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COLD CHAIN BANGLADESH ALLIANCE (CCBA) FINAL PERFORMANCE REPORT

June 30, 2016

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FINAL PERFORMANCE REPORT

COLD CHAIN BANGLADESH ALLIANCE (CCBA)

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ACRONYMS

BARI	Bangladesh Agricultural Research Institute
BASA	Bangladesh Association for Social Advancement
CCBA	Cold Chain Bangladesh Alliance
FSMS	Food Safety Management System
FTE	Full-time equivalents
FTF	Feed the Future
GAP	Good Agricultural Practices
GCCA	Global Cold Chain Alliance
GDA	Global Development Alliance
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis and Critical Control Point
LSP	Local Service Provider
M&E	Monitoring and Evaluation
MPC	Marketing and Planning Committee
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
SMKK	Sheba Manab Kallyan Kendra
TOT	Training of Trainers
WFLO	World Food Logistics Organization
ZOI	Zone of Influence

PROGRAM DESCRIPTION

From July 1, 2013 until June 30, 2016, Winrock International implemented cooperative agreement no. AID-388-A-13-00004 Cold Chain Bangladesh Alliance (CCBA), funded by the United States Agency for International Development (USAID), CCBA served as a pilot project aiming to establish Bangladesh first integrated cold chain to reduce postharvest losses and deliver high-value agricultural products to market. CCBA was a Global Development Alliance (GDA), USAID's model for public-private partnerships. USAID/Bangladesh and Winrock International partnered with Golden Harvest, a local food processing and transportation company, to implement this GDA. CCBA was implemented in collaboration with World Food Logistics Organization/Global Cold Chain Alliance (WFLO/GCCA) and various local grantees.

CCBA's goal was to increase the availability, access, and use of domestically produced and nutritious foods (Development Object 2 in USAID/Bangladesh's Feed the Future Multi-Year Strategy) in an effort to sustainably reduce poverty and hunger. CCBA aimed to reduce postharvest losses, deliver high-value agricultural products to market, improve availability of locally produced nutritious foods, and ultimately, improve the livelihoods of farmers producing high-value products.

CCBA had the following components:

- Component 1: Increased capacity of small and marginal farmers to grow high-value agricultural products
- Component 2: Improved agricultural market efficiency and planning
- Component 3: Increased private sector investment and capacity in cold chain management
- Component 4: Increased compliance with international food safety standards

Per the terms of the cooperative agreement, Winrock International submits this final performance report to the USAID/Bangladesh covering the award period. This reports encompasses life of project accomplishments, including activities and results of the last quarter of implementation.

SUMMARY OF ACCOMPLISHMENTS

During the life of the project (July 1, 2013-June 30, 2016), the Cold Chain Bangladesh Alliance (CCBA) actively increased farmers' capacity to grow high value agricultural products; created and strengthened collection centers; supported GDA partner Golden Harvest to strengthen their cold chain; and promoted Good Agricultural Practices to ensure food safety.

Under **Component 1, *Increased capacity of small and marginal farmers to grow high-value agricultural products***, CCBA began field activities in October 2013, targeting Jessore and Gazipur. In Year Two, in line with Golden Harvest's cold storage facilities growth, CCBA expanded its work to Comilla, Sylhet, and Chittagong. In Year Three, following USAID's guidance, CCBA began working in Khulna, Faridpur, Barisal, and Chuadanga, in the FTF ZOI. With expanded work in all of its nine project areas, CCBA was able to train 31,909 people (including 30,733 farmers), exceeding its target of 18,000 people by 176%.

CCBA organized producer groups in high-value crop, broiler chicken, and dairy sectors to facilitate technology transfer, access to inputs, and capacity building.¹ CCBA formed 741 high value vegetable producer group consisting of 21,977 farmers, 249 women backyard vegetable producer groups consisting of 7450 farmers, 28 broiler groups consisting of 826 broiler farmers, and 16 dairy rearing groups consisting of 480 dairy farmers in all nine regions.

CCBA organized 1,287 farmer trainings involving 30,733 farmers (8,049 females and 22,684 males). Training topics include high-value crop production, post-harvest technology, backyard vegetables production, post-production and nutrition, integrated pest management, good agricultural practices (GAP), food processing, gender equality, broiler production, dairy management, and marketing and market linkages. The project built the capacity and business acumen of 349 local service providers (LSP). CCBA organized three trainings on cold chain supply management for Golden Harvest and members of Bangladesh Cold Storage Association to sensitize the importance of cold chain system for storing and delivering safe and nutritious food to the consumers and minimize postharvest losses.

During the life of the project, CCBA established 216 demonstrations plots in all nine regions to showcase new crop varieties and different technologies. As a result of the demonstrations and training, 15,463 farmers applied new technologies in the field.

Under **Component 2 Improved agricultural market efficiency and planning**, CCBA established eight collection centers and 16 aggregation points to facilitate aggregation and postharvest handling of eggplant and other high-value crops. Though most of the farmers using these collection centers were those trained by CCBA, additional farmers not trained by the project also used these collection centers.

Thirty-five Marketing and Planning Committees (MPC) were formed to manage the collection centers and link farmers with wholesale markets. CCBA provided weighing scales, plastic crates, secateurs for proper harvesting, and other needed postharvest tools. CCBA provided 40 trainings to producers, trainers, and wholesalers on Marketing and Market Linkages.

Under **Component 3 Increased private sector investment and capacity in cold chain management**, CCBA started its works with its GDA partner, Golden Harvest, after executing a Memorandum of Understanding (MOU) and establishing a system for tracking and reporting Golden Harvest's leverage. In coordination with WFLO/GCCA, the project conducted a training needs assessment to evaluate Golden Harvest's current operational knowledge and the existing knowledge of international cold chain management techniques and standards amongst major stakeholders.

Early during CCBA implementation, Golden Harvest's business priorities led them to focus on ice cream/dairy sector rather than high-value vegetables as original envisioned in the proposal stage. None withstanding, CCBA provided an array of support to Golden Harvest including training on food safety, cold chain management, and technical assistance in establishing supply chains. CCBA developed local farmers' capabilities in the Golden Harvest zones by training poultry producers and establishing a direct

¹ Poultry groups were formed in Gazipur only and dairy groups in Sylhet only to respond to the product demands of GDA partner, Golden Harvest.

market relationship to supply Golden Harvest. CCBA also trained dairy farmers in anticipation of Golden Harvest's dairy farm operation. CCBA trained key Golden Harvest staff on Hazard Analysis and Critical Control Point (HACCP) and Good Manufacturing Practices (GMP). Resulting from training on Food Safety Management System (FSMS), Golden Harvest will receive its FSMS certificate soon.²

As part of the GDA and their investment in cold chain, Golden Harvest restructured its processing plants at Gazipur and established several cold storages in five locations. Golden Harvest set up 6,950 freezers, as well as 32 refrigerated vans for produce transportation and 19 cold storages in different locations including its main processing center at Gazipur, investing USD \$9,233,800.

Aside from the work directly benefiting Golden Harvest, CCBA conducted various cold chain studies to support future cold chain investments in Bangladesh. In coordination with WFLO, the project conducted assessed postharvest loss of selected crops and conducted a workshop with key stakeholders to take stock of the postharvest situation in Bangladesh. CCBA assessed the cold chain system and energy efficiency in cold storage operation. CCBA conducted three studies³ on postharvest loss and cold supply chain system. CCBA also conducted a study tour to India and visits to two top-class dairy operations in Bangladesh to disseminate first-hand knowledge about cold chain management and dairy processing.

Under **Component 4 Increased compliance with international food safety standards**, CCBA organized four training-of-trainers (TOT) on GAP for production of safe vegetables for research, extension, and NGO staff. CCBA also conducted eight FSMS training through SGS, a global leader in FSMS. Agora, a pioneer super shop in fresh food retail, has been awarded its Food Safety Management System certificate. Meena Bazar and Golden Harvest has received trainings and FSMS auditing has also been completed. Both the companies will be receiving certificate soon.

SPECIFIC PROGRAM ACTIVITIES

COMPONENT 1: INCREASED CAPACITY OF SMALL AND MARGINAL FARMERS TO GROW HIGH VALUE AGRICULTURAL PRODUCTS

Project Area Selection. CCBA assisted smallholder farmers to produce high-value crops and reduce postharvest losses, increase income and food security in suitable agro-ecological areas across nine regions, including five in FTF ZOI. In order to achieve the target of reaching 18,000 primary beneficiaries, CCBA worked in 25 upazilas.⁴ The selected areas were found to be most appropriate for providing designed

² As of June 30, 2016, the issuance of the certificate was pending, but notification that the certificate was forthcoming had been received and all the needful work for the certificate had been dutifully completed.

³ The first study assessed the profitability of using refrigerated vans versus normal trucks, available at: http://pdf.usaid.gov/pdf_docs/PA00M6V6.pdf. The second study was conducted by grantee Bangladesh Agricultural Research Institute (BARI) under research grant program, was entitled "Assessment of Postharvest Losses and Food Quality by Evaluating Postharvest Practices and Marketing Performances in Selected Vegetables Supply Chain in Bangladesh." The report is available at: http://pdf.usaid.gov/pdf_docs/PA00M6V7.pdf. A third impact study was conducted by a team of international consultant to assess impact of postharvest intervention by the projects, available at: http://pdf.usaid.gov/pdf_docs/PA00M6V9.pdf.

⁴ Selection criteria included: interviews with key informants; preliminary field visits; focus group discussions involving producers, input sellers, and market players; physical mapping of the potential areas; and an evaluation of agro-

interventions. Some difficulties were faced in Barisal due limited suitable area for production of high value crops commercially.

