Project Completion Report

Market and Value Chain Project

Market and Value Chain Studies of Selected Fruits and Vegetables with Reference to Postharvest Losses and Food Safety in Bangladesh.
Project Code: TF 31-VC/15

Submitted to

Submitted by

cdcs | Center for Development & Competitive Strategies Ltd.
Research & Strategy | Capacity Building | Intervention

May 2020

KRISHI GOBESHONA FOUNDATION (KGF)

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Project Duration: -38 Months; From: March 2017 To May 2020

CGP Project Call# KGF BKGET Fund/CGP 2nd call/VC/4/586**; Phase #.....(if any)**

Submitted to:
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করোনায় কৃষিপণ্যের বিপণন

নতুন মডেলে জিফোরজি কমিউনিটি কৃষক বাজার

নিজস্ব প্রতিবেদক ■

নভেল করোনাভাইরাসের কারণে সৃষ্ট পরিস্থিতিতে কৃষিপণ্যের বিপণনে নতুনত্ব এনেছে জিফোরজি কমিউনিটি কৃষক বাজার। এটি মূলত একটি অন্তর্ভুক্তিমূলক ব্যবসায়িক মডেল। যার মাধ্যমে কৃষক সরাসরি তাদের উৎপাদিত পণ্য ভোক্তাদের কাছে পৌঁছাতে পারছেন। এতে ভোক্তা যেমন নিরাপদ ও সাশ্রয়ী মূল্যে পণ্য পাচ্ছেন, তেমনি কৃষকও প্রচলিত দামের চেয়ে বেশি পাচ্ছেন। এখানে মধ্যস্বত্বভোগীদের স্থান না থাকায় কৃষক ও ভোক্তা উভয়েই লাভবান হচ্ছেন। আর করোনাকালীন কৃষকদের স্বাস্থ্য সুরক্ষা এবং বিপণনের জন্য যাবতীয় ব্যবস্থা করে দিচ্ছে সেন্টার ফর ডেভেলপমেন্ট অ্যান্ড কমপিটিটিভ স্ট্র্যাটেজিজ (সিডিসিএস) ও বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট (বারি)। এ গবেষণায় সহায়তা করছে কৃষি গবেষণা ফাউন্ডেশন (কেজিএফ)।

জানা গেছে, কৃষি সম্প্রসারণ অধিদপ্তর, কৃষি বিপণন অধিদপ্তর ও এটুআইয়ের সহযোগিতায় এবং সিডিসিএসের সার্বিক তত্ত্বাবধানে কৃষক গাজীপুরে সমরাস্ত্র কারখানায় লকডাউন কর্মকর্তা ও কর্মচারীদের জন্য নিরাপদ কৃষিপণ্য নিয়ে আসছেন এবং সরাসরি ভোক্তার কাছে বিক্রি করছেন। এখানে ঝিনাইদহের কোটচাঁদপুরের কৃষকরা তাদের পণ্য নিয়মিতভাবে বিক্রি করতে পারছেন। এতে কৃষক যেমন তার নিরাপদ পণ্যের ভালো মূল্য পাচ্ছেন, তেমনি ভোক্তাও সতেজ এবং গুণগত মানের পণ্যের জন্য কিছু অতিরিক্ত মূল্য দিতে আগ্রহ প্রকাশ করছেন। সামনের দিনে দেশের অন্য বাণিজ্যিক জেলাগুলোয় এ পদ্ধতি সম্প্রসারণ করা হবে।

এ বিষয়ে সিডিসিএসের ব্যবস্থাপনা পরিচালক ফারজানা মোরশেদ বলেন, সিডিসিএস জিফোরজি কমিউনিটি কৃষক বাজার চালু করা অত্যন্ত চ্যালেঞ্জিং ছিল। বিশেষত কভিড-১৯ পরিস্থিতিতে, সব পক্ষের নিরলস প্রচেষ্টায় এ বাজার স্থাপন ও বাস্তবায়ন সম্ভব হয়েছে। সিডিসিএস সামনের দিনগুলোয় এ মডেলটি নিয়ে আরো ব্যাপক আকারে কাজ করার পরিকল্পনা গ্রহণ করেছে। তবে এটি কোনো একক কর্তৃপক্ষ দ্বারা সমাধান সম্ভব নয়, এক্ষেত্রে সব পক্ষের সম্মিলিত প্রয়াস অত্যন্ত গুরুত্বপূর্ণ। উদ্ভূত কভিড-১৯ পরিস্থিতিতে এই মডেলের বাস্তবায়নের উদ্যোগ নেয়া হয়েছে।

জানা গেছে, কভিড-১৯ পরিস্থিতির কারণে দুর্বল সাপ্লাই চেইন ও স্থবির বাজার ব্যবস্থার ফলে কৃষকরা কৃষিপণ্যের ন্যায্যমূল্য পাচ্ছেন না। একদিকে উৎপাদন এলাকাগুলোয় কৃষিপণ্যের উদ্বৃত্ত সরবরাহ, অন্যদিকে বড় শহরগুলোয় চাহিদার স্বল্পতা ও পরিবহনের অব্যবস্থার কারণে কাঁচামালের মূল্য অসহনীয় পর্যায়ে হ্রাস পেয়েছে। এই পরিস্থিতি গোটা জাতিকে সামগ্রিকভাবে খাদ্য ও পুষ্টি সংকটের দিকে ঠেলে দিচ্ছে। এ অবস্থায় উৎপাদন ও বিপণনের জন্য একটি টেকসই ব্যবসায়িক মডেল অত্যন্ত প্রয়োজন। নিরাপদ খাদ্য উৎপাদন ও বাজার ব্যবস্থা উন্নয়নে সুদূরপ্রসারী লক্ষ্য সামনে রেখে তিন বছর ধরে একটি অন্তর্ভুক্তিমূলক নতুন ব্যবসায়িক মডেল উদ্ভাবনের জন্য ফলিত গবেষণায় নিয়োজিত রয়েছে সিডিসিএস ও বারি।

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Abbreviations and Acronyms

a2i	Access to information
B2B	Business to business
B2C	Business to consumer
BARI	Bangladesh Agriculture Research Institute
BAU	Bangladesh Agriculture University
BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi Taka
BMC-F	Business Model Canvas
BOF	Bangladesh Ordnance factory
CDCS GPN	CDCS G4G Partner Network
CDCS®	Center for Development and Competitive Strategies Ltd.
COVID-19	Coronavirus disease 2019
DAE	Department of Agriculture Extension
DAM	Department of Agriculture Marketing
FAO	Food and Agriculture organization
G4G	Go for Growth
G4G MAC	G4G Model Agribusiness Centers
G4G-ABC	G4G Agribusiness Center
G4G-FMVCM	G4G Forward Market Value Chain Model
G4G-IAM	G4G Inclusive Agribusiness Model
G4G-MEM	G4G Market Engagement Model
GAP	Good Agricultural Practices
GO	Government Organization
GPP7	Good Postharvest Practices 7
ICT	Information and communications technology
INGO	International non-Government Organization
IPM	Integrated Pest management
KGF	Krishi Gobeshona Foundation
MANCOM	Management Committee
MoU	Memorandum of Understanding
MSME	Micro small and medium enterprises
P2P	Peer-to-peer networking
PHTD	Postharvest Technology Division
SAMP10	Safe Agro Management Protocol
UDC	Union Digital Centers
UNO	Upazilla Officer
VCAs	Value chain Aators
WHO	World Health Organization

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Market and Value Chain Studies of Selected Fruits and Vegetables with Reference to Postharvest Losses and Food Safety in Bangladesh.

Project Code: TF 31-VC/15

Project Duration:- 38 Months; From- March 2017 To -May 2020

A. Basic Project Information

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i. Project ID No-(CN/FRPP): TF 31-VC/15
ii. Project Title: Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Postharvest Losses and Food Safety in Bangladesh
iii. Name of Coordinator (if applicable): Dr. Abdul Matin, Socio-economist
iv. Name of Principal Investigator: Ms. Syeda Farzana Morshed, entreprenurship & value chain expert
v. Name of Expert Professionals:
    a. Prof. Sheikh Morshed Jahan, Team Leader, Agribusiness & Inclusive Market expert
    b. Dr. Shahadad Hossain, National expert, Socio-economist
    c. Rezaul Karim Siddiqui, Technology Communication expert
vi. Name of Co-investigator:
    a. Dr. Md. Abdur Rashid (PSO), Socio-economic expert
    b. Dr. Md. Abdul Monayem Miah (PSO), Socio-economic expert
    c. Dr. Md. Miaruddin (PSO), Postharvest & processing expert
    d. Quazi Md ShafiqulIslam (PSO), Socio-economic expert
    e. Dr. Md. Akhtaruzzaman Sarkar (PSO), Entomologist
    f. Dr. Md. Monirul Islam (SSO), Plant Pathologist
vii. Name of the applying organization with address: Agricultural Economics Division, Bangladesh Agriculture Research Institute (BARI), Joydebpur, Gazipur-1701
viii. Name of component/collaborating organization(s): Center for Development & Competitive Strategies Ltd. (CDCS®), New DOHS Mohakhali, Dhaka 1206
ix. Project duration (months) 36 months; From:March 2017 to May 2020
x. Project commencement date (As per MoU) 6th March 2017
xi. Project locations/sites: Jessore, Rajshahi, Bogra,Gaibandha, Jhenidaha, Baneshor and Kotchadpur
xii. Project size : A total of 400 producers and 200 intermediaries/VCAs , G4G Farming and Trading Enterprise groups in 8 project hubs, G4G network partners in local levels and in distant market locations. However, the project has expanded beyond this number and engaged facilitators for scaling the project in the coming days to ensure sustainability in the long run.
xiii. Project cost (total) TK: 24,500,000 (Year-1: TK11,062,000, Year-2: TK 8,262,600 Year-3: TK 5,175,400)
xiv. Fund received in Tk. 2,11,92,101 & Expenditure made in Tk. 2,09,26,866 during the reporting period.

B. Executive Summary

Imagine, a farming community adopts sound farming practices, harvests their safe and nutritious agro-produce, performs good postharvest practices, arranges the produce in good bulk packages, hires a truck, loads it, drives it to a designated consumer community hundreds of miles away, sells their produce directly to the final consumers at a higher price than that of regular sellers, and returns happily with handsome amount of sales proceed that they never thought of! Is it ever possible in Bangladesh?

Yes, this is one of the major achievements of a three-year long action research project on Market and Value Chain conducted by CDCS® and BARI with funding support from KGF. The output of the research – CDCS® G4G Inclusive Agribusiness Model (G4G-IAM) on safe food value chains – has started delivering!

Not only that, G4G farming communities have already established a good brand image such that consumers make advance booking and enquire about their next schedule, and wait eagerly until then! Inspired by market feedback, G4G farmer groups are making significant investment in technologies (e.g. hot water treatment plant)! Moreover, peer-to-peer farmer networking has reached to the height that one farmer group procures and sells other group's agro-produce in different market places. Such cross- marketing opportunities are not only creating new value propositions for G4G farming communities, but also are building important social capital.

Background

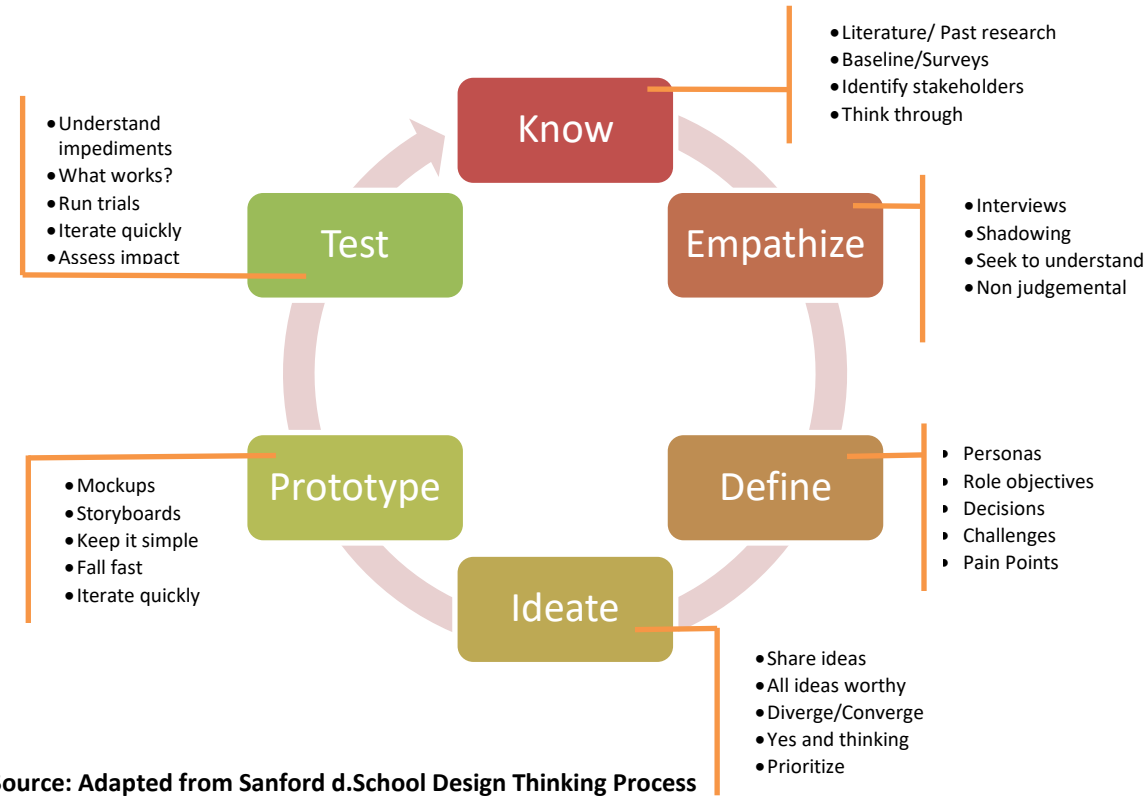
The fruits and vegetable sub-sectors in Bangladesh are plagued with sheer market system failure, backed by unsafe farming and postharvest management practices. Consequently, the market generates only sub-optimal outcome: largely unsafe food to consumers and poor return to farmers. On aggregate, it's a huge national loss.

Against this backdrop, this action research project – entitled "Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Postharvest Losses and Food Safety in Bangladesh" funded by KGF and conducted by BARI and CDCS® – experiments different ways and means in an effort to encourage adoption of good farming and postharvest practices and to develop an inclusive and sustainable agribusiness model that would potentially help farmers, consumer and others along agricultural value chains.

Approach and Methodology

Conventional research projects involving market and value chains development in Bangladesh has so far failed to create and establish any sustainable inclusive agribusiness model that directly benefits both farmers and consumers at the same time. With this background, this action research project approached the challenge innovatively – by adopting ***human-centered design*** (HCD) as the core component of its methodology. CDCS® approach to HCD may well be captured by a simple – but profound (implication-wise) – circular framework: **KNOW-EMPATHIZE-DEFINE-IDEATE-DESIGN-TEST** (adapted from Stanford d.School Design Thinking Process).

CDCS® Human Centered Design for Market and Value Chain Action Research



Source: Adapted from Sanford d.School Design Thinking Process

In so doing, CDCS® relied primarily on empathic design principle, but grounded the experiment to reality. Backed by wealth of accumulated knowledge of agricultural market and value chains dynamics in Bangladesh (gained through primary and secondary research as well as decade-long past interventions), the research team sought to understand, without being judgmental, the decision triggers of farmers and other value chain actors (VCAs) through shadowing, informal chats and interviews. This exercise helped researchers to DEFINE the opportunities, challenges and pain-points of VCAs.

At the ideation stage, the team ran several expert panel discussions, stakeholder consultations and team meetings in order to come up with innovative intervention ideas, capture the convergences and divergences, and solidify and prioritize ideas. This offered the much-needed foundation for designing and testing interventions. As the diagram and table below indicate, several market access experiments were designed and tested in order to assess which of the alternative market channels suits farming communities best in terms of value retention, profitability and operational sustainability.

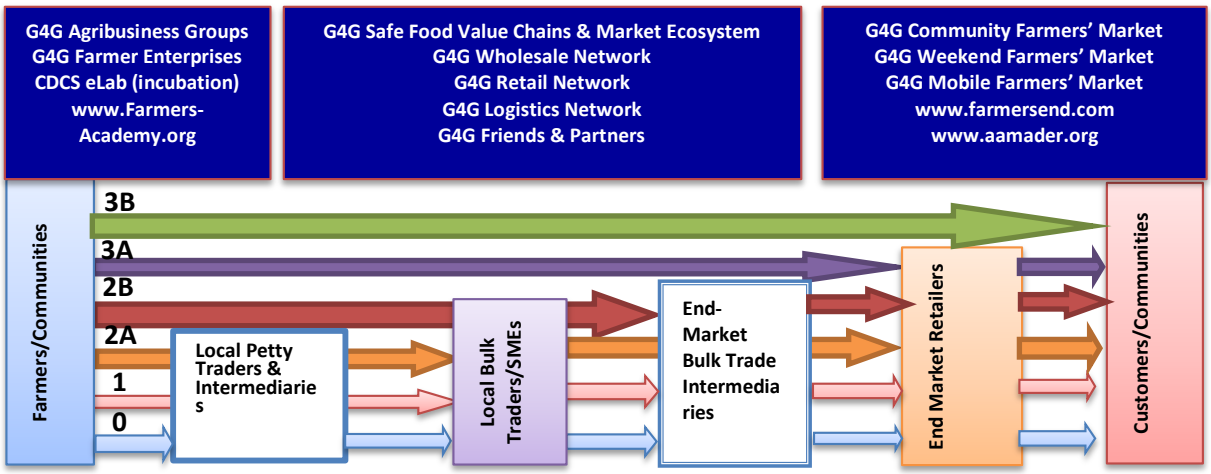


Figure: Intervention Roadmap

Experiment	Farmer/ Farming Community	Local Petty Trader (Foria)	Local Bulk trader (Bepari)	End Market Traders (Arots & Wholesalers)	End Market Retailer	Customer
# 0 (usual)	Active	Active	Active	Active	Active	Active
# 1	Active	**Bypass**	Active	Active	Active	Active
# 2A	Active	**Bypass**	Active	**Bypass**	Active	Active
# 2B*	Active	**Bypass**	**Bypass**	Active	Active	Active
# 3A	Active	**Bypass**	**Bypass**	**Bypass**	Active	Active
# 3B*	Active	**Bypass**	**Bypass**	**Bypass**	**Bypass**	Active

Note: Derivatives 2B and 3B were added during the course of actual market experimentation.

The project by design dealt with two fruits (mango and banana) and two vegetables (tomato and bitter gourd). However, in order to establish a sustainable business case, at the end the basket had to include all agro-produce that a particular farming community produced. In terms of location, the project started with eight high-volume product-locations: Bogura (2), Gaibandha, Rajshahi (2), Jhinaidah (2), Jashore. Subsequently, due to changed field reality, some changes in location had been made.

Key Activities

The action research project saw a host of extremely engaging activities over the past three years. Major activities of the project include, but not limited to, the following: (i) field exploration and farmer mobilization, (ii) farmer and VCA training, (iii) G4G agro-entrepreneurial group formation, (iv) G4G handholding (v) G4G incubation support, (vi) multi-stakeholder engagement and market-support partnerships, (vii) upstream and downstream value chain partnership, (viii) G4G market trials, (ix) G4G agribusiness centers, (x) G4G brand building and consumer sensitization, (xi) market linkage with end-market traders, (xii) direct market access through weekend farmers' market, mobile farmers' market and community farmers' market, (xiii) mass communication and awareness building, and (xiv) peer-to-peer networking among farmer groups and agro-value chain actors, and (xv) crisis time implementation trial of G4G Inclusive Agribusiness Model (G4G-IAM) amid COVID-19. Besides, numerous surveys were done, including baseline, end-line and customer surveys.

The Output (G4G-IAM)

The final output of the research project is G4G inclusive agribusiness model (G4G-IAM) for production and marketing of safe food. The model helps reduce unnecessary intermediaries from the chain and thereby offers more benefit to farmers as well as consumers with fair price and quality produce. Generally speaking, the model has two derivatives: (a) shortened value chain and (b) direct access to end consumer. It also offers the opportunity to get technologically integrated, depending on both end preparedness. The first derivative of the model, shortened value chain, allows farer groups to send their produce directly to distant urban wholesaler (bypassing all local intermediaries) from whom network retailers and others can buy. The second derivative, direct to end consumer, is its best form. Depending on the economies of scale and scope, there exists no intermediary at all between farmer groups and final consumers. The model achieved this feat through CDCS® G4G Community Farmers' Market, G4G Weekend Farmers' Market and G4G Mobile Farmers' Market. And this success came even in the context of COVID-19 pandemic. This proves the robustness of the model.

Having said that stakeholder engagement and strong collaboration is the hallmark of the model. G4G-IAM requires active collaboration among all agricultural market actors, market facilitators and market regulators. The success of the model has relied most on this approach.

From sustainability perspective, the project has successfully created, equipped and activated a host of initiatives and brands. These include, but not limited to the following: (i) G4G Agribusiness Groups, (ii) G4G Agribusiness Center, (iii) G4G Community Farmers' Market, (iv) G4G Mobile Farmers' Market, (v) G4G Weekend Farmers Market, (vi) G4G Enterprise Network, (vii) *aamader*, specialized retail shop, and (viii) *FarmersEnd*, marketing e-platform. The project also equipped the Farmers Academy, knowledge and technology dissemination e-platform.

Outcome and Impact

G4G interventions – e.g. training, handholding, incubation, brand building, market exposure, market linkages, and direct market access by farmers through several channels – have left profound impact on the farmer groups that could withstand extremely high demand of the research project. The successful farmer groups have started reaping the benefit. For example, in just three weeks of operation (that too under COVID-19 crisis), farmer groups participating in the implementation of G4G Community Farmers' Market model sold some 15-20 tonnes of agro-produce and fetched about BDT 3 million. And, inspired by such success, now they themselves have started making adjustment in their business and operations model. More importantly, they have started making significant investment in farming and postharvest management technologies (e.g. establishment of hot water treatment plant for fruits and vegetables). Moreover, the farmers have started networking not only with forward market traders in distant wholesale points, but also with other farmers and farmer-groups. Mentionable that such peer-to-peer (P2P) networking and business transactions at the farmers' level was beyond the envisaged goal of this research project. These are but a few signs of impact that the project is leaving behind.

G4G Inclusive Agribusiness Model: Signs of Impact

	Achievement	Description
1	First-ever private investment made by farmers in safe postharvest management technology	One of the farmer groups – G4G Kotchandpur – has made the first-ever private investment in setting up a Hot Water Treatment (HWT) plant, and during the period of June-August 2020, the group hot water treated 22.5 tonnes of mangoes on personal account. Besides, it also treated mangoes of other farmers and traders under "postharvest-management-as-a-service (PaaS)" fee-based model. This is a big success for the project in the sense that the farmer groups have not only understood the ways and means to ensure safe agro-value chains, but also have invested their own money in smart postharvest technologies such as HWT plant, and earning revenue from their service as well.
2	Innovative market channels established; running on 100% self-sustaining business model	CDCS® worked closely with DAM for over two years advising it to set-up weekend farmers markets so that farmers can gain direct access to the end market. CDCS® also worked with BoF to set up a community farmers market to serve its community with safe and fresh fruits and vegetables, particularly under COVID-induced restrictions. Despite all logistical challenges, two of the G4G farmer groups have sustainably been selling their safe fruits and vegetables every week at G4G Community Market at BoF-Gazipur, G4G Weekend Farmers' Market in Dhaka and/or G4G Mobile Farmers' Market. These operations are currently running on a 100% self-sustaining business model, without any project subsidy.
3	Crowding-in Effect	Farmer groups from beyond project locations have also joined (and are keen to join) CDCS® G4G agribusiness network. One such group – G4G Hobigonj – alone sold 13 tonnes of fruits and vegetables at G4G Community Market at BoF and 18 tonnes at the Weekend Farmers' Market in Dhaka during the period of April-August 2020. This has been achieved despite COVID-induced chaos and supply chain disruptions.

4	G4G inclusive agribusiness model proved COVID resilience	Despite COVID-19 pandemic, G4G agribusiness groups across the country have produced and sold (in 2020): 645 tonnes of safe tomato, 123 tonnes of safe bittergourd, 280 tonnes of safe banana, and 345 tonnes of safe mango. Of these, a notable portion was sold through G4G Weekend Farmers' Market, G4G Community Market and G4G Mobile Farmers' Markets, despite COVID-related restrictions and chaos. While a big portion was sold directly through G4G city arots (a channel established under the project), some were sold directly to end-customers by order (through G4G social network). However, a good portion was also sold through the traditional channel at regular price.

Lessons Learnt

This action research project has offered a host of key lessons, which would be very useful in any future endeavors. These include, but not limited to, the following:

1. Farmers will be motivated to adopt good farming, postharvest and marketing practices only when the return is significant and sustainable. Mere one-off training, without continuous handholding and incubation support, will not work.

2. Consumers will be willing to pay a bit more only if they are convinced that the produce is safe and offers better value for money. It requires lot of commitment to win and retain customers.

3. Market and value chain development requires an ecosystem perspective to agribusiness. All stakeholders– big and small – along the agricultural ecosystem should be brought to the same page of understanding, have confidence in each other and support each other. However, it must be noted that this itself is a gigantic task, but, to a large extent, doable.

4. An action research involving primitive agricultural value chains of Bangladesh requires continuous engagement and adjustment in approaches, strategies and actions. Although it would burn out a lot of time, energy and resources, there is no short-cut. It demands passionate, and often unorthodox, researchers to advance the cause. The mantra of success would be "dare to disrupt and innovate, and strive to deliver and excel'.

Conclusion and the Way Forward

The fact that CDCS® G4G Inclusive Agribusiness Model (G4G-IAM) on safe food value chain could withstand and deliver during such crisis as global COVID-19 pandemic is itself an enormous testimony of the model's robustness. Therefore, the model deserves scale-up with immediate effect. This is to ensure national food and nutrition security as well as for farmers' wellbeing.

Given the success of this market and value chain action research on safe agro-produce, this study recommends immediate piloting and scaling up the implementation of G4G Inclusive Agribusiness Model (G4G-IAM), which is developed under this project. In this connection, five specific recommendations involving such piloting are outlined hereunder:

1. Promote G4G Forward Market Value Chain Model (G4G-FMVCM) through extensive piloting across agricultural subsectors, nationally. In terms of forward market linkage, replicate and scale G4G Community Farmers' Market, G4G Weekend Farmers' Market and G4G Mobile Farmers' Market model-derivatives.

2. Promote agro-entrepreneurship by scaling G4G Agribusiness Center (G4G-ABC) Model across the country to mobilize and train farmers and to incubate and accelerate rural agro-enterprises.

3. For operational efficiency and sustainability of these models, explore ways and means for ICT integration around these models. Particular emphasis should be given to safe scientific farming, technology transfer and market linkages along upstream and downstream value chain segments.

4. Promote extensive multi-agency public-private collaboration to ensure skills and knowledge, quality monitoring and certification, sound transportation logistics and storage facilities, strong support industries (e.g. packaging), physical market places/outlets, innovative financial services, and appropriate technologies.

5. Build consumer awareness and policy advocacy campaigns on safe and nutritious food. And take follow-up measures in order to build a healthy nation, with sound immunity.

This study is confident that CDCS® G4G Inclusive Agribusiness Model (G4G-IAM) will be the key to future agricultural success as it involves safe food production and marketing, fair price to farmers and high quality nutritious agro-food to consumers. In short, G4G-IAM offers a pathway to national food and nutrition security. And that to in the context of 'evolving new normal regime'.

C. Introduction

C.1 Background

Safe food is a necessity for immunity, sound health and a productive nation. The importance of fruits and vegetables in the human diet is universally recognized. They are the major sources of vitamins and minerals without which the human body cannot maintain proper health and develop resistance against diseases.

