of better-bet agronomic messaging through input dealer networks and development partners

In Nepal, government and development partners often focus on new technology introductions without retaining a focus on the basics of sound management that provide the foundation for sustainable intensification. Consequently, **many farmers report a low-level of knowledge of research-based management recommendations** and achieve low yield levels and profitability accordingly. To close this gap, CSISA collaborated with the commodity programs of the National Agriculture Research Council (NARC), including the National Rice Research Program, the National Maize Research Program and the National Wheat Research Program, to develop better-bet agronomy 'tips' covering production practices for rice (including healthy seedlings), maize, and wheat. In very simple terms and with an emphasis on actionable advice, the factsheets explain low-risk options for improving management practices from seeding to harvest and storage. CSISA is deploying better-bet agronomic messaging through a range of public and private sector partners, with a companion focus on the development of master trainers so that better-bet agronomy is effectively mainstreamed and fully owned by partners.

Better-bet agronomy tips for spring maize; developed by CSISA with government partners and disseminated through conventional and non-conventional extension channels

***Rice*:** The use of healthy rice seedlings improves crop establishment and promotes vigorous early growth, helping to increase yields by 10–15% in Nepal, and even more in unfavorable years. Generally, Nepalese farmers are not aware about the importance of raising healthy rice seedlings, and seedling quality can be impacted by poor water management, insufficient fertilization, sub-optimal planting density, and improper handling during uprooting. To address these issues, CSISA collaborated with the government-led Mega Rice Production Program in six Terai districts (Kanchanpur, Kailali, Bardiya, Banke, Dang and Rupandehi) in the FtF zone by providing ToT for 6 government technicians, 18 co-operative members, and 25 lead farmers on the production of healthy rice seedlings and better bet agronomy for spring rice. Through partners, CSISA distributed 1,500 healthy seedling and 500 better-bet rice agronomy tips for spring rice. This effort resulted in 2,545 farmers adopting healthy rice seedling practices on 472 hectares. Similarly, 882 farmers adopted better-bet agronomy for spring rice on 105 hectares. These tips were also distributed to 60,205 rice farmers through the USAID-funded KISAN project during the *kharif* (monsoon) rice season.

Maize: Spring maize in the Terai is an emerging commercial crop that farmers grow with little previous experience or extension guidance. Although the production potential is high, so are production costs and therefore financial risks. CSISA organized ToTs for 4 government technicians, 12 feed mill representatives, and 50 cooperative representatives. Topics covered included planting methods (e.g., line seeding), irrigation, nutrient and weed management. To backstop these efforts, CSISA also distributed 2,000 better-bet spring maize tips. As a result, 1,072 farmers implemented new practices, including mechanized line seeding and balanced fertilizer management on 400 hectares.

***Wheat*:** To improve the wheat production, CSISA and the National Wheat Research Program developed better-bet agronomic tips for wheat, as well as a video documentary (developed in Nepali) focusing on better-bet agronomy and scale-appropriate mechanization. CSISA organized ToTs and video showings for 8 government technicians, 12 seed company representatives, 8 co-operative

members, and 23 lead farmers on the importance of timely seeding, better seeding methods, the importance of balanced fertilizer, and weed and water management. CSISA distributed 2,500 better-bet wheat agronomy tips. These efforts facilitated 1,964 farmers to apply better agronomy practices, especially seeding time, seeding methods and improved fertilizer management for wheat on 948 hectares.

Fertilizer: In Nepal, achieving the basic tenants of sound agronomic management is highly contingent on the policy environment both within the country and in India. In particular, changes to India's fertilizer subsidy disbursement regime (meant to reduce diversion of heavily-subsidized urea across international borders) may have profound implications for the domestic fertilizer supply in Nepal and the overall productivity of cereals and other staples. At present, it is not clear whether the proposed reforms in India are technically viable, nor whether there will be significant disruptions in Nepal. CSISA will continue observing the landscape on both sides of the border and will advise the Ministry of Agriculture Development in Nepal on plausible response options as the policy environment in India shifts in Q3 and Q4 of 2017.

Integrated weed management to facilitate sustainable intensification transitions in rice

Weed competition is universally cited as a major production constraint in Nepal, but there is almost no data available on the types of weeds that are common, or the contemporary control strategies implemented by farmers and supported by the private sector. To address these gaps in order to best target IWM interventions, CSISA conducted a field survey that documented that 22 different weed species are judged to be problematic by farmers in the Terai districts of the FtF zone. Among them, grassy weeds are the most problematic in both uplands and lowlands. About 60% of farmers apply herbicides in post- and pre-emergence applications to control weeds, mainly to minimize the costs as well as to cope with local labor scarcity. More than 85% of farmers purchased herbicides from input dealers and many requested herbicides based on the suggestion of a neighbor, based on the bottle color or based on the form of the herbicide – granular, liquid or powder. There appears to be **little effort by farmers or input dealers to match control tactics to the actual nature of the weed problem** on specific farms. This erodes the effectiveness of investments in weed control.

To facilitate the uptake of integrated weed management (IWM) strategies that are responsive to field realities, CSISA is developing a training manual on IWM for rice. This training manual will be the guide for master trainers – for example, government technicians, input dealers, private sector technicians, service providers and key farmers.

CSISA's integrated weed management interventions contribute to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship.

Income-generating maize production in neglected hill and plateau ecologies (also serves Obj 3)

Market facilitation to drive expansion of spring maize cultivation

In the Mid and Far Western Terai in the FtF zone, the area under spring maize is increasing where irrigation facilities are available. However, spring maize is a relatively new crop for this belt and the best management practices are not well known and the input–output markets to support intensified production are still not assured. Nevertheless, the size of the commercial opportunity is very large with Nepal importing about 400,000 tons of maize grain per year, primarily for feed mills. Very little maize is procured by mills within Nepal. To capitalize on the opportunity for local sourcing, CSISA organized a participatory market development workshop involving feed mills, farmer groups, government partners (e.g., extension officers from the Department of Agriculture) and input dealers. In response to needs identified by workshop participants, CSISA organized a ToT for 130 resource

persons from the public and private sectors on better-bet crop management practices including mechanization and post-harvest management. Following the workshop, 61 farmers signed **contracts with Rapti Feed Mill to supply maize produced on 350 ha during the 2017 spring season**. Based on this experience, a significant expansion of the maize area under contract with Rapti is now being negotiated with farmer groups for the forthcoming monsoon season crop with facilitation from CSISA. The agreements with Rapti represents one of the first (if not the first) time that maize grain has been produced under contract in the FtF zone, representing an important step in the commercialization of the crop and the creation of new income generating opportunities among staple crop farmers.

Partnership with the Prime Minister's Agricultural Modernization Project

With a planned commitment of more than US$ 100 m USD and a 10-year performance period, the newly launched *Prime Minister's Agriculture Modernization Project* (PMAMP) is the centerpiece of the Nepal Government's efforts to implement the *Agriculture Development Strategy* or 'ADS' that was passed by parliament in 2016 (see http://dofd.gov.np/en/agriculture-development-strategy/). The ADS provides a roadmap for investment and aims to make the country self-reliant in agriculture production through targeted science-led innovation, progressive policies, and support to the emerging private sector. The PMAMP is organized around 'super' zones (commercial areas of more than 1,000 ha), zones (> 500 ha), blocks (> 50 ha) and pockets (> 10 ha). **After consultation with the PMAMP leadership and by invitation, CSISA has initiated deep collaborations with the commodity programs for wheat, maize and rice that extend into the FtF zone**. For example, the Maize Super Zone program has included CSISA in its technical and advisory committees and joint work plan development has been initiated. Key activities for 2017 include:

- Demonstrating mechanized maize seeding in new areas by mobilizing CSISA-facilitated service providers;
- Developing 5 new commercial maize pocket areas (> 10 ha each) and providing better-bet agronomic messages for increasing yields, as well as linking input and output value chain actors with producer groups for sustainable commercial maize production;
- Organizing ToTs for technicians from PMAMP, DADOs, feed mills and lead farmers for better-bet agronomic messaging, and developing master trainers for wider dissemination of key information;
- Sharing CSISA's existing publications in the form of tips, posters, booklets and videos to aid extension and training activities of PMAMP staff.

Going forward, CSISA sees the PMAMP and its super zone programs as key mechanisms for scaling sustainable intensification technologies for cereals in Nepal. As such, CSISA will continue to make contributions to the program at the strategic, tactical, and operational levels.

Maize Super Zone staff review extension materials from CSISA in preparation for jointly-implemented training programs in Dang District.