Table 1. CCBA intervention areas

Region	Number of Upazila	Name of Upazila
Jessore	3	Monirampur, Chowgacha, Sadar
Khulna	3	Dumuria, Digholia, Metropolitan
Barisal	2	Babuganj, Banaripara
Faridpur	2	Modhukhali, Sadarpur
Chuadanga	3	Damurhuda, Jibon-nogor, Sadar
Gazipur	4	Kapasia, Kaliganj, Sreepur, Sadar
Comilla	3	Debidwar, Burichang, Adarsha-Sadar
Sylhet	3	Gowainghat, S. Surma, Sadar
Chittagong	2	Chandanaish, Potia
TOTAL	25	

Subsector Analysis. CCBA analyzed two agricultural subsectors using the USAID subsector analysis approach. CCBA selected subsectors based on production potential, competitiveness, impact potential, industry leadership potential, along with other cross-cutting issues. CCBA initially selected seven important subsectors; based on expert rankings, ultimately selected the two highest ranking subsectors (vegetables and poultry) for further in-depth study and project implementation. Vegetable subsector activities concentrated in Jessore and Gazipur, then expanding to seven more vegetable potential areas in both FTF and non-FTF regions. Poultry subsector activities concentrated in Gazipur and dairy subsector activities concentrated in Sylhet.⁵

Selection of high-value crops. CCBA conducted field and desk studies to identify the most profitable vegetable crops in the selected project areas. The study analyzed cost and return of several horticultural crops compared with high-yielding variety paddy, one of the widely cultivated crops throughout the country and among the most profitable of the cereals. Through the high-value crop ranking, CCBA found that production of garden pea, onion, cauliflower, tomato (summer and winter), eggplant (summer and winter), carrot, yard long bean, cucumber, bitter gourd, and green chili would yield net profits to the farmers of BDT 33,000 – 60,000 per acre in comparison to net profit of BDT 12,500 from high-yielding variety paddy on the same unit of land. By identifying the vegetables with the highest net profit returns, CCBA would be able to help small and marginal farmers, particularly women, produce high-value agricultural crops based on market demand and increase their incomes.

ecological conditions favorable for high-value crop production, farmers' willingness to adopt new technologies, farmers willing to produce a marketable surplus, existing infrastructure (roads and markets), and proximity to existing or planned collection centers and markets.

⁵ Dairy activities in Sylhet were included in order to serve as a potential supplier for Golden Harvest.

Producer groups. CCBA organized 741 high-value crop producer groups, 249 female producer groups focusing on backyard vegetable production and nutrition, 28 broiler groups in Gazipur, and 16 dairy groups in Sylhet. Broiler and dairy groups were formed to cater the needs of the GDA partner Golden Harvest and their business focus.

The producer groups consist of small and marginal farmers having a minimum of 0.25-0.30 acres of land available for producing vegetables any one of two season; willingness to work with the project; willingness to work in a group to get access to knowledge, skills, and new technology; and willingness to adopt good agricultural practices including appropriate postharvest handling methods. In Gazipur, considering the demand of the GDA partner Golden Harvest, CCBA targeted small poultry farmers with the capacity to produce 500–1,000 birds in one production cycle (30-40 days).

Table 2. CCBA producer groups by category

Group Category	No of Groups Formed	No. of Members		
		Male	Female	Total
High-value crops	741	21,440	537	21,977
Poultry (broiler)	28	764	62	826
Dairy	16	480	0	480
Backyard vegetable production and nutrition	249	0	7,450	7,450
Total	1,034	22,684	8,049	30,733

CCBA assisted the producer groups to form management committees, organize regular meetings, facilitate field visits to ensure on-time technical support, link the committees with LSPs and input-output markets, as well as assist in reducing postharvest losses. In order to ensure sustainability beyond the life of CCBA, CBA coordinated the organization of producer groups with local NGO partners, who will continue to provide services to these groups along with their micro-credit activities.

Local Service Providers. CCBA engaged with 349 Local Service Providers (LSPs) across seven regions. LSPs provided support and services to the producers and worked as a network in the rural value chain and marketing system. LSPs act as an important link between producers, input suppliers, traders, and other market actors, wholesalers, and retailers. They also provide technical and extension services to farmers. CCBA selected and trained all LSPs directly involved in field activities serving the CCBA producers in backward and forward market linkages.

The LSPs were selected from advance and lead farmers, suppliers of inputs, medicine trader, and

CCBA's Local Service Providers model provides increased incomes and necessary services

Faisal Ahmed used to sell pesticides in his village at Fotepur in Guwainghat in Sylhet. The business was not good; he struggled to support his family. Considering bleak future of pesticide business, Faisal got admitted in a training course on veterinary medicine. After receiving the training, he started providing services to livestock farmers in his village. "I was struggling to get clients. As I was new, farmers did not trust me," Faisal said.

In October 2015, Faisal received training from CCBA on marketing and became a local service provider. CCBA also established linkage between Faisal and livestock farmers. "When CCBA introduced me to the lead farmer, I started to get good number of clients," he said. Faisal's income has increased five times in the last one year. He used to earn USD 38, but now his income is USD 192. "Farmers used to go a distant place for their veterinary support but now they come to me," Faisal said.

sellers. Many of them also worked as vegetable traders. The LSPs in the field of poultry/broiler production were mainly feed, medicine, and broiler traders. The LSPs participated in a series of training that included topics such as the role and responsibilities of LSPs, marketing approaches and strategies, business plans development, and practical exercises for developing the presentation skills of the LSPs.

Table 3. Training for Local Service Providers by region

Region	Number of training	Male	Female	Total
Jessore	2	41	0	41
Gazipur	3	99	3	102
Comilla	3	73	2	75
Sylhet	1	21	1	22
Khulna	2	52	2	54
Chittagong	1	25	0	25
Barisal	1	27	3	30
Total	13	338	11	349

Some of the successful activities of LSPs include assisting producers in selling high value crops in the local and regional markets at relatively higher prices, and ensuring timely supply of quality seeds, seedlings, quality feed, vaccines, vermi-compost, and other inputs to producers at reasonable prices. LSPs provided up-to-date market information to the producers. They provide technical assistance and advocated good agricultural practices. Many LSPs have become successful traders of inputs and produce, creating links with the collection centers and wholesale markets, while providing embedded services to the farmers.

Training. CCBA facilitated 1,034 one-day training to producers, LSPs, and traders, food processors, and other stakeholders using both classroom-based trainings and field demonstrations. Trainings utilized participatory approaches, practical experience sharing, and group work. CCBA training modules introduced modern technologies for production, harvest, and postharvest handling of high value crops; food processing; gender and nutrition; safe and environmentally-friendly practices at the farm and processing levels; ethical business practices; compliance with best practices across the supply chain; and national and international safety and quality standards. CCBA developed and field tested a training curriculum in collaboration with BARI, Department of Agricultural Extension, various NGOs and universities, and the Department of Livestock Services.

Table 4. Number of participants by type of training

Type of Group	Number of Training	Total Participants
High-value crops	741	21,977
Backyard vegetable production and nutrition	249	7,450
Poultry	28	826
Dairy	16	480
Total	1,034	30,733

In addition to these value chain-based trainings, CCBA also conducted training on marketing and market linkages, and Integrated Pest Management (IPM), postharvest management, GAP, food processing, vegetable nutrition and gender equity, and biosecurity management in broiler production for the above beneficiaries. CCBA also provided training to traders, wholesalers, food handlers and processors, management staff of Golden Harvest, Agora and Mina Bazar, partner NGO staff, and LSPs.

Trainings provided by the CCBA to the beneficiaries has increased knowledge and skills significantly. The project conducted impact of each of training conducted by the project during the project period, which was almost consistent. The average change in learning new technologies increased is 31% to 82%. The figure below shows the improvements in participant learning based on the pre- and post-test evaluations.

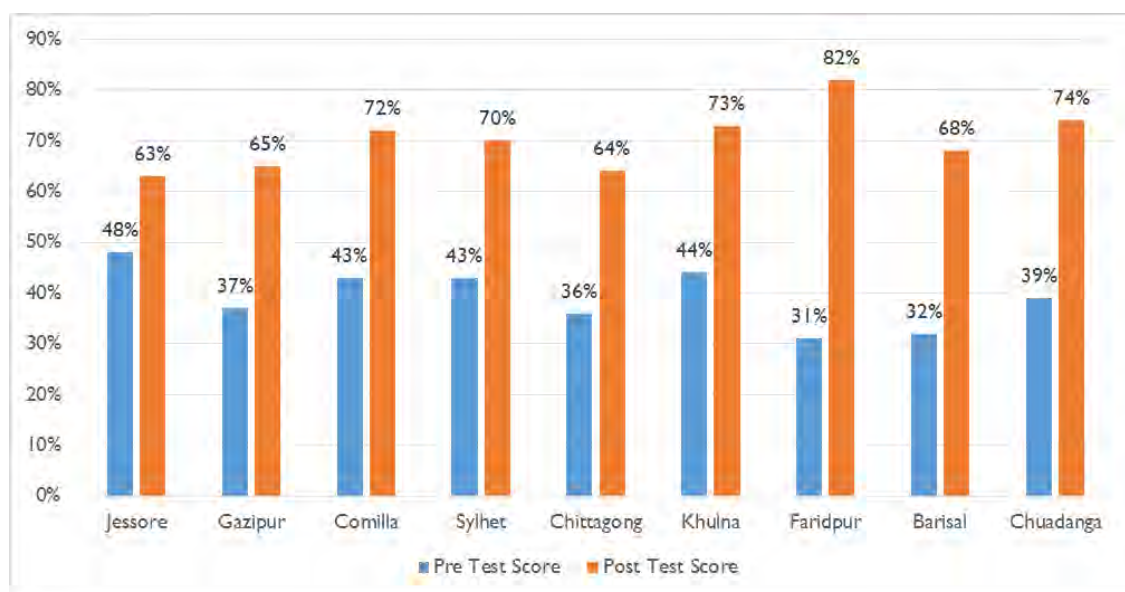


Figure 1. Progress Assessment of Training Evaluation

Training of Trainers. CCBA organized several training-of-trainers (TOT) workshops to develop a critical mass of resource persons with technical knowledge of production, post-harvest management, and good agricultural practices.

Table 5. Training of Trainers participants and training types

Name of Training	Number of trainings	Participants		
		Male	Female	Total
Production Technology and Post-Harvest Management of high-value crops	1	22	0	22
Good Agricultural Practices	4	90	5	95
Post-Harvest Technology for high-value crops	2	58	7	65
Total	7	170	12	182

Three TOT trainings on GAP were conducted by Dr. Y. Martin Lo, GAP Expert and Food Safety Specialist, and one TOT training on postharvest technology of high value crops was conducted by Dr. Kerstin Hell,

WFLO consultant on postharvest. The rest of the trainings were conducted by the local resource persons. The TOT on GAP was first of its kind in the country; 40 participants from various Bangladeshi agencies, NGOs, and USAID projects participated, including the USAID Agricultural Extension Project, USAID Agricultural Value Chains Project, USAID Agro-Inputs Project, and USAID Horticulture Project. These TOT on GAP created a resource pool of local experts, which have trained farmers. The TOT on GAP is considered an important milestone in Bangladesh’s agricultural development.