Unfortunately, the fruits and vegetable sectors in Bangladesh are plagued with harmful farming techniques with rampant application of harmful pesticides and ripening chemicals, poor postharvest management practices, and above all sheer market system failure. These not only lead to unsafe agro-food at consumer end, but also result in huge postharvest losses and poor return to farmers. On aggregate, it's a huge national loss. This three year long action research project – entitled "Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Postharvest Losses and Food Safety in Bangladesh" funded by KGF and conducted by BARI and CDCS® during the years 2017-2020 – experiments different ways and means in its effort to develop an inclusive and sustainable business model that would potentially help improve the situation. Though the project includes four fruits and vegetables namely mango, banana, tomato and bittergourd in eight different locations, it plans to scale it up in the piloting phase to complete the sustainability dimension of the endeavor.

C.2 Trend of Area, Production and Yield of Selected Fruits and Vegetables

In Bangladesh, per capita consumption of fruits and vegetables is only 211 g/day, against a minimum requirement of 400 g/day (FAO/WHO 2003; BBS 2010). This manifests a poor dietary status of the people in the country. Currently, Bangladesh produces respectively around 1606 thousand and 4812 thousand metric tons of vegetables (including potato) and fruits per year (BBS 2016). Both area coverage and production volume of fruits and vegetables are increasing each year in Bangladesh.

The trends of area, production and yield of selected fruits and vegetables are shown in Figures 1.1 to 1.4. Figure 1 revealed that the area, production and productivity of banana fluctuated from 2006-07 to 2015-16. But in the case of mango, the area fluctuated from 2006-07 to 2015-16, but production increased gradually from 2006-07 to 2015-16. The yield of mango was also fluctuated within these period (Fig 1.2).

The area of tomato showed increasing trend up to 2012-13 and decreasing trend from 2012-13 to 2013-14 after that area increased up to 2015-16. Tomato production increased up to 2011-12. After that period, it showed decreasing trend up to 2013-14 and then production was increased up to 2015-16. The tomato yield showed increasing trend from 2006-07 to 2011-12, after that, it showed fluctuating trend (Fig 1.3). The area of bitter gourd was increasing from 2006-07 to 2010-11, but after this period area showed fluctuating trend. Bitter gourd production increased up to 2012-13. After that period, it showed decreasing trend up to 2013-14 and then production showed increasing trend up to 2015-16. However, the yield of bitter gourd showed fluctuating trend within the whole period (Fig 1.4).

The overall situation of banana, mango, tomato and bitter gourd cultivation in the country in 10 years period showed a gloomy picture. Though the area of above mentioned crops were fluctuated but the area of banana and tomato were less fluctuated. The production of mango increased from 2006-07 to 2015-16 due to introduction of improved verities, improved management practices, and development

of farmers' awareness toward mango cultivation. But the yield of mango was more fluctuated than the others crops.

C.3 Growth Rates of Area, Production and Yield of Fruits and Vegetables

The productivity of all four items, mango, tomato and bitter gourd has risen at an increasing rate over the years except for banana,that is to some extent static over the years. (Table 1.1).

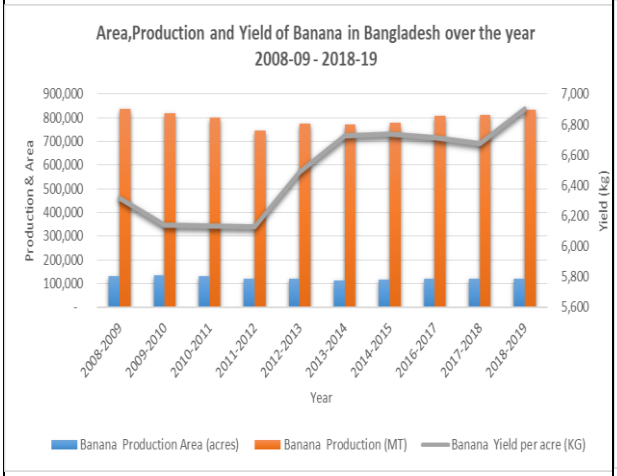


Fig 1.1: Area and production of **banana** in Bangladesh over the year 2008-09 to 2018-19

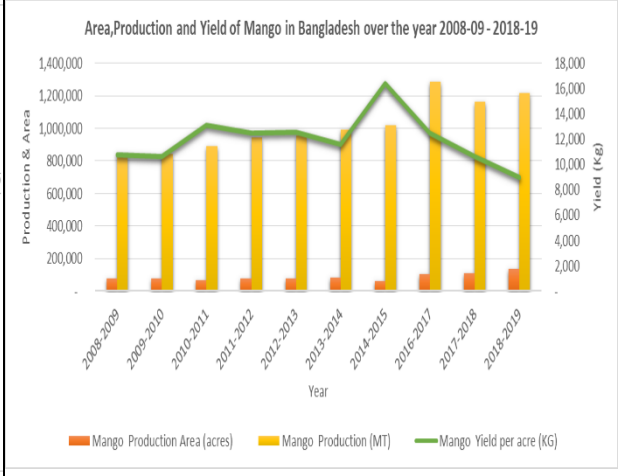


Fig 1.2: Area and production of **mango** in Bangladesh over the year 2008-09 to 2018-19

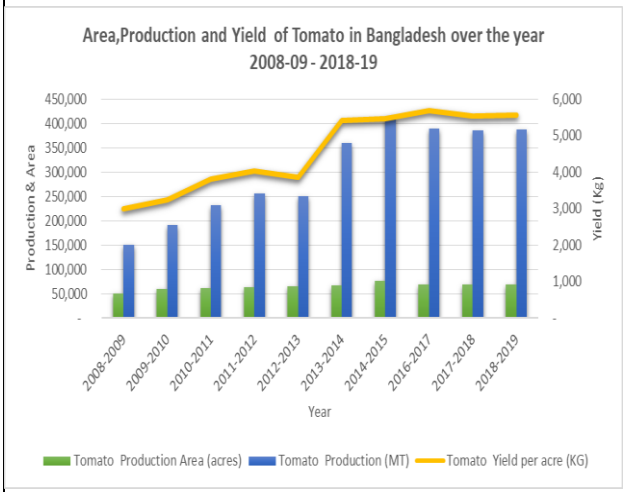


Fig 1.3: Area, production and yield of **tomato** in Bangladesh over the year 2008-09 to 2018-19

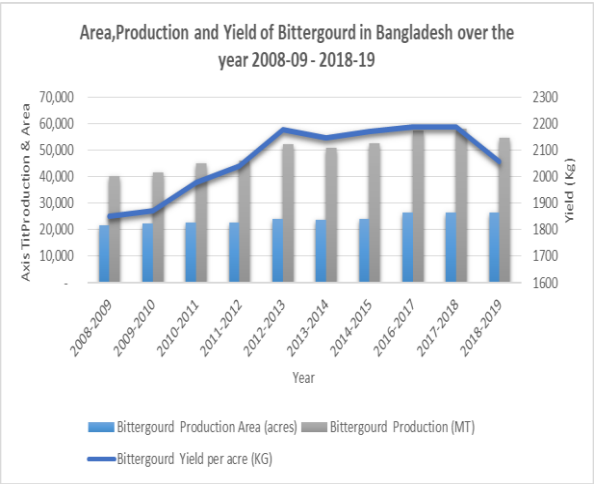
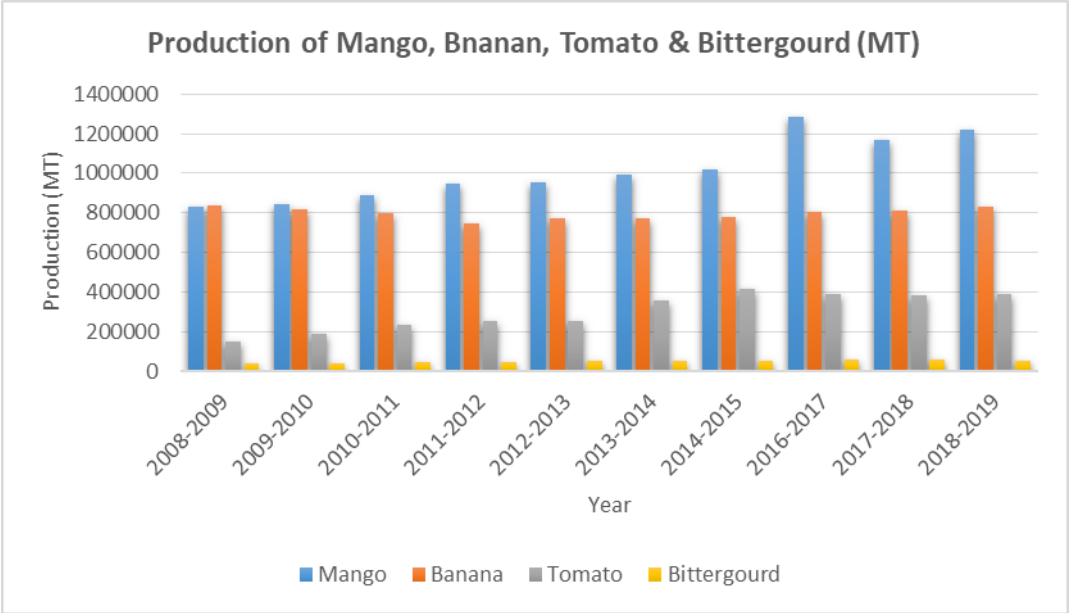


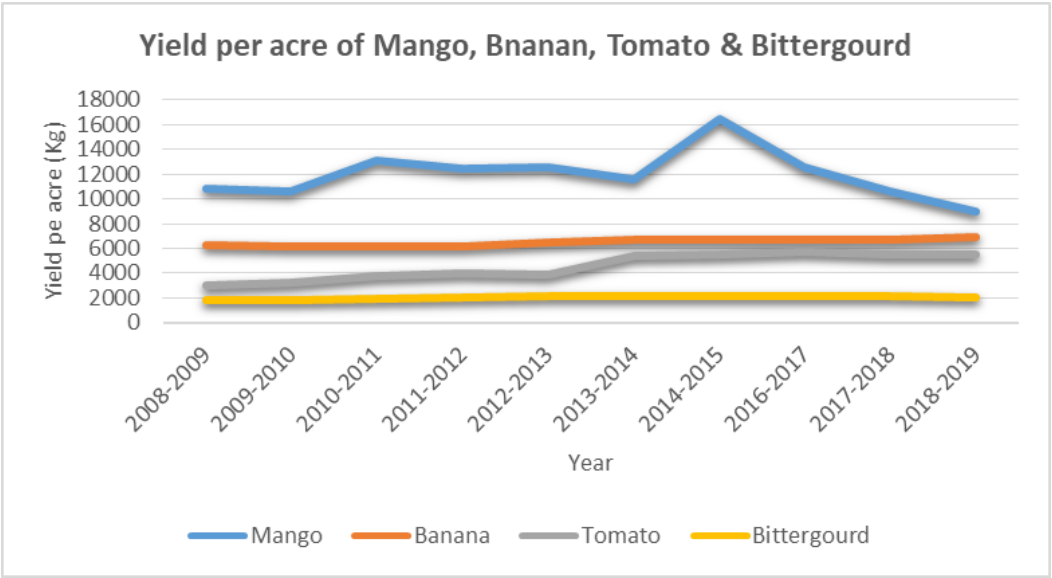
Fig 1.4: Area, production and yield of **bitter gourd** in Bangladesh over the year 2008-09 to 2018-19

Table C.1 Growth rate (%) of area, production and yield of selected fruits and vegetables in Bangladesh, 2008-09 to 2018-19

If we look at the comparative scenario, we find that in terms of production volume, mango production was the highest followed by banana while tomato and most of all bittergourd lags far behind. Over the years, increasing number of farmers got involved in mango production in wider areas and as such production also increased. Now if we analyse the yield curves, we find that mango has the highest yield followed by banana while tomato and bittergourd has the lowest yields. Thus, farmers can attain higher yields by producing mangoes and make more profit hence over the years more lands came under mango production.

Fruits and vegetables	Area (ha)	Production (MT)	Yield (t/ha)
Banana	-2.41***	-2.16***	0.25
Mango	0.77	3.99***	3.22**
Tomato	-1.73	3.47	5.20***
Bitter gourd	2.19***	4.82***	2.62***





Also at market end, mangoes fetch the highest revenue while tomato and bittergourd are low cost vegetable items. Similarly, safe items are able to earn greater profit if properly marketed and hence, it is clear that high value items attract greater farmer attention and has greater potential to be grown by farming communities under safe initiative.

C.4 Justification of the Study

The fruits and vegetable sectors in Bangladesh are plagued with huge level of postharvest losses due to their perishability and poor pre-and postharvest practices. Due to seasonal glut and the absence of proper marketing system, bulk quantity of the harvested produce gets wasted every year. The Postharvest Technology Division (PHTD) of BARI estimated postharvest losses of some selected fruits (i.e. banana, pineapple, orange, mango, litchi, and jackfruit) and vegetables (i.e. tomato, country bean, cauliflower, brinjal, cabbage, and cucumber) in Bangladesh. The estimated losses for fruits ranged from 5.6 to 9.8% at farmers' level and 8.1 to 32.4% at traders'

level. Again, the estimated losses for vegetables ranged from 3.5 to 9.03% at farmers' level and 20.5 to 27.64% at traders' level.

The total value of vegetables produced in Bangladesh is around Tk. 19400 million, calculated at average retail price. About 70% of the vegetables pass through the marketing channels. If the spoilage is 10%, the loss comes to Tk. 1,462 millions. These losses are due to inadequate knowledge on harvesting, carrying, packaging, transport and storage techniques. In the vegetable marketing channels, traders suffer maximum losses, because they handle and transport more quantities from one place to another than any other intermediaries (Rashid, 1998). Another calculation made by Hasan (2010) revealed that the postharvest loss of fruits and vegetables in Bangladesh ranged from 23.6 to 43.5%, which accounts for an annual loss of Tk. 34,420 Million. The quality and nutritional value of fresh fruits and vegetables are also affected by postharvest handling and storage condition. Non-judicious use of pesticides by the farmers is also causing problems for human health and the environment. Inefficient marketing system also responsible for lower price of produces for farmers and higher postharvest loss of traders resulting the higher price for the consumers. Therefore, the knowledge of postharvest management for fruits and vegetables is very much important at producers' and various stakeholders' levels for reducing postharvest losses and ensuring food safety for the consumers. Empirical data and adequate information regarding the above issues are lacking in Bangladesh. Again, BARI and CDCS have generated a number of postharvest management technologies and food safety measures respectively for fruits and vegetables in order to reduce postharvest loss and make food healthy for human consumption. Unfortunately, the technologies are mostly unknown to the producers, traders and even consumers of fruits and vegetables in Bangladesh.

On the other hand, the downstream of the supply chain is responsible for connecting the producers to consumers. The activities associated at this stage of the supply chain are buying or collecting goods from producers, transportation, warehousing, analysing customer needs and fulfilling customer requirements, locating logistic facilities, and planning other services necessary to facilitate transfer of products from producers to consumers (Wisner, et al., 2012). The downstream of fresh vegetable supply chain in Bangladesh is composed of five types of intermediaries - Faria, Bepari, Aratdar, Paiker, and Retailer.

Various studies have identified some flaws and inefficiencies in the vegetable supply chain structure of Bangladesh. Unstable supply and demand, lack of regulatory control over the market, growers' absolute dependence on local wholesalers for market access, unreliable and expensive transport system are some barriers to the efficient functioning of the supply chain (Karim & Biswas, 2016). Poor pre-packaging, poor handling methods and lengthy ineffective marketing system causes post-harvest losses and shrinkages of vegetables and fruits and it often goes up to 40 percent of total produce (Badrud-doza, 2006).

The fruit and vegetable producers and distributors in the country cannot maintain the required safety standard as required by the provisions of Sanitary and Phytosanitary Measures. Multiple independent studies identify serious infrastructure and logistic problems, lack of cold storage and transport facilities, premature harvest, profit mongering of businesses, and the absence of a licensing and monitoring authority for commercial farming are behind unbridled food contamination in Bangladesh (Rahman & Pandey, 2014).

The local traders are unacquainted to food safety, hygiene, and environmental issues associated with fruit and vegetable supply chain. The Table 4 presents the level of knowledge and practice of supply chain organizations on safety, hygiene, and environmental issues. The HACCAP is the systematic approach to prevent food items from biological, chemical, and physical hazards. The principles of this system are applicable to fruit and vegetable items as well. But the local traders do not know or practice it when most of the exporters (61.5%) has knowledge about this system and could not comprehend the importance of it.

However, the local traders or suppliers of the fruits and vegetables are not aware of these issues and do not practice the procedures. Hence, fruits and vegetable are produced in the country has low safety standard. Organic fruits and vegetables are considered as a healthy food item, but local traders do not understand its

importance. Local traders has idea to classify produces in grades to some extent, when it is a must element for exporters.

Table 4: Food safety, hygiene, and environmental standard of fruit and vegetable supply chain

Safety, Hygiene, Environmental Factors	Exporter (Percent)	Local Traders (Percent)
HACCAP (hazard analysis and critical control points)	61.5	0.0
Standardization	76.9	8.0
Grading of vegetables	100.0	50.0
Pollution control	84.6	20.0
Organic vegetables	76.9	20.0
Buyers' compliance	61.5	4.0

Source: Estimated from survey data.

Thus it is important that along the value chain, starting from farmer level to trader levels at different stages, actors are aware about the quality parameters and safety standards. Also they need to understand why these are important and how the quality parameters and safety standards would benefit them both in terms of loss minimization and profit maximixation.

With these in mind, this project, entitled "Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Postharvest Losses and Food Safety in Bangladesh" was undertaken by BARI and CDCS®, with funding support from KGF.

Soure:
https://www.researchgate.net/publication/328555471_The_Vegetable_Supply_Chain_of_Bangladesh_Is_it_Capable_to_Meet_the_Requirements_of_International_Trade

D. Specific Project Objectives

The ultimate goal of the project is to analyze value chain efficiency, reduce postharvest losses and create and pilot an inclusive and safe business model for major fruits and vegetables marketing in Bangladesh. The specific objectives of the project are given below:

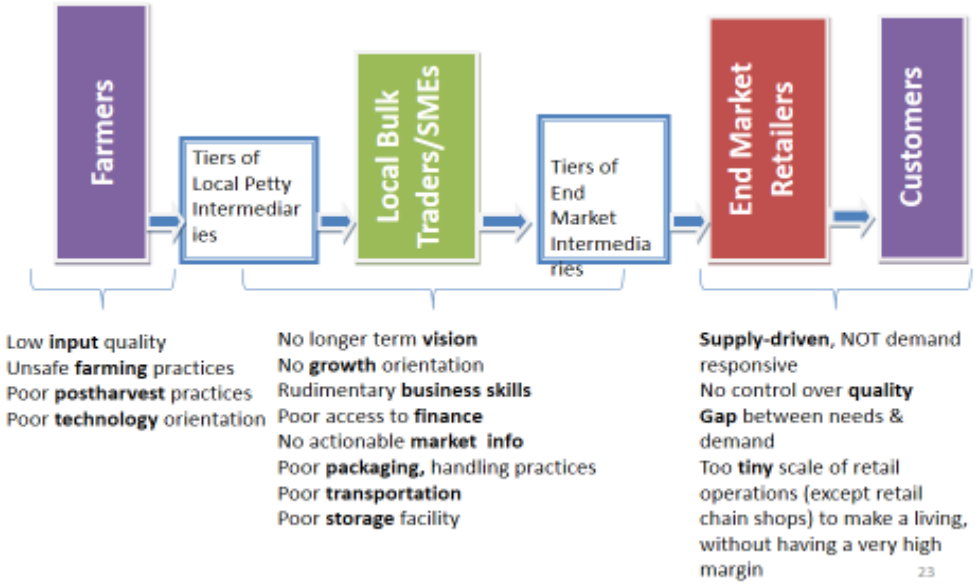
1. To assess the current agriculture and agribusiness scenario with particular reference to selected fruits and vegetables
    a) To generate baseline indicators for production and marketing practices, postharvest losses and food safety of selected fruits and vegetables
    b) To map the agribusiness ecosystem with key institutions and actors, the dynamics of their interactions, their interests and influence and implications for inclusive agribusiness promotion
    c) To identify preferences, practices and decision triggers of consumers, farmers and VCA in order to help strategize inclusive business model(s)
2. To disseminate existing technologies and build capacity in safer food production and good postharvest practices and marketing
    a) To orient farmers and VCAs in safer food production and good postharvest management practices
3. To craft, pilot and validate inclusive business model(s) for production and marketing of safe fruits and vegetables by smallholder farmers (or agro-MSMEs) through incubation support to agro entrepreneurs
4. To assess the end-line situation of piloting of inclusive business model (along the dimensions of MSME competitiveness) in safe fruits and vegetables

E. Detailed Technical Report

E.1 Statement of the Researchable Problem

A huge amount of fruits and vegetables are damaged and contaminated every year due to seasonality, bulkiness, poor infrastructure, use of hazardous chemicals and preservatives and poor postharvest handling and processing. This situation needs to be improved through post harvest technology, value chain management, awareness building and innovative business incubation scheme that promote market-responsive agro-MSMEs.

Based on research on the entire agribusiness ecosystem-practices, power dynamics and competitiveness paradigm of different stakeholders, a simplified version of problem-potential aspects mapping is shown below.



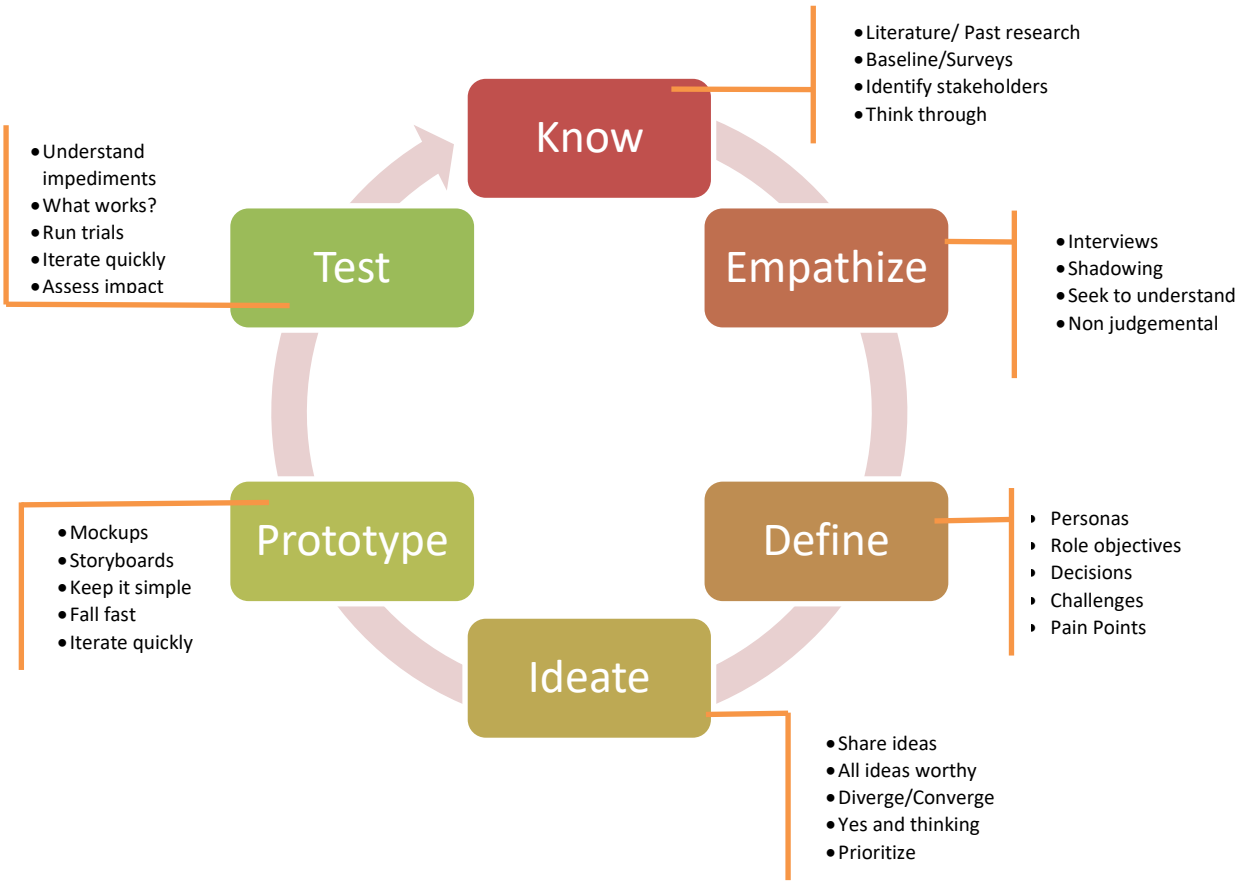
The problem areas identified above at different stages of the value chain also signify the improvement and intervention potential for future up gradation. The main approach is to intervene taking three major areas in consideration including knowledge and technology transfer, access to safe inputs and machineries and market knowledge and market access.

E.2 Research Approaches and Methodology

E.2.1 Approaches

Conventional research projects involving market and value chains development in Bangladesh has so far failed to create and establish any sustainable inclusive agribusiness model that directly benefits both farmers and consumers at the same time. With this background, this action research project approached the challenge innovatively – by adopting ***human-centered design*** (HCD) as the core component of its methodology. CDCS® approach to HCD may well be captured by a simple – but profound (implication-wise) – circular framework: **KNOW-EMPATHIZE-DEFINE-IDEATE-DESIGN-TEST** (adapted from Stanford d.School Design Thinking Process).

CDCS® Human Centered Design for Market and Value Chain Action Research



Source: Adapted from Sanford d.School Design Thinking Process

In so doing, CDCS® relied primarily on empathic design principle, but grounded the experiment to reality. Backed by wealth of accumulated knowledge of agricultural market and value chains dynamics in Bangladesh (gained through primary and secondary research as well as decade-long past interventions), the research team sought to understand, without being judgmental, the decision triggers of farmers and other value chain actors (VCAs) through shadowing, informal chats and interviews. This exercise helped researchers to DEFINE the opportunities, challenges and pain-points of VCAs.

At the ideation stage, the team ran several expert panel discussions, stakeholder consultations and team meetings in order to come up with innovative intervention ideas, capture the convergences and divergences, and solidify and prioritize ideas. This offered the much-needed foundation for designing and testing interventions. As the diagram and table below indicate, several market access experiments were designed and tested in order to assess which of the alternative market channels suits farming communities best in terms of value retention, profitability and operational sustainability.

Fruits and vegetables and locations under study

The project by design dealt with two fruits (mango and banana) and two vegetables (tomato and bitter gourd). However, in order to establish a sustainable business case, at the end the basket had to include all agro-produce that a particular farming community produced.

In terms of location, the project started with eight high-volume product-locations: Bogura (2), Gaibandha, Rajshahi (2), Jhinaidah (2), Jashore. Subsequently, due to changed field reality, some changes in location had been made.

Fruits & vegetables	Project location at the inception	Final Project locations
A. Vegetables		
Tomato	Bogra , Rajshahi	Bogra & Bagerhat
Bitter Gourd	Jessore, Bogra	Jessore & Bagerhat
B. Fruits		
Mango	Rajshahi, Kotchadpur	Rajshahi and Kotchadpur
Banana	Bogra, Jhinaidah	Jhinaidah, Kotchadpur

Though we started with eight different product locations, during the journey based on field realities we needed to replace few points with other more progressinve and successful ones in terms of adopting safe production, monitoring and marketing initiatives. In case of tomato, growers from Rajshahi are in practice of spraying lots of pesticides and harmful ripening agents. As such we shifted to Bagerhat and included the safe tomato producing farmers from there. Same is true for Bittergourd farmers from Bogra whom we replaced with farmers from Bagerhat. Also, in case of Banana farmers from Bogra, even after much grooming we found them unwilling to stop applying growth hormones on banana fruits as such we replaced them with banana farmers from Kotchadpur who follow safe practices.