CSISA's maize production interventions contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, IR **2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship **CC IR 4:** Increased youth empowerment and livelihoods. **CC IR 5:** More effective governance, policy and institutions

Commercial expansion of scale-appropriate machinery and associated service provision models for reapers and seeders (also serves Obj 2)

Mechanical seed drills for maize planting

Seeding maize manually, almost universally practiced among farmers in Nepal, is tedious and labor-demanding, resulting in high production costs and yield losses associated with uneven plant stands. As labor markets tighten due to out-migration, the prevalence of traditional practices is also a primary bottleneck for the area expansion of commercial maize production. Mostly, women farmers are responsible for manual maize seeding and intercultural operations. In this context, CSISA is working to create awareness of mechanized maize seeding technologies and facilitating the emergence of new service providers while linking existing service providers with farmers in the major maize growing areas in the FtF zone. CSISA's focus on the introduction of mechanized technologies and service provision models allows maize farmers to reduce drudgery and enhance profitability through costs savings and yield enhancement from precision management. Additionally, this helps mechanized service providers increase their income by diversifying services beyond wheat and rice. In the 2017 spring season, 322 farmers adopted mechanized maize seeding on 203 hectares through service provision, constituting the largest such pocket in Nepal.

Old ways: hand-sowing *New tech: mechanized sowing* *Impact: uniform maize crop with no drudgery*

BANKE DISTRICT IN THE FTF ZONE, SPRING 2017

Private sector-led market development for seed drills

With backstopping support from CSISA, The Habi Traders (a Nepali business that imports seed drills from National Agro Industries of Ludhiana, India) is running a marketing campaign across the Terai on the yield and economic benefits of using seed drills. CSISA is providing the technical messaging for this campaign. Since 2014 when CSISA helped them form business relationships with Indian seed drill suppliers, the Habi sold more than 150 drills through their retail network, with around 50 units sold during the reporting period. Before the market facilitation efforts of CSISA, drills were not commercially available in Nepal. Accelerating sales volumes are a reflection of CSISA's efforts with partners to build broad-based awareness of the benefits of zero-tillage and other mechanized sustainable intensification technologies.

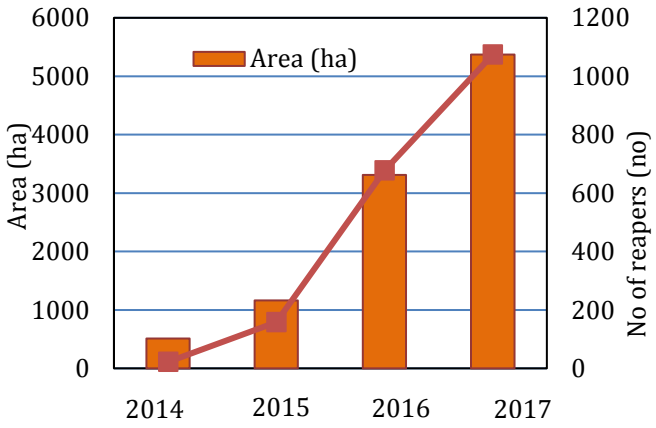
Private sector-led marketing campaign for building awareness of the yield and economic benefits of sowing crops with seed drills.

Having seen the benefits of using seed drills through CSISA's work and through private sector networks, the government's District Agriculture Development (DADO) Offices have mainstreamed farm machinery into their annual programs through provision of cost-sharing programs for selected technologies. In the past, the DADO's programs have worked at cross-purposes with the private

sector by putting government agencies in the lead role for both procuring and distributing supported machinery. With guidance from CSISA, several DADO's in the FtF zone are now taking a different approach and working in collaboration with private sector partners for procurement and distribution, thereby helping establish sustainable markets and supply chains, including for spare parts and maintenance, rather than crowding out the private sector. This dimension of operational policy reform is well-aligned with the public-private partnership objectives of the ADS.

Increasing reaper sales and the area under reaper harvesting

In the Mid and Far West Terai, CSISA introduced the reaper in 2012 in collaboration with machinery suppliers. The number of reapers and the area under reaper harvesting have significantly increased from a base number near zero due to increasing awareness about the economic benefits of using reapers as well as building the business case for the technology to service providers. As of January 2017, **1,070 reapers have been sold by our private sector partners, harvesting more than 5,500 hectares on an annual basis**. In collaboration with reaper suppliers, CSISA has been working for the capacity development of service providers and facilitating repair and maintenance services, as well as increasing the local availability of spare parts. The introduction and commercialization of reapers has created new business opportunities for machinery retailers and service providers in the FtF zone, particularly among returning migrants who are seeking employment opportunities beyond the farm.



Reaper sales and area reached by the technology in the Terai districts of the FtF zone. Prior to CSISA's efforts to introduce and establish markets for this technology in 2012, reapers were not commercially available in the FtF zone.

A primary reason for the swift spread of reapers thus far is that many Nepali farmers and service providers who are already owners of two-wheel tractors have a strong entrepreneurial spirit. As they already understand the costs, risks, and returns of owning agricultural machinery they can quickly see a strong business case for the reaper.

Another reason reaper harvesting has spread quickly was that CSISA and the importers were encouraged by CSISA to order and stock additional reapers rather than waiting for orders to accrue. This approach ensured that would-be customers could see and test a reaper at the retail level before committing to purchase. CSISA and the importers encouraged and backstopped (providing advice and even used reapers for demos) profit-motivated sales agents in the FtF zone to conduct their own independent farmer field days.

A two-wheel tractor reaper in use by a service provider in the Nepal Terai region.

Lastly, CSISA facilitated FM radio advertising campaigns that explained the economic opportunities achievable with reaper-based crop harvesting and, crucially, emphasized the costs of the machinery

and where it could be purchased through local retail shops. It is difficult to measure the specific impact of FM radio jingles, but importers and local agents have reported that after the jingles air, their businesses experience greater interest and sales.

CSISA's relationships across the machinery value chain

In the first days of CSISA, the team focused almost exclusively on new technology introductions. **Recognizing that introduction alone will not drive technological change, CSISA's efforts also emphasize marketing campaigns, backward linkages with machinery manufacturers, and government cost-share programs that serve to stimulate private sector investments.**

The table below highlights the successful partnerships that CSISA has successfully facilitated. CSISA's involvement included providing introductions, facilitating tours to launch linkages, providing advice, and strategically nudging both parties along the way to move partnerships towards fruition.

Table 2. ***CSISA's facilitation efforts across the machinery value chain in the FtF zone of Nepal***

Exporter / Location	Importer	Partnership Established	Product(s)
Khedut India	SKT (initially) BTL and Global Trading (currently)	March 2016 January 2017	Lower-cost seed drills for minitiller Lower-cost seed drills for two-wheel tractor (2WT) Lower-cost seed drill four-wheel tractor (4WT) Lower-cost manual planters, jab planters and pull planter
National Agro India	Initially The Habi and Kubir and Sons Currently	December 2015 Apr – Dec 2016	Premium four-wheel tractor seeders and planters
KGBK, Jharkhand	Kubir and Sons	March 2016	Hand tools (weeders, etc)
Durga Engineering India	SKT	May 2016	Open drum thresher
Dharti India	Kubir and Sons	December 2016	Lower cost minitiller, 2WT, & 4WT seeders
Various Chinese suppliers	BTL SKT Kubir and Sons Tikapur	Before project 2014 2014 2016	2WT reapers
Various Chinese suppliers	BTL	July 2016	Premium vertical plate maize planter
Various Chinese suppliers	SKT and AMC	2016	Hand cranked seed and fertilizer spreader
Various Chinese suppliers	Shrestha Agro, SKT, BTL, AMC	2015 (via CSISA Earthquake Recovery Support Program)	Irrigation-water pumps for mini-tillers

Expansion of farm mechanization in Nuwakot and Makwanpur, Earthquake Zone

The powerful earthquakes that struck Nepal in the spring of 2015 exacerbated the labor shortages that the most badly affected districts were already confronting due to intense out-migration. Building on the knowledge gained and networks established under CSISA's Earthquake Recovery Support Program (2015–16) that was funded by USAID-Nepal, CSISA continues to support the introduction of farm machinery into the earthquake-affected districts of Nuwakot and Makwanpur to address the issues of declining agricultural labor availability and the need to create businesses to keep small farms viable. After reapers were introduced into Nuwakot in September 2016, 66

households were able to harvest more than 20 ha of rice and wheat. CSISA then collaborated with DADOs, trader and farmers' groups for the introduction of the push row seeder and seed drill for mechanically seeding maize for first time in the district.

CSISA's efforts to demonstrate and introduce new scale-appropriate machinery and improved agronomy has caught the eye of other development partners like **USAID's SABAL project, which has incorporated machinery demonstrations and trainings for farmers, especially women, into their programming in Nuwakot and beyond with technical backstopping from CSISA.**

Introduction of low-cost tools for precise and drudgery-reducing crop establishment in the earthquake-affected districts of the mid-hills of Nepal.

CSISA's scale-appropriate machinery interventions contributes to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable, **IR 2:** Strengthened and expanded access to markets and trade, **IR 3:** Increased employment and entrepreneurship, **IR 5:** Improved proactive risk reduction, mitigation and management **CC IR 3:** Increased gender equality and female empowerment and **CC IR 4:** Increased youth empowerment and livelihoods.