Demonstration sites and technology transfer. New technologies are key drivers to address endemic agricultural problems in Bangladesh. CCBA increased the capacity of producers through demonstrations, introducing them to new varieties and facilitating the adoption of new technologies. During the life of project, CCBA set up 216 demonstration sites with new varieties and farmers adopted over 90% of the technologies demonstrated. The table below shows the new varieties demonstrated.

Table 6. New varieties demonstrated by CCBA

Crop Name	New Variety	Company
Tomato	Novelty F1 and Sigma-16	Metal Seed
Tomato	Mintu Super, Delta	Lalteer Seed company
Cauliflower	Mid Best, C-33321, and Sevan	Metal Seed
Chili	Picnic, BARI-1	Metal Seed, BARI
Cucumber	Chokori	Metal Seed
Cabbage	Tropical Quick	Metal Seed
Eggplant	Soldier	Metal Seed
Bitter gourd	Green Arrow	Metal Seed
Yard long bean	Kegornatoki, 1070 Lalteer	Metal Seed, Lalteer Seed
Bitter gourd	Lima	Metal Seed
Eggplant	Green Ball, Retina	Metal Seed, Getco Agro Vision
Cucumber	Bonolata	Metal Seed
Tomato	Tidy	Metal Seed
Bitter gourd	Taj 88	Lal Teer
Cauliflower	Marbel	Lal Teer
Bitter gourd	Tia F1	Lal Teer
Eggplant	Banani F1, BARI-8	Lal Teer, BARI
Eggplant	Retina	GETCO Agro Vision Ltd.
Cauliflower	Snow Baby 60	GETCO Agro Vision Ltd.
Cabbage	GT Cross	GETCO Agro Vision Ltd.
Carrot	Koroda	Getco Agro Vision Ltd.
Onion	Taherpury King	Lalteer Seed Company
Green Pea	BARI-3	BARI
Cauliflower	Snow Baby 60, Snow Boss, Snow Start	GETCO, United Seeds, Sakata Japan
Cucumber	Lucky-7, Alavi Green, Green Line	GETCO Agro Vision Ltd, Lalteer, Chia-Tai (Thailand)

CCBA established demonstrations to showcase the effect of vermi-compost and tricho-vit on plant growth along with pheromone traps for biological control of pest and diseases. The combination of multiple biological and safe production technologies helped reduce the use of pesticides by 20%, saving about BDT 15, 000 to 20,000 in 0.33 acres of eggplant crop over one cropping cycle.

Along with introducing new and improved varieties, the demonstrations are useful to show environmentally-friendly practices to the producers. In many plots, the producers used vermi-compost for the first time. The demonstration farmers maintained schedules for seed sowing, transplanting, fruiting, and harvesting, which many producers had not been practicing.

CCBA conducted demonstrations for women producer groups focusing on seed preservation, seedbed and pit preparation, and seed sowing. CCBA also conducted demonstrations on food processing such as preparing pickles and sauces from eggplant, bitter gourd, and tomato.

Another important demonstration and technology transfer are the postharvest demonstrations that CCBA conducted focusing on safe harvesting by using secateurs, using of trolleys for carrying products from field, using shade, cooling in water, cleaning, grading, using plastic crates for packing or hard bamboo basket with paper lining, and careful loading in transport. By showcasing these postharvest approaches, CCBA has left a lasting impact on the farmers' income.

CCBA conducted an assessment⁶ of the impact and outcomes of postharvest practices disseminated. The assessment reveals that farmers experienced reduced losses after implementing improved postharvest methods and technologies. A simple return on investment worksheet shows that a positive return on investment can be obtained for secateurs use, use of shade, cooling eggplant in water, using improved containers for transportation. Refer to the *Lessons Learned* section for more detailed information.

Gender and nutrition training.

CCBA actively addressed gender equity by focusing trainings specifically on women and their needs in the rural households. In order to create awareness about their rights and increase their capacity in homebased production and processing system, CCBA organized 60 trainings events for 1,404 women producers on vegetable-nutrition and gender equality. The training covered basic technology of backyard gardening, classification of vegetables, nutritional value of



Figure 2. Vegetable cooking demonstration for CCBA beneficiaries

vegetables, nutrition requirements, dietary guidelines, components of a well-balanced diet, personnel hygiene, the importance of safe and clean food, and diet during pregnancy and lactation. Practical

⁶ Available at: http://pdf.usaid.gov/pdf_docs/PA00M6V9.pdf.

demonstration on vegetable based mid-day meal preparation was also conducted. The training also covered gender equity and equality.

Part of food security is improving the nutritional status of project beneficiaries. Therefore, CCBA provided trainings to 1,076 women farmers on backyard vegetable farming and nutrition. CCBA trained women how to cultivate different types of vegetables in their backyards, on an average land size of 0.033 acres.

CCBA conducted a survey among the trained women producers in two regions to see the outcome of the intervention. Production, consumption, and sale of vegetables increased significantly among the project beneficiaries after the intervention. Households are producing 58 kg of additional vegetables than before, which is about 69% more than the baseline data. Total consumption of vegetables increased by 66%. On average, households are now producing 141.73 kg of vegetables, of which 114.73 kg is consumed and 36.05 kg is sold in the market, contributing to food and nutrition security and household income.

Home level processing. Home level processing engages women in a productive activity that contributed to family income and food security. This intervention also contributes to loss reduction by sorting unsalable vegetables at the collection point. CCBA piloted home level processing. In Jessore, three home level processing groups were formed involving 45 women. They were trained on preparation of pickles, tomato ketchup, and preservation of vegetables in brine solutions. As a result, the women learned to process, seal, label, and store the products for home consumption or sale. CCBA linked the women processors to Green Bazar, a super shop. A tasting session was held at the shop. Then, the super shop places an order for the pickles made by the community women.

CCBA promoted home level processing to reduce losses and provide economic opportunities for women

The village Hurgati is popular for its eggplant production. Despite high yields, they had problems with quality. “Buyers always want good quality products but low quality products are big headache for us,” said Jasim Uddin, 35, a farmer. In order to deal with the postharvest losses from low quality vegetables, CCBA trained Hurgati women on eggplant pickling. Women used discarded eggplants that are not suitable for sale at the market, but that are perfect for pickling and processing. After receiving the training, Jasim’s wife, Selina, 30, produced dozens of bottles eggplant pickles. CCBA linked Selina to a super shop in Jessore where she sold her pickled eggplants. “The manager from the super shop phoned me the other day and told me that three dozen of our products were being sold at the super shop and more people are expressing their interest,” Salina said.

COMPONENT 2: IMPROVED AGRICULTURAL MARKET EFFICIENCY AND PLANNING

Rural collection centers and aggregation points. High value crop producers generally pick their produce twice per week during harvesting season. By having small marketable quantities, they are at a weak bargaining position and too far from assembly markets. Rural collection centers allow farmers to bring together their harvests directly from the field to sell to collectors. It also provides a place for farmers close to their fields to aggregate, clean, wash, pack under a shade, and then forward to the market.

Collection centers were established in collaboration with the producers, at the most convenient location of a production cluster, preferably near a rural road having suitable inward and outward access to larger markets in a suitable vacant and unutilized land piece having the consent of the owner. CCBA helped farmers form a market planning committee (MPC) to manage each collection center. CCBA provided crates, weighing scales, register books, training on postharvest practices, and assisted in organizing buyer-seller meeting. Production clusters with 120-200 small producers were brought together by the collection center, which increased for economy of scale and created linkages to output markets.

Collection centers helps farmers sell their produce directly to buyers

The collection center is designed so that farmers can sell their products directly to buyers from the center itself. At the collection center, they sort, grade, clean, and package their crops and directly sell to the buyers. An estimate shows that from October to December 2015, 289.70 metric tons of vegetables were sold in the Birnarayanpur collection center, generating USD 54,398 in revenue for the farmers. Ayub Ali, a buyer based in Khulna, said that he is also benefiting from the collection center. "I know if I come to this collection center, I can buy my necessary products," he said. "There were days when we cut our crops but could not sell them as we could not take them to market. But things have changed. Now the buyers come to the collection center. If we can take our products to the collection center, our worry ends," says Mofidul Molla, an area farmer. Refer to **Annex 3 Success Stories** for more details.

The first collection center was established in Hurgati village, Vhojgati Union, Monirampur Upazila to facilitate the aggregation and postharvest handling of eggplant and other high-value crops produced by more than 180 farmers in one cluster. Farmers, acting independently, were previously unable to effectively aggregate and sort their products.

The collection centers gave the producers the opportunity to assemble, prepare their produce for sale, and finally sell to the buyers at the quality and at the price that allows both the buyer and the seller to get the most advantages. The collection centers create market opportunities for the producers through market linkages and bulk sales.

In all, CCBA established eight collection centers and 15 temporary aggregation points across seven project areas. The collection centers have successfully aggregated and marketed eggplants, bitter gourd, yard long bean, chili and some other minor crops and generated substantial revenues, as demonstrated in the table below. All aggregated products are now undergoing an improved postharvest handling process before being sold. The produce is sorted, cleaned, graded based on size, quality, and maturity, weighed, pre-cooled, and properly stacked in crates for being transported to the markets.

An important lesson from the establishment of collection centers and aggregation points is that having a gathering place for the farming community provides a simple and low cost way



Figure 3. Hurgati Collection Centre in Jessore

to reach target audiences for training and information and technology dissemination. The site could be a simple shed or a more modernize cement structure, but it should have shade, a clean working surface or floor, space for demonstration of improved practices, and near farmers and traders. Table 7 shoes the revenue and production reported by CCBA-supported collection centers.