Thus, the locations have been selected based on how much they are popular as a hub growing the particular items under study and their interest in bringing about a change by following safe agricultural practices. The project team had several sensitization meetings at different prominent hubs before inception and selected the locations based on the discussions and assessment of the same.

In terms of numbers of farmers and traders, we started with building capacity of around 50 farmers and agro entrepreneurs in each product location totaling 400 producers and interacted with more than 200 value chain actors along the agro value chains that includes actors from both the backward and forward market segments such as, input, machinery and technology suppliers, agro traders at different levels, transportation and logistics support providers, procurement and processing organizations, packaging and handling support froviders and many more.

Stakeholders along the value chain especially those at the grassroots have been brought under a capacity building and knowledge sharing framework. Communities were involved through several engagement meetings. Farmers were selected based on criteria such as how much of the selected crop they produce year round, their intention and interest of following safe practices, their basic production skills and their communication method, length of period in cultivation and/or in doing business or trading the produced items, age, size of land cultivated, and networks pursued to remain in the trade.

Women have been particularly emphasized from the perspective that they are closely involved in the households especially at postharvest level. During the project span women were involved in two locations namely, Bagerhat and Bogra. However, though women are much involved at farming end, at market end they do not have much visible role.

In an attempt to test alternative approaches in developing an inclusive model, agro entrepreneurs, private sector players, trading enterprises and other relevadnt actors have been engaged through Stakeholder engagement and market linkage workshops and meetings and small agro entrepreneurs have been provided with incubation support to graduate them along the value chain. Combining all the efforts in parallel, an innovative inclusive business model have also been developed and piloted at different producer and value chain actor level.

Besides, an active effort have been put through intervention to shorten the chain from farmer to consumer as much as possible in the following manner bypassing different actors at different levels.

It is found that G4G farmers and farming entrepreneurs are able to sell their produce at higher prices and make more profit if they pursue Entrepreneural path following G4G inclusive agribusiness model. Thus eventually once project is scaled up and supply schain is strengthened with larger number of farming communities, the venture is expected to become self sustaining and run on its own without formidable project support.

Research Components

The project covers broad areas of market and value chain aspects of the above mentioned fruits and vegetables with special reference to postharvest management and food safety. Stakeholders along the value chain especially those at the grassroots have been brought under a capacity building and knowledge sharing framework. In an attempt to test alternative approaches in developing an inclusive model, agro entrepreneurs, private sector players, trading enterprises and other relevadnt actors have been engaged through Stakeholder engagement and market linkage workshops and meetings and small agro entrepreneurs have been provided with incubation support to graduate them along the value chain. This was done more on a one on one basis, through incubation and acceleration support i.e. building the capacity of value chain actors through engaging in discussions and engagement meetings, enhahcing their exposure, etc. Combining all the efferts in parallel, an innovative inclusive business model have been developed and piloted through such incubation support at different producer and value chain actor level.

The research approach includes among others protocol development, capacity building and advisory support to G4G farmers and incubation & acceleration support to agro entrepreneurs, connecting the groups with input suppliers and different sevice providers and helping them get connected with consumers and communities as a whole. It is important to understand that only good agricultural practices and technical production related knowledge would not enable farmers and agro entrepreneurs continue selling safe produce at competitive prices. It definitely requires good entrepreneurial skills and exposures guided and supported by structured business training and uninterrupted incubation support.

In fine, the project pursued three major components, as follows:

<u>Component 1: Foundation Research & Mobilization</u>

a) Stakeholder mobilization workshop (BARI-CDCS)
b) Baseline survey on production and marketing (BARI)
c) Research on agribusiness competitiveness and inclusive market development(CDCS)

<u>Component 2: Piloting and Implementation Schemes</u>

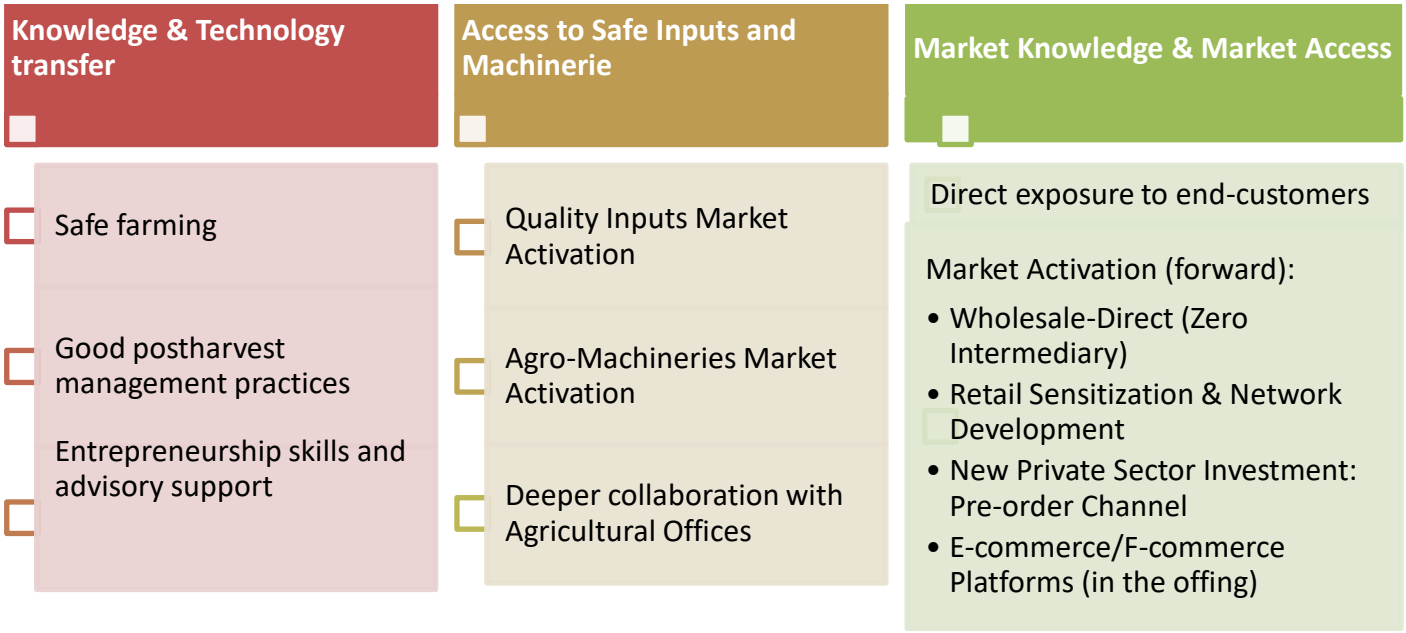
a) Market linkage (sensitization and training) workshops for farmers and VCAs (BARI-CDCS)
b) Development and testing of a new business model (CDCS)
c) Enterprise support on technology and business competitiveness (CDCS)

<u>Component 3: Monitoring & Evaluation</u>

a) Capturing signs of impact in terms of technology adoption and business competitiveness (BARI-CDCS)

The intervention is aimed at building capacity of the farmers as well as value chain actors on safe food production, harvesting and post-harvest management, and connecting those to safe input and technology suppliers and along the chain create and incubate entrepreneurs at different levels. Such trained actors

at different levels is expected to shorten the chain as much as possible between farmer-agro entrepreneur and consumer and thereby ensure greater value for all actors both in terms of quality and benefit.



The diagram above shows three major areas in which the project emphasised. Under knowledge and technology transfer segment, as focus was given on safe farming, harvesting and post harvest management, knowledge was also transferred on agro entrepreneurship. Mostly these were done through G4G Krishiaddas i.e. group discussions (face to face and virtual over the phone, whatsapp, Viber, Messange etc. whichever suitable)

Input suppliers (Ispahani, Lalteer, Partex agro etc.) and agro machinery service provider (Janata Engeenering) has been engaged through discussion. On a need based manner, CDCS met, discussed and negotiated with these suppliers for G4G group members and thus activated the market players positively. Such as, G4G Kotchadpur group installed hot water treatment plant with advisory support from CDCS. Besided, in each G4G location, agricultural officers have been brought under close loop so that in collaboration with G4G Agribusiness Centers they can oversee and certify G4G fermer's safe produce. Deeper collaboration with Agricultural Officers is also helpful for farmers and agro entreprenerus in the communities in so many other ways and for long term sustainability of the project.

Finally, market engagement and market access has been facilitated for G4G communities as outlined above through wholesale or direct sales to consumers. These are discussed in greater detail in later chapthers.

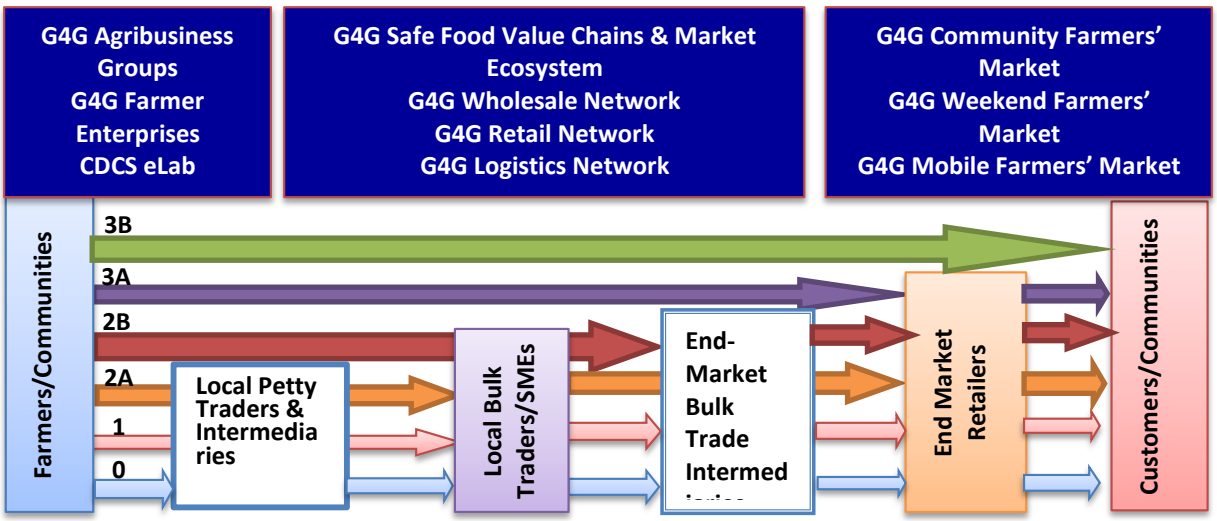


Figure: Intervention Roadmap

Experiment Levels	Farmer/ Farming Community	Local Petty Trader (Foria)	Local Bulk trader (Bepari)	End Market Traders (Arots & Wholesalers)	End Market Retailer	Customer
# 0 (usual)	Active	Active	Active	Active	Active	Active
# 1	Active	**Bypass**	Active	Active	Active	Active
# 2A	Active	**Bypass**	Active	**Bypass**	Active	Active
# 2B*	Active	**Bypass**	**Bypass**	Active	Active	Active
# 3A	Active	**Bypass**	**Bypass**	**Bypass**	Active	Active
# 3B*	Active	**Bypass**	**Bypass**	**Bypass**	**Bypass**	Active

Note: Derivatives 2B and 3B were added during the course of actual market experimentation.

As depicted in the diagram and table above, the intervention tried to build safe production, handling and markering capacity among others of the stakeholders along the value chain and thereby shorten the chain from farmer to consumer as much as possible.

Level 0 (existing practice): At level 0 agro produce move from farmer to local petty intermediaries/ foria to traders/ bepari at local haats to end market intermediaries (beparies at distant markets) to retailers and finally to customers. This is the general practice and flow of or supply chain.

At level 1 the project skiped the forias and directed farmers to local beparies while at level 2 there are two options that has been tried. In 2A project skipped petty intermediaries at both local and distant market ends and worked on having one bulk purchaser bringing the produce from farmer to retail end. While in 2B, which is found to be more promising at the moment, all local level traders have been bypassed and G4G farmers are directed to big city wholesalers who then sells through end market retailers.

This has further been shortened by directly linking farmers to end market retailers at level 3A who then sells the prduce to consumers. However, in this case, the project walked one further step at 3B which is parallel to level 3A by directly connecting G4G farmers to Consumer communities at Dhaka and Gazipur through newly formed G4G Community Farmers Market, G4G Mobile Farmers Market and Weekend Farmers Market. Experiment 3B has been found extremely promising where farmers get the highest return and consumers receive safe, unadulterated produce directly from the farmers.

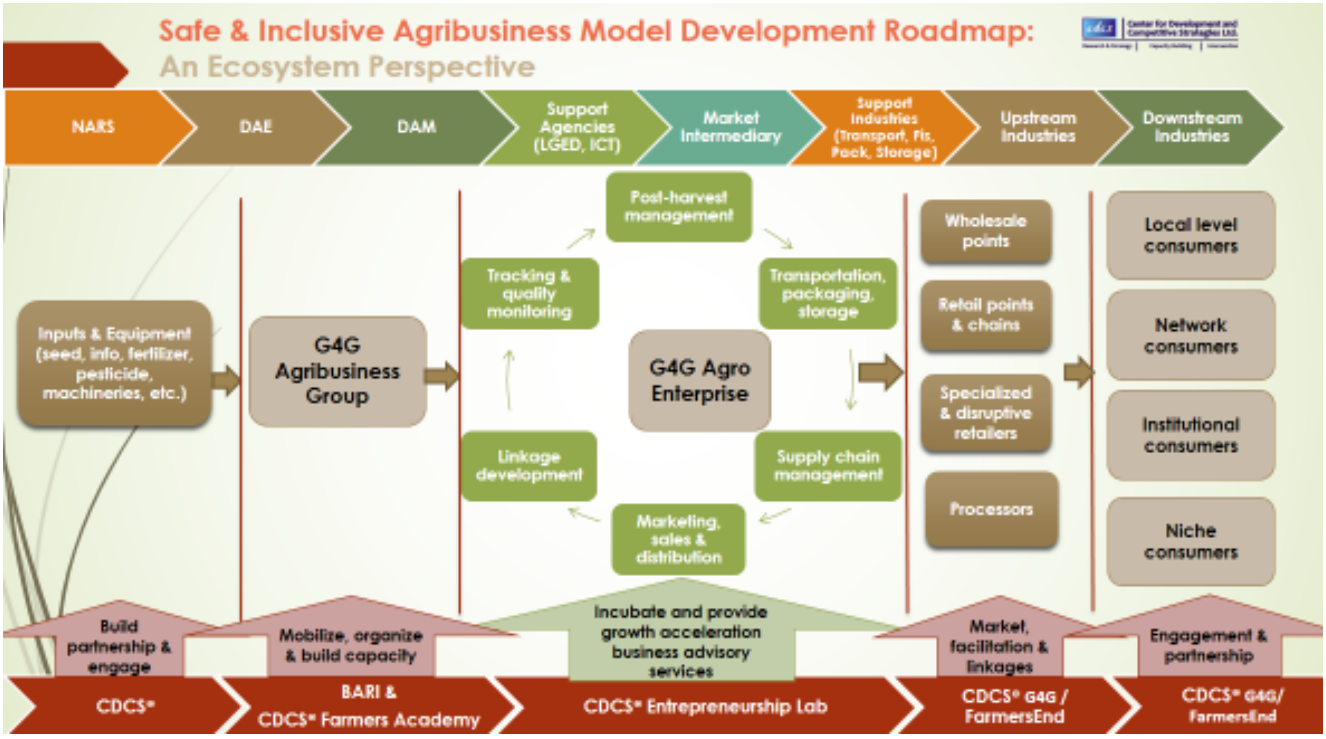
E.2.2 Methodology

In an endeavor to develop a safe business model several alternative routes have been tried and worked on following a businessecosystem approach that actively addresses and includes all the stakeholders and value chain actors while designing the intervention. A business ecosystem is the network of entities or individuals—including suppliers, distributors, customers, competitors, government agencies, and so on—involved in the delivery of a specific product or service through both competition and cooperation.The idea is that each entity in the ecosystem affects and is affected by the others, creating a constantly evolving relationship in which each entity must be flexible and adaptable in order to survive, as in a biological ecosystem.

In the ecosystem we started with mobilizing farmer and agro-entrepreneur groups organizing them and building their capacity on pre production planning, safe agro production, post harvest handling and

marketing etc., supporting them with advisory support, handholding and market trial, linking them with backward and forward market actors and much more.

While doing these we also built partnership with private sector input companies, technology providers, other support service organizations, government and nongovernment players as relevant and appropriate along the chain.



The diagram in the middle part shows the value chain where individual farmers under the G4G Agribusiness Groups procure different kinds of inputs such as, seed, fertilizer, pesticide, insecticide, machinaries, information etc. from input companies. G4G Agroenterprises formed in each location are at the center supporting the group members in different activities including postharvest management, transportation, packaging, supply management, quality monitoring, linkage development and in cases, marketing & sales etc. G4G agroenterprise sends the produce as applicable wholesale points, retail points, specialized shops, processors etc. And from this section agro produce goes to different segments of consumers including those at the local levels, within the network, niche consumers and institutional consumers.

In the bottom end, At intervention level, in the first input supply block, CDCS built partnership with different organizations by signing MOU to ensure supply of demanded quality items to G4G communities on the basis of their demand and other areas of mutual interest.

Then comes the G4G agribusiness groups in eight different locations where CDCS, BARI and Farmers Academy through a concerted effort mobilized, formed and built capacity of the group members on safe production, postharvest management and marketing of the same.

Next, CDCS through its entrepreneurship lab, created G4G enterprises by signing MOU with one progressive entity in each location that can be selected as G4G enterprise and entrusted with the responsibility of the community G4G members. These G4G enterprises then was provided with incubation and acceleration support for their growth acceleration and business competitiveness in marketing, sales and distribution, quality monitoring, postharvest management, transportation, packaging and storage, supply chain management, networking and linkage development etc. G4G enterprises got these through several hands on advisory support

and market trials in which G4G members participated enthusiastically, and thus have been groomed and facilitated in market participation over past several months.

In the next two blocks, with active networking support from CDCS and also through an online platform, FarmersEnd, created by CDCS, G4G entreprise and thereby the group members reached different segments of consumers as outlined in the diagram above either directly through different categories of G4G Farmers markets (discussed in detail in later chapters) or through different channels including wholesale points, specialized shops etc.

At the top end, are all the agriculture and agribusiness ecosystem actors including NARS institutes, DAE, DAM, LGED, ICT division, the market intermediaries, support industries and all the upstream and downstream market actors that directly and indirectly impacts and contributes towads the safe agro production and marketing activities in numerous ways.

The Inclusive model for safe agro produce

In an effort to build an Inclusive Model, work has been done in three major parts and intervention has been carried out in all three ends.

I. Farming End: At the grassroots that incudes farmers, agroentrepreneurs and other support service providers such as input company representatives etc. at the grassroot locations.

II. Market End: This includes all the market actors at institutional level starting with G4G Agro entrepreneurs, moving on to agro support organizations in input, machinery, transportation, logistics etc. and finally covering agro marketing actors at wholesale, retail and consumer end.

III. Ecosystem End: This actualy involves the players in the agriculture and agribusiness ecosystem end including DAE, BARI, DAM, Local government, Ministry of Agriculture etc.,that both directly and indirectly contribute in project implementation and has huge potential in contributing towards long term sustainability of the project.

Major Building blocks at the Farming End

Upon mobilizing the farmers in different selected locations/farming hubs, intervention was carried out in four aspects:

- Safe food production and postharvest management manual development and protocol design (Column 1 in the diagram below)
- Farmer-Entrepreneur capacity building and advisory support (Column 2 in the diagram below)
- Quality control framework and monitoring mechanism development (Column 3 in the diagram below)
- Platform development for networking, knowledge sharing and communication among different stakeholders specially including farmers (Column 4 in the diagram below)

For farmer groups and actors including G4G enterprises, input company reps, packaging and transportation service providers, local DAE officers etc. at the grassroots, manuals and safe protocols has been developed, and groups are being groomed and provided with need based advisory support services during production, harvesting, post harvest management and marketing phases.

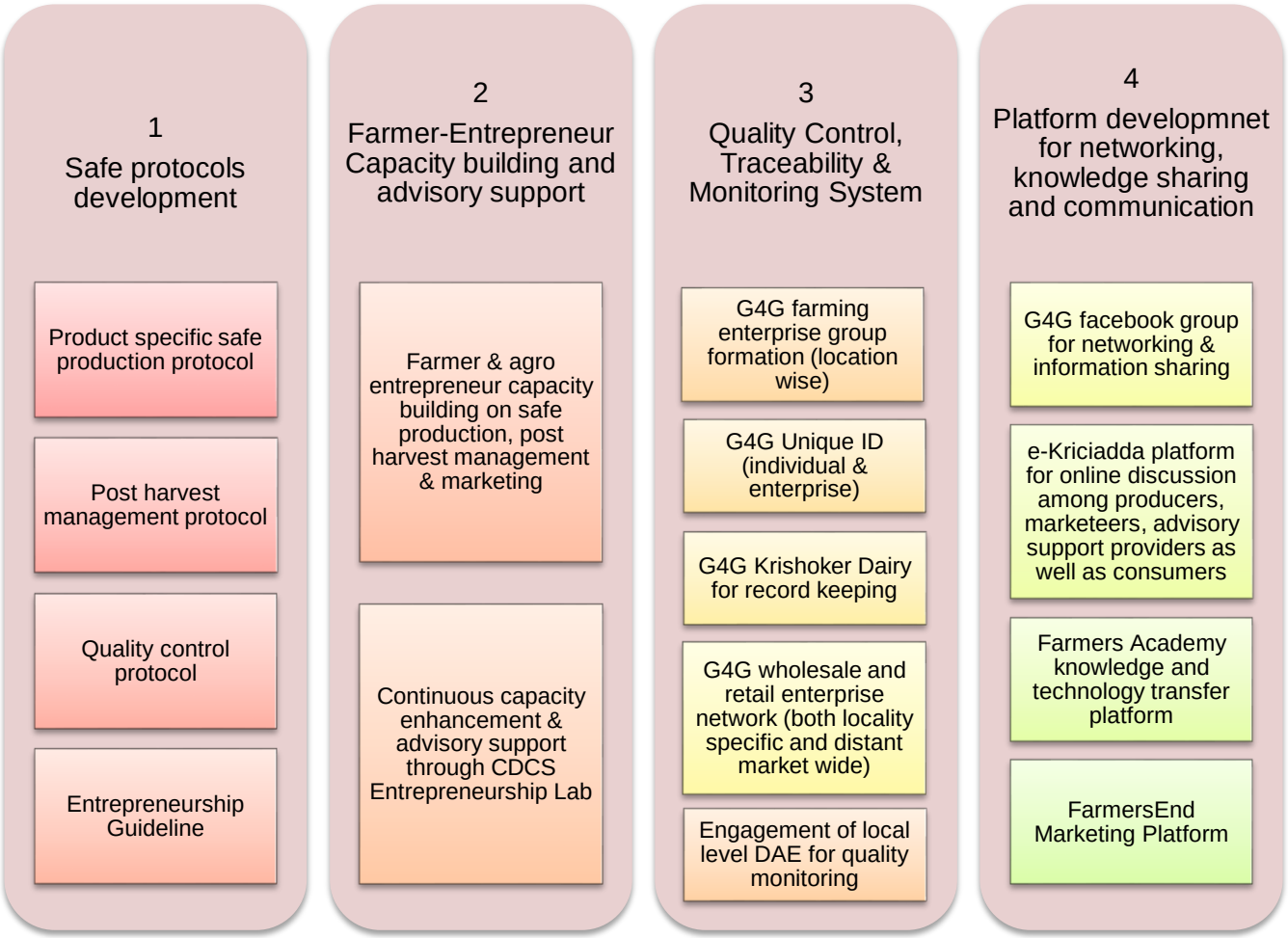
While pursuing these, system has also been developed for quality control and monitoring through G4G farming and enterprise group formation, farmer identification using unique ID cards, introduction of Krishoker dairy and by ensuring engagement of local level DAE officials along the quality assurance

framework. Besides, supply of G4G farmers' produce through partner wholesale and retail enterprises will ensure smooth and traceable supply of safe agro produce.

Also, few platforms has been created to facilitate farmers' networking, knowledge sharing and communication. Constant communication with farmers and farming communities has been given much priority and virtual platforms like ***G4G facebook group, G4G e-krishiadda platform, Farmers academy*** and ***FarmersEnd*** etc has been created to establish contact at both farmer level and market level. Trials have been given on how it may work. The first two platforms, ***G4G facebook group, G4G e-krishiadda platform,*** are knowledge sharing and networking platforms created solely for G4G group members and these are working well though we have to much more ICT capacity building and popularizing activities among the G4G group members and value chain actors to make greater utilization of the platforms.

Farmers academy, the open for all knowledge sharing platform also needs a larger group of farmers, agroentrepreneurs and value chain acrors to be activated in actively contributing and promoting their produces and technologies through the platform to make it vibrant. The project plans to do such activities in the next phase.

Regarding ***FarmersEnd***, the safe produce marketing and sales platform, G4G members are waiting to have a bigger scale where many farmers across the country may be groomed and included into the group and brought under the platform to be able sell their producec using the online platform to make it viable. As such platform would only be viable to operate profitably and sustainably if done in bigger scale. G4G members plan to pursue this in the next phase.



Partnership with Value chain actors at farming end

Parnerships have been made with several input companies including Ispahani Agro Ltd., Partex Agro, Lal Teer, GME Agro, etc. and agro machinery providers including Janata Engeeneering. The partners along the agro value chain helps G4G enterprises and through them the farmers access inputs and other necessary items very easily. Also joint efforts are to be pursued for greater farmer orientation on safe agro production and entrepreneurship capacity building of farming communities in marketing those safe produce accordingly. List of MoUs are attached.

The services are market driven and input companies will sell and supply items as per farmers' demand. As G4G farmers are supported by G4G enterprises in each location as well as the DAE officers are also working in close neat with overall advisory support from CDCS Entrepreneurship Lab, input quality monitoring and governance will not be a problem and issues will be addressed accordingly.

Entrepreneurship Capacity Building of farming communities

Entrepreneurship capacity building and advisory support includes among others -

- Guiding through Business canvas model
- Postharvest management, packaging and presentation support
- Exposure to direct consumer –understanding their demand, expectation and feedback
- Branding quality produces under G4G umbrella to demonstrate quality perception
- Pricing strategies for safe agro produce
- Planning ahead for smooth supply and beyond

It is important to note that only classroom teaching cannot build capacity of these communities in a manner that enables them to convert the teachings into action. As sucg it needs a combination of both theoretical as well as practical action oriented activities. Without proper grooming and advisory support farmers and agro entrepreneurs are unable to follow through the entrepreneurship route whereby they can ensure the delivery of safe items they produced upto consumer end and secure their share of the value along the safe agro value chains.

Major Building blocks at the Market End

I. Market Preperation and engagement

At the market end much effort has been given in organizing the stakeholders and creating linkages. Market preparation & engagement includes following major parts:

1. **Branding scheme**

Brands allow farmers to position their agricultural produce according to its quality, size or physical appearance etc. Introduction of G4G product umbrella for farmers is a step towards creating farmers' brand that represents safe agroproduce supplied by farmers under G4G Agribusiness Group. G4G farming community's safe produces are presently supplied in G4G Community Farmers Market in Gazipur, BOF and Dhaka Weekend farmers Market. Also there is an endeavor of running G4G mobile

Farmers Market. Market trials of G4G mobile farmers market is quite successful and G4G group is working on continuous running of the same.