Objective 2: Strengthened resilience among people and systems

Zero-till wheat to tackle energy and economic constraints and to enhance crop productivity

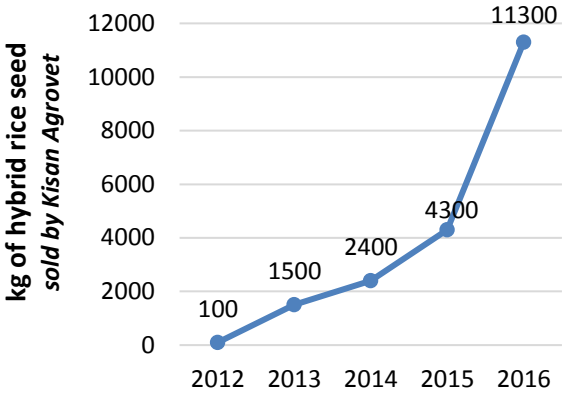
In Nepal, the national average wheat productivity is far below other Asian countries with similar production ecologies. A CSISA survey conducted across the Terai's wheat growing districts in 2016 showed that >25% of the wheat farmers suffer net financial losses, mainly due to high production costs and low productivity. Zero tillage significantly reduces the cost of sowing wheat and helps facilitate early seeding, especially in lowland areas, thereby reducing production costs and increasing productivity while significantly reducing risk and boosting resilience by helping farmers avoid terminal heat stress. CSISA is facilitating ZT wheat technology by facilitating the emergence of well-trained ZT service providers. This collaborative effort in 2016–17 facilitated **901 farmers to adopt ZT wheat on 337 hectares. Most encouragingly, adoption of ZT has been achieved through increased private sector provision of seed drills.** As noted elsewhere in this report, ZT drills were not commercially available in Nepal before CSISA intensified its market facilitation efforts in 2014. Around 50 drills were sold during the current reporting period, and the 'leading edge' indicator strongly suggests that this technology and the service arrangements to support it are primed to quickly expand in Nepal.

Coping with a weak and variable monsoon

Facilitating adoption of high-yielding and shorter duration rice hybrids

In Nepal's Mid and Far West Terai, rice is grown on 246,976 ha and average productivity is around 3.4 t/ha, much below the area's achievable yields. Some farmers are growing improved varieties, but many of these varieties do not have resilience traits that are advantageous for maintaining high yields in the rainfed and partially-irrigated systems that predominate in Nepal.

In 2012, CSISA began participatory field evaluations of rice hybrids that were registered in Nepal but not commonly available in the market in the FtF zone. These evaluations found that DY 69, a short-duration rice hybrid that matures in 120 days, to be consistently high yielding. As a short-duration hybrid, DY 69 avoids late season water stress in years when monsoon rains end prematurely and allows farmers to capture residual moisture and sow winter crops early, which can increase the yield of wheat by up to 50%. CSISA distributed limited quantities of DY 69 seed through District Agriculture Development Offices in six FtF districts and evaluated DY 69 in large plots and strategic demonstrations. CSISA also organized monitoring visits for DADOs and CSISA advisory committee members to show the performance of DY 69.

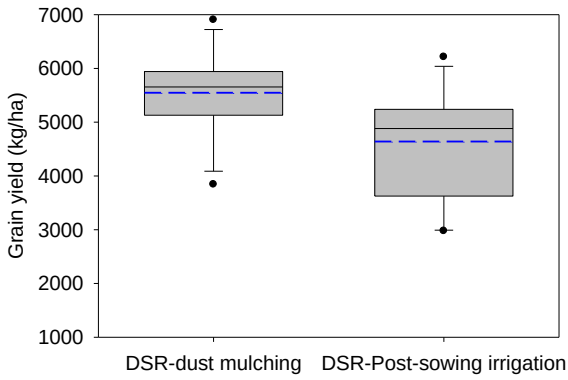


Rapidly increasing sales of rice hybrids helps Nepali farmers reduce risk in low rainfall years, while boosting production in all years.

Many farmers who have observed DY 69's high yield and resilience to stress began cultivating it. Due to rapidly increasing demand for DY 69, Kisan Agrovet, one of the leading dealers of DY 69 based in Dhangadhi, reported that his sales of this hybrid have increased significantly each year and reached 11 MT (see inset). **In 2016, more than 40 retailers in the FtF zone sold a total of 20 MT of hybrid seed, enough to plant over 1,000 ha.** Farmers reported yields of between 8 and 10 t/ha this year, and demand out-stripped supply – an envious position that the retailers will capitalize on in 2017 by stocking more seed.

Directly-sown rice (DSR) to address labor and energy constraints to precision rice establishment

Due to outmigration and an aging rural workforce, seasonal scarcity of agricultural labor is one of the biggest challenges to the viability and profitability of Nepalese agriculture. Traditional rice establishment practices of manually transplanting seedlings into puddled fields cost farmers time, labor, energy, and money. Machine-sown dry direct seeded rice (DSR) is a cost-effective technology that allows the direct line sowing of rice seeds into non-puddled fields and avoids the cost of raising rice nurseries and transplanting seedlings. In this context, DSR can be a suitable alternative to conventional transplanted puddled rice.



Agronomic innovations for DSR like 'dust mulching', significantly reduce production risks associated with the technology.

DSR can also be riskier, though, than transplanted puddled rice due to higher weed pressure and the possibility of stand mortality with early rains. The selection of suitable land, deployment of trained service providers, timely crop establishment and utilization of integrated weed management practices are pivotal for reliably obtaining good yields with DSR. Innovation also plays a role, with the 'dust mulching' approach to stand establishment along with investment in early irrigation now being evaluated across landscape gradients in Nepal from the perspectives of risk-reduction, yield stability, and yield potential. CSISA III's DSR-related activities function synergistically with the machinery focus of the CSISA-Nepal Mechanization and Irrigation program, and also expand beyond the FtF zone into

areas where machinery value chains are the strongest (e.g. Nawalparasi and Rupandehi Districts). For a technology that is a radical departure from conventional practices, it is essential to help create a critical mass of first adopters.

Reducing production risks is the essential first steps towards making DSR viable at scale. CSISA conducted on-farm evaluations of DSR using 'dust mulching', a simple management adjustment that uses pre-sowing irrigation followed by shallow tillage to better control weeds and limit evaporative losses, thereby reducing early irrigation requirements. Paired experiments comparing dust mulching to post-establishment irrigation were conducted on 16 farmers' fields in Banke, Bardiya, Kailali and Kanchanpur Districts. Results showed that dust mulching significantly **increased yield (20% higher) and decreased early weed pressure (25% less)** compared to post-sowing irrigation DSR (see inset)**.**

To scale DSR and to create a critical mass of first adopters, CSISA organized a coordination meeting with service providers, key farmers, the District Agriculture Development Office (DADO), and machinery traders. To help famers cope with shrinking labor availability and water limitations to rice establish, DSR has now been adopted as a priority technology for the Terai by the Department of Agriculture as a direct result of CSISA's efforts. In Rupandehi District, the DADO conducted block demonstrations of DSR in 25 new areas with backstopping support from CSISA. In all demonstrations, DSR produced similar or higher yields to conventionally transplanted rice while significantly reducing production costs and early water requirements for crop establishment. **In aggregate, more than 350 ha was planted to DSR through service providers in 2016 – an increase of more than 60% over 2015.**

Transitioning to maize in drought-prone areas

The productivity of rainfed rice in the well-drained soils that predominate in pockets of the Terai is unstable and very low in years when monsoon rainfall is weak. To reliably grow high-yielding rice in these soils requires frequent rainfall or irrigation. In these areas, crop diversification away from rice by substituting crops like maize or soybean may be the best options for mitigating drought and increasing stability and average productivity.

In the Mid and Far West there are large areas with light textured soil that may be more suitable for maize than rice. CSISA introduced maize to several of these areas in 2016, comparing it with rice cultivation in adjacent fields. **Even in a relatively 'normal' monsoon year like 2016, the profitability of maize was approximately US$ 250 per hectare higher than for rice**. In a drier year, we anticipate that this difference will be even higher. The output of CSISA's research is being shared and deployed through DADOs, farmers' groups, feed industries, and the government's agriculture modernization project (i.e., maize 'super zone' chosen to make the country self-reliant in maize production) and for coping with a weak and variable monsoon. We estimate that there are approximately 10,000 hectares of excessively drained land in the Nepal Terai within the FtF zone where farmers can profitably transition to maize. The same market development approaches used to accelerate the expansion of commercial maize in the hills will be deployed in these ecologies.

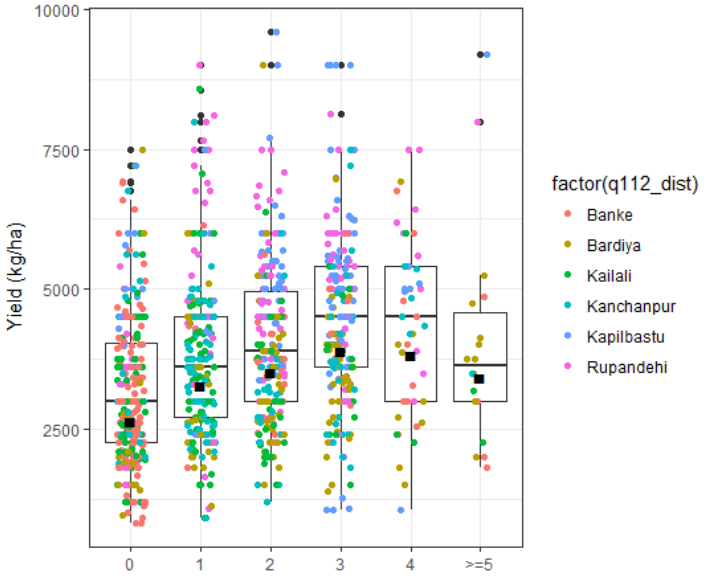
Maize grown on a light textured soil in Banke District that was planted to rice in previous monsoon seasons.