Table 7. Collection center revenue and production

Name of Collection Center	Total Revenue Generated (USD)	Total Volume of Produce Aggregated and Marketed (MT)
Birnarayanpur, Jessore	82,702.88	420.11
Hurgati, Jessore	85,732	315.40
Nongorpur, Jessore	74,671.84	413.51
Bagbari, Jessore	33,658.64	111.28
Swarupdah, Jessore	144,845	376.00
Modonpur, Jessore	39,895.67	132.25
Shikulia-Pubail, Gazipur	43,648	252.31
Pagoil, Sylhet	11,276.19	78.25
Total	\$516,430.22	2,099.11 MT

Market linkages. CCBA assisted producers, traders, wholesalers, and markets or super shops establish linkages to allow produce to move from field to table. CCBA facilitated a deal between producers and two leading retail super shops in Bangladesh, Agora in Dhaka and Meena Bazaar in Khulna. This was a new experience for both the parties. The produce was transported by a refrigerated truck hired from the Bangladesh Agricultural Development Corporation (BADC) to deliver high-value, nutritious, and safe food to the end consumers. CCBA producers now have a better understanding of the product quality required by the super shops, and a relationship has been established between the producer groups and super shops.

Although this was a big breakthrough for the project, the super shops only required small quantities (20 kg -30 gg) of twenty different type of vegetable per purchase. On the other hand, farmers in one collection point harvest and aggregate large quantities (5-10 MT) of one or two marketable products at each day. Neither farmers nor the traders have the required incentives to send small quantities of several products separately, since super shops do not pay premium price. Farmers prefer to sell bulk to local traders who take the whole lot to the wholesale market. Therefore, for the farm to super shop linkage to be sustainable and successful, it required a large chain of super shops across the country with large temperature controlled warehouses to buy from the farmers. At present super shops have a 2-3% of market share of fresh products.

Another important aspect to establishing market linkages are the buyer-seller meetings. In the rural context, it is often difficult for small producers to find suitable buyers for their products; and it is also challenging for some buyers to find reliable sources of high quality produce. Producers also find it hard to source quality inputs. The input and output market actors along the value chain play a vital role in linking

the producers to the end consumers, and must be able to manage supply and demand, provide fair prices, and ensure quality.

Keeping that in mind, CCBA has organized 80 buyer-seller meetings to improve linkages with both input and output market actors. The meetings focused on ways to establish efficient market linkages, group marketing to reduce transportation costs, and better market prices by maintaining quality and reducing postharvest loss. These meetings and visit to wholesale markets

made a great impact in establishing direct linkage between CCBA producers and markets. As a result of meetings, transactions became easier and saved time for both the producers and the buyers, as the producers collected their vegetables in one place and the buyers could buy the produce from a single location. It also reduced the number of times the produce was loaded and unloaded. Some of these buyers are linked with Khulna, Dhaka, Gazipur, and Chittagong wholesale markets, therefore the produce reached a wider market, fetching higher price which would not have been the case if the producers had sold individually at the local markets.

Golden Harvest notes difficulties in sourcing good quality live birds and lacking the proper supply chains to get an uninterrupted supply of chickens. At their request, CCBA facilitated buyer-seller meetings with Golden Harvest and the Kapasia cluster. The Kapasia cluster farmers and Golden Harvest entered into a contract that solidifies a supply arrangement, including the rate per kilogram for the birds, date of supply, quantity, average size, and transportation costs. Resulting from this deal, Golden Harvest receives a steady and reliable supply of high quality birds at a pre-fixed rate, and the farmers have a dependable buyer for their product paying fair prices.

CCBA also created market linkages between producers and local input dealers with the objective to establish a self-sustaining network in the rural marketing system so that producers can select the best quality input materials and receive the supporting services to enhance their knowledge and skills. CCBA signed MOUs with ACI and Metal Seed Company to provide technical services, establish demonstration plots, and ensure supply of high quality seed and other inputs to CCBA farmers. As a result, ACI and Metal provided quality seeds and supported in establishing demonstrations plots to showcase best practices. Other input suppliers, including Ispahani Agro Limited, Russell IPM America, Lalteer Seed Company, Kasem Seed Company, and BRAC seed, have provided services to the CCBA producers.



Figure 4. Fresh vegetables and fruit for sale at Meena Bazar in Khulna

COMPONENT 3: INCREASED PRIVATE SECTOR INVESTMENT AND CAPACITY IN COLD CHAIN MANAGEMENT

The work under Component 3 focused on increasing the capacity of Golden Harvest's cold chain management through trainings and assessments. These trainings and assessments were fundamental in supporting the growth and understanding of cold chain in Bangladesh. Furthermore, CCBA organized two major cold chain events (Symposium and Expo), with the support from WFLO/GCCA, which provided state-of-the-art knowledge to Bangladeshi industry, government, and other stakeholders on cold chain issues and technologies. CCBA also conducted various studies on postharvest losses to demonstrate the importance of cold chain and the supply chain to stakeholders.



Figure 5. US Ambassador to Bangladesh Dan W. Mozena and USAID/Bangladesh Mission Director Ms. Janina Jaruzelski inaugurated the Cold Chain Network with Golden Harvest

Capacity building on cold chain management. In early 2014, WFLO conducted a training need assessment focusing on cold chain management and operations. Based on the recommendation of experts in this subject matter, CCBA organized trainings on cold chain management for Golden Harvest and members of the Bangladesh Cold Storage Association. WFLO experts, James “Rusty” Eason, a cold supply chain expert, and Michael Morton, expert on operation and warehousing, conducted the trainings. The training course covered the fundamentals of the food storage industry, cold chain users, management and warehouse operation, preservation, principles of refrigeration, cold chain warehouse, modern warehousing, cold storage safety, human resource management, HACCP, and other basic food safety issues.

Cold chain energy needs assessment. WFLO energy expert Matt Chang conducted an energy needs assessment of existing cold store facilities. The assessment determined current energy consumption, inefficiencies, constraints, operating costs, and opportunity for energy savings. The assessment provided energy efficiency guidelines that included refrigeration, lighting, heating, ventilation, air conditioning, and insulation. Since the cost of energy is rising, use of alternate sources and efficient use of energy is paramount for the industry to move forward.

Cold chain assessment. CCBA partner WFLO conducted a cold chain assessment in August 2015 focusing on findings and recommendations for cold chain management in regards to postharvest, processing, transportation, storage, warehousing, and retail. Mr. Eason concluded that actors within the cold chain in Bangladesh do not understand the importance of maintaining temperature control throughout the supply chain. As with many developing countries, transport appears to be the weakest link in the cold chain in Bangladesh, as refrigerated transport is almost nonexistent. He noted that it is critical for farmers, logistics providers, exporters, and logistics operators (e.g. warehouses and transportation

fleet owners) to understand how product quality can and should be maintained from farm to fork. This knowledge will facilitate the demand and incentive to invest in cold chain. He recommended that an association inclusive of retailers could form an alliance and implement a business model that includes a buyers' program for association members that would also help to control costs. This would be followed by the implementation of a cold supply chain and distributor service, which would include warehouses/distribution centers and transport with logistical management services. This would take time and growth but these are the types of business systems that need be implemented to benefit the consumer both domestically and internationally.

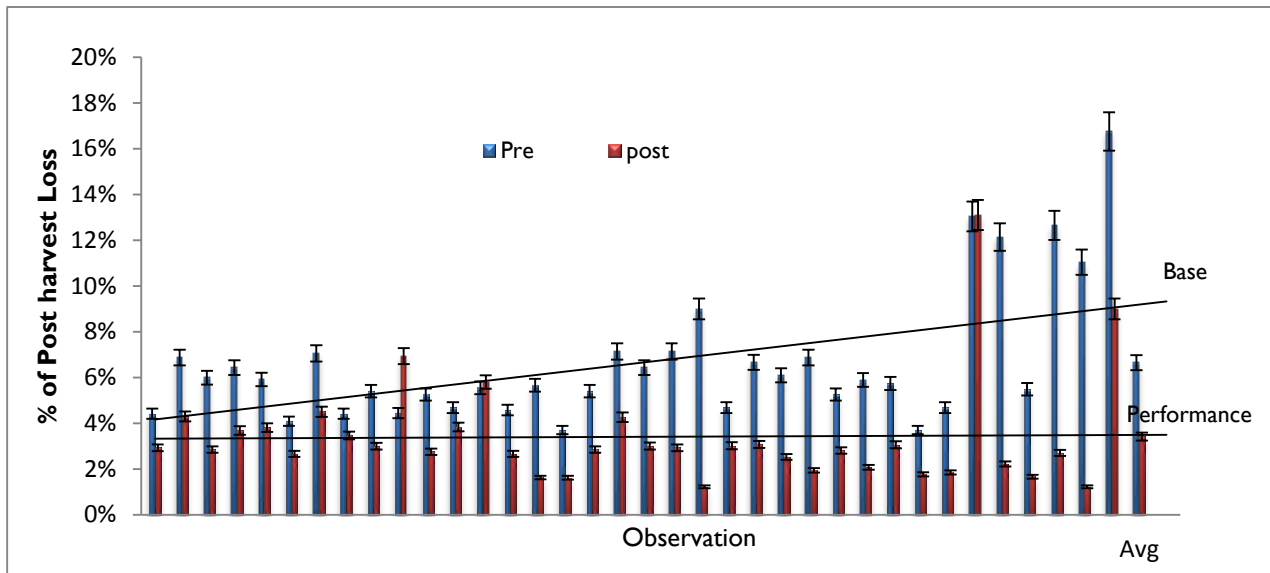
Cold chain management and food safety training. CCBA held a Cold Chain Management and Food Safety training for 22 participants from the leading Bangladeshi super shops and suppliers. WFLO consultant, Mr. Eason, conducted the training, covering standard operating procedures of cold store warehouses, food safety awareness, inventory management, supply chain management, business process management, customer relationship management, cold chain for processors, and logistical carrier management covering mobile temperature sensors.

Postharvest loss assessment. In conformity with CCBA's objective of reducing postharvest losses, WFLO fielded Dr. Kerstin Hell to conduct a study on postharvest losses in the CCBA project areas. Dr. Hell assessed the postharvest losses of four major winter crops (cabbage, cauliflower, chili, and eggplant), gathered baseline data, carried out focus group discussions, met with the regional agents, and surveyed the market. The findings show cumulative postharvest losses along the vegetable market chains range from 5% to 39%. The maximum losses are incurred at the harvesting stage, reaching up to 15%. The postharvest losses at different points along the market chain are shown in the table below.