Besides, FarmersEnd marketing platform and Aamader retail network, both of which represent safe agro produce from G4G farming communities, has also been created to support easy marketing and sales of G4G farmers' produce. Planning and execution of such branding scheme helps distinguish farmers' safe produce from the rest of general supplies and positions it separately. Thus, branding is found most crucial as it helps the market actors at different levels especially the consumers to clearly recognize G4G safe produce supplied by G4G farming communities.

2. Supply chain mapping

Supply chain mapping has been done under the project, by pursuing the process of engaging actors across value chain including companies and suppliers and document the source of every input, item, produce and transection involved in bringing agroproduce to market/consumer. As supply chain mapping may focus on many different aspects including a particular consumer segment, on the processes, organizations, flows, facilities, and/or geographic relationships, it highlights the point of strategic advantage. Thus CDCS worked on the overall supply chain mapping of agro produce from G4G communities and outlined the supply map connecting input suppliers with G4G centers/farming communities, then agro produce to the markets and consuming communities.

3. **Advisory Support**

CDCS, through G4G centers, offered advisory services on different aspects of market preparation including good production, postharvest management, technology adoption and business management practices and built the capacity of agro entrepreneurs accordingly.

4. **Safe Protocols**

Introduced product specific safe protocols for the G4G agro entrepreneurs as well as traders. G4G protocols are discussed in the later segments. It is important to note that when G4G farmers and entrepreneurs send produce through G4G channel, they are bound to follow the protocols as per consumer demand (at BOF Gazipur and DAM) and to uphold their unique value proposition that makes rheir produce different from others.

5. Transportation & logistics

Partnership has been built with transportation and logistics suppliers to ensure cost effective transportation for the G4G farmers and agro entrepremneurs to carry their produce from G4G farming points to desiered destinations and or market places. MOU is attached herewith.

6. **Networking**

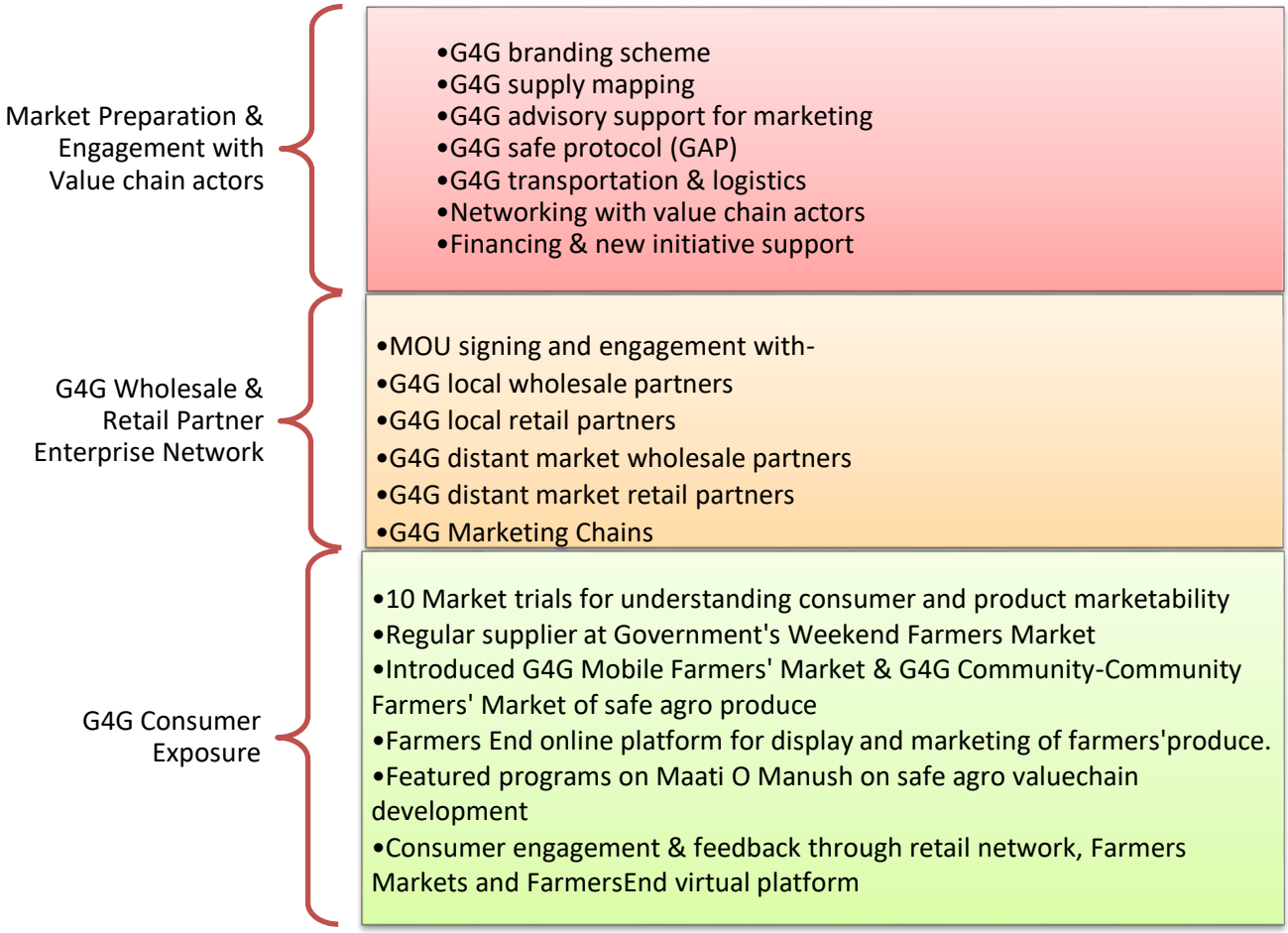
Creating and connecting agro entrepreneurs dealing with safe items. Besides, in order to construct a traceable value chain MoUs have been signed with input, technology and other service providers and is pursued as a continuous process.

7. **Financing**

The project encouraged private investments and financing by G4G farming entrepreneurs and facilitated availing government's matching grant options by G4G Agribusiness Group at field level such as, G4G Kotchadpur installed the hot water treatment plant last mango season. Besides, the project also supported agro entrepreneurs with sustainable financing opportunities in innovative and new initiatives. In this connection, though in a very small scale, angel investors has been arranged for supporting G4G farmers' initiatives such as: Aamader trading platform for selling safe agro produce and investment for new safe mango garden in one of the intervention locations.

II. G4G Wholesale & Retail Partner Engagement Network Building

Moving forward, creation of an evolving G4G wholesale-retail partner enterprise network involving players at the grassroots as well as local and distant markets is an integral part of the model that will allow smooth flow of safe G4G produce along the traceable (using G4G location code and G4G member code attached to the supplies brought to market) value chain. Accordingly, MoUs have been signed with all the partners and a communication and feedback loop has been created accordingly.



III. G4G Consumer Engagement

G4G agro entrepreneurs and farmers participated in 10 different market trials whereby the groups got hands on experience and advisory support while participating at national and international (two International Agriculture Technology exhibitions held at Dhaka including the 8th Agro Tech Bangladesh - 2018 and 9th Agro Tech Bangladesh-2019) level agro fairs and symposiums. In order to understand consumer preference, build awareness and test business viability several such participation in market trials were really helpful for the G4G groups. Such engagement and mentoring support enhanced the capacity and confidence of G4G entrepreneur groups and created a brand image that can be piloted in broader spectrum.

As an outcome of such initiatives, G4G group successfully enlisted their names as proud suppliers of the Government's ***Weekend Farmers' Market*** and snached the interest of many safe food buyers including the secretary of Agriculture and DG DAM as supplier of quality items at the market. Also our most recent sucessful initiatives include ***G4G Mobile Farmers' Market*** & ***G4G Community-Community Farmers' Market*** that in collaboration with DAE, DAM and a2i supplies safe agro produce at different neiche corners of Dhaka city and Gazipur.

Also an online platform for display and marketing of farmers' safe produce has been created. It is now extremely important to build awareness of consumers about the importance of safe food through different means and integrate consumers accordingly. In an effort to bring consumers under G4G

umbrella, consumers are being registered on FarmersEnd platform while communication through other means including contacting them over phone, facebook, e-mail is being pursued as appropriate.

Besides, Maati O Manush featured two separate programs on safe agro value chain and business viability of safe value chains particularly emphasizing mango (as it was captured during mango season but covered the concept of whole initiative of G4G safe and inclusive agribusiness model). Also, Hridoye Maati O Manoosh program of Channel I covered G4G Community Farmers Market initiative at BoF Gazipur where G4G agro entrepreneurs sell their safe vegetables directly to consumers.

However, it is important that we need to put much more effort in the area of consumer awareness building and branding of farmers' safe agro produce at all levels.

Major Building block at the Ecosystem End

In order to have a macro level impact, agriculture and agribusiness ecosystem partners were also integrated. The agribusiness ecosystem actors including NARS institutes, DAE, DAM, LGED, ICT division, the market intermediaries, support industries and all the upstream and downstream market actors that indirectly impacts and contributes towads the safe agro production and marketing activities in numerous ways.

From among them, the project got involved and engaged with local level DAE offices so that in collaboration with G4G Agribusiness Centers, they can oversee and certify the quality aspects of G4G products. DAE officials in every G4G location work in very close cooperation with G4G centers established by the project and the farmers in maintaining safe quality protocols and certifying farmers' produce when they send those to local and distant markets.

Partnership with BARI, the production technology partner, plays a crucial role in addressing farmers' production technology related issues. Jointly BARI and CDCS published safe vegetable production and post harvest management manual (attached with the report) and brought about generic and product specific safe production protocols for easy adoption and adherence by the farmers. Apart form this any technical quarries sought by farmers are forwarded to BARI scientiests in CDCS Farmers Academy panel and upon receiving clarification from them CDCS coveys it to the farmers through ***G4G farmers' facebook group*** or over the phone. Also at regular intervals, BARI tests samples of safe produce that come to different markets under G4G brand name.

In partnership with DAM, CDCS has already started working on initiatives including creation of separate market platforms for safe agro produce at Dhaka city and beyond. ***Weekend Farmers' Market*** and ***Mobile Farmers' Market*** are few such initiatives where G4G farmers bring in their safe produce in bulk amount during the weekend settling first at the Weekend Farmers' market and then getting dispursed at different high demand consumer points around Dhaka city for selling the produce through DAM Operated Mobile Vans. When farmers themselves bring safe product in smaller amount compared to the bulk sales route. In the process, there is a transportation cost that gets added to the production cost of safe items brought under G4G umbrella which needs to be made up from higher sales volume. Though the initiative is very small scale now, eventually in piloting phase, we plan to implement it in larger scale. Mobile farmers market thus is expected to enable farmers to sell in larger volume and in the long run help the farmers create a direct market for safe agro produce through which G4G farmers can sell their produces profitably.

G4G Community Farmers' Market (Farming community to Consuming Community) especially at the present lockdown situation when we have isolated farming communities and consuming communities, has enabled farmer mobility in limited way and contributed positively with much success in ensuring fair price for farmers and safe produce for consumers. G4G Community Farmers' Market connects G4G farming communities in different parts of the country to targeted consuming communities who are in need of perishable supplies. G4G farmers thus are supplying safe vegetables and fruits including tomato, bittergourd, Banana and Mango to G4G Community Farmers' Market at BOF Gazipur. Besides, G4G farmers are also quite active in Weekend Farmers Market operated under the joint initiative of DAM and the Ministry of Agriculture.

The initiative is supported by DAM and a2i while DAE officials are actively involved in G4G locations under the project, in cooperation with G4G Agribusiness centers, overseeing and supporting the farming communities with quality production, handling and marketing. This initiative if scaled and replicated around the country will produce much impact in creating a solid network of farming communities producing and marketing safe produce.

Also DAM and CDCS are pursueing with city corporations as well as with DCs and UNOs in creating green corners for selling safe agro produce seperately in metropolitan cities as well as at different district and upazila levels respectively.

Partnership with a2i is expected to go way beyond, covering digital transformation of G4G farming communities and G4G agro entrepreneurs in the coming days while making them more competitive and technology friendly in order to become profitable in the market as supplier of safe agro produce. On the other hand consumer segment identification, mobilization, awareness building and engagement is another crucial area where CDCS and a2i will jointly work in the coming days. In the process a2i's Union Digital Centers (UDCs) and ekshop platform will be engaged to pursue the safe initiatives outlined above.

Model construct methodology

The Model has been constructed through three broad cycles of experiments:

Experiment Cycle 1: Farmer groups organized, G4G farmers brand created, faremrs identified with individual ID connected with wholesellers and traders at local level and at distant markets and their produce brought to consumer communities through project support directly.

Experiment Cycle 2: Farmer hub based farming enterprises were created that can take care of quality of farmers' agro produce and can organize farmers better. The enterprises were linked with the upstream market i.e. input, agro machinary and other companies while at the forward market, they were tagged to G4G wholesale partners, dedicated shops and community based consumers. Though it could ensure farmers' fair price, it was unable to ensure a sustainable and profitable business because of the small scale of operation and very limited basket of produce offered to consumers.

Experiment Cycle 3: In order to have a more organized, resourceful and structured setting at G4G production hubs, ***G4G Model Agribusiness Centers*** has been established with constant and continued technical and advisory support from CDCS Entrepreneurship Lab. G4G centers connected the farming groups with other backward and forward market stakeholders, estanlished coordination and monitoring for quality control, marketing, technology dissemination and acts as the control point for the hub at the

grassroots. G4G groups are connected with distant market wholesale and retail traders as well as with specialized shops.

Among others, partnership has been made with DAE, DAM and a2i, and discussion started with city corporations and other relevant stakeholders, in order to take the safe marketing initiative to scale. Mapping and executing plans for nation wide replication of the G4G safe inclusive model has been started. G4G participation in DAM's Weekend Farmers' Market, G4G Mobile Farmers' Market targeting prime consumer clusters around Dhaka city are few such steps already taken. The newly launched ***G4G Community Farmers' Market,*** that enables farmers to sell their produce directly by themselves to consumer communities, is a very promising step forward whereby farmers can sell their safe produce even during COVID-19 pandemic situation when otherwise, most of their produce were getting destroyed or being sold at extremely cheap rates at localities. Such Community market initiative will also run quite smoothly even after the pandemic, making a sustainable channel for G4G farmers to pursue.

With entrepreneurship capacity building, digital transformation and networking support from CDCS Entrepreneurship lab G4G group is expected to scale their initiative in collaboration with public and private sector partners in the coming days.

E.3 Results and Benefits

E.3.1 Details of research undertaken by each component organization

<u>Components Completed by BARI</u>

- Stakeholder mobilization workshops
- Baseline survey on production and marketing
- Training on production technology
- Manual preparation for four products
- Distribution of inputs for safe production
- Testing for quality monitoring
- Endline Survey (separate report attached herewith)

<u>Components completed by CDCS</u>

- Research on agribusiness competitiveness and inclusive market development
- Research on Consumer behavior and safe food demand dynamics (separate report attached)
- Stakeholder mobilization workshops
- G4G Group formation in production hubs, Identification of farmers through unique ID
- Product specific and generic (concerning all agro produce) good production and post harvest management practices material development
- CDCS G4G safe protocol development and dissemination

- Market linkage (sensitization and training) workshops for farmers and VCAs
- Market linkage (sensitization and networking) events involving market players including input company reps., agro machinery, packaging, transportation & courier, midea etc)
- G4G Entrepreneurs' Meet
- MoU signing and stakeholder engagement at all levels
    - Agro input companies
    - Agro machinaries and equipments providers
    - Agro entrepreneurs at different hubs
    - Logistics companies
    - Traders (wholesale and retail)
    - Consumer Communities

- Building Safe Brands for Farmers
- Online platforms for communication, technology dissemination and marketing
    - G4G Farmers Facebook Group (Closed group)
    - Farmers End Platform for farmers' produce display and sales
    - Farmers Academy Platform for technology dissemination and knowledge support

- Development and testing of the new inclusive business model at three stages
- Market trials involving G4G agro communities through national, regional and international level fairs (G4G group participated in two International Agriculture Technology exhibitions held at Dhaka including the 8th Agro Tech Bangladesh -2018 and 9th Agro Tech Bangladesh-2019) and community based selling of safe agro produce. More than 10 such market trials took place over the period.
- Handholding support to farmar groups and agro entrepreneurs from CDCS Entrepreneurship Lab at several market trials
- Agro Entrepreneurship advisory support on agro technology and agribusiness competitiveness

- Engagement with facilitation partners:
    - Partnership with DAE and DAE local Offices for market trial, farmers' Safe protocol maintenance support and quality monitoring
    - Partnership with DAM for scaling Farmers' Market initiative
    - Partnership with a2i for innovative initiatives towards safe value chain, agro entrepreneurship development and digital integration at all levels

- Establishment of G4G Model Agribusiness Centers at 6 local production hubs (listed in section E.3.2)
- G4G farmer participation at Weekend Farmers Market
- Launching innovative market initiatives for farmers' safe products:
    - G4G Mobile Farmers' Market
    - G4G Community Farmers' Market
- Capturing the signs of impact in terms of technology adoption, business competitiveness and market activation.

Output of the action research: G4G Model Construction

While working on the inclusive model, different arrangements and combinations were tried out keeping in mind four basic objectives outlined below:

1. Farmers to be able to make higher profit selling safer agro produce
2. Consumers to be able to identify farmers' safe produce as safe and get need based supply
3. Chains to be shortened as much as possible to reduce repeated handling of agro produce
4. All the actors involved in the chain gets some added value/benefit (financial/otherwise) from business point of view for handling safe items.

Keeping all these in perspective, market trial has been given on 4 alternative model arrangements at different scenarios and contexts in different locations. Also over the period of three years, market dynamics has changed and we had to tailor the model addressing changed market realities.

Inclusive Model Experiment Cycle 1

A simplistic version of the model where trained farmers in different locations were brought under the umbrella, provided with unique ID cards and and through traders were asked to send their produces to Dhaka based consumers and institutional buyers. Such arrangement worked for mango during the season and could ensure better price to the farmers. But due to poor scale, that is, small number of sellers involved in selling mangoes to limited number of buyers the overall operation was not found cost effective and sustainable in the long run as a lot of project subsidy was there. Also it did not meet trader interest either who trade in bulk on commission basis.

Also, in order to attain quality, individual level farmer capacity building and qulity control measures are to be enhanced at greater level. In case of selling through institutional retail chains, the project along with farmers had discussion with Sawpno, Meenabazar, CSD, Astha. It was found that due to their unfavourable pricing policies(loss calculation, payment cycle etc.) and handling of unsold amount, farmers finally can not make much profit from such deal and hence were not interested to send their safe produce to retail chains.

Success

- Farmers became identified as individual suppliers to a network and got more organized
- Got first hand exposure to consumer community and their expectations
- Farmers received constant advisory support and hands on training on product quality requirements, marketing, brandiing and selling of safe produce

Problems

- Lack of farmer's capacity in quality control aspects.
- Absence of reliable quality monitoring framework.
- Lack of farmer's exposure to market need or consumer expectation.
- Small scale of operation and limited basket as such not sustainable from profitability point of view
- Unfavourable pricing and handling policies of private institutional buyers and super shops that do not ensure farmers with their expected and fair value share.

Inclusive Model Experiment Cycle 2

In order to address the quality related problems, and to have constant consultation, training and coordination, online platforms including Farmers Academy, G4G facebook group etc. were introduced. Through these and through virtual means (phone call, whatsApp, Viber, Emo etc.) farmers were brought to frequent discussion. For monitoring purposes, CDCS signed MoU with one farming enterprise in each location that is entrusted with the responsibility of monitoring and coordination other farmers in the location. The hub/location based farming enterpreneurs together with farmers got strengthened to produce safe items and coordinate among them accordingly. Also CDCS signed MoU with several private partners including input and agro machinery

On the market end, we started with mango season and arranged several market trials participated by farming entrepreneurs from different locations. These initiatives and small but significant successes were really productive and contributed towards shaping the under standing of an inclusive and sustainable model and actors involved in it along the chain. Though it was relatively easy with mango, it was not at all easy with vegetables which are relatively of low cost and where diversity in the product basket is important when you go to consumers. Hence, it was difficult to persuade traders to accept only few safe vegetable items that meant no good deal on any end (neither buyer nor seller).

Hence, CDCS attracted private investment and expanded the product basket beyond the project limit. We signed MoU with bulk buyers as well as small retailers for selling safe produce both at farming group localities as well as in distant cities including Dhaka. We also continued with community based as well as shop specific selling initiatives while pursuing with individual wholesale and retail trading partners for selling safe produce of the farmer groups. However, though combined efforts from all ends brought about much progress in the safe food initiative, still these were not enough to contribute much to bring about change in the total ecosystem and thus to build a comprehensive model for sustainable safe agriculture in Bangladesh.

Though at the beginning most of the people associated with value chain initiatives thought that only selling safe items to Dhaka or other places would be enough to call it a model, latter on it was quite clear that transformation in the eco system calls for some concerted and comprehensive effort by the value chain actors.

Success

- Farmers got connected through online and virtual platforms for continuous technical and advisory support
- Under G4G brand umbrella farmers, hub based farming enterprises and other value chain actors including input, agro machinery as well as wholesale and retail trading partners in the distant markets got engaged.
- Private investor got involved in procuring safe items from the farmers under G4G brand umbrella making a way to curving some sustainable impact

Problem areas

- Small scale of operation of safe items is not profitable and sustainable in the long run
- Absence of safe certification body
- Fruitful partnership between government and private organizations was not prevalent yet

Inclusive Model Experiment Cycle 3

Adressing all the shortcommings, and based on discussion and work with different segments of stakeholders along the agro value chains, we finally streamlined all major segments of stakeholders in order to have a sustainable impact:

G4G Model Agribusiness Centers (Farming enterprises): Hub based G4G Model Agribusiness Centers (G4G MAC) were formed that are run by a MANCOM selected from G4G Farming Enterprises and beyond. G4G Centers work very closely with the farmers in the community as well as its value chain partners that includes G4G partner Input Companies (Ispahani, Lalteer, Partex Agro, etc), Farm mechanization (Janata Engeeneering…), G4G logistics Partners, G4G Knowledge & Technology Partners (BARI, CDCS..) and G4G Monitoring and Quality Control partners (DAE, CDCS, BARI)

1. G4G MAC at Kotchadpur Jhinaidah
2. G4G MAC at Bagerhat
3. G4G MAC at Jessore
4. G4G MAC at Bogra
5. G4G MAC at Rajshahi

These centers are established at the physical premises of the G4G enterprises at different hubs.

1. **G4G Input, Machinary and logistics partners:** These are primarily both public and private sector organizations including input sellers like Ispahani agro, Lal teer, Partex agro etc, Janata engeeneering(agro machinery), Vector Power (solar) etc. Besides, a2i and DAM are also supporting G4G Agribusiness Group in its Community Farmers' Market and Mobile Farmers' Market initiatives. Community based transportation partners are there from whom G4G farmers hire transportation as needed at reasonable cost. Two of the locations has been activated in this manner.

2. **G4G Wholesale and Retail partners:** These are all the individual and organizational partners at the market end dealing with safe agro produce from G4G community.

3. **G4G Facilitators (GO & INGO):** In order to have a sustainable impact, CDCS made partnership with several facilitating organizations including DAM, Local level DAE Offices, a2i. Partnership with local DAE offices is particularly important on the ground that they do the monitoring and local level safe certification part for the farmers under safe production initiative. DAE officers along with G4G enterprises closely monitor and follow up on the farmers and agro entrepreneurs whether they are following G4G safe protocols at different stages. Accordingly, DAE officers issues letters mentioning that farmer undersigned is following safe protocols. This is a temporary solution to safe certification of farmers' safe agro produce. The project plans to pursue the proper certification option in the piloting phase.

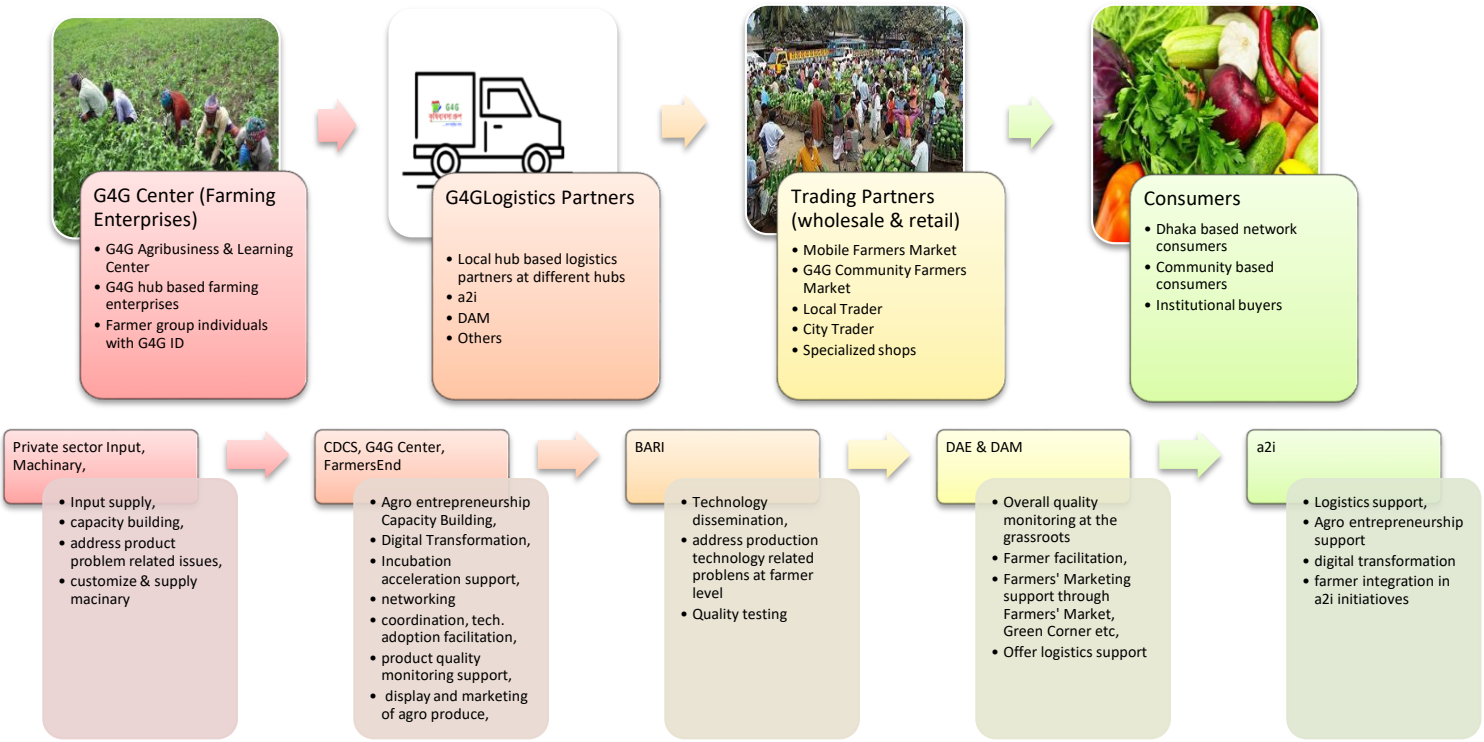
   The Weekend Farmers' Market initiative by DAM, and the DAM-CDCS Mobile Farmers' Market initiative facilitates the marketing of safe agro produce brought to Dhaka Market by G4G farmer groups. Alao, an extremely successful G4G Community Farmers Market is run at BOF Gazipur that started amidst the very challenging initial days of COVID 19 pandemic when all logistics movements and farmers' sales were slashed down since April. It has been possible for the fasilitation and support from Bangladesh Ordinance Factory, Gazipur that caters to around 1500 families inside its premises. Besides, ekshop of a2i and similar other initiatives will have safe agro supplies from G4G farmer groups in the coming days. Farmers' Greencorner initiative will start very soon where DAM and CDCS will work together to create safe agro produce sales corners run by farmers and agro entrepreneurs at district and union levels.