Understanding the importance and decisions processes around rice irrigation

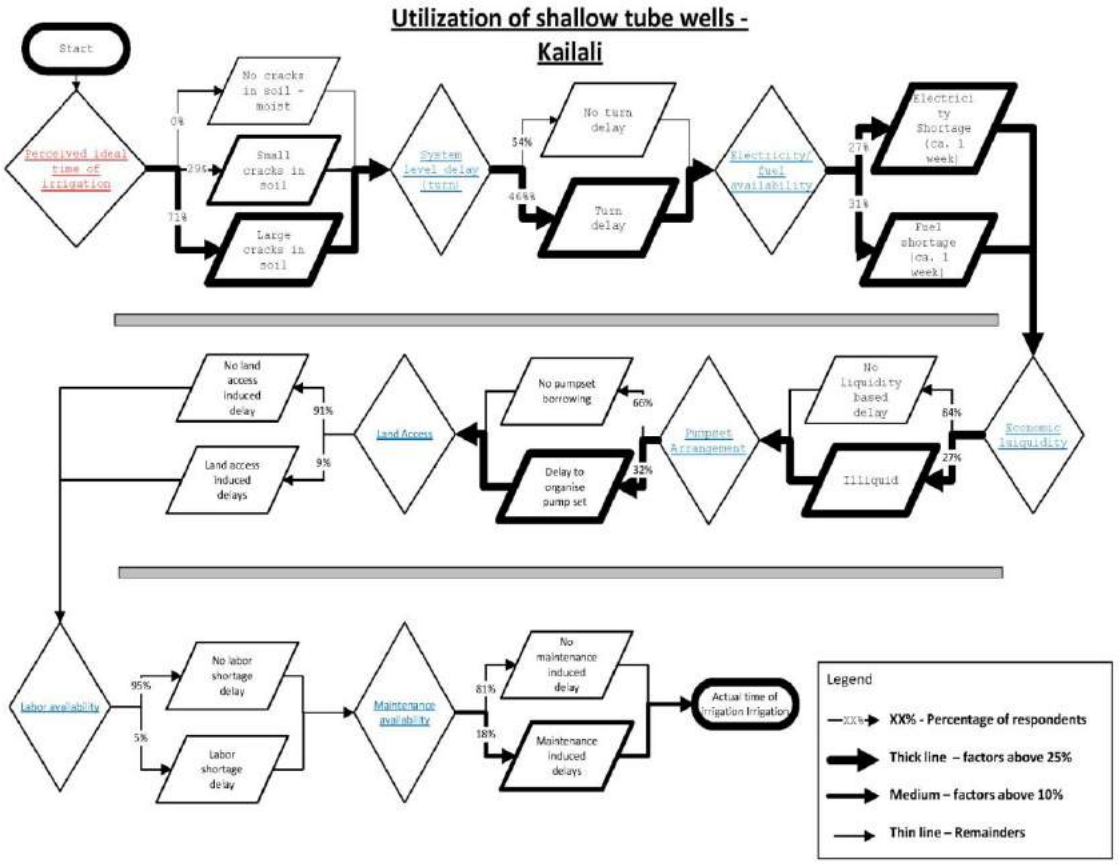
CSISA's yield and production practices survey for the 2016 rice crop confirms the importance of supplemental irrigation for reducing risks and achieving high and stable crop yields. Across the Terai districts where the survey was implemented (total of more than > 1,050 households), farmers who

irrigated three or four times had rice yields that averaged approximately 4.5 t/ha, whereas farmers who did not irrigate achieved yields of 3.0 t/ha, indicating that **water stress in even a 'good' monsoon year reduces rice yield potential by 33%**.

Past and on-going efforts to expand the use of irrigation in Nepal for staple crop production have focused primary on assuring supply by supporting the expansion of infrastructure such as tubewells for groundwater pumping. Through CSISA's surveys and stakeholder engagement, it has become clear that **many farmers who insufficiently irrigate rice do, in fact, have access to irrigation water but choose not to use it**. To change this scenario and to increase systems resilience, yield, and profitability, CSISA has partnered with the Water Resources Management Group at Wageningen University to characterize farmer decision process around irrigation use in rice. Results are now being processed, but several factors appear to contribute to insufficient irrigation, including: knowledge deficiencies about crop water requirements, issues with coordination for shared infrastructure, and cash liquidity issues that make farmers reluctant to invest in irrigation, particularly when relying on expensive diesel-based pumpsets. An example of decision processes for rice irrigation in Kailali District is given below. CSISA will devise additional interventions for rice based on the synthesis of results from this study.



Survey-based documentation of the influence of the number of irrigations on rice yields across districts in the FtF zone. Average yields decline by roughly a third where irrigation is not applied.



Farmer decision processes around irrigation utilization for rice in Kailali District in Nepal. Several factors appear to contribute to insufficient irrigation, including: knowledge deficiencies about crop water requirements, issues with coordination for shared infrastructure, and cash liquidity constraints that make farmers reluctant to invest in irrigation, particularly when relying on expensive diesel-based pumpsets.

Objective 3: A well-nourished population, especially women and children

Intensified livestock feeding strategies to enhance milk production, increase income for women, and ensure better nutritional outcomes

The Livestock Innovation Lab (University of Florida) is just initiating programming in Nepal through sub-grantees including Heifer International. Heifer is leading an initiative in the FtF zone to identify optimal ration balances for dairy cows. While ration balancing is extremely important, so are efforts to **improve the quantity of high-quality feeds at the farmstead and village levels**, particularly for small-scale milk producers who rely almost exclusively on these sources to maintain their animals in mixed crop-livestock systems. CSISA is in the process of formalizing a collaboration with Heifer to characterize the benefits of maize intensification on milk production, with economic, labor, and nutritional considerations firmly in view. The collaboration will be centered in the same districts and communities prioritized by the Innovation Lab. Research approaches will include field-based interventions as well as tradeoff analysis with LivSim modelling framework.

Women in Vaniyang who rent the mini-tiller through a cooperative © C. Manfre 2016

Male outmigration has led to an accelerating trend of feminization in agriculture with many women becoming *de facto* household heads and assuming responsibilities that were typically done by men. Labor, including for livestock feeding, has become increasingly scare and has created a strong need for the introduction of new scale-appropriate technologies that can reduce drudgery while improving management. In July 2016, CSISA also initiated a partnership with the USAID-funded INGENEAS project to conduct a technology assessment examining how the introduction of mini-tillers are aiding women farmers. Initial findings suggest that **labor savings associated with the use of the mini-tiller permit women farmers to give higher priority to income-generating activities including dairy and vegetable production**. CSISA will continue to work with INGENEAS and other development partners to identify and capitalize on the synergies between mechanization and livestock productivity.

Diversified and more remunerative staple crop production systems for nutritious diets, especially for women and children

Because of unstable and erratic rainfall patterns, rice productivity in rainfed upland areas is very low. If the monsoon starts very late, farmers cannot transplant rice on time, and have to transplant old seedlings. To get good yields in upland areas frequent rainfall or assured irrigation are needed, which is not possible in the present context. This leads to a reduction in crop yield and overall decrease in rice production due to poor crop growth. In this context, growing less water-demanding crops such as maize, soybean or pigeon pea could provide an alternative for generating income and improved nutrition at the household level. Just as we've done with mungbean in the CSISA 'scaling' project, we will **track end-uses of pulses in diversified systems, including what is kept for household consumption**.

Soybean

Nepal is importing large quantities of soybeans to fulfill national demand, especially for feed mills. Soybean can also be a valuable source of protein for women and children. Realizing its importance, CSISA is planning to introduce soybean in collaboration with Rapti Feed Mill and the Government Soybean Mission program as an alternative for rice in rainfed upland areas, as well as stalk rot-prone areas where summer maize becomes severely affected. In summer 2016, about 25% of the maize area in western Dang was affected by stalk rot. The introduction of soybean could provide an alternative to the problem of rot-induced maize losses.

Pigeon Pea

Pigeon pea is a leguminous crop that can grow well in rainfed upland conditions in summer, especially in the Mid and Far West Terai. It has high protein content, which can be a valuable source of nutrition for women and children. In Nepal, there are only two varieties available, both released in the 1990s. The introduction and evaluation of improved high-yielding varieties that can fit into the existing cropping systems for rainfed upland areas are important for the scaling out of pigeon pea in Nepal. Therefore, CSISA has collaborated with National Grain Legume Program (NGLP), and International Crops Research for the Semi-Arid Tropics (ICRISAT) to import suitable germplasms for evaluation in the Nepalese context. We already have received 20 genotypes to evaluate for this season. The on-farm evaluation of those germplasm has been planned for June 2016 in collaboration with NGLP, Khajura. If the short-duration and high-yielding genotypes are identified through on-farm

evaluations, CSISA on-going collaborations with seed companies will be leveraged to push towards registration and commercialization.