Table 8. Postharvest losses of the selected winter vegetables

Crop	Postharvest Losses (%)				
	Harvest	Local Market	Wholesaler	Retail	Total
Cabbage	7-15	2-3	2-7	3-7	14-32
Chili	0.5-1	0.5-1	1-2	2-3	5-7
Eggplant	8-12.5	8-10	4-8	3-8	23-38.5
Cauliflower	10-12	2-3	5-7	5-6	22-28

Postharvest loss reduction. CCBA trained and supported farmers and traders to improve their capacity to reduce post harvesting losses by adopting efficient post harvesting handling management. As a result of all the interventions, postharvest losses at farm level for eggplant and bitter gourd (aggregation point of Jessore) has decreased from 6% to 3%. This means that farmers successfully reduced 50% of their losses at the aggregation point and vegetables quality remained high. The community behavior in adopting the postharvest management practices has been consistent and stabilized to minimum level of 3% instead of diverse and inconsistent behavioral pattern.



businesses, strengthening capacity of different kinds of cold chain stakeholders so that they can promote sustainable cold chain solutions and establish business-to-business linkage among different stakeholders of cold chain system. The expo brought together 30 companies who are mainly involved in cold chain businesses; more than 100 attendees including government officials, business leaders, and NGO staff participated the expo.

The expo gave companies an opportunity to showcase their products and services, which included cold storage companies, super shops, traditional and alternative energy service providers, refrigeration companies, dairy producers, and cold logistics service providers.

The expo also included educational sessions in topics including alternative energy options, distribution of fruit and vegetable through cold chain, efficient storage structures suitable for Bangladesh, and innovations in transportation technology. In another breakout session, speaker Mr. Harshal Sarange informed participants about energy efficiency and application of solar energy in cold storage.

The expo received media attention. Leading newspapers and television channels covered the event. Two television channels ran stories during prime time.

The expo created enthusiasm among the stakeholders and help create business-to-business linkages. The expo established a platform among stakeholders to discuss challenges and opportunities for establishing and developing a safe and effective cold chain in Bangladesh.

COMPONENT 4: INCREASED COMPLIANCE WITH INTERNATIONAL FOOD SAFETY STANDARD

Good Agricultural Practices (GAP) is an internationally recognized regulatory framework for reducing risks associated with the use of chemicals, particularly pesticides, taking into account public and occupational health, environmental, and safety considerations. GAP addresses environmental, economic, and social sustainability for on-farm production and post-production processes resulting in safe and healthy food and non-food agricultural products. As a part Component 4, CCBA organized various training-of-trainers (TOT) on GAP in order to develop a technical pool of GAP experts in the country and curriculum development and training manual creation for farmers. These interventions were new to Bangladeshi stakeholders.



Figure 8. CCBA supported Agora to receive its FSMS certificate

Seminar on GAP. CCBA organized two seminars on GAP in the Context of Bangladesh. Dr. Y. Martin Lo served as the trainer and shared his experience of working with scientists and development practitioners in developing GAP curriculum for the producers of Bangladesh. The Chief Science Officer of the Bangladesh Agricultural Research Council gave an overview of GAP initiatives. The topics covered included aflatoxin control, third party certification, framework of certification body, and food safety issues along with GAP. The seminar brought together the government and private entities working for the successful establishment of GAP in Bangladesh. Participants included representatives from the Department of Agricultural Extension, Soil Resource Development Institute, and Second Crop Diversification Project, Pilot Program for Climate Resilience, Bangladesh Safe Agro Food Efforts Foundation, Hunger Free World, BARI, Bangladesh Agricultural Research Council, Horticulture Research Center, Bangladesh Accreditation Board, FAO Food Safety Programme, Meena Bazar, and Bangladesh Fruits, Vegetables and Allied Products Exporters Association. The event gave all an opportunity to share and explain their approaches and activities in regards to GAP.

Food Safety Management (ISO 22000:2005) Certification. CCBA signed MOUs with Rahimafrooz Super Store Limited (Agora) Limited and Gemcon Food & Agricultural Products Ltd. (Meena Bazar), two leading super shops. The purpose of the MOUs with these organizations was to establish a link between the CCBA-supported collection centers and provide them with the needed training and support to achieve food safety certification. CCBA engaged SGS, a world leading certification company, to organize series of trainings on Food Safety Management Systems and introduce Agora and Meena Bazar staff to ISO 22000, followed by documentation and auditing.

Rahimafrooz Super Store Limited (Agora) Limited was awarded with their Food Safety Management (ISO 22000:2005) Certificate on June 19, 2016. Agora is the first super shop in Bangladesh to attain this international certificate. Meena Bazar also qualified for the certificate, but at the time of project close out, the certificate has not been officially issued. Golden Harvest Factory staff also received training on food safety management and are qualified to receive certification.

Food safety certification is a lengthy and costly process and the food industry in Bangladesh have limited motivation to improve safety standard to international level. Therefore, Agora, Meena Bazar, and Golden Harvest certification status is an important milestone in Bangladesh food safety.

LIFE OF PROGRAM RESULTS

During life of the project CCBA trained 30,733 farmers, against a target of 18,000, on topics including production and postharvest, integrated pest management, GAP, food processing, marketing and market linkages, and nutrition and gender, exceeding the target by 179%. CCBA exceed this target is because it expanded its original plan of working in four districts to nine districts. Furthermore, a total of 31,909 people received training through CCBA, including local service providers, partner NGO staff, Golden Harvest, and super shop staff.

Among the trained farmers, 15,463 farmers (about 50.3%) applied new technologies which has resulted incremental sales. The 50% technology adoption rate is quite impressive as adoption rates are often lower after a technology has been introduced. As a result, 1,448 hectares of land came under new technologies. Farmers’ incremental sales over the life of project was USD 12,094,180, exceeding the target of USD 7.2 million by 163%. CCBA directly benefited 29,018 rural households, exceeding the target of 18,000 rural households.

Eight collection centers were established by the project for aggregating, sorting, grading, cleaning, packing, and selling vegetables. During the period, 1,055.4 full time jobs were created. A total of 247 enterprises, women producer groups, and producer association applied improved technologies on food safety, production, postharvest handling, food preparation, amongst other topics. The project reduced postharvest loss from 6% to 3% at the aggregation point against the baseline data.

CCBA completed all necessary training and auditing with SGS to provide international food handling standard – food safety management system certification (ISO 22000:2005) to three local companies. One company got the certificate and the other two will be getting soon⁷. The SGS auditors informed CCBA that they have recommended both companies for certification, yet there is a mandatory 45-day waiting period before the certificates are issued.

Over the life of the project, 1,055.4 full-time equivalents (FTE) jobs were created, mainly new jobs that Golden Harvest required to run their expanded operations. The target of 21,600 jobs was not a realistic target for a pilot project targeting 18,000 farm families holding 0.25-0.30 acres of land.

Golden Harvest invested USD 9,233,800 for establishment of cold storages, freezers, and refrigerated vans, which is a significant investment against the target of USD 10.2 million⁸.

Table 9. CCBA life of project indicators, targets, and achievements

FTF Ref.	Indicator	Unit	Target	Achievement
4.5.2-7	Number of individuals who have received USG supported short-term agricultural sector productivity or food security training	Number	18,000	31,909⁹
				23,206 male 8,703 female
4.5.2-5	Number of farmers and others who have applied improved technologies or management practices as a result of USG assistance	Number	15,000	15,463
				15,339 male 124 female

⁷ The assessment, training, capacity building and auditing have been completed successfully. The companies applied for the certificates soon after receiving notification of the successful completion of the audit.

⁸ The reported figured was provided to CCBA by Golden Harvest in June 2015. Later, Golden Harvest informed CCBA that their cold chain investment continued and may have exceeded \$10.2M. However, as of June 30, 2016, CCBA was unable to verify this information and receive a more up-to-date report on their cold chain investment.

⁹ The indicator includes farmers, ranchers, and other primary sector producers who receive training in a variety of best practices in productivity, postharvest management, market linkages, etc. It also includes rural entrepreneurs, processors, managers, and traders receiving training in application of new technologies, business management, linking to markets, etc., and training to extension specialists, researchers, policymakers, and others who are engaged in the food, feed, and fiber system and natural resources and water management.

FTF Ref.	Indicator	Unit	Target	Achievement
4.5.2-42	Number of private enterprises, Service Provider, Farmer Groups, producer organizations, water user associations, women's groups, trade and business associations and community-based organizations (CBOs) that applied improved technologies or management practices as a result of USG assistance	Number	180	247
4.5.2-2	Number of hectares under improved technologies or management practices as a result of USG assistance	Hectares	1,300	1,448
4.5.2-13	Number of rural households benefiting directly from USG interventions	Number	18,000	29,018 22,684 male-headed households 6,334 female-headed households
4.5.-2	Number of jobs attributed to FTF implementation	FTE ¹⁰	21,600	1,055.4 608.8 male 446.6 female
4.5.2-23	Value of incremental sales (collected at farm-level and outlets) attributed to FTF implementation	USD	7,200,000	12,094,180
4.5-10	Total increase in installed storage capacity (m3) (Golden Harvest)	M ³	6000	2573
4.5.2-38	Value of new private sector investment in the agricultural sector or food chain leveraged by FTF implementation	USD	10,200,000	9,233,800
Custom 1	Percentage of postharvest loss	%	15	3
Custom 2	Number of certifications for compliance with international food handling standards awarded to local firms	Number	5	3

CHALLENGES, LESSONS LEARNED, AND RECOMMENDATIONS FOR FUTURE IMPLEMENTATION

CHALLENGES

Shift in project focus. The CCBA project concept as discussed with GDA partner Golden Harvest hinged on their planned investment on the vegetable cold chain. Golden Harvest later shifted their focus on dairy, responding to market demands given the high value of ice cream. Once CCBA was awarded, Golden Harvest had become completely dedicated to ice cream and therefore did not have a need to establish linkages with high value vegetable producers. To address this significant shift in the project's focus, CCBA adapted its work. As part of the original project design, CCBA continued to support Golden

¹⁰ Jobs are defined as all types of employment opportunities created during the reporting year in agriculture- or rural-related enterprises (including paid on-farm/fishery employment). Jobs lasting less than one month are not counted in order to emphasize those jobs that provide more stability through length. Jobs should be converted to *full-time equivalents* (FTE). One FTE equal 260 days or 12 months. Thus a job that lasts 4 months should be counted as 1/3 FTE and a job that last for 130 days should be counted as 1/2 FTE. The number of hours worked per day or per week is not restricted, as work hours may vary greatly.