4. **G4G online Platforms:** ***FarmersEnd***, an online platform for display and sales of G4G Farmers' agro produce will give farmers an opportunity to display their agro produce highliting the features of safe items and eventually deliver those to consumers through sustainable channels. Besides, we have enabled virtual capacity building, coordination and monitoring platforms. ***G4G Farmers' Facebook Group, Farmers Academy*** and other platforms have been deployed for constantly offering advisory support through krishiadda, facebook based communication and communication through viber, whatsapp, messenger and communication over the phone. Such coordination is availed multiple ways among farmers, agroentrepreneurs and CDCS Entrepreneurship lab. However, to reap maximum benefit from the online platforms the project needs to build ICT capacity of G4G farmers and agro entrepreneurs, enable and engage market actors and important stakeholders, include more locations under G4G initiative and in piloting phase so that economy of scale can be attained.

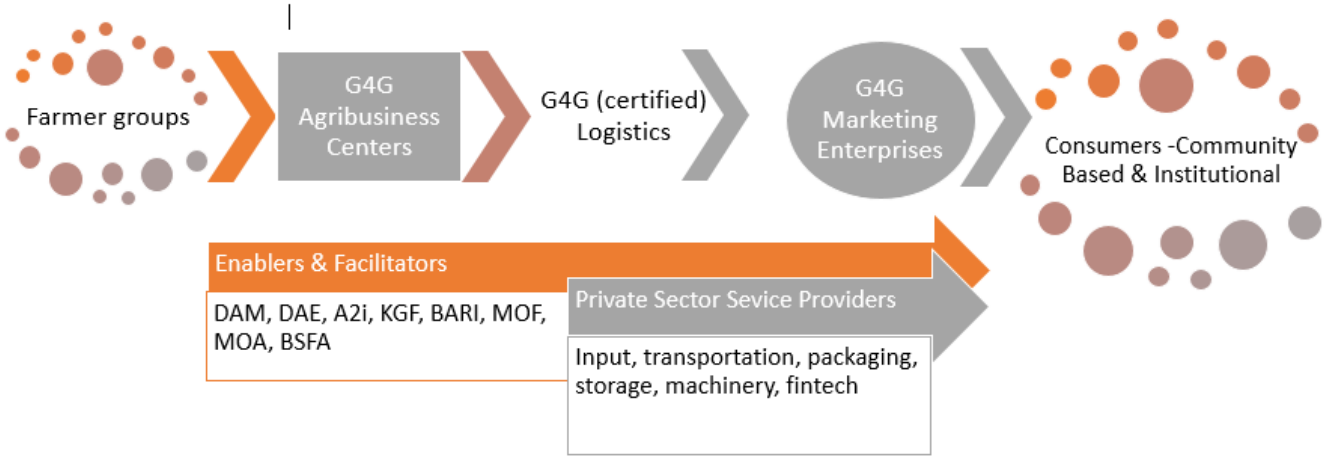
5. **G4G Network consumer bases:** An ever evolving group of community based consumers and consumers along G4G network has been brought under one umbrella and will continue to grow as G4G operation starts in full swing once it enters the scale up phase in piloting the model. Besides individual networks, CDCS partnerships with DAM, a2i and other such facilitating organizations are expected to help G4G farming communities work together in finding new consumer bases such as the mobile farmers markets, G4G community farmers market and thereby making their operations sustainable.

   Connecting all the players and platforms described above the inclusive model for safe agro value chain has been completed. Though the model will have minor customization addressing different agro produces and different dynamics at fields, acoross the agro value chains this model can be applied and replicated.

G4G Inclusive Agribusiness Model- Experiment Cycle 3

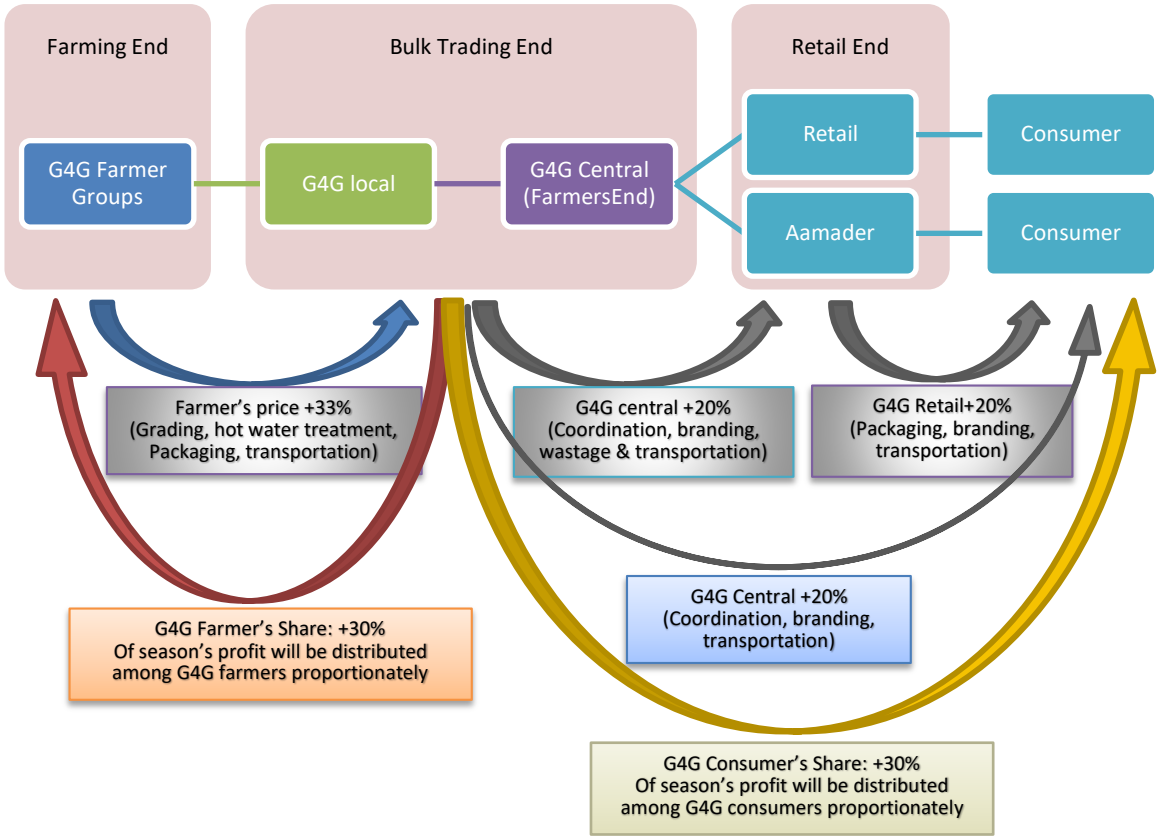


G4G Inclusive Agribusiness Model



Thus the G4G Inclusive Agribusiness Model for safe agroproduce starts with G4G registered farmers in the hubs with G4G Farming enterprises as their coordinating members. G4G Agribusiness Centers have been established at the farming hubs that are taken care of by the G4G Farming Enterprises. These G4G farming enterprises coordinate with input, machinery and other partners along the chain as and when necessary. At the local level the G4G groups are connected with DAE and other local level stakeholders and recognized as safe agro producer. However, the farming enterprises pursue different routs as deemed appropriate. They are already linked to G4G city wholesellers/trading enterprises, to G4G Community Farmers Markets, Weekend Farmers Market, Mobile Farmers Market and also G4G Network Consumers. They are also connected at their old channels with the regional and locat market players. The group members receive advisory services and incubation support on a constant basis from CDCS Entrepreneurship Lab. They are connected through online platforms, offline group accounts or over the phones. Thus it is evident that with larger scale the endeavors are going to be more profitable and sustainable.

G4G Value Distribution Model



According to G4G pricing model, Farmers charge for produce at their local market price plus up to 10-33% of cost depending on activities undertaken including grading sorting, postharvest treatments (as applicable), packaging and transportation etc. and transport it to G4G local or central enterprise level at local hubs or in Dhaka market respectively. At G4G Central up to 25% premium is added to cover admin, coordination and branding as well as for wastage, transportation and handling. In order to supply G4G produce through retail network up to 20% premium is added to G4G central price while B2B or B2C consumers (anyone or entity ordering in crates of 20kg) can directly buy from G4G central at retail price.

We plan to have this working as the online platform stars working in full swing at piloting stage with many more suppliers supplying and selling safe agro produce and many registered consumers buying through FarmersEnd platform. The innovation here is that, at the end of each season both participating G4G farmers and registered consumers will receive share of profit as available from G4G central premium proportionately. However for consumers the form of value share may be gift voucher or points that a consumer can utilize for buying G4G produce in his/her future prchass.

E.3.2 Objective-wise activities resulting in specific output(s)

Specific Project Objective(s)	Planned activities performed against each objective	State progress made clearly during the reporting period against each activity	Outputs/ results achieved during this period
To assess the current agriculture and agribusiness scenario with particular reference to selected fruits and vegetables	Mobilization & orientation • Resource mobilization • Recruitment and selection • Project team orientation meeting • Site & audience selection • Orientation meetings with selected audience	• Team orientation & mobilization (Completed, CDCS) • Intervention locations and potential audience groups identified (Competed, BARI-CDCS)	Team mobilized, locations finalized
	✓ Inception presentation preparation and planning,	✓ Inception report & presentations made, feedback incorporated and intervention plan finalized (Completed, BARI-CDCS)	Plan finalized with input from all
	• Stakeholder orientation and sensitization meetings with selected audience (farmers and other VCA) • Preliminary farmer & trader identification and listing	• Location specific stakeholder sensitization meetings organized involving different levels of stakeholders relevant to agriculture and agribusiness ecosystem in the community. (Completed, BARI-CDCS) • Preliminary farmer- trader list (completed, BARI-CDCS)	Stakeholders sensitized & faremrtrader list finalized
	✓ Baseline questionnaire development & pre-testing ✓ Baseline indicators measurement, analysis & reporting	✓ Questionnaires/guidelines developed (Completed, BARI-CDCS) ✓ Baseline report prepared (production & marketing) (BARI)	Baseline report done on production and marketing aspects
	• Assessment of current agriculture and agribusiness scenario ✓ Research on agribusiness ecosystem and competitiveness dynamics ✓ Consumer behavior survey (CDCS) ✓ Discussion with institutional buyers and local traders (CDCS) ✓ KAP study for farmers (CDCS) Secondary Literature review • Agri production tehnology (BARI) • Agribusiness Competitiveness (CDCS) • Agriculture & Agribusiness technology (CDCS)	• Report on agribusiness ecosystem and competitiveness dynamics prepared (CDCS) • Consumer behavior Survey Report completed (CDCS)	Reports on agribusiness ecosystem & consumer behavior

	✓ Stakeholder engagement workshop series on agribusiness competitiveness involving different levels of stakeholders and market actors (CDCS)	✓ Report on Stakeholder engagement workshop series o Input company o Packaging and support o Logistics o Agro machinery o Agro financing o Wholesale o Retail chains etc.	Stakeholder engagement workshop report
- To disseminate existing technologies and build capacity in safer food production and good postharvest practices and marketing	o Technology training manual publication and printing (on all items including Mango, Banana, Bittergourd and Tomato) (BARI-CDCS) o Audience specific training material development (BARI CDCS) ✓ Presentation on Production & postharvest technology (BARI) ✓ Presentation & flipcharts on Good Postharvest Practices **- GPP 7** (CDCS) ✓ Safe production and agro entrepreneurship Protocols (CDCS)	✓ Production & post-harvest training manual/booklet (BARI-CDCS) ✓ Presentation on Production & postharvest technology (BARI) ✓ Presentation on G4G Agribusiness group formation, mobilization and online engagement with FarmersEnd platform(CDCS) ✓ Product specific ***GPP7***, ✓ Protocol development: 10 points for Safe Agro Management Protocol ***(SAMP10)*** ✓ New & existing good technologies dissemination and ***Farmers Academy Prescription*** generation for G4G farming communities ✓ Farmer friendly Business Model Canvas ***(BMC-F)*** development ✓ Promotional material development for ***FArmersEnd brand*** – an authentic brand connecting farmer's with consumers	Manual Presentations & Flipcharts GPP7, SAMP10, Farmers Academy Prescriptions, BMC-F, FarmersEnd branding leaflets and banners etc.(CDCS)
-To orient farmers and VCAs in safer food production and good postharvest management practices	o Training and capacity building events for farmers & traders (BARI) o Formation & Engagement of G4G Agribusiness Group for Market linkage, knowledge dissemination and traceability (formation & training) workshop series (CDCS) • Providing farmers with knowledge based solutions both in the areas of cultivation, harvesting, postharvest management, business planning and marketing etc.(CDCS)	✓ Farmer & trader training report (BARI) ✓ Formation, mobilization and Engagement workshop report and followup mechanism (CDCS) • Orientation on Safe Agro Management Protocol (SAMP10) and distribution at all G4G Hubs • Farmer friendly Business Model Canvas (BMC-F) was introduced at field level through Krishi Adda • G4G groups are serverd through G4G facebook group, online krishiadda, facebook live and Farmers Academy online platform.	Training report G4G groups G4G unique ID Krishiaddas and followup mechanism (CDCS)

		Problem specific prescriptions are posted on facebook group or communicated over phone after CDCS Online KrishiAdda	
	• Market linkage sensitization & engagement events (CDCS)	• Separate stakeholder engagement events held to sensitize market players including o upstream, o downstream, o transportation, o packaging, o midea & communication, o public agencies o financing and o other support organizations.	Workshops and engagements
	• Market trials held during different events in order to provide faremrs and agroentrepreneurs an opportunity to meet consumers and understand their perspectives and expectations.	• G4G farmers and agro entrepreneurs participated in six different such programs successfully displaying and selling their safe produce: o Mkt Tr1: Seasonal fair at DU club o Mkt Tr2: Month long stall at DU club o Mkt Tr3: National fruit fair 2018 o Mkt Tr4: National vegetable fair 2019 o Mkt Tr5: National Safe food day fair2019 o Mkt Tr6: National Agro tech fair 2019	G4G monthly reports and pictures
	• Input & technology promotion in G4G hubs (BARI)	• Product specific quality input and good production technologies were promoted among the member farmers and traders in each G4G hub (6 locations)	Input distribution checklist (BARI)
	• Labtesting of farmers' & traders' produce (BARI)	• Labtests were done on mango,bittergourd and banana	Lab test reports (BARI)
To craft, pilot and validate inclusive business model(s) for production and marketing of	• Designing an inclusive market development business model involving agro-SMEs (CDCS) o Market trial of G4G safe produce through Farmers	• Preperation of the product supply map and movement map showing availability of produce and routs/transportation alternatives in drawing an outline of the inclusive business model(CDCS) o Market trial done of G4G produce through Farmers End platform at different	Monthly reports Online G4G Agribusiness group, Farmers End platform

safe fruits and vegetables by smallholder farmers (or agro-MSMEs) through incubation support to agro entrepreneurs	End safe platform at several different points ○ Engagement meetings with relevant stakeholders	communities, national and international fairs and other market chains. ○ Several engagement meetings completed with potential stakeholders at different industries ○ input, ○ agro machinery, ○ logistics, ○ agro trading (wholesale and retail)	
	• Fine tuning and activating online e-commerce and other platforms to run the model (CDCS) ○ Designing the Farmers End platform ○ Rintroducing the Farmers Academy knowledge sharing platform ○ Formed facebook group of farmers & traders in G4G	E-commerce and knowledge sharing platforms used to activate G4G groups and provide need based support accordingly (CDCS) • Communication and information support through G4G Agribusiness Group (facebook group) • Marketing and promotion support through FarmersEnd e-commerce engagement platform • Information and networking support through Farmers Academy knowledge shring website and facebook page for all • Aamader online platform for consumer networking and promotion support for G4G agribusiness groups.	Online G4G Agribusiness group, Farmers End platform
	• Brands created	• Different brands has been created as follows- ○ G4G Agribusiness group encompassing farmers and agroentrepreneurs ○ FarmersEnd product Marketing brand ○ Aamader Retail Marketing brand	Brands
	• Stakeholder Engagement drive & Testing model through different events and activities(CDCS)	• Engagement (MoU signing) with retail partner Aamader • Engagement with 5 whole sale partners at different markets • Engagement with 6 retail partners at different retail points within Dhaka city • Engagement with distant local retail partners at and around G4G hubs for branding and marketing safe	MoU with different stakehoders along the valuechain (CDCS) Stakeholder Engagement report

		G4G produce through partner enterprises	
	• Engagement with facilitating organizations that includes government organizations and INGO partner(a2i) engaged	• Engagement established with o Department of Agricultural Extension and its local level DAE offices, o Department of Agricultural Marketing and o a2i o Discussion going on with City corporations and district/union levels	MoUs and correncepon dence notes
	• CDCS Entrepreneurship Lab –an entrepreneurship support initiative of CDCS offers enterprise competitiveness advisory support on agro technology and agri business competitiveness to G4G farmers (CDCS) o Machine readable bar coaded ID card for farmers & traders of G4G group o Engagement through facebook group of G4G Agribusiness group members (closed group) o Online krishiadda series & communication with groups at different locations o Engagement with Farmers end and Farmers Academy platform	Through CDCS Entrepreneurship Lab, a framework for enterprise support on agro technology and agri business competitiveness has been established which is pursuing the following activities (CDCS) • Ensuring traceability and constant direct communication through G4G enterprises and G4G MAC at different locations • DAE officials at G4G hubs are engaged in quality monitoring and technology adaptation (they provide certificates to farmers who produce safe items) • Advisory services offered through direct communication and G4G Agribusiness facebook group (closed group) • Weekly Online krishiadda series, communication & follow-up are done with G4G sub-groups at different locations • Farmer friendly Business Model Canvas (BMC-F) was introduced at field level through Krishi Adda different parts of which is being implemented through handholding support fron CDCS Entrepreneurship Lab • G4G groups were served with need based Farmers Academy Prescriptions through CDCS Online KrishiAdda and beyond • G4G enterprise provided with a quality monitoring(for G4G farmer	G4G Model Agribusiness Centers at different hubs and coordinating, technology transfer, marketing, quality monitoring and followup systems established

	• • G4G Model Agribusiness Centers (G4G MAC) has been established at 7 local grassroot hubs; creating a one stop coordination and facilitation point for G4G farming communities • Farmers Market Initiatives Launched and pursued that needs to be multiplied in coming days for nationwide coverage	group) and supply chain management framework • G4G MAC and the enterprises responsible at different hubs are provided with a quality monitoring(for G4G farmer groups) and supply chain management framework • G4G Model Agribusiness Centers (G4G MAC) have been established in local grassroot hubs. These are physical places in grassroot locations with virtual connectivity with CDCS Entrepreneurship Lab.: • G4G MAC at Kotchadpur Jhinaidah • G4G MAC at Bagerhat • G4G MAC at Jessore • G4G MAC at Bogra • G4G MAC at Rajshahi • Farmers markets for Safe Produce - Launching done • Safe ***Mobile Farmers Market*** operation during weekends in prominent consumer locations in Dhaka City • Safe ***Community Farmers Market*** operation is going on connecting G4G farming communities and Consuming communities • G4G group is also taking part in DAM's ***Weekend Farmers' Market***	G4G MAC at different locations Farmers Market operations
To asses the signs of impact	Monitoring & evaluation (BARI-CDCS) • Half yearly, Annual and Project Completion rports (BARI-CDCS) • End line survey	• Half yearly rport (BARI-CDCS) • Annual report (BARI-CDCS) • Early signs of impact (BARI-CDCS) • Project Completion Report (BARI-CDCS)	Reports

G4G Farmers in different locations:

G4G Bogra Tomato

G4G Rajshahi, Mango

G4G Jhinaidah, Banana

G4G Kotchadpur, Mango

G4G Jessore, Bittergourd

G4G Bagerhat, Bittergourd

G4G Hobiganj, Tomato and Bittergourd

G4G Kotchadpur, Hot Water Treatment Plant

E 3.3 Outputs/Results

- **Agribusiness ecosystem dynamics & consumer beghavior map:** As an outpt of our rapid market assessments, the competitiveness dynamics on the agribusiness ecosystem and consumer behavior map has been layed out. The important aspects of the agri business ecosystem and comprehensive understanding of the highly complicated industry structure and complex value chain dynamics, including market governance and power relationships has been analysed and presented in the report on Agribusiness ecosystem while the consumer behavior map outlines consumer's perception, expectations, buying preferences and overall attributes and factors impating consumer behavior towards safe food.

- **G4G Safe Protocols & Manuals:** Manuals and learning materials on safe cultivation technologies and market responsive good post harvest management practices has been produced, validated and introduced among G4G group members. Protocols include among others product specific GPP7 s, G4G ten points, G4G quality control protocol etc. The protocols have been validated by concerned authorities at BARI and KGF.

- **G4G Enterprise Engagement**: Market responsive engagement models involving producers, valuechain actors as well as consumers and institutional buyers has been formed and MoU signing process among the members started.

- **G4G Model Agribusiness Center establishment**: G4G MAC (model agribusiness center) has been established as an outcome of the overall safe value chain intervention started. The centers are housed at CDCS G4G enterprises at each farmer location. G4G centers has connected the farming groups with other backward and forward market stakeholders, estanlished coordination and monitoring for quality control, marketing, technology dissemination and acts as the control point for the hub at the grassroots. G4G groups are connected with distant market wholesale and retail traders as well as with specialized shops and other markets through the G4G MAC. G4G MAC works as a coordination and meeting point for all G4G farmers and stakeholders with active support from CDCS Entrepreneurship Lab.

- **G4G Communication & Knowledge sharing**: Effective mechanisms established to stay connected at all levels to ensure the sharing of knowledge, information and experiences. The mechanisms include among others direct field visits, over phone communication, posting on G4G facebook group, Farmers Academy, Farmers End websites etc.

- **G4G Entrepreneurship Incubation**: As part of G4G entrepreneurship incubation support, farmers and more importantly agro entrepreneurs in every hub receives agro entrepreneurship incubation and advisory support on a continuous basis. These G4G agroentrepreneurs then make necessary arrangements for market trials and sales initiatives. Thus interested G4G individuals and or groups are provided with incubation support for attending and pursuing different market trials and sales initiatives.

- **Greater awareness among G4G farming communities built:**Higher level of knowledge has been attained on benefit of fruit bagging, packaging and post-harvest loss reduction measures. Medium to high level of knowledge has been achieved by the respondent farmers on beneficial insects, appropriate dose of pesticides and fertilizers in fruits and vegetables production. However, medium level of understanding has been stated by some farmers regarding identification of diseases and adulterated pesticides (Table 2).

Table E.1. Comparative status of farmer's knowledge or understanding

Particulars	Before training	After training
1. Awareness on safe food production	Low	Medium to high
2. Knowledge of beneficial insects	Very low	Medium to high
3. Knowledge on identification of diseases	Very low	Medium
4. Knowledge on proper dose of pesticides	Low	Medium to high
5. Knowledge on identification of adulterated pesticides	Very low	Medium
7. Determination of proper fertilizer dose	Low	Medium to high
6. Knowledge on benefit of fruit bagging	Unknown	Very high
8. Knowledge on proper packaging	Low	High
9. Knowledge on post-harvest loss reduction measures	Medium	High
10. Receiving premium price for safe produce	Not received	Received to some extent

Source: FGD (2020)

- **G4G Farmer-Consumer Inclusive model building**: Inclusive model has been created to facilitate the production, marketing and sales of safe agro produce and enhance value for all relevant stakeholders along the value chains. Under the model G4G Farmers and agro entrepreneurs are selling their safe products through three innovative avenues apart from safe wholesale and retail channels. These are:
    - Weekend Farmers Market
    - G4G Mobile Farmers Market and
    - G4G Community Farmers Market

Under G4G inclusive model, G4G farmers are connected with backward market players in one hand and forward market players on the other. They are connected through online platforms for technology support, networking and capacity building. G4G group members also get entreprise incubation and advisory support on an ongoing basis through CDCS entrepreneurship lab.

G4G Mobile Farmers Market Launching in cooperation with DAM

G4G Community Farmers Market at Bangladesh Ordinance Factory, Gazipur

G4G group at Weekend Farmers Market, Dhaka

E.3.4 Benefit/Outcome

- **Impact on Post-harvest Loss Reduction at Farm Level:** Majority of the G4G farmers reported that, at farm level, the rate of post-harvest loss has come down. This is due to the adoption of G4G quality control protocols as well as good post harvest practices (GPP7).

  In case of tomato and bitter gourd, presently post harvest loss is only 2-3 kg per maund while previously it was 4-5 kg per maund. Mango producers also reported a good reduction of post harvest loss due to better garden management and cleanliness protocol, good harvesting, grading-sorting and handling practices as well as introduction of hot water treatment which is a new technology they adopted under the project. Also for transportation G4G farmers use only plastic crates that helps keep the quality intact. Hence, in case of mango, post harvest loss has come down to 5-6% from 10-12%. Thus there is almost 50% reduction in overall postharvest loss over the years.

- **Change in G4G farming and postharvest management practice**: Farmers & traders are aware of pre and postharvest technologies and has started following good practices outlined in the G4G Protocols. Presently, G4G farmers are doing chemical treatment before sowing seeds of vegetables including tomato and bitter gourd. They using maximum organic fertilizers compared to the past when they used huge amount of in-organic fertilizers in vegetables cultivation. The scenario has changed sharply due to their greater awareness.

  G4G farmers apply IPM technology for producing fruits and vegetables which is a big shift from earlier practices. The mango farmers of Rajshahi (Baneshwar) and Jashore (Kotchadpur) opined that they apply pesticides 2-3 times per season which was 6-8 times per season earlier. Also, they are using mango bagging technology for select mango varieties and synthetic poly bags in banana at Kotchadpur and Jhinaidah during winter (at kotchadpur and in by select few farmers in Hatgopalpur) to protect it from insect-pest infestation. This result is quite comparable with the study conducted by Miah and Hoq (2018).

  However, in case of banana, our G4G farmers from Kotchadpur suggest that banana bags bring good results if they use it during winter. According to our farmer groups, use of poly bags during summer does not bring good result as it creates huge heat inside and hampers banana growth. (CDCS Entrepreneurship lab report, 2019).

  According to the G4G farmers, use of appropriate tools, ringt timing, proper maturity stage, good collection container, grading sorting mats, cleanliness of all the items and handling precautions are crucial for safe harvesting and good post harvest management of agro produces in order to attain the desired quality expected by consumers. Groups are much more careful now in maintaining all these protocols following CDCS GPP7 and other relevant guidelines.

Table E.2. Pre-harvest and post-harvest activities taken by respondent farmers after receiving training on safe food production and marketing

Pre- and post-harvest activity	Actions taken before training	Actions taken after training			
		Fruits		Vegetables	
		Mango	Banana	Tomato	Bitter gourd
Seed treatment	Not done	Not done	Not done	Done	Done
Fertilization	Use in-organic & organic fertilizers	Use in-organic & organic fertilizers	Use in-organic & organic fertilizers	Use much organic fertilizers	Use much organic fertilizers
Crop protection	Use plenty of pesticides	Use pheromone trap, bagging, less pesticides	Use less pesticides, Bagging,	Use less pesticides, Pheromone trap	Use less pesticides, Pheromone trap
Crop harvest	Apply traditional method	Use *Tusi*, hand picking, keep on plastic sheet or jute sac	Apply traditional method	Hand picking, keep on plastic sheet or jute sac	Hand picking, keep on plastic sheet or jute sac
Grading	Not graded	Graded	Graded	Graded	Graded
Packaging and transportation	Jute sac, bamboo basket, traditional method	Plastic karate	Traditional method	Plastic karate	Plastic karate

Source: FGD (2020)

Good packaging is extremely important for maintaining product quality, to transport to distant places, and to reduce postharvest losses. As such, G4G farmers mostly use plastic crates and cartoon boxes for packaging purposes.

- **Demonstration Effect of the Capacity building Programs**

It is observed that there is a demonstration effect of the capacity building program that held in three forms.