CSISA's livestock and nutrition interventions contribute to USAID's intermediate results **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable**, IR 4:** Increased sustainable productivity, particularly through climate-smart approaches, **IR 5:** Improved proactive risk reduction, mitigation and management, and **IR 6:** Improved adaptation to and recovery from shocks and stresses**.**

Upcoming activities and events for April-September 2017

In the remaining half of the project year, CSISA's effort will be on summer rice and maize activities. Major actions in rice will be scaling which include a) agronomic messaging about DSR, integrated weed management, healthy seedling production technology, irrigation and fertilizer application in the forms of tips, jingle, video, local campaign; b) facilitating LSPs on business development approach and strengthen their linkage with NAMEA and c) strategic research on different options to address the monsoon variability (strategies to address drought and water logging). In case of summer maize, the focused activities will be strengthen value chain by capacitating development partners, service agents, millers and farmers in the commercial pockets; and actions in the marginal area will be understanding the contribution of maize in livestock production, and awareness raising about increasing maize productivity. As discussed in rice, agronomic, machinery and action research activities will be integrated in maize. To increase farmers access to new promising genetics (e.g. early maturing crop varieties including hybrids), technical support will be provided to dealers to organize demonstrations and advertisements about seed. Similarly, dealers' network will be mobilized to increase access of pesticides, herbicides, seeds, etc. Moreover, the project will form thematic working groups in rice and maize in the national level which could provide technical guidance to Prime Minister Agriculture Modernization Project and thus help to mainstream the CSISA validated technical, process and policy innovations in the national system.

One of the primary challenges that CSISA has encountered in its policy reform work has pertained to staffing limitations. In the coming period, CSISA will be significantly expanding the presence of its policy team in South Asia, including a newly hired Project Manager, an Associate Research Fellow (PhD-level; joining in August), and the re-assignment of Patrick Ward to IFPRI's South Asia Office (pending divisional and institutional approvals). The strengthened presence in-country will engender greater alignment of policy reform activities within CSISA's broader technological priorities, and CSISA's policy team will be in an advantageous position to develop and capitalize on partnerships within both Nepal and Bangladesh, as well as to leverage knowledge gleaned from prior and ongoing activities.

Engagement with Missions, FTF partners and project sub-contractors

USAID Missions

In Bangladesh, the CSISA Phase III Bangladesh country coordinator regularly updates the USAID/Bangladesh Mission staff under the Office of Economic Growth with regards to ongoing activities. CSISA is also regularly consulted by the Mission for information on cereal based cropping systems, agricultural mechanization, and appropriate agricultural development investments. Notable consultations include requests for information and ideas on improving gender mainstreaming in agricultural development, in addition to solicitation of ideas for future investments. Most recently and at the Mission's request CSISA Phase III participated in a field visit to Bangladesh and project sharing program for Dr. Gary Lindon, the Acting Deputy Assistant to the USAID Administrator.

In Nepal, CSISA has engaged with the Nepal mission in the following core areas in FY16:

- Formulated the *Earthquake Recovery Support Program*, which was implemented under the banner of CSISA with funding from USAID-Nepal (US$ 1 m, June 2015 – September 2016). This program leveraged ongoing CSISA work on mechanization value chains to bring scale-appropriate small tractors and attachments to hill communities that lost draft animals and agricultural labor in the devastating earthquakes that affected Nepal in April and May of 2015.
- Convened the first National Seed Summit with USAID-Nepal and the Ministry of Agricultural Development, which informed the design and created political momentum for the recently started *Nepal Seed and Fertilizer* project (US$ 15 m investment). This project was awarded to CIMMYT and is functionally aligned and support by CSISA.
- Provided technical advice and support to the KISAN project (USAID-Nepal's flagship FtF program) on staple crop management.
- Shared technical insights into challenges and opportunities confronting the sustainable intensification of staple crop systems in Nepal that (we believe) have informed the development of the forthcoming KISAN II project solicitation.

FTF partners

CSISA Phase III also directly collaborates with the following FtF projects in Bangladesh:

- **Agricultural Inputs Project (AIP):** This CNFA led project works to improve the knowledge of and access to quality agricultural inputs for farmers in the Feed the Future (FTF) zone of Bangladesh. Phase III collaborates with AIP and the Agricultural Input Retailer Network (AIRN) to scale-up farmers' access to information on better-bet agronomy and integrated weed management. Details on AIP can be found here: https://www.cnfa.org/program/agro-inputs-project/
- **Rice Value Chain (RVC) Project:** The IRRI-led RVC project is a 15 month activity starting on 1st October 2015 and ending on the 31st December 2016. It builds on the lessons learned from the, Cereal Systems Initiative for Southeast Asia in Bangladesh (CSISA-BD), and supports the private sector improve the efficiency of the rice value chain. The project will work out of hubs based in Jessore, Khulna, Barisal and Faridpur. Because of RVC's closure at the end of 2016, CSISA Phase-III will build on the project's activities and inherit staff and partnerships to continue to scale-out farmers' use of premium quality rice varieties in the FtF zone.

- **Cereal Systems Initiative for South Asia – Mechanization and Irrigation (CSISA-MI) project**: CSISA-MI emerged out of CSISA's ongoing efforts in the USAID/Bangladesh Mission-funded CSISA expansion project (2010–15), and during CSISA Phase II. It continues to be strategically aligned with the broader CSISA Phase III program in Bangladesh, and is led by CIMMYT in partnership with International Development Enterprises (iDE). CSISA-MI is a five- year project (July 2013 – September 2018) that focuses on unlocking agricultural productivity through increased adoption of agricultural mechanization technologies and services. The CSISA-MI Project Leader has a position on the CSISA Phase III technical coordination committee. The Phase III Bangladesh Country Coordinator also maintains a position on the leadership committee of CSISA-MI.

  Although it does not fall under the FtF program, CSISA wheat blast research activities on disease forecasting and modeling are also strategically aligned with the USAID-Washington funded **Climate Services for Resilient Development (CSRD) project**, which falls under the Global Climate Change Office Bureau for Economic Growth - Education and Environment. Strategic alignment with CSISA is assured as the CSRD Project Leader is also the CSISA Phase III Bangladesh Country Coordinator.

  In Nepal, the KISAN project, part of USAID's global Feed the Future initiative, is a US$ 20 million five-year program working to advance food security objectives by increasing agricultural productivity. KISAN works collaboratively with CSISA by utilizing technical and extension materials and advice to improve the uptake of better-bet sustainable agriculture production and post-harvest practices and technologies for targeted cereals. KISAN has a reach of hundreds of thousands of farmers, who have been exposed to CSISA information, materials, and technologies through this partnership.

  During the reporting period, CSISA and KISAN have:

  - Produced accessible guides for **better bet agronomy for rice and maize** – information that is generally not available to smallholders**.** KISAN has reproduced these guides with their own resources and they provide the backbone of their technical training programs for maize and rice, the two core staple crop value chains for the project. In 2016, 60,205 **farmers have received the rice tips and 69,923 farmers has received the maize tips in the 20 FtF districts** through the KISAN network.
  - Developed a factsheet on better nursery management for healthy seedlings and provided training to technicians from DADOs, KISAN, seed companies and some key farmers in different districts with the objective to disseminate the information to additional farmers.
  - Established block demonstrations of maize under best management practices (variety, planting method, and proper plant population and fertilizer and weed management) in different areas while comparing the farmers' practices to increase farmers' motivation. With the adoption of best management practices maize yield can increase by 3 times. Through DADOs, KISAN, farmers' co-operatives, and NIMBUS, CSISA distributed tips on best management practices for maize before the season.

Project Sub-Contractors

CSISA Phase III maintains three sub-contractual partners in Bangladesh that are essential in scaling-out CSISA supported technologies and for reaching farmers at large. This is particularly important as CSISA is coordinated through a partnership of three research institutions. It is only by working with development partners that the knowledge products produced through the CGIAR's research can be effectively deployed in farmers' fields. CSISA therefore

strategically vets and selects partners based on their philosophical alignment with the CSISA approach and ability to generate impact at scale. Current partnerships include the following:

- International Development Enterprises (iDE): This sub-contract extends through 2018. The purpose of iDE's involvement in CSISA-III is to leverage iDE's existing work in CSISA-MI to contribute to the agricultural machinery commercialization objectives of CSISA-III. Specifically, iDE will build upon its current relationships with private sector and financial sector partners to support the commercialization of target technologies – power tiller operated seeder and reaper– first in Dinajpur District and then in other districts of Rangpur Division. The sub-grant value is USD 400,000. More about iDE can be found here: http://www.ide-bangladesh.org/
- Agricultural Advisory Society (AAS): This sub-contract extends into February of 2017. The purpose of the sub-agreement is to increase knowledge, skills, and Practice of farmers on the quality rice seedlings production through video shows and training on healthy rice seedlings production in seven FTF districts within two CSISA hubs (Jessore and Faridpur) in the south western region. The sub-grant's target output is the development of awareness and motivation on healthy rice seedlings production of 24,000 interested farmers through video shows and training on the healthy rice seedlings production at 240 communities in seven FTF districts within Jessore and Faridpur hubs. This sub-grant's value is USD 17,875 More about AAS can be found here: http://aas-bd.org/
- Agricultural Input Retailers' Network (AIRN): This sub-contract extends into March of 2017. AIRN formed as a result of CNFA led efforts in the above-described Agricultural Inputs Project. Partnering with CSISA, AIRN is training 800 inputs dealers on the principles and practices of integrated weed management in Faridpur and Jessore Hubs. This sub-contract has a value of USD 18,461. More about AIRN can be found here: http://www.aipbd.org/airn/airn/
- The Bangladesh Research Institute (BRRI): This sub-agreement extends until June of 2017. Under this agreement, BRRI assists with (1) implementation of on-farm trials of new Premium Quality Rice (PQR) varieties in 6 Upazilas within 3 hubs of CSISA to identify best-bet premium quality varieties in terms of yield and farers', millers', and traders' preferences, (2) on-farm performance evaluations of integrated weed management (IWM) options to increase yield and profit in farmers' fields, (3) on-station trials to develop/ fine tune mat nursery method of raising rice seedlings for manual transplanting, and (4) Organize additional on-farm trials and collect necessary crop cut data as required. The total sub-grant value is USD 17,000. More information is available online about BRRI can be found here: http://www.brri.gov.bd/index.php?lang=en

Appendix 1 – Key Staff

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BANGLADESH					
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Appendix 2 – Project subcontractors and key partners

BANGLADESH				
PARTNER	**PARTNERSHIP OBJECTIVE**	**ALIGNMENT WITH THEMES**	**LEVERAGING OPPORTUNITY**	**STATUS OF PARTNERSHIP**
Government of Bangladesh				
Bangladesh Agricultural Research Institute (BARI)	Development, validation, and refinement of technologies and new research methods, boosting scaling capacity	Innovation towards impact	With a network of regional research stations and strong input into the development of extension materials, approaches, and policy, and with integration in the Ministry of Agriculture, BARI provides leveraging opportunities to mainstream sustainable intensification innovations into the Government of Bangladesh NARES system.	CIMMYT maintains a formal partnership MoU; BARI has collaborated with CSISA in Phase II and will continue into Phase III
Bangladesh Rice Research Institute (BRRI)	Development, validation, and refinement of technologies and new research methods, boosting scaling capacity	Innovation towards impact	With a network of regional research stations and strong input into the development of extension materials, approaches, and policy, and with integration in the Ministry of Agriculture, BRRI also provides leveraging opportunities to mainstream sustainable intensification innovations in the Government of Bangladesh NARES system.	IRRI maintains a formal partnership MoU; BRRI has collaborated with CSISA in Phase II and will continue into Phase III
Department of Agricultural Extension (DAE)	Extension and scaling	Achieving impact at scale	DAE boasts over 5,000 field extension agents throughout Bangladesh. In CSISA Phase II and CSISA-BD, DAE collaborated with activities within Bangladesh's Feed the Future zone, and in Dinajpur hub. By sensitizing DAE agents to sustainable intensification technologies and approaches, large opportunities for improved reach and awareness-raising among farmers are possible, with sustainability aims for messaging after Phase III is completed.	CIMMYT maintains a formal partnership MoU with the DAE, collaboration in CSISA III has been initiated and is ongoing

Agricultural Information Services (AIS)	Production of extension materials for DAE use	Achieving impact at scale	AIS produces extension materials and media that are used by DAE. Strategic partnerships with AIS facilitate the integration of sustainable intensification principles into extension materials and messaging.	CSISA III has initiated informal collaboration with AIS, with activities ongoing
Bangladesh Television (BTV)	Large-scale public showings of training videos and materials on national television	Achieving impact at scale	In CSISA Phase II, and CSISA-BD, work with BTV resulted in millions of television viewers being exposed to messaging on improved crop management and scale-appropriate machinery on the weekly farm-oriented program Mati-o-Manush (MoM)	Informal partnership with MoM to produce and show training videos. Sub-contracts developed on an as-need basis
Bangladesh Private Sector				
Janata Engineering	Development and sales of scale-appropriate machinery	Achieving impact at scale	Domestic production and import of sustainable intensification scale-appropriate machinery and sales through the private sector	Established relationship with commercial Joint Venture Agreement
Metal Pvt Ltd	Development and sales of scale-appropriate machinery	Achieving impact at scale	Domestic production and import of sustainable intensification scale-appropriate machineries and sales through the private sector	Established relationship with commercial Joint Venture Agreement
Rangpur Foundry Limited (RFL)	Development and sales of scale-appropriate machinery	Achieving impact at scale	Import of sustainable intensification scale-appropriate machineries and sales through the private sector	Established relationship with commercial Joint Venture Agreement
Advanced Chemical Industries	Sales of scale-appropriate machinery, fungicides, weed control products and seed. IRRI is working with ACI to produce a range of hybrid and open-pollinated rice seeds	Achieving impact at scale	Import of sustainable intensification scale-appropriate machineries and sales through the private sector. Along with a range of chemical and cereal seed products.	Established relationship with commercial Joint Venture Agreement
Bangladesh projects				
Agricultural inputs project (AIP)	Facilitation of linkages to input dealers, outlet for extension messaging and	Achieving impact at	This USAID-funded project works with 3,000 agricultural input dealers in the Feed the Future zone. Coordination with AIP permits the broad extension of	Established and ongoing working arrangement, though without formal

	value chain work to extend weed control products to farmers	scale	SI information to dealers, including recommendations, chemicals, seeds, fertilizer and other materials, and an avenue for increasing the availability of critical weed control products and precision nutrient management recommendations.	agreement
Agricultural Extension Project (AEP)	Coordination assistance for interactions with DAE/AIS, capacity development of DAE Extension Agents in scaling and new extension methods	Achieving impact at scale	AEP works closely with DAE and AIS and assists in coordination of both bodies to align to CSISA's objectives. In addition AEP is working with 6,000 farmer groups in the areas where CSISA III is operating.	Established and ongoing working arrangement, though without formal agreement
Women's Empowerment Project (WEP)	WEP identifies and facilitates linkages to women entrepreneurs	Systemic change towards impact	WEP works with both the Women's Ministry and DAE and will identify women who interested in adopting CSISA technologies. WEP will serve an important role in healthy rice seedling enterprises.	In the process of establishing relationship and working modality
NGOs				
iDE Co-implementer and project subcontractor	Development of business models, facilitation of private sector partners in scale-appropriate machinery scaling	Achieving impact at scale; Innovation towards impact	Value chain and market development NGO responsible for business modeling and joint venture agreements with the private sector partners listed above	Formal CSISA-MI and CSISA Phase III partner. Sub-contracts under CSISA-MI and CSISA III formalized. CSISA III subcontract for $400,000.
Agricultural Advisory Society (AAS) Project subcontractor	Facilitates village screenings of training films and conducts follow-up studies	Achieving impact at scale	Working with AAS in Phase II and CSISA-BD, we were successful in reaching 110,000 farmers in village training video screenings accompanied by question and answer sessions to raise awareness among farmers on scale-appropriate machinery and associated crop management practices.	Subcontract for CSISA III currently in place for $17,634.
Agro-Input Retailers Network (AIRN)	Trains input dealers & retailers	Achieving impact at	Will train 800 advanced retailers in integrated weed management in Southern Bangladesh by Feb 2017.	Subcontract for CSISA III currently in place for

Project subcontractor		scale		$18,461.
Universities				
Wageningen University	Strategic research on farmer decision making processes and fallows intensification	Innovation towards impact	Strategic high-end research capacity to assist in the analysis of farmer decision-making processes with respect to intensification decisions	Formal established working relationship with CIMMYT; this relationship entails research deliverables in support of CSISA Phase III
Georgia Tech University	Technical support for the development of scale appropriate machinery	Innovation towards impact	Laboratory facilities for rapid prototyping of machinery innovations and technical support on testing in collaboration with BARI	Established yet informal relationship in co-support of CSISA III, with ongoing collaboration
Bangladesh Agriculture University	Bangladesh's largest and first agricultural university	Innovation towards impact	Bangladesh's largest agricultural university, with influence over the next generation of young scientists, many of whom go on to work in BARI, BRRI, and the DAE	Relationship with Phase III in process of establishment. Relationship is envisioned to be informal
Bangabandu Sheik Mujibur Rahman Agriculture University (BSMRAU)	Strategic partnership in wheat blast research, and in advancing methods of crop cut surveys	Innovation towards impact	BSMRAU scientists have formally collaborated with CSISA-BD and CSISA Phase II on the basis of individual sub-contracts to co-support research efforts in crop cuts and accompanying diagnostic surveys. Additional informal collaboration in geospatial analysis and remote sensing in support of wheat blast development and spread is ongoing.	Formal relationship with sub-contracts for specific work packages; on-going informal collaboration with professors and students to assist in analysis of wheat blast risks.