Harvest with their business priorities, while still supporting vegetable farmers in the FTF ZOI. CCBA continued the project activities in building farmer capacity in high value vegetable production and created market links with other private sector partners who are working with the vegetable value chain in the project zones.

Geographic expansion. Golden Harvest's geographic area of intervention did not include USAID's FTF zones. CCBA began working in the zones where the GDA partner was operating. Then, CCBA expanded its work to additional areas in the FTF ZOI. CCBA approached additional private sector partners who work in the vegetable value chain in the FTF ZOI to help create market linkages for project beneficiary farmers. However, due to the expansion in geographic areas and the three-year implementation timeframe, project interventions in were staggered, which means that some areas did not receive as much support as needed and created extra pressure on staff to be able to serve all of these project areas.

Political operating environment. The political situation in Bangladesh early in the project life (October 2013) was challenging; strikes and blockades prevented CCBA staff from conducting field work. Frequent *hartals* disrupted transportation; the cost of transportation increased sharply, which had negative impact on farmers' incomes and livelihoods. In January 2015, once again project activities and staff movement became significantly restricted due to the political situation in Bangladesh. Field activities started again in mid-April 2015 once the political situation stabilized. These challenges in the operating environment had lasting effect on overall planning and implementation of the project activities.

Collection center set up. CCBA established eight collection centers and 16 aggregation points in collaboration with producer groups. Finding suitable land to set up these collection or aggregation points was challenging. Criteria for establishing collection centers include land that is far from flood plains, access to roads, proximity to the production areas, and owner's willingness to give the land for public use are required to establish a collection center. Once such a suitable land is found, the next challenge is related to the production groups' ability to set up the collection center with a permanent roof, floors, and access to potable water. The collection centers established by CCBA are temporary in nature, as the production group needs to move the center forward by making it a permanent structure.

LESSONS LEARNED

CCBA worked with a consultant to document the lessons learned¹¹ from CCBA implementation. Some of those lessons are highlighted below.

Producer groups are beneficial to the value chain. CCBA established smallholder producer groups, commercially linking them with one collection center. The objective of the producer groups was to increase the focus of farmers on high-yield crops, disseminate improved production practices and link the farmers to input suppliers and LSPs. CCBA identified willing farmers in rural areas by holding community meetings in villages to understand the needs of the farmers and identify farmers interested in the opportunities and willing to commit to group involvement. Typical farmers selected for the group were

¹¹ The lessons learned report is available at: http://pdf.usaid.gov/pdf_docs/PA00M6V8.pdf

marginal farmers with 0.25 – 0.30 acres of land available for farming, showing high interest in year-round production of high value crops. The selected farmers required willingness to learn new technology, adopt good agricultural practices and improved post-harvest practices plus essential willingness to work in a group to get access to knowledge and skills from CCBA staff and private sector stakeholders.

Producer groups demonstrated significant benefit to the smallholder farmers in adopting new technologies quickly and minimizing postharvest losses. During this period, groups are at different levels of experience and maturity, showing varying levels of adaption of demonstrated practices. In addition, even in geographic areas where production groups do exist, some farmers have not willingly joined, raising the need to further understand the unmet needs of farmers. Continuation of the group formation practice and adaption to local needs is required for realization and confirmation of sustainable benefits.

A deeper understanding is required for the business impact that has been experienced. For this, a study needs to be conducted to estimate the improved production efficiency; improved yield and factors leading to the adoption of good agricultural practices including successful use of pesticide alternative; and reduction in costs of production – which collectively results in higher profit per unit land owned per farmer. Such a business impact study will allow increased dissemination and adoption of the practices introduced by CCBA.

Market Planning Committees play a critical role in managing collection centers. Successful collection centers have strong Market Planning Committees (MPCs) that are able to deal with land disputes and alterations between the members. MPCs represent producers, traders, and local leaders, and establishes effective linkages between service providers, market actors, and producers. Each MPC has a charter (constitution) and specific duties and responsibilities. Two MPCs have opened bank accounts and members pay monthly subscriptions to raise a seed money to be used to buy crates and other necessary equipment. MPC will eventually charge fees for the services they are providing in future. By having MPC manage the collection centers, CCBA can ensure longer term sustainability and community ownership.

CCBA organized and trained the MPC members on market information, bargaining techniques, organizing buyer seller meetings and visiting to wholesale markets to establish direct linkages with wholesalers. Additional training on management, budgeting, and marketing is necessary to make the MPCs more effective and provide better services to producers.

Costs and benefits of individual improved practices for harvesting and postharvest handling had a large impact on adoption. Systemic postharvest handling and logistics upgrading across the horticulture trade from collection centers through local and regional markets has been highly effective in improved products, better prices and increased trade. A research team visited various collection centers and surveyed farmers and traders. Overall, the farmers in three collection centers visited and the farmers surveyed in Jessore had adopted the majority of the improved harvest and postharvest practices promoted by CCBA, especially if they were shown to be cost effective and if farmers received a small bonus in price when sorting/grading for better quality. Non-CCBA affiliated farmers had observed and adopted a few of the improved practices. The traders who purchased the crops of CCBA trained farmers reported that

they were very pleased with the improved quality and reduced losses, which had improved their own profits, and asked for more farmers to be trained.

A simple cost-benefit analysis (see example below) demonstrated that the use of simple postharvest technologies and practices have quick and positive return on investments.

Table 10. Example of cost-benefit analysis and return on investment for the use of secateurs for *brinjal* harvesting

Crop: Brinjal Country/Region: Jessore, Bangladesh Assumption: 1000 kg harvest over the course of the season		
	Current / traditional practice	New / improved practice
Description	Pulling fruit from plant, which damages both individual fruit and plants	Using secateurs to harvest <i>brinjal</i>
COSTS		
180 taka per each secateur (4)	0	180 taka x 4 = 720 taka
Relative cost	0	+ 720 taka
EXPECTED BENEFITS		
% losses	5-10%	0%
Amount for sale	900-950 kg	1000 kg
Value/kg (average price)	23 taka / kg	25 taka / kg
Total market value	20,700 to 21,850 taka	25,000 taka
Market value minus costs	Maximum of 21,850 taka	24,280 taka
Relative profit for the season	---	+ 2,430 taka
Return on investment	---	Return of investment is less than one season. Secateurs are fully paid for during the first season of use, so the next season's profits will increase to approximately 4,000 taka.

These improved postharvest practices have directly resulted in increasing the percentage of income the farmer receives for higher grade product. It has also resulted in a reduction in the loss of value coming from handling damage and inconsistent product within marketed lots. The table below summarizes the return on investment from various CCBA interventions.

Table 11. Summary of relative costs, benefits, and return on investment for adoption and use of improved postharvest practices

Practice and assumption	Traditional practice <i>Relative cost</i> <i>Market value</i>	Improved practice <i>Relative cost</i> <i>Market value</i>	Increased earnings per load and per kg	Return on investment
Using secateurs in Jessore Region to harvest brinjal (1000 kg per season)	Pulling brinjal from the plant by hand <i>Relative cost = 0 taka</i> <i>Market value = maximum of 21,850 taka</i>	Harvesting brinjal by cutting it from the plant with secateurs <i>Cost for 4 secateurs = 720 taka</i> <i>Market value = 25,000 taka</i>	2,430 taka/1000 kg or 2.4 taka/kg	Positive Secateurs are fully paid for during the first season of use, so the next season's profits will increase to approx. 4,000 taka.

Practice and assumption	Traditional practice <i>Relative cost</i> <i>Market value</i>	Improved practice <i>Relative cost</i> <i>Market value</i>	Increased earnings per load and per kg	Return on investment
Using secateurs in Jessore Region to harvest bitter gourd (1000 kg per season)	Pulling bitter gourd from plant by hand <i>Relative cost = 0 taka</i> <i>Market value = Maximum of 17,100 taka</i>	Harvesting bitter gourd by cutting it from the plant with secateurs <i>Cost for 4 secateurs = 800 taka</i> <i>Market value = 20,000 taka</i>	2,700 taka/ 1000 kg or 2.7 taka/kg	Positive Secateurs are fully paid for during the first season of use, so the next season's profits will increase to approx. 3,000 taka.
Use of shade for bitter gourd (100 kg load)	No shade provided <i>Cost = 0 taka</i> <i>Market value = 1,530 taka</i>	Shade during sorting, grading, and packing <i>Cost = 0</i> <i>Market value = 1,940 taka</i>	410 taka /100 kg or 4.1 taka/kg	Positive Provides increased profits of 410 taka for every 100 kg load at average market price.
Use of pre-cooling for brinjal (100 kg load)	No pre-cooling <i>Cost = 0 taka</i> <i>Market value = 2,070 taka</i>	Pre-cooling via cool water dip in metal tray <i>Cost = 500 taka</i> <i>Market value = 2,450 taka</i>	380 taka/100 kg or 3.8 taka/kg	Positive First use fully pays for pre-cooling tray; pre-cooling generates subsequent profits of 380 taka per 100 kg load.
Transportation from Jessore to Dhaka for bitter gourd (250 kg load)	Bamboo basket (250 kg) <i>Cost = 300 taka</i> <i>Market value = 7975 taka</i>	Plastic crates (17 each holding 15 kg) <i>Cost = 3000 taka</i> <i>Market value = 8980 taka</i>	1,300 taka/250 kg load or 5.2 taka/kg	Positive Plastic crates fully paid for on second use, followed by 1,300 taka per load added earnings (crates can be used 28 times).

In summary, simple solutions to minimize the losses, like careful harvesting in proper time of maturity, keeping the products under shade, cleaning and cooling in water, sorting and grading, and finally packing in crates helped increase profits for farmers and also brought down the postharvest losses to 3%. Once the produce is transported from the collection point to the wholesale market, the overall quality remain better and postharvest loss is also minimum.