1. Formal and delivered once at the begining: Day long training at the onset in formal environment jointly offered by BARI and CDCS
2. Continuously delivered throughout the period: Enterprise advisory support on technology and business competitiveness offered online/ through field visits/ over the phone constantly on an ongoing basis throughout the period of intervention
3. Event based support: Handholding support to G4G agro entrepreneurs during several market trials

Such rigorous and multi layered capacity building support for G4G farming communities created much impact in most of the intervention locations. G4G team claimed that many non G4G farmers in the community who did not participate in the training program at the beginning also has started following G4G safe production and handling protocols in order to attain benefits.

- **Financial Benefit of the Farmers**

G4G farmers who received advisory support all through and produced fruits and vegetables following the scientific safe cultivation methods and G4G safe production and agro management protocols could reduce a substantial amount of cost in production and received higher return in exchange (Table E 3).

- **Productivity and profitability of vegetables**

Tomato: The cost of production of safe tomato (variety: *Minto*) under improved practices is estimated at Tk. 191612 per hectare which is 16.3% lower than the production cost incurred under traditional cultivation practice. G4G farmers could lower production cost by using less chemical fertilizers and pesticides.

Also, they could sell safe tomatos in 25% higher price. Thus on an average they received about 14.6% and 22.9% higher gross and net return from safe tomato sales respectively, although it produced 8.3% lower yield (Table 3). Most safe tomato producers could sell their produce to terminal markets (Dhaka, Gazipur) through middleman traders (*Bepari*) in the early stage of production and regional markets (Bogura, Rajshahi) in the middle and later stage of production.

Bitter gourd: In case of bitter gourd, the cost of safe production under improved practices is Tk. 200594 per hectare (approx.) which is 7.9% lower than the production cost under traditional method. G4G farmers could also save this amount by using natural fertilizer, vermicompost, and pheromone trap instead of chemical fertilizer and pesticides. Thus, though safe bittergourds did not fetch higher price in the market, the cost saving from lower costs in input use resulted in 3.4% higher net return for G4G farmers.

Table E.3. Comparative scenario of costs and returns of vegetable production

Cost and return	Tomato (Tk/ha)		Bitter gourd (Tk/ha)	
	Traditional practice	Improved practice	Traditional practice	Improved practice
A. Cost of production	**229036**	**191612 (-16.3)**	**217809**	**200594 (-7.9)**
Land preparation	11976	11976	13473	13473
Human labour	33682	33682	52394	52394
Seed/seedling	11227	11227	6736	6736
Weeding	31436	31436	31436	31436
Manure & fertilizer	56136	44909 (-19.9)	48652	43412 (-10.7)
Irrigation	28442	28442	8982	8982
Pesticides/Pheromone trap	29939	3742 (-87.5)	18712	6736 (-64.0)
Land use cost	26197	26197	37424	37424
B. Gross return	**1077818**	**1235000 (14.6)**	**718545**	**718545**
Production (kg)	53891	49400 (-8.3)	35927	35927
Price (Tk/kg)	20	25 (25.0)	20	20
C. Net return (B-A)	**848782**	**1043388 (22.9)**	**500736**	**517952 (3.4)**

Source: FGD (2020)

Note: Figures in the parentheses indicate percent increase (+) or decrease (-) over before practice

- **Productivity and profitability of fruits**

MangoG4G farmers incur (39.5%) higher average cost at production stage compared to cost incurred under traditional practice. This cost includes the cost of bagging which is the most expensive one to bear and farmers use bagging technology selectively targeting a specific group of customers. G4G farmers apply less pesticides, use pheromone traps, and selectively used mango bags (for covering mango) in order to protect mango from insect-pest infestation. Irrigation, fertilization and labor cost is also higher in this case.

Though the average yield is almorst the same, farmers get higher price for mango under bagging technology. Also G4G farmers apply hot water treatment for mango that increases the shelf life, gives the fruit a brighter clean look and fetches higher price. Thus on an average, G4G farmers make approximately 20.8% higher return and make 21% more profit compared to the ones folloing traditional production and post harvest practices.

Table E. 4. Comparative scenario of costs and returns of fruit production

Cost and return	Mango (Tk/ha)		Banana (Tk/ha)	
	Traditional practice	Improved practice	Traditional practice	Improved practice
A. Cost of production	**214067**	**298645 (39.5)**	**247,000**	**249245 (0.9)**
Land preparation	7485	7485	7,485	7485
Human labour	59879	74848 (25.0)	56,136	48652 (-13.3)
Sucker			14,970	14970
Manure & fertilizer	18712	22455 (20.0)	52,394	52394
Irrigation	4491	7485 (66.67)	37,424	37424
Pesticides, pheromone & bagging	48652	111524 (129.2)	3,742	13473 (260)
Land use cost	74848	74848	74,848	74848
B. Gross return	**1347273**	**1670992 (20.8)**	**703,576**	**729960 (3.7)**
Production without bagging (kg)	53891	42664	35,179	8795
Production with bagging (kg)	-	14221	-	26384
Price of normal fruit (Tk/kg)	25	25	20	20
Price of bagging fruit (Tk/kg)	-	42.5	-	21
C. Net return (B-A)	**1133206**	**1372347 (21.1)**	**456,576**	**480714 (5.3)**

Source: FGD (2020)

Note: *Figures in the parentheses indicate percent increase (+) or decrease (-) over before practice*
Fruit variety = Asshina (mango) & Sabri (banana); No. of fruit tree/sucker per bigha = 20 Nos. (mango) & 350 Nos. (banana); bagging of fruit 25% (mango) & 75% (banana), Average weight of mango = 1 kg/piece, Price of bag = Tk.6.0 (mango) & Tk.5.0 (banana) per bag,

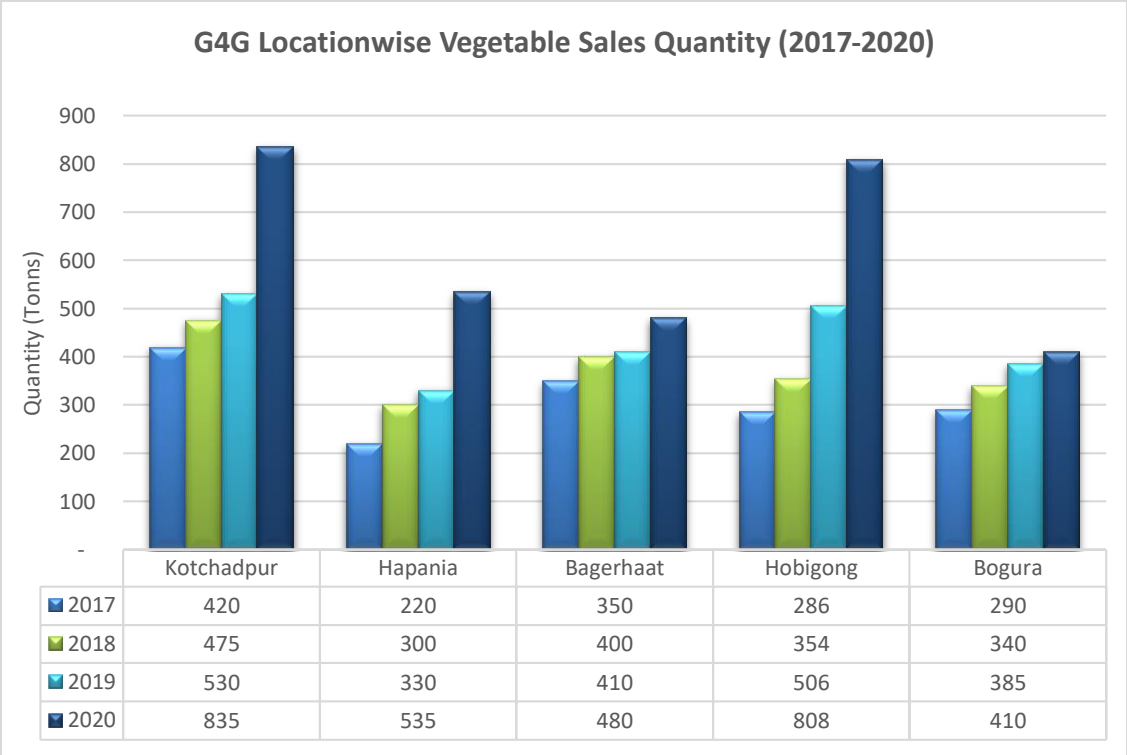
Banana

G4G farmers use less pesticide but pheromone trap and poly bag covers to save it from insect infestation during winter. Thus production cost difference is not much while net return is around 5.3% higher than that earned through traditional practices. However, yield difference between two practices is not much either. Thus the extra profit primarily comes from higher price of bagged banana that looks fresh and spotless.

Thus the intervention has impacted farmers by raising their net return in the range of 23% to 5% based on different agro produces and specific technologies adopted by G4G farmers.

G4G Safe Produce Sales over the years:

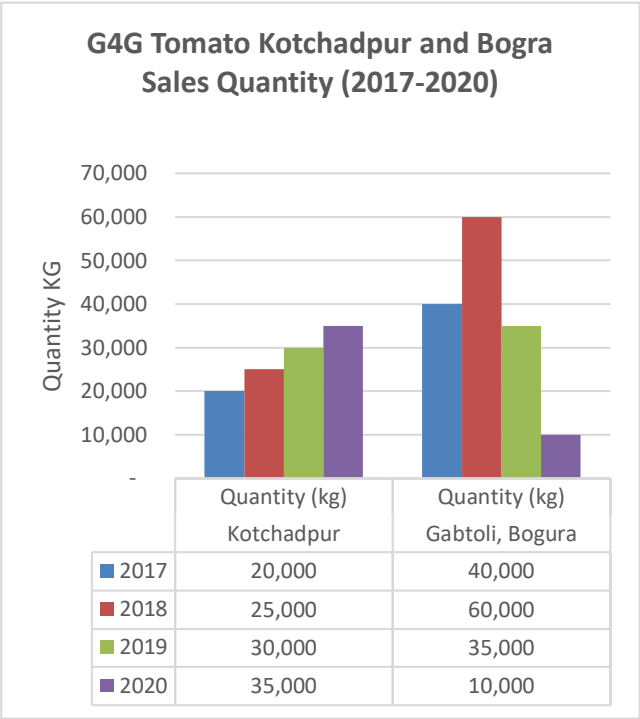
Over the years, farmer groups in all the G4G locations have been producing safe vegetables (all that they produce safe) as presented in the graph below. Though they have been using one or two safe methods, their practice was not consistant as there was no particular market for safe items nor there was any monitoring structure to certify those produce as safe. With the advent of G4G initiative in the locations farmers started getting confidence and maintaining quality control parameters consistently. In all the locations we find that sales of safe vegetables has increased over the years. Among them G4G Kotchadpur and G4G Hobiganj are participating in the newly created G4G market channels while others mostly sell through regional channels as well as at local levels. Thus there is huge potential that G4G farmer groups sell all their safe produce through safe channels and make higher profits in the long run.

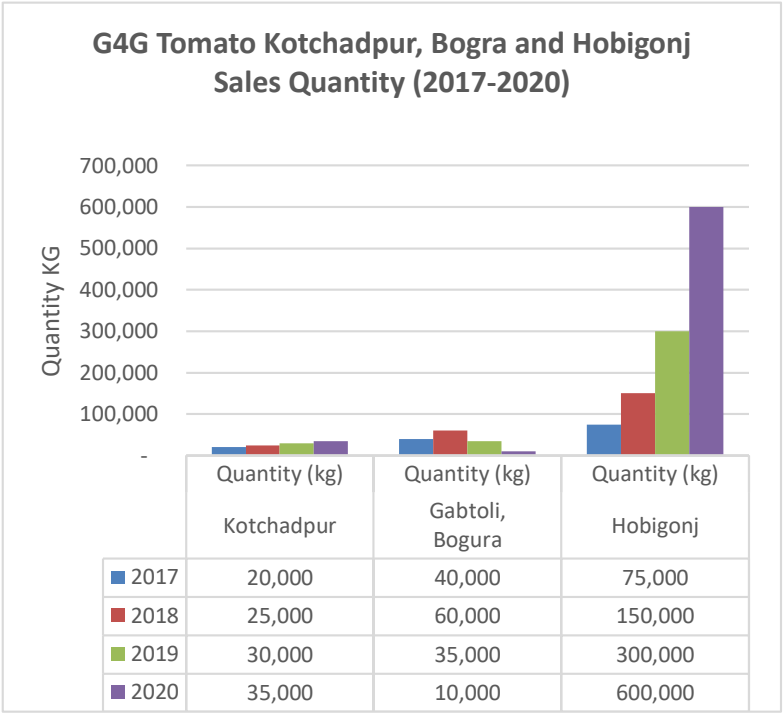


	Kotchadpur	Hapania	Bagerhaat	Hobigong	Bogura
2017	420	220	350	286	290
2018	475	300	400	354	340
2019	530	330	410	506	385
2020	835	535	480	808	410

Source: CDCS Market Intelligence

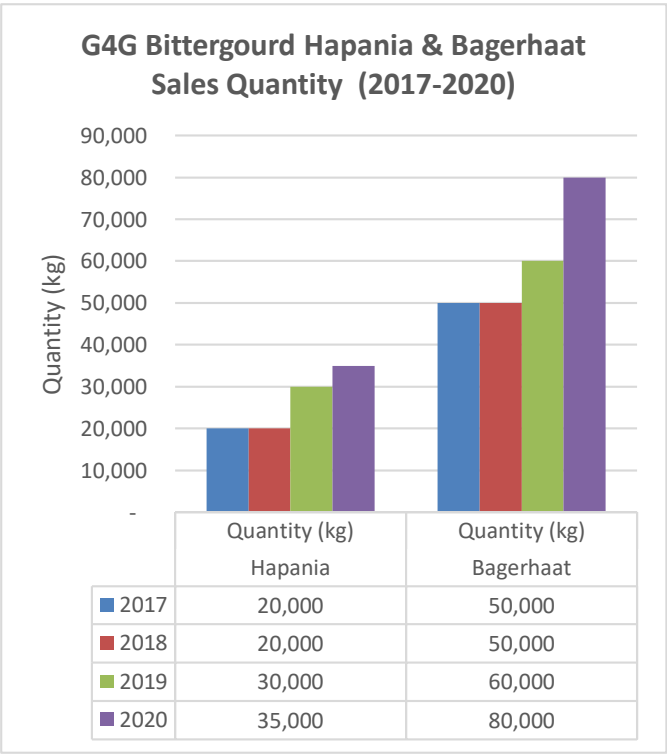
As shown in the graphs below, in case of tomato, though G4G Bogura grows larger quantity of safe tomatos compared to Kotchadpur, this year due to flash flood, they could not sow seed and could sell very little quantity ie. Only 10 tonns of Tomatos. On the other hand, our new G4G member who joined G4G group from crowding in effect, had very good sales in year 2020 which is almost double the quantity they sold in 2019.

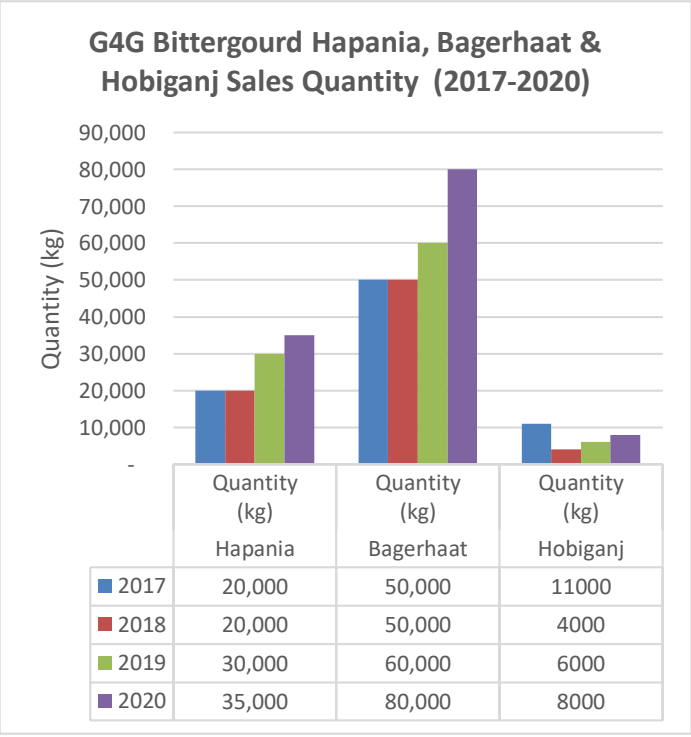




Source: CDCS Market Intelligence

In case of Bittergourd, Bagerhaat is the largest bittergourd producing group among the G4G members but they prefer to sell locally and regionally. G4G Bagerhaat has started one safe vegetable sales center at upazila level and are happy with the progress they have made. However, they have much potential which needs to be explored in the scale up phase.



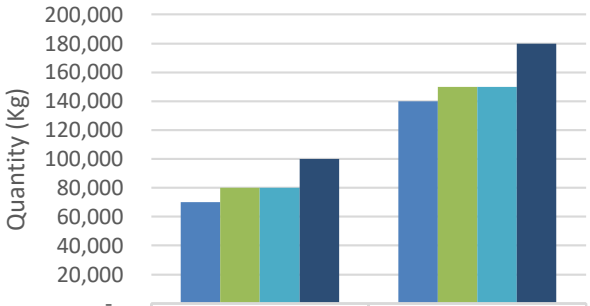


Source: CDCS Market Intelligence

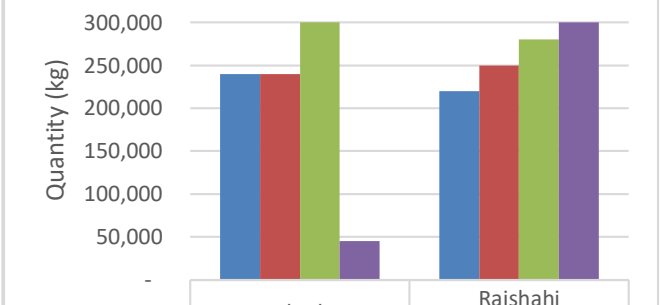
In case of banana, Hatgopalpur sells larger volume of banana compared to Kotchadpur. But they also prefer to sell through traders who come to buy produce in bulk at local arots though they do not get

higher price for selling safe produce at local arots. However, intervention is needed at regional level to enhance their safe food sales at regional and local levels.

On the other hand, in case of Mango, though G4G Kotchadpur team lost 80-90% of their matured mangoes in cyclone amphan, they applied Hot Water Treatment on the rest of their mangoes and sold it in the market at premium price. Though Rajshahi G4G team produced safe mangoes, could not apply Hot water treatment on their produce as they do not have a plant at their place. However, Rajshahi team plans to install one before the next season. They sold around 300 tonnes of safe mangoes during 2020.



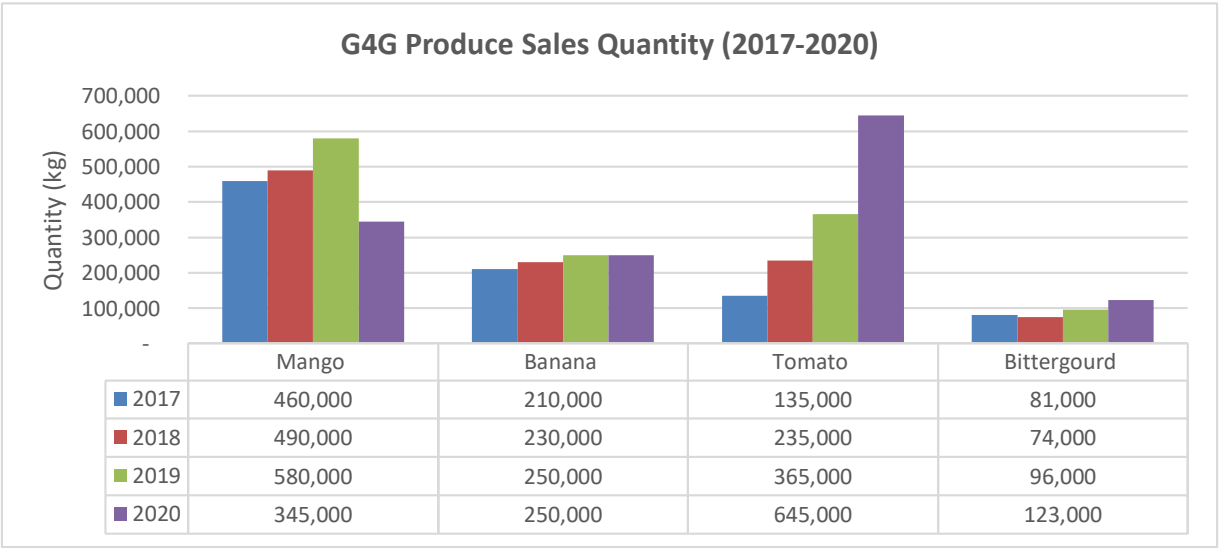
	Quantity (kg) Kotchadpur	Quantity (kg) Hatgopalpur
2017	70,000	140,000
2018	80,000	150,000
2019	80,000	150,000
2020	100,000	180,000



	Kotchadpur Quantity (kg)	Rajshahi Quantity Sales (kg)
2017	240,000	220,000
2018	240,000	250,000
2019	300,000	280,000
2020	45,000	300,000

Source: CDCS Market Intelligence

In the product wise graph below total quantity of each item sold from all the G4G location is presented. It is apparent from the graph that G4G group members scored highest in selling mangoes then comes tomato then banana and finally bittergourd. Though, mango sales was low this year due to Cyclone Amphan otherwise the trend was higher than the other items. Thus it can be deduced that farmers are more inclined to deal with high value items rather the low value ones as high

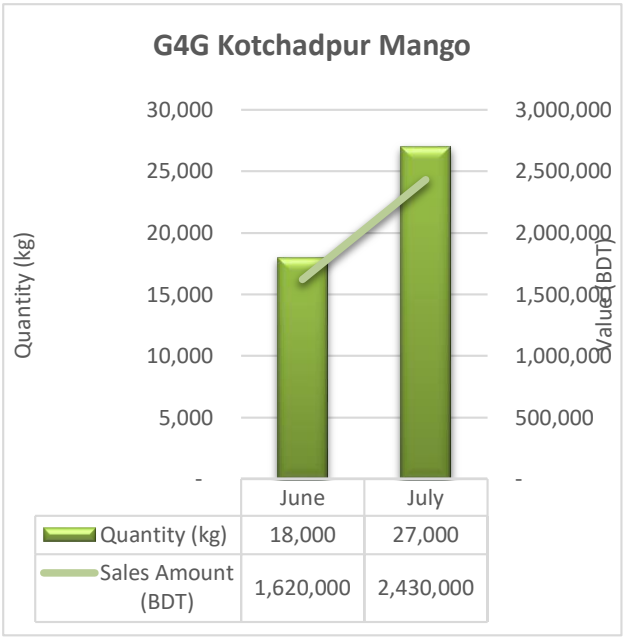


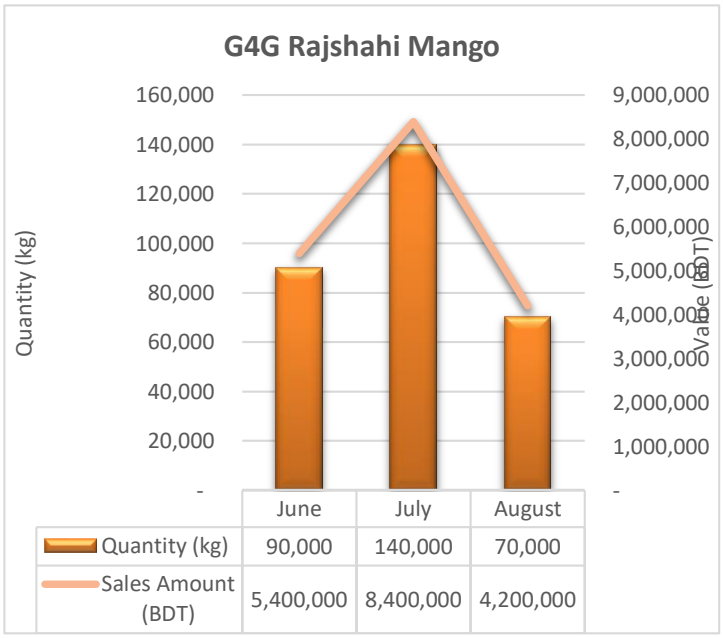
	Mango	Banana	Tomato	Bittergourd
2017	460,000	210,000	135,000	81,000
2018	490,000	230,000	235,000	74,000
2019	580,000	250,000	365,000	96,000
2020	345,000	250,000	645,000	123,000

Source: CDCS Market Intelligence

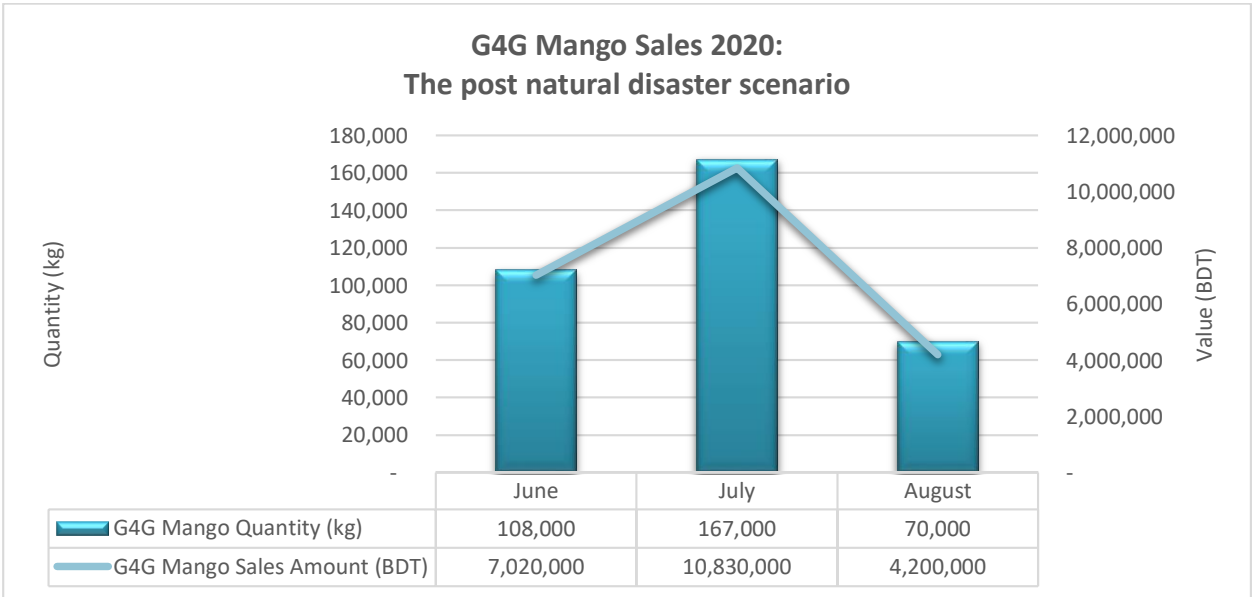
This mango season G4G mango farmers sold a total of 345 tonnes of mangoes which fetched a revenue of BDT 220 lacs for the G4G farmers. As cyclone Ampan caused huge devastation in Kotchadpur area, at the beginning of the mango season, our farmers this year lost around 80-85 % of their mango crop and thus though they at the beginning planned to sell arond 350 tonnes, were actually able to sell only 45 tonnes of mango at approximately BDT 40 lacs. It should be noted that Out of these 45 tonnes, 22.5 tonnes were hot-water treated. The remaining 300 tonnes were from G4G Rajshahi, which sold for approximately BDT 180 lacs.