NEPAL				
PARTNER	**PARTNERSHIP OBJECTIVE**	**ALIGNMENT WITH THEMES**	**LEVERAGING OPPORTUNITY**	**STATUS OF PARTNERSHIP**

Government of Nepal				
Ministry of Agricultural Development	Technical guidance for GoN investments in agricultural development	All	New Agriculture Development Strategy approved by GoN in Fall of 2015. CSISA acts as a technical partner to shape the loan and investment programs associated with ADS, which may exceed $100 m USD.	Active and sanctioned by CIMMYT's host country agreement
Nepal Agricultural Research Council (NARC)	Strategic and applied research on SI technologies	Innovation towards impact	NARC is responsible for providing the science basis of all state recommendations; their endorsement and ownership of emerging sustainable intensification technologies is essential.	Active and long-standing
Department of Agriculture (DoA)	Front line extension and support to farmers, service providers, and private sector	Achieving impact at scale	DoA has staff at the district level across Nepal and considerable budgets to support programming; CSISA assist in improving the quality of extension messaging and works to deepen linkages to private sector.	Active and long-standing
Nepali private sector				
Machinery importers (BTL, SK Traders, Dhahal, etc.)	Introduction and market development for scale-appropriate machinery	Achieving impact at scale	Rapid expansion of investment in scale-appropriate machinery and support for emerging service provision markets.	Active and long-standing
NIMBUS	Introduction and market development for new crop varieties and hybrids	Achieving impact at scale	Registration and market development for hybrids in the Feed the Future zone from a base of zero in 2015.	Active since 2015
NGO				
NAMEA	Trade association formed with the help of CIMMYT to create an enabling environment and policy dialogue for scale-appropriate mechanization in Nepal	Systemic change towards impact	Important voice for private sector with GoN as the Agriculture Development Strategy support programs take shape.	Active since 2014

SEAN	Trade association strengthened with the help of CSISA to create an enabling environment and policy dialogue for seed system strengthening / SMEs in Nepal	Systemic change towards impact	Important voice for private sector with GoN as the ADS support programs take shape.	Active and long-standing
Universities				
University of Illinois	Strategic research and landscape diagnostics to uncover patterns of spatial variability in crop performance and the contributing factors for yields gaps in Nepal cereal crops	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research questions.	Active
University of Nebraska	Opportunities for agronomic practices to conserve water, reduce risk, and enhance yields in maize-based systems in the hills of Nepal	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research questions.	Active
Wageningen University	Role of livestock and value chains in farmer willingness to invest in maize intensification	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research questions.	Active
Projects				
Knowledge-based Integrated Sustainable Agriculture and	Strategic partnership to co-support on the large scale deployment of extension	Achieving impact at	The KISAN project, part of USAID's global Feed the Future (FTF) initiative, is a US$ 20 million five-year program working to advance food security objectives	Active for 3+

Nutrition (KISAN)	information and technologies	scale	by increasing agricultural productivity. KISAN works collaboratively with CSISA by utilizing technical and extension materials, and advice, to Improve the uptake of better-bet sustainable agriculture production and post-harvest practices and technologies for targeted cereals. KISAN has a reach of hundreds of thousands of farmers, who have been exposed to CSISA information, materials, and technologies through this partnership.	
High-value Agriculture Project (HVAP) - IFAD	Opportunistic partnership to take advantage of value chains and entrepreneurial skills created by HVAP, including among women farmers	Achieving impact at scale	HVAP has worked on literacy, numeracy, and value chain strengthening for high value commodities like vegetables. CSISA is taking advantage of the social and market capital created by HVAP to introduce and expand commercial maize production in the mid-hills.	New

Appendix 3. Indicator Numbers Covering October 2016 through March 2017: BANGLADESH

Indicator / Disaggregation	2017 Comment	2017 Deviation Narrative	2017	
			Target	Actual
EG.3.2-18: (4.5.2-2) Number of hectares of land under improved technologies or management practices with USG assistance (RAA) (WOG)				
Technology type			12,971	9,986
crop genetics	This category captures CSISA's work on Premium Quality Rice (PQR) in Bangladesh. CSISA has trained DAE officials on this activity while it also created awareness on PQR through distributing premium quality rice (half of the requirements) to grow. It has also started liaison with the millers and association as an extended activity of the previously run USAID's RVC project.	By the first semester of the year, CSISA has achieved most of the targets. But, it has planned to do millers survey after the harvesting which will give the final result on hectare coverage. The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	2,000	1,813
cultural practices	This category captures CSISA's work on Better-bet agronomy, healthy rice seedling, and scale appropriate mechanization in Bangladesh. Under better-bet agronomy CSISA has produced leaflet, booklet, and video on Healthy Rice Seedling and booklet on Mungbean which were disseminated among thousands of farmers through partners i.e. DAE, Similar USAID Project, Parner NGO etc.. iDE in Northern part is working to boost-up machineries availability under scale appropriate mechanization.	Within the first six months of the fiscal year, CSISA has made huge progress in achieving hectares target under crop genetics. However, due to this year's wheat blast significant reduction has been observed of wheat grown areas in the southern part. The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	4,971	3,595
pest management	Integrated Weed Management Training will be captured through this intervention. Already, CSISA has partnered with AIRN which provided training to 818 agriculture input retailers. Only a few hectares of land were under demonstration i.e. farmer learning center.	The deviation narrative in case of either positive or negative will be given during the FTFMS '17.		
disease management				
soil-related fertility and conservation				
irrigation				

water management (non-irrigation)				
climate mitigation or adaptation	This category captures CSISA's work with earlier wheat growing intervention. Due to wheat blast DAE gave precaution on not to grow wheat in the most effected 8 districts. Still, CSISA worked to produce factsheets and leaflet on wheat blast and early wheat sowing which resulted a good progress across the country.	Although the target has not been achieved and the season has already completed, the deviation narrative in case of either positive or negative will be given during the FTFMS '17. But, it will be worthwhile to mention here that the untimely rain in mid-November delayed sowing for all most all of the wheat growing areas due to high moisture. This has direct implication to not achieving target on earlier wheat sowing this year.	6,000	4,576
other				
total w/one or more improved technology			12,971	9,986
Disaggregates Not Available				
Sex			12,971	9,986
Male		The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	11,674	8,936
Female		The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	1,297	1,050
Joint				
Disaggregates Not Available				
Commodity **NEW**			12,971	9,986
Maize grain			0	0
Rice			4,000	4,660
Wheat			6,000	4,713
Mung Bean			2,971	613
Lentil				
Disaggregates Not Available				

Indicator / Disaggregation	2016 Comment	2016 Deviation Narrative	2016	
			Target	Actual
EG.3.2-17: (4.5.2-5) Number of farmers and others who have applied improved technologies or management practices with USG assistance (RAA) (WOG)				
Producers				
Sex			39,306	33,335
Male		The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	35,375	29,710
Female		The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	3,931	3,625
Disaggregates Not Available				
Technology type			39,306	33,335
crop genetics	This category captures CSISA's work on Premium Quality Rice (PQR) in Bangladesh. CSISA has trained DAE officials on this activity while it also created awareness on PQR through distributing premium quality rice (half of the requirements) to grow. It has also started liaison with the millers and association as an extended activity of the previously run USAID's RVC project.	By the first semester of the year, CSISA has achieved most of the targets. But, it has planned to do millers survey after the harvesting which will give the final result on hectare coverage. The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	6,060	6,846
cultural practices	This category captures CSISA's work on Better-bet agronomy, healthy rice seedling, and scale appropriate mechanization in Bangladesh. Under better-bet agronomy CSISA has produced leaflet, booklet, and video on Healthy Rice Seedling and booklet on Mungbean which were disseminated among thousands of farmers through partners i.e. DAE, Similar USAID Project, Parner NGO etc.. iDE in Northern part is working to boost-up machineries availability under scale appropriate mechanization.	Within the first six months of the fiscal year, CSISA has made huge progress in achieving hectares target under crop genetics. However, due to this year's wheat blast significant reduction has been observed of wheat grown areas in the southern part. The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	15,064	12,485

	livestock management				
	wild fishing technique/gear				
	aquaculture management				
	pest management	Integrated Weed Management Training will be captured through this intervention. Already, CSISA has partnered with AIRN which provided training to 818 agriculture input retailers. Only a few hectares of land were under demonstration i.e. farmer learning center.	The deviation narrative in case of either positive or negative will be given during the FTFMS '17.		4
	disease management				
conservation	soil-related fertility and				
	irrigation				
irrigation)	water management (non-				
adaptation	climate mitigation or	This category captures CSISA's work with earlier wheat growing intervention. Due to wheat blast DAE gave precaution on not to grow wheat in the most effected 8 districts. Still, CSISA worked to produce factsheets and leaflet on wheat blast and early wheat sowing which resulted a good progress across the country.	Although the target has not been achieved and the season has already completed, the deviation narrative in case of either positive or negative will be given during the FTFMS '17. But, it will be worthwhile to mention here that the untimely rain in mid-November delayed sowing for all most all of the wheat growing areas due to high moisture. This has direct implication to not achieving target on earlier wheat sowing this year.	18,182	14,000
	marketing and distribution				
storage	post-harvest - handling and				
	value-added processing				
	other				
improved technology	total w/one or more			39,306	33,335
	Disaggregates Not Available				
Commodity **NEW**					33,335
	Maize				0