Private sector partnerships with super shops open new doors for cold supply chains. CCBA formed partnerships linking farmers to super shops that sell a variety of groceries, including fresh vegetables. The super shops offer a convenient single location to buy a variety of goods. Super shops are more popular with consumers during the rainy season, however during good weather consumers will

return to the open-air markets to do their shopping. However, over time the convenience of super shops is attracting busy professionals and will be more widely used.

As super shops increase in popularity, they will need more widespread and improved access to cold chain and cold storage. At the moment, super shops only purchase small quantities of a diverse amount of produce. In the future, as they become the “to go” shop for busy professionals, super shops will need to be able to carry and storage larger amounts of produce. For the farm-to-super shop linkage to work, a large chain of super shops network will need to set up large temperature controlled warehouses. At present super shops have a 2-3% of market share of fresh produce.

High cost of refrigeration for vegetable traders affects the establishment of a cold chain; low cost vegetable cooling practices and logistics are effective. Reducing the temperatures of harvested vegetables by 10°C doubles their shelf life. Immediate cooling after post-harvest is known to be the most effective intervention for horticultural products. The intervention reduces respiration (lessens perishability); reduces transpiration (less shriveling), and slows ripening (maintains texture, flavor, and nutrients) which collectively reduces physical loss of vegetables and increases their market price.

Due to a lack of required infrastructure of cold storage facilities and transportation system and high capital costs, an integrated cold chain for horticultural products using complex systems for forced air, hydro-cooling or vacuum cooling is not proven to be feasible for the Bangladesh market.

An analysis conducted by CCBA¹² demonstrates that profits for a vegetable cold chain are low in Bangladesh. For example, the average cost per kilogram of conventional, open back transport using bamboo baskets was 2.25 BDT/kg while the refrigerated truck, packed in plastic crates, was 4.92 BDT/kg, or more than double the cost (119%).¹³ The farmers themselves bear the cost of renting a truck to transport their produce, and the cost of hiring a refrigerated truck is much higher than renting a regular truck. The refrigerated produce does not increase farmer gains enough to make it worth the cost. In addition, losses both in profit and produce are higher if the cold chain is not maintained following delivery to market.

Furthermore, a study conducted by BARI¹⁴ confirmed the results of the previous study. It showed that irrespective of type of transportation and cool supply chain system, vegetable postharvest losses can be attributed to the use of packaging (conventional vs. improved plastic crates) and to whether the producers used improved postharvest procedures like cleaning, grading, and pre-cooling in water. The postharvest losses of vegetables are much higher for long distance transportation with conventional packaging using regular trucks compared to improved packaging in regular trucks and cold chain transportation using plastic crates. Traditional transportation in non-refrigerated trucks with improved packaging can efficiently minimize losses of selected vegetables and ensure better margins for the traders. The lowest postharvest losses occurred in the cold chain method, but the system is not cost effective to the traders.

¹² Available at: http://pdf.usaid.gov/pdf_docs/PA00M6V6.pdf.

¹³ This is the average cost for samples of eggplant, bitter gourd, and pointed gourd.

¹⁴ Available at: http://pdf.usaid.gov/pdf_docs/PA00M6V7.pdf

The BARI study showed that when using conventional packaging in an unrefrigerated truck, the percent of postharvest losses of eggplant (brinjal) is 27.2%; under improved packaging in an unrefrigerated truck the losses are 16.4%. In cold chain method with plastic crates, the total loss is 13.6%, which is much lower than other two methods. However, the cold chain system is not cost effective to the traders. In monetary terms, traders (*Bepari*) spend BDT 3,704, BDT 3,804, and BDT 7,467 respectively for conventional, improved, and cold chain marketing of eggplant. Once the trader subtracts the transportation and marketing costs, the net margins for eggplant are BDT 1,196 using the conventional method, BDT 1,496 for the improved method, and BDT -2,067 for the cold chain method.

Traditional transportation with improved packaging can efficiently minimize losses of selected vegetables and ensure better margins for the traders. While the lowest postharvest loss is occurred in the cold chain method, it is not cost effective to the traders.

In addition, CCBA piloted low cost/low technology methods proved very effective. Of this, the most impactful and well accepted by farmers is water cooling of vegetables at collection centers immediately post-harvest, reducing their temperatures by up to 20°C in hot weather. This was previously not practiced in Bangladesh; the intervention has demonstrated the increased shelf life of vegetables. Other than the farmers showing immediate acceptance, vegetable traders are increasingly willing to pay higher prices and travel to collection centers to purchase the higher quality vegetables.

As noted above, while cold chain may not be cost effective for traders or farmers at this juncture in time, larger networks of super shops, with more investment capital and access to financing, may be able to set cold supply chains.

The business case for a vegetable cold chain is critical to its establishment. As explained earlier in this report, at this moment, the business case to be made, yet, for the storage of horticulture produce, including the vegetables that CCBA supported. While Golden Harvest made business decision that a cold chain for vegetables was outside their business priorities, they used their cold chain investment for the dairy sector. Golden Harvest is targeting ice cream at the moment, which is a high value product with potential for growth. Currently in Bangladesh, the demand of fresh produce exceeds the supply to a great extent. Therefore, fruits and vegetables do not need to be treated to any short-term cold storage. The general view is that all of the vegetables are sold and losses are relatively low because all products are consumed eventually. Although all produce might be sold within days, there is an economic loss to the value and quality of the product. Within wet markets, the highest quality products are sold early in the morning to those who can afford it. As they wilt and deteriorate as the day wears on, prices are reduced. This results in an economic loss that is currently being borne by producers and traders, but is not yet fully understood. However, even with this in mind, the incentive for utilizing cold chain for fruits and vegetables is not paramount.

While the costs of refrigeration are high for a trader, larger businesses could be incentivized to develop cold chains for perishable products, including vegetables. The burgeoning middle class within Bangladesh will demand a higher quality product, providing a clear example of the economic loss suffered from products that deteriorate due to poor handling, transport and storage. The current habit of consumers

within Bangladesh is to shop daily in the wet markets, as opposed to the larger super shops for produce. As a result, strengthening the cold chain within the local markets and collection centers through better storage and transport practices could assist in meeting the needs of the growing middle class.

The inclusion of women and understanding gender dynamics is paramount to success. In the horticulture value chain, women are actively involved in the vegetable production at farm level throughout the soil preparation, sowing, maintenance, harvesting and post-harvesting activities. However, they have little influence on decision-making such as in input purchase, crop selection or product marketing. Especially in areas where there are community led efforts such as at collection centers, women have minimal voice in the decision making. Women have control in homestead gardening where they can decide which vegetables to grow and how to utilize the harvest. The CCBA project learnt that all the production and post-harvest training provided to men farmers was later taught by them to the women involved in the practice also. Women received separate training on homestead gardening, food processing and nutrition. None of the same training was offered to both genders.

The fact that the production and post-harvest training is provided to women by their partners is a clear proof of the need for women to also receive the same training. It is also known in Bangladeshi culture that men prefer to be well aware of the exposure women receive from outside players. Being the primary decision makers in the culture, they need to be directly educated on nutritional benefits of food selection and preparation to reduce risk of benefit loss to women education.

Local Service Providers should be entrepreneurs. Past experiences demonstrates that only knowledge-based LSP do not have the proper incentives to provide services to farmers and farmers do not have enough funds to pay for these services. On the other hand, LSPs that engage in input supply or trading produce are successful in providing various embedded services, including inputs, knowledge, and information. The ideal LSP has entrepreneurship capability, engages inputs or vegetable trade, and has some kind of link with farmers. Training those people on entrepreneurship and new technology will make them better service provider.

RECOMMENDATIONS FOR FUTURE IMPLEMENTATION

Involve government and financial institutions in cold chain. The role and involvement of government, financial institutions, and banks is crucial to establish a functional cold chain given the high costs and risks related to this work. Future successful implementation cold chain projects in Bangladesh should involve government and financial institutions from the start of the project to ensure that proper financing and support is available for the procurement and development and cold chain infrastructure.

Provide business driven solutions to private and public sector partners. When Golden Harvest diverted its investment to the ice cream product line, there was immediate misalignment with USAID's social and development objectives. It is important to note that private sector partners in a GDA or under other public-private partnerships must be based on long term business plans. For sustainability, it is important for the solution to be 'business driven' and there needs to be confirmation and evidence that the private sector partner has long term plans for continued business interest as initially expressed. At

the same time there needs to be sufficient flexibility built into the project knowing that the some of the intended piloting effort may fail in one area but the investments or interventions could be shifted to other promising areas for longer period of time. This kind of projects should have sufficient flexibility in revising the design in course of implementation.

Pilot collective asset ownership at collection centers. Collection centers has played a significant role in postharvest practice adoption and increased farmers bargaining capacity with traders. The collection centers supported by CCBA are at varying levels of establishment and require continued support for maturity and self-sustainability. Though these collection centers demonstrated postharvest loss reduction and leveraged bargaining capacity of the farmers, the variations in the physical structures, facilities available, as well as the MPC organizational capacity clearly indicate needs for varying levels of improvements. Additional technical assistance and organizational training is required for their sustainability and the sustainability of other collection centers supported by other donors and projects. Future projects should pilot the introduction of shared assets that are too costly for individual farmers, such as larger water based pre-cooling centers.

Maximize the inclusion of women in training and extension. The benefits of production and post-harvest education provided to farmers will be multifold if provided to both genders in groups together in regions where men and women traditionally work collectively in the field. In selected regions with conservative culture, the same trainings will need to be gender segregated while keeping men in the loop to enhance their cooperation. Through training, women's functionality and role in the value chain can be improved in all areas where they are already active.

Similarly, men need nutritional improvement training to ensure they do not prevent women from newly learned practices. To avoid cultural violation, the training need not be essential for men but they should be aware that their presence is welcome. The preferred impact can be achieved by choice of appropriate time and venue of training when both genders are likely to be together.

Interventions designed for value chains in Bangladesh will be significantly more effective if the assistance and training is provided to women in parallel to men, especially in all areas of agricultural production and post-harvest activities. The impact can be further augmented by provision of gender friendly agricultural extension services. Similarly, there should be greater planning of closely linking of women to the value chain till the post-harvest stage and planning of their greater involvement in an incremental way in steps beyond their current involvement. This will be essential at the planning phase of projects and less effective if done as an add-on feature at later stages of the project.