However, as G4G Kotchadpur team sold their produce directly to consumers, they fetched approximately 90 Tk per kg on an average for safe hotwater treated mangoes while G4G Rajshahi sold their produce mostly to bulk traders in their region and fetched on an average 60 Tk per kg.





Source: CDCS Market Intelligence



Source: CDCS Market Intelligence

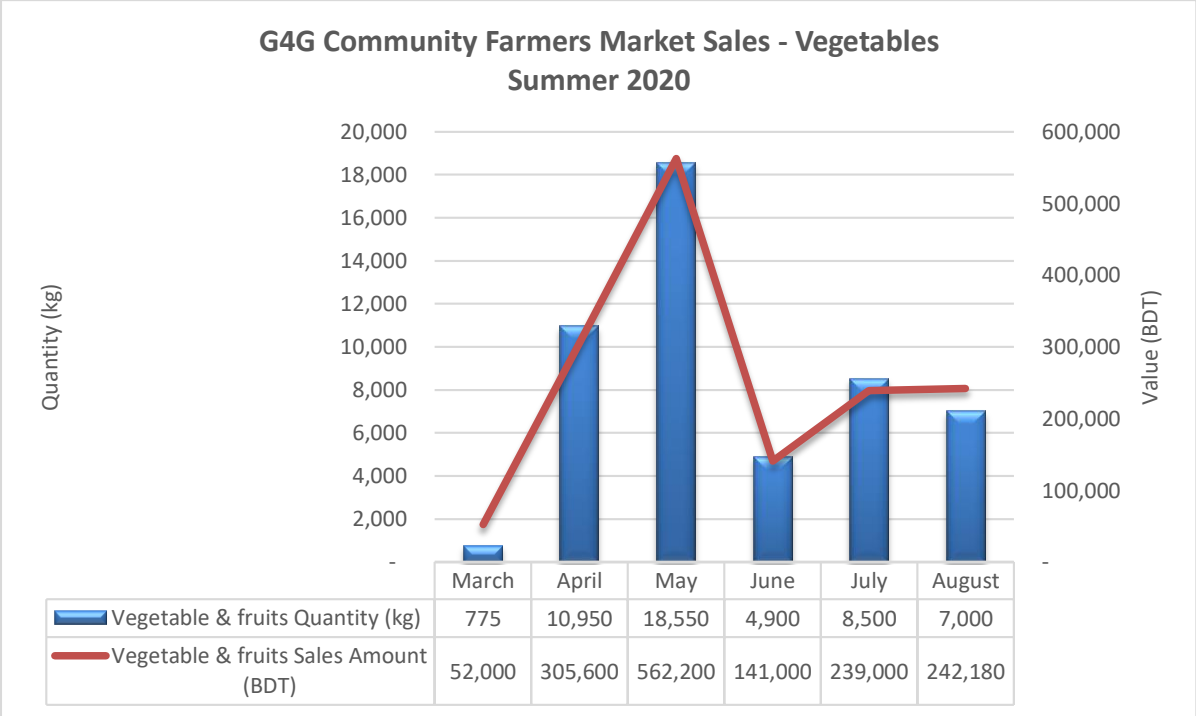
G4G Sales Scenario in the Newly Created Market Channels

Through facilitation and support from CDCS Entrepreneurship Lab, G4G group members started selling their produces at G4G Community Farmers Market, BOF, Gazipur and at Weekend farmers Market, Dhaka under the supervision of DAM and Ministry of Agriculture.

During the extremely challenging COVID 19 pandemic situation when in March-April the farming communities around the country were completely stuck, G4G farmers started G4G community farmers Market at BOF, Gazipur. Also the farmer groups continued selling products at Weekend farmers market, Dhaka with intervels due to COVID 19 crisis.

During the earier months of the year they sold mostly vegetables and one or two fruit items such as Banana, Kul, Guava, Melon etc. The vegetable items include besides Tomato and bittergourd, different kinds of gourds, okra, lemon, leafy vegetables, papaya, eggplant, longbean, green chilli, potol, cucumber etc. It was more so because coming to market with just one or two vegetable items (that is covered under the project) do not attract the consumers nor it is feasible from farmers' profitability point of view. Hence, the project brought all the safe items produced in a community under the umbrella of G4G and brought it to the markets once in a week.

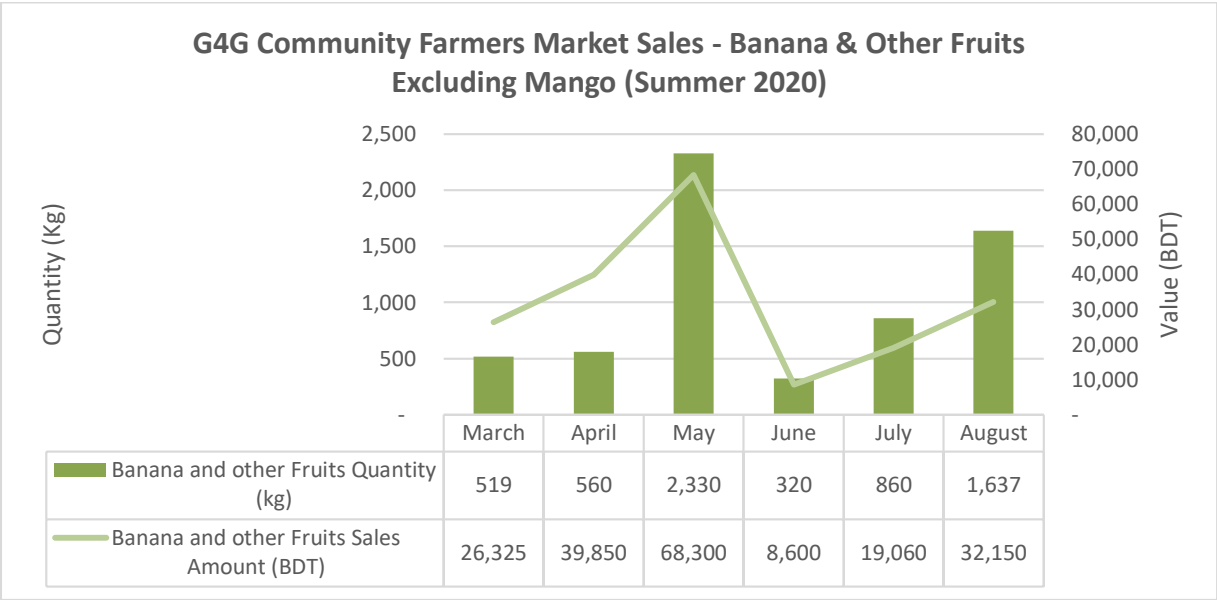
Though the vegetable sales started in March, due to COVID Pandemic they could only sell only once in the first week of March at Dhaka Weekend Market. In May, which was the month of Ramadan, sales was the highest but then cyclone Amphan destroyed most of their vegetable gardens and hence in June sales dropped. However, the greatest success is that farmers are getting higher prices for their safe produce. It is important to note that farmers are selling their produce in a competitive market where local vendor next to G4G group sell their items at lower price. Still consumers are eager to pay little extra for good quality items.



	March	April	May	June	July	August
Vegetable & fruits Quantity (kg)	775	10,950	18,550	4,900	8,500	7,000
Vegetable & fruits Sales Amount (BDT)	52,000	305,600	562,200	141,000	239,000	242,180

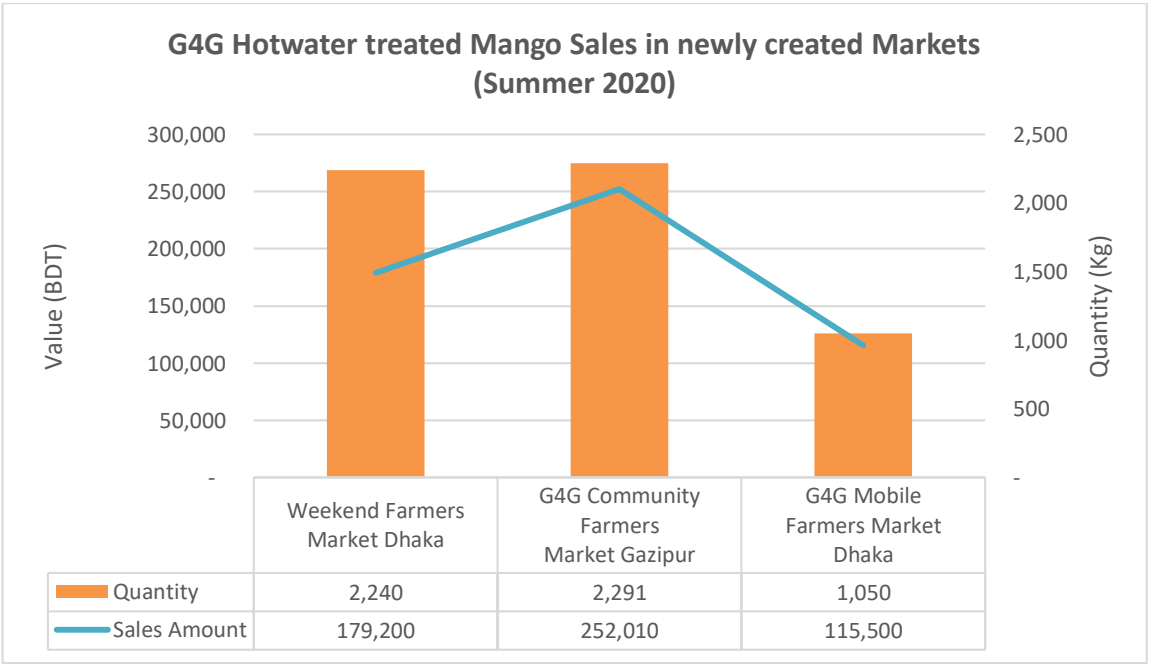
Source: CDCS Market Intelligence

In case of banana, and few other fruits such as guava, kul, melon etc. , farmers sold the highest in May and then as the G4G locations were hit hard by Amphan sales dropped in June then again picking slowly as shown in the graph below. Please note here that G4G famers sold their produces only once or twice a week which also was disrupted due to natural calamity and/or COVID 19 pandemic.



Source: CDCS Market Intelligence

The most exciting news is that G4G Kotchadpur installed Hot water treatment plant this year at the beginning of the mango season and for the first time brought safe and hotwater treated mango to the market. Though cyclone Amphan destroyed maximum of their mangoes just when they were prepared to harvest, whatever was left came to market with much care. As shown in the graph below, G4G farmers received higher return at G4G community Farmers Market at BOF, Gazipur. They also pursued G4G Mobile Farmers Market Initiative around the city in a very limited scale though due to COVD crisis.



Source: CDCS Market Intelligence

However, the G4G market operation is a continuous endeavor and once scaled in the scaleup phase, is bound to produce much positive impact at all levels.

Enhanced integration of companies and bulk buyers: Along the G4G safe fruit and vegetable chains enhanced numbers of input companies, agro machinery, logistics and other support service providing entities has been integrated through MoU signing. This G4G partners include:

- G4G farming enterprise partners
- G4G Input Company partners
- G4G Agro machinery partners
- G4G Logistics Prtners
- G4G Wholesale Network Partners
- G4G retail Netwiork Partners
- G4G Govt. and INGO facilitators:
    - Department of Agricultural Extension
    - Local Offices of DAE at G4G hubs
    - Department of Agricultural Marketing
    - A2i

Quality control and monitoring framework established: Through the formation of G4G Model Agribusiness Centers, integration with G4G hub based enterprises and partnership with local level DAE officials, a framework for monitoring, quality control and traceability has been established.

Enterpreneurship Advisory support and continuous communication: G4G members receive entrepreneurship advisory support and are constantly being communicated over the phone, through e-platforms including Farmers End, Farmers Academy and G4G agribusiness (closed) facebook group. Also G4G members get faceface advisory support from frequent field visits by CDCS team when CDCS team provide the G4G farmers with incubation and advisory support on different issues.
G4G group members are tagged to online platforms through ***Weekly Online Krishiadda*** series where members discuss different issues, report situations, get information and get advisory services.

Consumer access to safe fruits and vegetables: Segments of consumers including G4G network consumers and consumers visiting the DAM run weekend farmers market, G4G Mobile farmers market and G4G community farmers market are receiving safe agro produce from G4G farmers on a continuous basis. Consumers who avail safe produce from G4G group tend to continue connection with the farmers and purchase fresh and safe produce as and when available.

E 4. Technology Developed:

Research and analysis done
Baseline, Agribusiness Ecosystem & Consumer Preferance

Training Manual prepared & delivered
Market based safe agricultural value chain: cultivation & postharvest

GPP 7: Seven Good Postharvest Practices
Introduced and followed up

E-platforms created & group members tagged
Farmers End, Farmers Academy, G4G Agribusiness facebook group

Stakeholder Linkages Developed
Private sector Seed, fertilizer, pesticide , packaging, transportation, distribution etc.

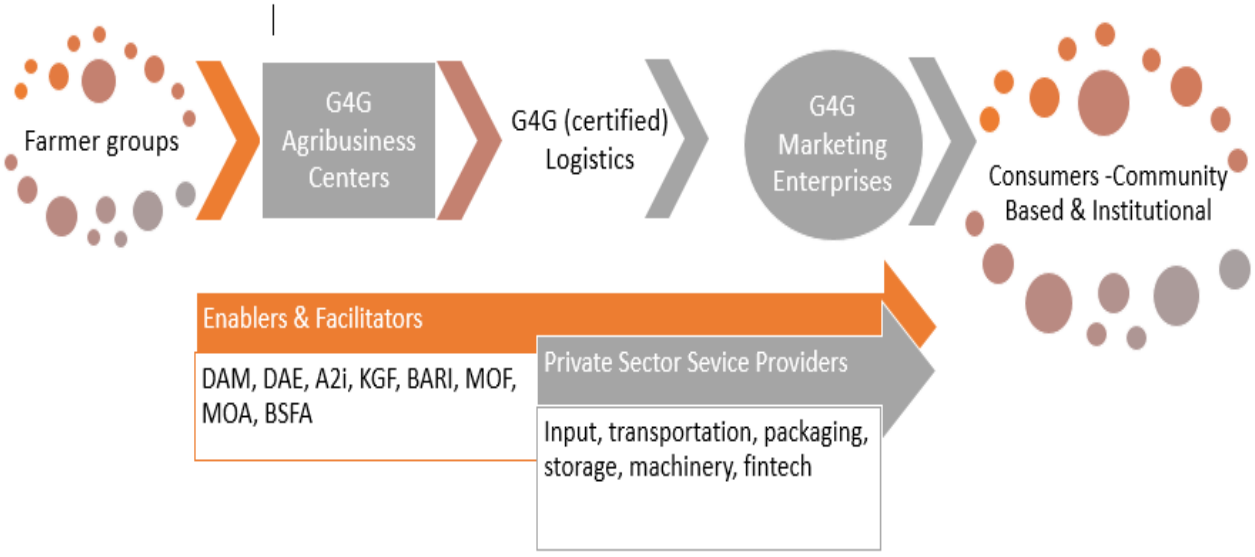
Weekly Online Krishiadda piloted
Establish communication at the grassroots and make farmers & traders on board

Community based Market trials at three locations
Created avenue for G4G farmers &traders

Participation at National fruit fair 2018
Farmers participated at the national fruit fair with their mangoes

New Farmers Market Models introduced
G4G Community Farmers Market & G4G Mobile Farmers Market Launched

G4G Inclusive Agribusiness Model (G4G IAM)



Connecting all the players and platforms, G4G Inclusive Agribusiness Model (G4G IAM) for safe agro value chain has been completed. Though the model will have minor customization addressing different agro produces and different dynamics at fields, acoross the agro value chains this model can be applied and replicated. The major components of the model are:

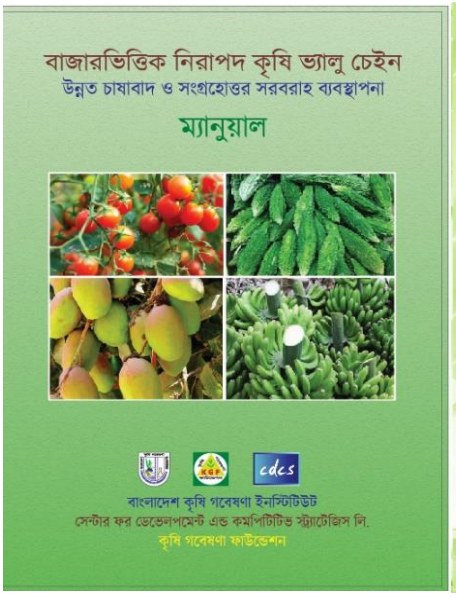
- G4G Model Agribusiness Centers (Farming enterprises)
- G4G Input, Machinary and logistics partners
- G4G Wholesale and Retail partners
- G4G Facilitators (GO & INGO)
- G4G online Platforms for Communication, Technology transfer and Marketing & sales
- G4G Farmers Markets
- G4G Network consumer bases

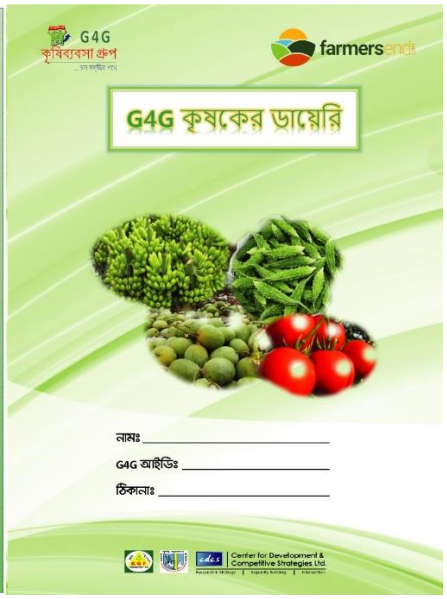
E.5 Publications made/under process

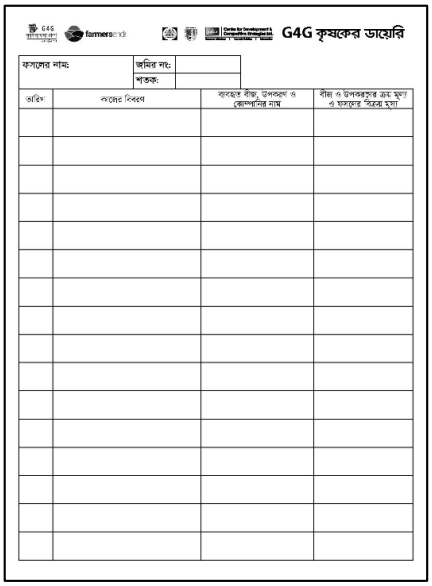
Booklet, Manual and monitoring tool developed:

Training manual: Through joint initiative of BARI & CDCS, one training manual has been published titled "Market based safe agricultural value chain: Improved cultivation and postharvest supply management" in bengali and distributed among the farmers and traders of G4G Agribusiness group.

G4G Krishoker Diery: This is the record keeping book for G4G farmers in which for each agro produce farmer can record his activities with date. It includes input use, including its company names of inputs, irrigation, fertilization, labour use, harvesting, sales of the produce and cost and sales proceeds. Such a record keeping book is extremely useful in folloing farmers' field activities. For any disease control or pest control in farmers' field and even for selling safe produce and getting agro loans this diery can be used as a base document.







Post-harvest Management Protocols:

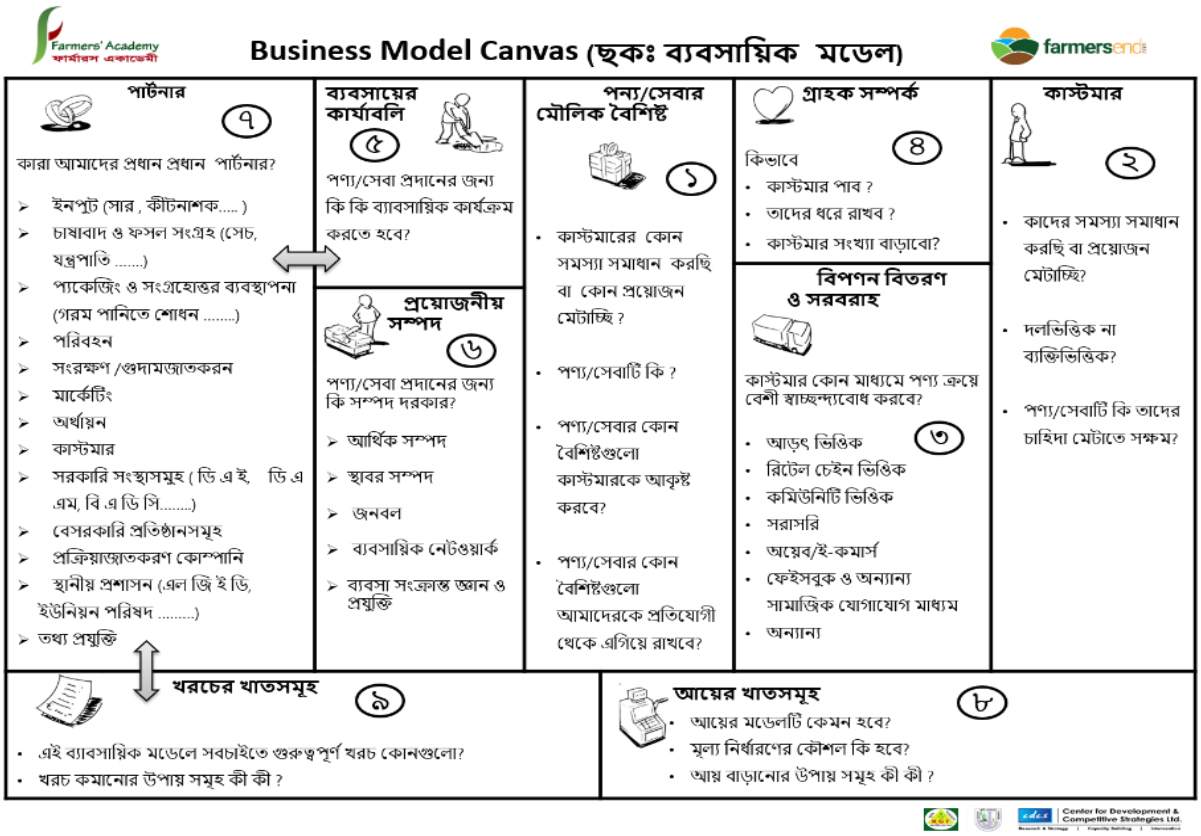
GPP 7: CDCS® GPP7 (Seven good postharvest practices), an 'easy-to-adopt' 'suitable-for-local-context' product specific techniques/technologies re handling and packaging practices in post-harvest, pre-marketing agricultural value chain activities, has been published both in the training manual and in flipchart form for hanging in each G4G group KrishiAdda location. Four (4) such GPPs have been developed (one for each crop: Mango, Banana, Tomato and Bitter gourd) and published targeting four different categories of farmers & traders.

Business advisory services along BMC:

CDCS business advisory service outlines the basic issues an agro entrepreneur should keep in mind while getting involved in any transaction or business activitiesinvlving his safe agro produce. The nine basic steps are as follows:

1. Unique value proposition of the agroproduce
2. Customer or the consumer segment they target
3. Means of distribution and logistics support
4. Relationship with the consumers
5. Business activities needed to be pursued
6. Resources required to accomplish the tasks on hand
7. Partners and facilitators essential for doing the job
8. Sources of revenues and the revenue stream
9. Expenditures that needs to be incurred.

The protocol has been explained for the G4G farmer and agro entrepreneur groups and are constantly worked on for better understanding and application of the same in all endeavors.



Safe Agricultural Management (Ten-Point) Protocol and Memento:

CDCS has developed a ten point agro safety maintenance protocol also called Safe Agricultural Management Protocol (SAMP 10). The protocol in 10 points covers all the good practice directives starting form farmers' field to consumers' place in order to maintain and ensure safe food production and consumption. G4G farming commuties should be much careful and responsible while producing safe agricultural items and take good care in all the steps outlined below. The safe agro management protocols include following:

1. Good land preparation basics
2. Prerequisites for seed or sapling used
3. Balanced fertilizer and nutrient application for safe production

4. Integrated pest management and bio pesticide use
5. Maturity index maintenance and safe harvesting practices
6. Good Postharvest Management Practices(GPP 7)
7. Good storage and handling practices for greater shelf life of safe items
8. Safe packaging and transportation management
9. Sales and retail handling for safe items
10. Consumer awareness and safe handling of produce

Memento for CDCS G4G Partner Network (CDCS GPN) members:

CDCS has also developed one memento outlining the value promise all the G4G partners along the safe and inclusive model needs to share and uphold in order to maintain and ensure greater and equtable value distribution among all the partners anolg the chain.

Brands Created and Supported

Safe brands have been created/supported to bring farming communities under one umbrella. These include:

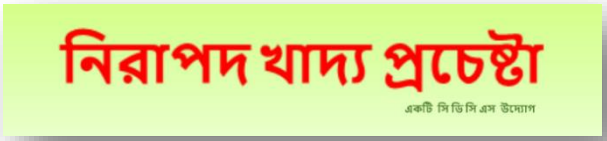
1. G4G Agribusiness Group
2. G4G Agribusiness Center
3. Aamader, specialized retail shop
4. Farmers End, marketing e-platform
5. Farmers Academy, kowledge and technology sharing platform

G4G Agribusiness Group is such a brand that represents farming communities that produce safe items. All the farmers, agro entrepreneurs and other support organizations including input companies, logistics, post harvest, packaging and agro machinery working to support safe production, handling, marketing, procurement, processing and sales can come under this umbrella of G4G.

Also we have created farmersEnd, an online platform, for display and sales of G4G farmers' safe agro produce. Once popularized widely among bulk consumers and communities can work very well to display and sell G4G farmers' safe produce. Besides, another brand Aamader, a retail online platform, has been created to reach regular online consumers.

Farmers Academy, a knowledge sharing and technology dissemination platform that works for all relevant stakeholders who has an interest in working though online media and get connected with farming communities remotely.

Also we prepared a tagline for capturing the whole initiative placed below:



Our most effective inclusion to the SAFE BRANDS is creation of uniqe market brans that connects our G4G farming communities directly with the Consuming communities. These are:

- G4G Mobile Farmers Market and
- G4G Community Farmers Market

Also G4G group is selling their agro produce through Weekend Farmers Market run by DAM and Ministry of Agriculture.

Leaflets for awareness Building and Market Trials:

Promotional Materials: CDCS has published different promotional materials targeting the G4G group members and consumers who are expected to buy their safe produce through FarmersEnd platform. During the market trials at different national fairs, community based markets and programs the leaflets were distributed and banners published to aware people about the safe initiative of G4G farmers, about their products and the philosophy behind the initiative.

G4G Quality Managrment protocol:

In order to have wider understanding of safe food production practices and CDCS approach to safe initiative, integrated effort at all levels along the value chain and introducing the brands - G4G Agribusiness group, Farmers Academy and Farmers End to symbolize farmers' safe produce. This is also extremely important for consumers and buyers as the value proposition of safe items and procedures followed to ensure that value proposition needs to be communicated with much clarity especially when G4G farming communities face consumers during different market trials and other sales events. Also, CDCS supplied these quality control prerequisites to G4G wholesale and retail partners as they come into contact with different levels of consumers there.

E-platforms

CDCS has launched three e-platforms accordingly, Farmers Academy, G4G Agribusiness facebook Group and Farmers End, to facilitate G4G group members' engagement and activities along the value chain. While Farmers Academy and G4G Agribusiness facebook Group support the farmers' and traders' sharing of knowledge, information and experiences, and receive solution to different problems they face time to time, Farmers End platform is expected particularly to connect the farmers and traders at the grassroots directly to specific pockets of consumers.