Rice				15,389
Wheat				14,350
Mung Bean				3,596
Lentil				
Disaggregates Not Available				

Indicator / Disaggregation	2016 Comment	2016 Deviation Narrative	2016	
			Target	Actual
EG.3.2-1: (4.5.2-7) Number of individuals who have received USG-supported short-term agricultural sector productivity or food security training (RAA) (WOG)				
Type of individual			763	1,644
Producers				
People in government	This number counts training participants representing government offices, mainly District and Upazila Agriculture Development Officers as well as Sub-Asst. Agricultural Officers in Bangladesh.	There has been significant over achievement in providing training to the Govt. staff. Due to orient the field level extension workers on CSISA it was required and this has impacted well in the overall implementation of CSISA activities in Bangladesh. The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	113	619 (M:540, F:79)
People in private sector firms	This number counts training participants from private seed companies, agricultural input suppliers (agrovets) and cooperatives, as well as local service providers providing agro machinery services.	The reason for over achievement in this sub-category is due to the training provided to 818 agriculture input retailers on integrated weed management. The impact of the intervention is yet to be finalized and the deviation narrative will be given during the FTFMS '17.	260	945 (M:894, F:51)
People in civil society	This number counts training participants representing local level non-governmental organizations and community-based organizations.	The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	113	80 (M:73, F:7)
Disaggregates Not Available				
Sex			763	1,644
Male		Male participation in the training is still measures more than 90% in case of Bangladesh. In the upcoming FTFMS this will be written separately.		1507

Female		Female participation in the training session in Bangladesh is still below 10% which needs special attention. CSISA will be working on this to change the scenario in the coming six months.		137
Disaggregates Not Available				

Indicator / Disaggregation	2016 Comment	2016 Deviation Narrative	2016	
			Target	Actual
4.5.2(37) Number of Micro, Small, Medium Enterprises (MSMEs), including farmers, receiving business development services from USG assisted sources				
MSME Size			192	88
Micro	This category of farming has captured mostly the local service providers and the entrepreneurs of healthy rice seedlings.	The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	192	88
Small				
Medium				
MSME Type				
Agricultural producer				
Input supplier				
Trader				
Output processor				
Non-agriculture				
Other	This has been reported under the new indicator EG.5.2-1: Number of firms receiving USG-funded technical assistance to improve business performance	The deviation narrative in case of either positive or negative will be given during the FTFMS '17.	192	88
Duration				
Male NEW				88
Female CONTINUE				
Disaggregation not available				

NEPAL

Indicator / Disaggregation	2017 Comment	2017 Deviation Narrative	2017	
			Target	Actual
EG.3.2-18: (4.5.2-2) Number of hectares of land under improved technologies or management practices with USG assistance (RAA) (WOG)				
Technology type			7,238	3,945
crop genetics				
cultural practices	This category captures CSISA's work on healthy spring-rice seedling management, better-bet agronomy on rice, maize and wheat, scale appropriate mechanization, commercial maize (winter & spring) cultivation.	Deviation of this category will be achieved during April-Sept, 2017 by adopting various cultural operations and scale appropriate mechanizations on rice and maize cultivation.	5,238	3,561
pest management				
disease management				
soil-related fertility and conservation	This category counts area under soil fertility management activities specifically zero tillage wheat cultivation and fertilizer management on rice (spring) and maize (winter and spring) cultivation.	Deviation of this category will be achieved during April-Sept, 2017 by adopting soil-fertility and conservation activities on rice and maize.	500	384
irrigation				
water management (non-irrigation)				
climate mitigation or adaptation	This category counts area under climate adapting coping technologies such as use of climate resilient hybrid crop varieties.	This activity will be implemented during coming summer season by introducing climate resilient hybrid rice and maize varieties in a system based approach. Targeted area will be achieved.	1,500	0
other				
total w/one or more improved technology				
Disaggregates Not Available				
Sex			7,238	3,945
Male		Deviation in this category will be achieved during April-September 2017.	6,514	3,332
Female		Deviation in this category will be achieved during April-September 2017.	724	614
Joint				
Association-applied				

Disaggregates Not Available				
Commodity **NEW**			7,238	3,945
Maize grain		This number captures cumulative area (ha) under various technologies adopted by beneficiary farmers on maize.		1,195
Rice		This number captures cumulative area (ha) under various technologies adopted by beneficiary farmers on rice.		927
Wheat		This number captures cumulative area (ha) under various technologies adopted by beneficiary farmers on wheat.		1,823
Mung Bean				
Lentil				
Disaggregates Not Available				

Indicator / Disaggregation	2017 Comment	2017 Deviation Narrative	2017	
			Target	Actual
EG.3.2-17: (4.5.2-5) Number of farmers and others who have applied improved technologies or management practices with USG assistance (RAA) (WOG)				
Producers				
Sex	The actual number counts total farmers involved in various technologies or management practices.		21,933	10,274
Male	This number counts male farmers who have applied improved agricultural technologies such as adoption of various types of cultural practices and soil-related fertility management practices.	Deviation will be achieved during April-Sept, 2017	19,740	8,892
Female	This number counts female farmers who have applied improved agricultural technologies such as adoption of various types of cultural practices and soil-related fertility management practices.	Deviation will be achieved during April-Sept, 2017	2,193	1,382
Disaggregates Not Available				
Technology type	The actual number counts cumulative of farmers involved in various technologies or management practices.		21,933	12,055
crop genetics				
cultural practices	This number counts farmers adopting improved technologies and management practices such as healthy spring rice seedling management, better-bet agronomy on rice (spring), maize and wheat; scale appropriate mechanization; commercial maize (winter and spring) cultivation etc.	Deviation will be achieved during April-Sept, 2017	15,873	10,896
livestock management				
wild fishing technique/gear				
aquaculture management				
pest management				
disease management				
soil-related fertility and conservation	This number counts farmers adopting soil fertility management activities specifically zero-tillage wheat cultivation and fertilizer management practices on rice and maize.	Deviation will be achieved during April-Sept, 2017	1,515	1,159
irrigation				

water management (non-irrigation)					
climate mitigation or adaptation	This category counts the farmers adopting climate mitigation technologies through the use of climate resilient hybrid crop varieties.	This activity will be implemented during coming summer season by introducing climate resilient hybrid rice and maize varieties in a system based approach. Targeted area will be achieved.		4,545	0
marketing and distribution					
post-harvest - handling and storage					
value-added processing					
other					
total w/one or more improved technology (Not Applicable)					
Disaggregates Not Available					
Commodity **NEW**				21,933	12,055
Maize		This number captures cumulative number of farmers involved in adopting various technologies on maize.			2,894
Rice		This number captures cumulative number of farmers involved in adopting various technologies on rice.			4,907
Wheat		This number captures cumulative number of farmers involved in adopting various technologies on wheat.			4,254
Mung Bean					
Lentil					
Disaggregates Not Available					

Indicator / Disaggregation	2017 Comment	2017 Deviation Narrative	2017	
			Target	Actual
EG.3.2-1: (4.5.2-7) Number of individuals who have received USG-supported short-term agricultural sector productivity or food security training (RAA) (WOG)				
Type of individual			509	315
Producers	This number counts producer trainees who attended trainings on better-bet crop management practices.	Deviation will be achieved during April-Sept, 2017	173	153
People in government	This number counts training participants representing government offices, mainly District Agriculture Development Offices, staff of Agricultural Service Centers, including NARS	Deviation will be achieved during April-Sept, 2017	75	26
People in private sector firms	This number counts training participants from private seed companies, agricultural input suppliers (agrovets) and cooperatives, as well as local service providers providing agro machinery services.	Deviation will be achieved during April-Sept, 2017	174	88
People in civil society	This number counts training participants representing local level non-governmental organizations and community-based organizations.	Deviation will be achieved during April-Sept, 2017	75	48
Disaggregates Not Available	This number counts training participants representing local citizen forums and clubs.	Deviation will be achieved during April-Sept, 2017.	12	0
Sex			509	315
Male				
Female				
Disaggregates Not Available	To have wider impact the CSISA focused training on ToT approach so the participants attended various training representing their respective groups or organization so all are counted as dis-integration not available category.	Deviation will be achieved during April-Sept, 2017.	509	315

Indicator / Disaggregation	2017 Comment	2017 Deviation Narrative	2017	
			Target	Actual
EG.5.2-1: Number of firms receiving USG-funded technical assistance for improving business performance (O)				
Type of Firm			128	61
Formal	This number counts the formal firms (registered in public organization) received technical assistance for their business performance improvement.	In general to receive any support, registered firms are more eligible compared to non-registered. Now a days, most of the firms are registered. So need to set target for this category.	0	15
Informal	This number counts the informal firms (not registered in public organization) received technical assistance for their business performance improvement.	Deviation will be achieved during April-Sept, 2017	128	46
Disaggregates Not Available				
Duration				
New	This number counts the firms those received technical assistance from the CSISA for the first time during reporting period to improve their business performance.	Deviation will be achieved during April-Sept, 2017	128	61
Continuing				
Disaggregates Not Available				