Expand home-level food training due to its dual benefits. CCBA introduced food processing to rural women in order to reduce postharvest losses and contribute to the homestead's nutrition. Scaling up and linking the women to the local market for selling processed food can help develop a cottage industry and serve as another source of income for women, reducing their financial dependence. Currently, most of the processed food is consumed at home, improving nutrition as it consists of pickled or canned vegetables. Food processing has been well accepted by women and women's groups, with requests for additional training. Future donor-funded projects and local organizations should continue supporting home-level food processing for both home consumption and retail in local markets and potentially super shops too.

Expos provide services and therefore they should be fee-based; require local partnerships.

The Expo that CCBA organized in the last quarter of the project life was successful at bringing together actors interested in cold chain. Since this expo was part of the program, it was free of cost to participants. Generally, it is not advisable for expos to be free. It does not instill the value for the provision of such services, and therefore establishes a pattern where private sector expects such services to be free. While this is possible when funded by an aid or development project, it is not sustainable. When possible, it is always best to work in partnership with and through a local organization, to guide that organization and strengthen their ability to put on such events, demonstrating value to those attend and enabling their ability to receive fees for services. This option was not a possibility for CCBA, but it is a best practice when possible for future expos.

ANNEXES

ANNEX I. LIST OF GRANTEES AND SUBRECIPIENTS

Name of organization	Award duration	Amount	description
World Food Logistics Organization (WFLO)	August 1, 2013 to June 15, 2016		Design and provide support, training and specialized interventions on cold chain development, international standards, and best practices to cold chain associations and enterprises.
Bangladesh Association for Social Advancement (BASA)	January 4, 2015 to April 30, 2016		Select producers, organize them in producer's groups, and link them to a collection center. Provide technical assistance to producer groups in horticulture and poultry production in Jessore and Gazipur.
Sheba Manab Kallyan Kendra (SMKK)	January 4, 2015 to April 30, 2016		Select producers, organize them in producer's groups, and link them to a collection center. Provide technical assistance to producer groups in horticulture and poultry production in Comilla and Sylhet.
Satkhira Unnayan Sangstha (SUS)	October 15, 2016 to April 30, 2016		Organize producer groups comprising of smallholder farmers and other value chain actors and build their capacity in safe production, improved postharvest handling, marketing, and food safety through technical assistance, trainings, and demonstrations in Khulna.
Action in Development (AID)	October 15, 2016 to April 30, 2016		Organize producer groups comprising of smallholder farmers and other value chain actors and build their capacity in safe production, improved postharvest handling, marketing, and food safety through technical assistance, trainings, and demonstrations in Chuadanga.
Action in Development (AID)	October 15, 2016 to April 30, 2016		Organize producer groups comprising of smallholder farmers and other value chain actors and build their capacity in safe production, improved postharvest handling, marketing, and food safety through technical assistance, trainings, and demonstrations in Faridpur.
Protyashi	October 15, 2016 to April 30, 2016		Organize producer groups comprising of smallholder farmers and other value chain actors and build their capacity in safe production, improved postharvest handling, marketing, and food safety through technical assistance, trainings, and demonstrations in Chittagong.
Association for Development Activity of Manifold Social-Work (ADAMS)	October 15, 2016 to April 30, 2016		Organize producer groups comprising of smallholder farmers and other value chain actors and build their capacity in safe production, improved postharvest handling, marketing, and food safety through technical assistance, trainings, and demonstrations in Barisal.

Bangladesh Agricultural Research Institution (BARI)	January 1, 2016 to April 30, 2016		Estimate quantitative and qualitative postharvest losses in CCBA vegetable value chains via field research.
Lebutola Birnarayanpur CCBA Udpadat and Biponon Samity	March 1, 2016 to May 30, 2016		In-kind grant for postharvest equipment, such as plastics crates, generator, secateurs, and sorting table.

ANNEX 2. LIST OF PROJECT TRAININGS

1	High value crop production and postharvest management training on bitter gourd
2	High value crop production and postharvest management training on cauliflower
3	High value crop production and postharvest management training on chili
4	High value crop production and postharvest management training on cucumber
5	High value crop production and postharvest management training on carrot
6	High value crop production and postharvest management training on eggplant
7	High value crop production and postharvest management training on onion
8	High value crop production and postharvest management training on green pea
9	High value crop production and postharvest management training on tomato
10	High value crop production and postharvest management training on yard long bean
11	High value crop production and postharvest management training on French bean
12	Modern technology on broiler production, farm management and marketing
13	Dairy production technology and farm management
14	Backyard vegetable production, postharvest management, and nutrition
15	Biosecurity security management and broiler production
16	Integrated Pest Management (IMP)
17	Good Agricultural Practices (GAP)
18	Food processing / pickle processing
19	Marketing and market linkages
20	Postharvest management
21	Vegetable nutrition and gender equality
22	Local Service Provider capacity building and business development
23	Capacity building training for partner NGO staff on production and postharvest management
24	Capacity building training for partner NGO staff on monitoring and evaluation
25	Hazard Analysis and Critical Control Point (HACCP) and Good Management Practices (GMP)
26	Cold supply chain management
27	Food Safety Management System ISO 22000
28	Training-of-trainers on production technology and postharvest management of high-value crops
29	Training-of-trainers on Good Agricultural Practices (GAP)
30	Training-of-trainers on postharvest technology of high-value crops

ANNEX 3. SUCCESS STORIES



SUCCESS STORY

Collection Centers: changing the way that small scale farmers in Bangladesh conduct business

The USAID-funded Cold Chain Bangladesh Alliance (CCBA) is increasing the capacity of small and marginal farmers to produce high value agricultural products and ensuring food safety through environment friendly practices.



Photo Credit: Mushfiqur Warud

Resulting from CCBA's interventions, Nizan and Mofidul are now role models for their communities.

CCBA aims to empower farmers through practical trainings, guidelines and technical support to make the best use of the resources, be self-sustaining, produce safe food, which in turn gives the farmers the provision to augment their earnings and grow even further.

Telling Our Story

U.S. Agency for International Development
Washington, DC 20523-1000
<http://www.usaid.gov/results-data/success-stories>

On a foggy winter morning in early February, farmers of Bimarayanpur village under Sadar upazila in Jessore district were seen sorting and grading their crops under a shed adjacent to a vast crop land. While some farmers were busy preparing their crops for sale, some were seen bargaining with the buyers who were also present at the place.

"This is an every-day affair during this season. You will see many farmers are making their crops prepared for sale. In pick season, the place is so crowded that you cannot stand here," said Nizam Uddin, a farmer in the village, while sorting his tomatoes.

"We used to struggle a lot to take our products to market in foggy or rainy days but after the establishment of this collection center, we are now relaxed," he added. The set-up of the collection center facilitated by USAID-funded Cold Chain Bangladesh Alliance (CCBA).

The village is famous in this region for good yields; yet farmers struggled to make profit due to poor supply chain system. Given its poor road condition, farmers spent a good amount of time and money to take their crops to the market.

"There were days when we cut our crops but could not sell them as we could not take them to market. But things have changed. Now the buyers come to the collection center. If we can take our products to the collection center, our worry ends," says Mofidul Molla, an area farmer.

The collection center is designed so that farmers can sell their products directly to buyers from the center itself. At the collection center, they sort, grade, clean, and package their crops and directly sell to the buyers. An estimate shows that from October to December 2015, 289.70 metric tons of vegetables were sold in this collection center, generating USD 54,398 in revenue for the farmers.

Ayub Ali, a buyer based in Khulna, said that he is also benefiting from the collection center. "I know if I come to this collection center, I can buy my necessary products," he said.

The CCBA project has set up eight collection centers and dozens of aggregation points in nine regions.



SUCCESS STORY

Babor Ali... incredibly closer to his dreams!

USAID-CCBA is increasing the capacity of small and marginal farmers to produce high-value agricultural products and ensuring food safety through environment friendly practices.



Photo Credit: Mustabshira Jamnat

The inspiring story of Babor Ali's journey from being a common farmer to a role model for the community and a spokesperson for USAID-CCBA represents all those who has the latent competencies to flourish in their own profession but are just in need to be rekindled. And once that happens, great opportunities start to unfold.

USAID's Cold Chain Bangladesh Alliance (CCBA) aims to empower farmers through practical trainings, guidelines and technical support to make the best use of the resources, be self-sustaining, produce safe food, which in turn gives the farmers the provision to augment their earnings and grow even further.

Telling Our Story

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Imagine working from dawn to dusk on the field come rain or shine, giving your utmost concentration, and employing all of your knowledge with hopes to make ends meet but in the end you cannot even provide your family with the day-to-day sustenance. This is the story of millions of farmers in Bangladesh and Babor Ali is just one of them; an ordinary village dweller from Chalkidanga, Jessore. However, with some access to trainings and resources, extraordinary successes can be accomplished. With that aim, USAID is working with farmers around the globe under the Feed the Future (FTF) project.

Babor Ali aspires to become a big farmer one day and with that ambition, he became a part of USAID-CCBA farmers' group and received support through trainings and consultations. He executed the knowledge perfectly practicing environment friendly technologies while he cultivated a new variety of eggplant named White Irate. He used pheromone trap as a safe and cost effective way to control pest instead of the pesticides that he used to apply before and the result was incredible! It reduced his cost from over \$250 to only \$13 US dollars. Furthermore, he is selling his eggplants at the highest possible price because of the improved quality of his produce whereas previously he had to sell his eggplants at the lowest price to the middleman. He is making \$1 extra in each KG now. His wife is also learning from him and contributing directly in the family's turnover by increasing sources of income. Babor Ali's achievements are inspiring others in the community to make the effort of learning and practicing improved technologies.

Babor Ali already produced 11,519 KGs of eggplants on his leased land of 0.17 hectares. Production capacity before on the same land was around 6580 KGs. His total sale is currently above USD 2300 and cost is approximately \$580, earning him a profit of \$1720. Previously expense was over USD 900. So the overall cost has decreased by \$320. With increased production, reduced cost and higher selling price, Babor Ali has now been able to buy his own farmland and he can confidently say that he has achieved a milestone in reaching his goal. ***"USAID-CCBA trainings and follow-up counseling sessions strengthened my understanding of farming and improved my planning skills as a cultivator. I expect that my revenues will increase day by day and finally my dream of becoming a big farmer will come true!"*** - Babor Ali says.