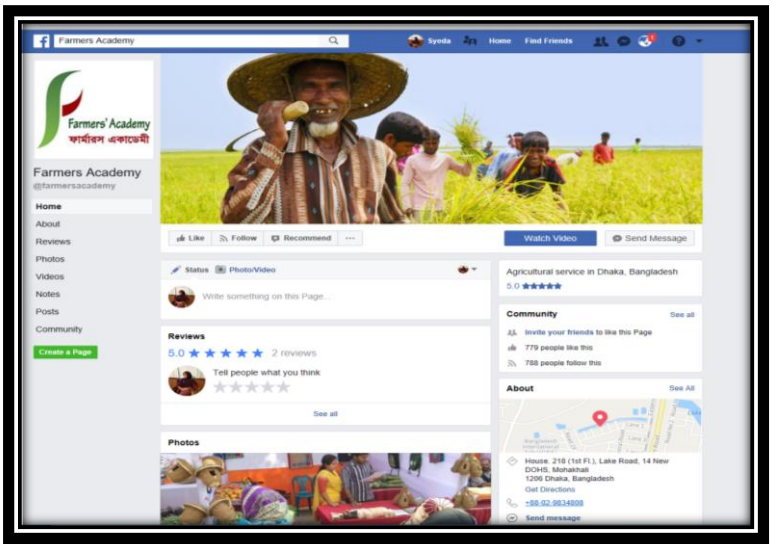
G4G Farmers' Facebook Group:

This group is extremely important through which CDCS runs online Krishi Adda on a regular basisi. The platform helps G4G farmers by givig them easy communication access with CDCS incubation support team. They upload the pictures of their field and agro produce, roport any problem or crop disease, any support needed etc. Also CDCS runs facebook lives on different topics of farmer interest and necessasity.

Farmers' Academy:

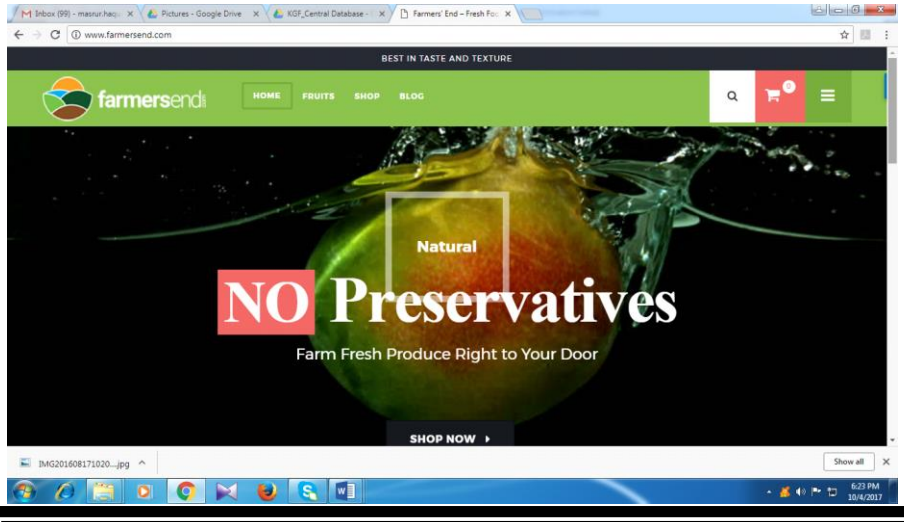
Farmers academy has been created as a knowledge sharing & networking platform. It is an open to all platform through which all stakeholders related to agriculture and agribusiness may get connected and interact according to their needs. Participants are free to communicate, share knowledge and pursue networks.

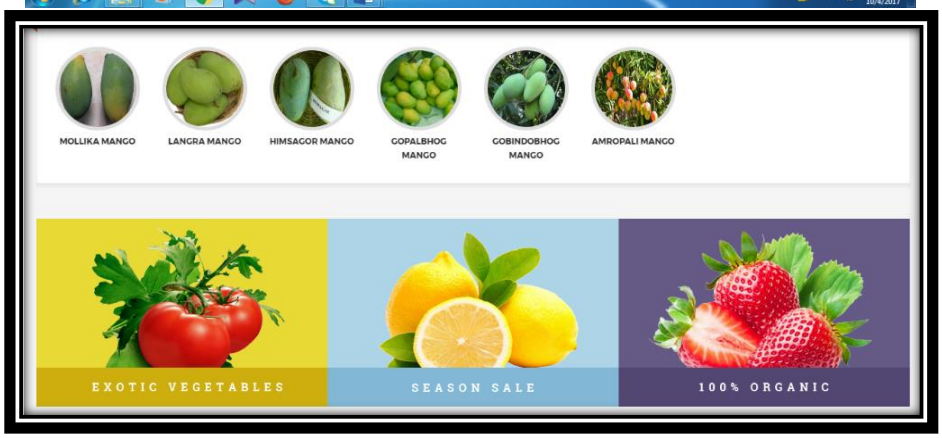
Participants include researchers, activists, development & extension workers, private sector as well as people at the grassroots and any one with interest in the sector. It is an integrated e-platform in making

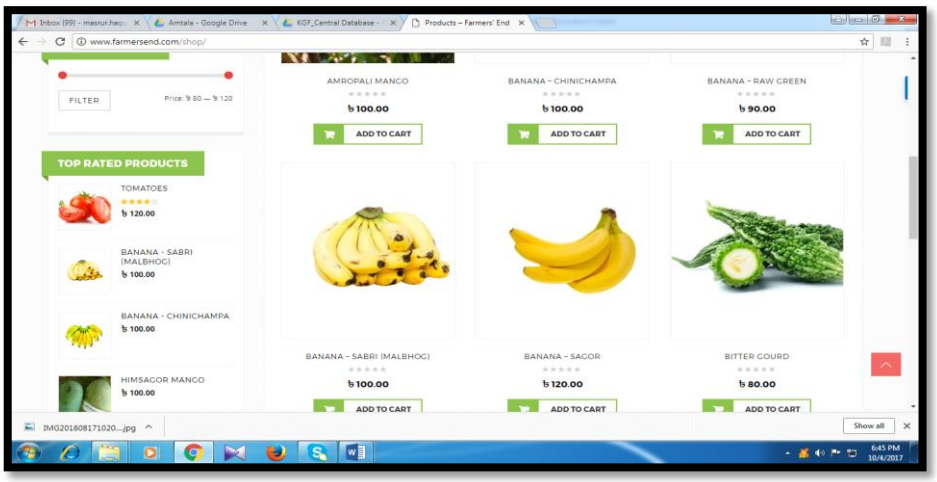


Farmers End:

Farmers End is an online platform for G4G farmers and agro entrepreneurs where their agro produces will be posted and displayed. The platform once popularized can offer great opportunity for both farmers and consumerlooking for safe produce directly from faremrs' yard.







Introduction of Safe Technology at Farmers' Field:

Crop specific samples of items promoting safe technology and inputs were distributed by BARI among the farming communities and G4G group members at field levels. The items include among others, pheromon traps for bitter gourd, bags for mango bagging, long poly bag for banana and few pesticides and

insecticides that are not harmful if applied following prescribed dosage. Each G4G location received few relevant samples of the items.

First Ever Private Investment in Post Harvest Machinery: Installation of Automated Hotwater treatment Plant

With overall facilitation and support from CDCS Entrepreneurship Lab, one of the farmer groups – G4G Kotchandpur – has made the first-ever private investment in setting up an Automated Hot Water Treatment (HWT) plant. CDCS helped them collaborate with agro machinery partner under G4G group umbrella and helped them avail partial financial support from DAE for the machine. During the period of June-August 2020, the group hot water treated 22.5 tonnes of mangoes on personal account. Besides, it also treated mangoes of other farmers and traders under "postharvest-management-as-a-service (PaaS)" fee-based model. This is a big success for the project in the sense that the farmer groups have not only understood the ways and means to ensure safe agro-value chains, but also have invested their own money in smart postharvest technologies such as HWT plant, and earning revenue from their service as well.

Automated Hot Water Treatment Plant at G4G Kotchadpur

Newly Created Market Channels – the Launching of G4G Farmers Markets

CDCS has launched two innovative kinds of platforms for farmers through which they can sell their produces and get directly connected with consumer groups. These are as follows:

- G4G Community Farmers Market (connecting consumer communities with producer communities. Started with Gazipur BOF) &
- G4G Mobile Farmers Market (Selling safe vegetables and fruits in different high demand consumer points through mobile vans. Started with Dhaka city)

Apart from these, G4G group also joined Weekend Farmers Market run by DAM at Dhaka.

It should be noted that though the project is supposed to deal with only four items namely Tomato, bittergourd, mango and banana, while bringing produce to market, inorder to make it a viable endeavor both for farmers and consumers, CDCS covered all the safe items produced in the G4G Communities. During the earier months of the year 2020 G4G Groups coming to these newly formed markets sold mostly vegetables including tomato, bittergourd, different kinds of gourds, okra, lemon, leafy vegetables, papaya, eggplant, longbean, green chilli, potol, cucumber etc and one or two fruit items such as Banana, Kul, Guava, Melon etc. During the mango season, the mango producing hubs sold mangoes while vegetable producing hubs continued with vegetables available during that season.

G4G Mobile Farmers Market launching

G4G Community Farmers Market

Local level Safe Farmers Markets

The initiative connected G4G farmers to local traders or locally established sales centers in four locations including Mollahat-Bagerhaat, Adamdighi-Bogra and Hapania-Jessore. G4G farmers bring all the safe items they produce to these local points and receive relatively higher price compared to selling those items here. However, as these are local level centers, the custiomer base is not that big and price is also not that high.

Local Safe Vegetable Sales Center at Mollahat, Bagerhat

Local Safe Vegetable Sales Center at Adamdighi, Bogra

Local Safe Vegetable Sales Center at Kotchadpur, Jhinaidah

Local Safe Vegetable Sales Center at Hapania, Jessore

G4G Community Farmers Market initiative attracts news coverage

On 16th May, 2020, Channel i Maati O Manush program covered our G4G Community Farmers Market initiative at Bangladesh Ordnance Factory, Gazipur. Here G4G farmers are directly selling their safe agro produce to BOF community resided by around 1500 families inside. Though the initiative started amidst COVID-19, BOF community is eager to continue having G4G Community Farmers Market there permanently even after the situation normalizes.

Maati O Manush Program on Channel i

Also on 17th May, Daily Bonik Barta, a prominent newspaper covered the news on G4G Community Farmers Market initiative under the G4G Inclusive Agribusiness Model (G4G IAM).

করোনায় কৃষিপণ্যের বিপণন

নতুন মডেলে জিফোরজি কমিউনিটি কৃষক বাজার

নিজস্ব প্রতিবেদক ■

নভেল করোনাভাইরাসের কারণে সৃষ্ট পরিস্থিতিতে কৃষিপণ্যের বিপণনে নতুনত্ব এনেছে জিফোরজি কমিউনিটি কৃষক বাজার। এটি মূলত একটি অন্তর্ভুক্তিমূলক ব্যবসায়িক মডেল। যার মাধ্যমে কৃষক সরাসরি তাদের উৎপাদিত পণ্য ভোক্তাদের কাছে পৌঁছাতে পারছেন। এতে ভোক্তা যেমন নিরাপদ ও সাশ্রয়ী মূল্যে পণ্য পাচ্ছেন, তেমনি কৃষকও প্রচলিত দামের চেয়ে বেশি পাচ্ছেন। এখানে মধ্যস্বত্বভোগীদের স্থান না থাকায় কৃষক ও ভোক্তা উভয়েই লাভবান হচ্ছেন। আর করোনাকালীন কৃষকদের স্বাস্থ্য সুরক্ষা এবং বিপণনের জন্য যাবতীয় ব্যবস্থা করে দিচ্ছে সেন্টার ফর ডেভেলপমেন্ট অ্যান্ড কমপিটিটিভ স্ট্র্যাটেজিজ (সিডিসিএস) ও বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট (বারি)। এ গবেষণায় সহায়তা করছে কৃষি গবেষণা ফাউন্ডেশন (কেজিএফ)।

জানা গেছে, কৃষি সম্প্রসারণ অধিদপ্তর, কৃষি বিপণন অধিদপ্তর ও এটুআইয়ের সহযোগিতায় এবং সিডিসিএসের সার্বিক তত্ত্বাবধানে কৃষক গাজীপুরে সমরাস্ত্র কারখানায় লকডাউন কর্মকর্তা ও কর্মচারীদের জন্য নিরাপদ কৃষিপণ্য নিয়ে আসছেন এবং সরাসরি ভোক্তার কাছে বিক্রি করছেন। এখানে ঝিনাইদহের কোটচাঁদপুরের কৃষকরা তাদের পণ্য নিয়মিতভাবে বিক্রি করতে পারছেন। এতে কৃষক যেমন তার নিরাপদ পণ্যের ভালো মূল্য পাচ্ছেন, তেমনি ভোক্তাও সতেজ এবং গুণগত মানের পণ্যের জন্য কিছু অতিরিক্ত মূল্য দিতে আগ্রহ প্রকাশ করছেন। সামনের দিনে দেশের অন্য বাণিজ্যিক জেলাগুলোয় এ পদ্ধতি সম্প্রসারণ করা হবে।

এ বিষয়ে সিডিসিএসের ব্যবস্থাপনা পরিচালক ফারজানা মোরশেদ বলেন, সিডিসিএস জিফোরজি কমিউনিটি কৃষক বাজার চালু করা অত্যন্ত চ্যালেঞ্জিং ছিল। বিশেষত কভিড-১৯ পরিস্থিতিতে, সব পক্ষের নিরলস প্রচেষ্টায় এ বাজার স্থাপন ও বাস্তবায়ন সম্ভব হয়েছে। সিডিসিএস সামনের দিনগুলোয় এ মডেলটি নিয়ে আরো ব্যাপক আকারে কাজ করার পরিকল্পনা গ্রহণ করেছে। তবে এটি কোনো একক কর্তৃপক্ষ দ্বারা সমাধান সম্ভব নয়, এক্ষেত্রে সব পক্ষের সম্মিলিত প্রয়াস অত্যন্ত গুরুত্বপূর্ণ। উদ্ভূত কভিড-১৯ পরিস্থিতিতে এই মডেলের বাস্তবায়নের উদ্যোগ নেয়া হয়েছে।

জানা গেছে, কভিড-১৯ পরিস্থিতির কারণে দুর্বল সাপ্লাই চেইন ও স্থবির বাজার ব্যবস্থার ফলে কৃষকরা কৃষিপণ্যের ন্যায্যমূল্য পাচ্ছেন না। একদিকে উৎপাদন এলাকাগুলোয় কৃষিপণ্যের উদ্বৃত্ত সরবরাহ, অন্যদিকে বড় শহরগুলোয় চাহিদার স্বল্পতা ও পরিবহনের অব্যবস্থার কারণে কাঁচামালের মূল্য অসহনীয় পর্যায়ে হ্রাস পেয়েছে। এই পরিস্থিতি গোটা জাতিকে সামগ্রিকভাবে খাদ্য ও পুষ্টি সংকটের দিকে ঠেলে দিচ্ছে। এ অবস্থায় উৎপাদন ও বিপণনের জন্য একটি টেকসই ব্যবসায়িক মডেল অত্যন্ত প্রয়োজন। নিরাপদ খাদ্য উৎপাদন ও বাজার ব্যবস্থা উন্নয়নে সুদূরপ্রসারী লক্ষ্য সামনে রেখে তিন বছর ধরে একটি অন্তর্ভুক্তিমূলক নতুন ব্যবসায়িক মডেল উদ্ভাবনের জন্য ফলিত গবেষণায় নিয়োজিত রয়েছে সিডিসিএস ও বারি।

epaper.bonikbarta.net

E.6. Training/workshop organized:

Farmer- entrepremeur training Workshops:

Training workshops were organized involving farmers and traders in eight locations as presented in the table below. The workshops were divided into three main parts:

(i) Crop production, paste and disease management practices (BARI)

(ii) Market and value chain aspects including Good post-harvest(GPP7) and safe food marketing practices (CDCS)

(iii) Formation, mobilization and engagement (CDCS)

Implemented date	Venue	Crop name	Participants		Total
			Farmers	Traders	
6-7 December 2017	OFRD, Bogra	Tomato	50	20	70
7-8 December 2017		Banana	50	20	70
9-10 December 2017		Bittergourd	50	20	70
14-15 December 2017	Fruit Research Center,Rajshahi	Tomato	50	20	70
16-17 December 2017		Mango	50	20	70
02-03 February 2018	RARS, Jessore	Bittergourd	50	20	70
04-05 February 2018		Banana	50	20	70
06-07 February 2018	Kourtchandpur, Jhenaidha	Mango	50	20	70
Grand Total			**400**	**160**	**560**

The first part was delivered by BARI and the second and third parts were run by CDCS®.

Farmer-Agro entrepreneur Mobilization and Group formation Initiative

Through the mobilization workshops farmers & traders were organized in subgroups and brought under the umbrella of G4G Agribusiness Group. G4G (Go for Growth) is a CDCS facilitated group of farmers & traders that follow safe production, harvesting, postharvest and marketing practices.

Covering eight locations, a total of 49 small subgroups were formed from the all the participants, each subgroup comprising of roughly 8 to 10 members. The participants were given the liberty of forming their own subgroups.

Each group comprises of a group leader, a deputy group leader and a smart leader (person with access to a smart phone). These group leaders will have the task of disseminating new information from CDCS to the other group members with the help of his deputy group leader and smart leader. They are also entrusted with the responsibility of organizing farmers tagged to G4G Online platform and bring them to pre announced KrishiAdda Series.

Photographs and information details of each participant were taken for ID cards to be distributed at later dates for ensuring proper monitoring and traceability.

Continuous E krishiAdda and Advisory Services

Apart from this, few innovative training schemes were run by CDCS through out the period of intervention. These include among others,

1. Online discussions and training through e-krishiadda
2. Constant coordinationand followup using Whatsapp, Viber, Emo, or over the phone etc.
3. Mentoring and handholding during the market trials participated by group farmers and agroentrepreneurs
4. E prescriptions through G4G farmers' facebook group.

E.7. Graduate Studies

Not Applicable

E.8 Linkages Developed

CDCS® has developed partnerships through communication and understanding and/or through signing MoUs with the following stakeholders as appropriate

Government and agencies	Private Sector Organizations	G4G Local Enterprise	G4G Wholesale and Retail
DAM	Ispahani Agro Ltd.	সলেমানপুর দক্ষিন পাড়া পুরুষ সি আই জি (ফসল) সমবায় সমিতি লিঃ	Nadia Enterprise (Karwan Bazzar)
a2i	Lal Teer Seeds	হাট গোপালপুর কৃষি পণ্য সংগ্রহ বিপণন কেন্দ্র	Shajahan Banijjaloy (Karwan Bazzar)
BOF	Partex Agro	শিবপুর পূর্বপাড়া আই সি এম যুব সমবায় ক্লাব	New Janata Farm ((Karwan Bazzar)
DU Teachers' Club	Janata Engineering	পুলিয়া কৃষিপণ্য সংগ্রহ ও বিপণন কেন্দ্র	কৃষক বাংলা এগ্রো প্রোডাক্টস্ (Gulshan 1 DCC Market)
DAE	Syngenta Bangladesh Ltd.	বিসমিল্লাহ্ ট্রেডাস	Fresh Corner (Mohakhali DOHS)
DAE – Jessore	SEMCO	মেসার্স আরবি এন্টারপ্রাইজ	মোঃ সাগর, (বনস্রি মার্কেট, রামপুরা, ঢাকা)
DAE – Jhenidah	GME Agro	আকন্দ পাড়া আই সি এম কৃষক সমবায় সমিতি	মোঃ আলম (বনস্রি মার্কেট, রামপুরা, ঢাকা)
DAE – Satkhira	Shundarban Courier Service	মের্সাস জুঁই এন্টারপ্রাইজ	মোঃ কাজল, (বনস্রি মার্কেট, রামপুরা, ঢাকা)
DAE – Rajshahi	Shaymoli Paribahan	দি হাইব্রিড নার্সারি	মোঃ মামুন, (বনস্রি মার্কেট, রামপুরা, ঢাকা)
DAE – Bogura	Mukta Enterprise	Uzirpur Organic	মোঃ আলমগির হোসেন (হাতিরপুল কাঁচাবাজার)
DAE – Bagerhaat			
DAE - Gopalgonj			

E.9 . Equipment/Appliances Purchased:

Sl no.	BARI office equipment/appliances	Actual cost (Tk.)
1.	Laptop (1no.)	85,000
2.	Desktop (1no.)	65,000
3.	Printer (1 no.)	20,000
4.	Multimedia (1no.)with accessories	90,000
5.	Camera (1no. digital)	25,000
6.	Lamination machine (1no.)	20,000
7.	Scanner machine (1no.)	12,000
	Total	**3,17,000**

	CDCS Office Equipment	Actual cost (BDT)
1.	Laptop (1 no.)	60000
2.	Database Server (shared)(1 no.)	127500
3.	Color Printer (1 no.)	20500
4.	Scanner (1 no.)	5100
5.	MM Projector (1 no.)	45000
6.	Camera (1 no.)	15050
	Total	**273,150**

F. Highlight of Research Findings

1. Continuous capacity building of G4G farmers and agroentrepreneurs on safe agro production, postharvest management, marketing and sales is crucial at all stages.

2. G4G farming communities and G4G agro entrepreneurs should be provided with a continuous, need based handholding support on safe and ICT smart technology adaptation

3. G4G, the farmer's safe brand, should be established as a priority marketing and awareness building endeavor for popularizing farmer's safe agro produce

4. G4G farmers should be provided with direct exposure to the consuming and bulk/retail buying communities for ultimate empowerment of the farming communities working on safe agro produce as well as to ensure

5. Incubation support should be continuously provided for budding and existing G4G agro entrepreneurs and other G4G marketing and sales partners through market trials, community based sales initiatives etc. at different hubs.

6. Engagement under G4G umbrella, should be an ever evolving effort and should involve different stakeholders along the value chain starting from farming communities to input, agro machinery, logistics, finance, other support organizations as well as with trading , retail, B2B, B2C and consumer communities

7. Facilitating organizations such as DAE, DAM, a2i and other relevant ones should be in the loop for wider replication and sustainability of the model

8. Creation and activation of online platforms is a must for smooth communication, knowledge sharing, technology transfer, advisory support, marketing, sales, liaison as well as netwporking among the peers, partners and facilitators.

G.Conclusion

The demand (to be precise, latent demand) for safe food has been there for ages. Unfortunately, with the emergence of commercial agriculture, the burgeoning market system has failed to offer a sustainable and inclusive business model that incentivizes the farmers to produce and market safe food in one hand, and the consumers to buy safe food with confidence and trust on the other. Despite scattered initiatives, including those involving agricultural value chains, the existing market mechanism has failed to respond to the demand for safe food. Therefore, it has been a necessity that research is undertaken to innovate an inclusive and sustainable model through bold, disruptive and of course risky market development interventions and experiments. This action research project has exactly done that.

The fruits and vegetable sectors in Bangladesh are plagued with unsafe farming techniques with rampant application of harmful chemicals, poor postharvest management practices, and above all sheer market system failure. These not only lead to unsafe food at consumer end, but also result in huge postharvest losses and poor return to farmers. On aggregate, it's a huge national loss. This action research project – entitled "Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Postharvest Losses and Food Safety in Bangladesh" funded by KGF and conducted by BARI and CDCS® – has experimented different ways and means in its effort to develop an inclusive and sustainable business model that would potentially help improve the situation.

The action research project has seen a host of extremely engaging activities over the past three years. Major activities of the project include, but not limited to, the following: (i) field exploration and farmer mobilization, (ii) farmer and VCA training, (iii) G4G agro-entrepreneurial group formation, (iv) G4G handholding (v) G4G incubation support, (vi) multi-stakeholder engagement and market-support partnerships, (vii) upstream and downstream value chain partnership, (viii) G4G market trials, (ix) G4G agribusiness centers, (x) G4G brand building and consumer sensitization, (xi) market linkage with end-market traders, (xii) direct market access through weekend farmers' market, mobile farmers' market and community farmers' market, (xiii) mass communication and awareness building, and (xiv) peer-to-peer networking among farmer groups and agro-value chain actors, and (xv) crisis time implementation trial of G4G Inclusive Agribusiness Model (G4G-IAM) amid COVID-19. Besides, numerous surveys were done, including baseline, end-line and customer surveys.

The major output of the research project is G4G inclusive agribusiness model (G4G-IAM) for production and marketing of safe food. The model helps reduce unnecessary intermediaries from the chain and thereby offers more benefit to farmers as well as consumers with fair price and quality produce. Generally speaking, the model has two derivatives: (a) shortened value chain and (b) direct access to end consumer. The first allows farmer groups to send their produce directly to distant urban wholesaler (bypassing all local intermediaries), while in the second there exists no intermediary at all between farmer groups and final consumers. The model achieved this feat through CDCS® G4G Community Farmers' Market, G4G Weekend Farmers' Market and G4G Mobile Farmers' Market.

G4G interventions have left profound impact on the farmer groups that could withstand extremely high demand of this research project. The successful farmer groups have started reaping the benefit. Three quick examples are: (i) in just three weeks of crisis time implementation of the G4G-IAM model during

COVID-19 pandemic, farmer groups participating in the implementation of G4G Community Farmers' Market model could sell some 15-20 tonnes of agro-produce and fetched about BDT 3 million. (ii) Inspired by such success, the farmers themselves have started making adjustment in their business model. More importantly, they have started making significant investment in farming and postharvest management technologies. And, (iii) the farmers have started networking not only with forward market traders in distant wholesale points, but also with peer farmers and farmer-groups. Mentionable that such peer-to-peer (P2P) networking and business transactions at the farmers' level is rather been a windfall gain (i.e. beyond the envisaged goal of this research project). These are but a few signs of impact that the project is leaving behind.

It is envisaged that with a consisitent and scaled up supply chain in the next phase, when a lot more G4G farmers from many farming communities across the country would participate in G4G group, the on line platform will become finantially viable to operate. Also, farming communities will need higher level capacity building to operate on the online platform by themselves. Besides, partners like DAE, DAM, a2i will through their countrywide channels will work alongside CDCS in scaling the entire initiative.

Regarding women engagement, the project aims to directly involve greater number of women at the piloting phase by building their capacity and strengthening their ties with their male counterparts so that they may also become skilled in helping grow their safe initiatives and they may work as units of families working together towards safe agro production, marketing and sales rather than males working in isolation.

This action research project has offered a host of key lessons: (i) capacity building is a continuous process, and therefore trainings must be rigorously followed up with handholding and incubation activities, (ii) consumers are ready to pay if their trust is won which requires true commitment, (iii) isolated actions may not deliver, and an ecosystem perspective to agribusiness competitiveness is crucial, and (iv) continuous engagement and adjustment in approaches, strategies and actions are crucial to intervention success. Therefore, any value chain and market development research and intervention demands innovative and bold experiments to be crafted and executed by a passionate multi-disciplinary team of researchers.

The fact that CDCS® G4G Inclusive Agribusiness Model (G4G-IAM) on safe food value chain could incentivize farmers and attract consumers, and thereby withstand and deliver even during such crisis as COVID-19 pandemic, is an enormous testimony of the model's robustness. Therefore, the model deserves scaling-up, with immediate effect. This is to ensure national food and nutrition security and to advance farmers' wellbeing.

H.Recommendation

Given the success of this market and value chain action research on safe agro-produce, this study recommends immediate piloting and scaling up the implementation of the model developed under this project. In this connection, five specific recommendations involving piloting are outlined hereunder:

1. Promote CDCS® G4G Forward Market Value Chain Model (G4G-FMVCM) through extensive piloting across agricultural subsectors, nationally. In terms of forward market linkage, replicate and scale G4G Community Farmers' Market, G4G Weekend Farmers' Market and G4G Mobile Farmers' Market model-derivatives.

2. Promote agro-entrepreneurship by scaling CDCS® G4G Agribusiness Center (G4G-ABC) Model across the country to mobilize and train farmers and to incubate and accelerate rural agro-enterprises.

3. For operational efficiency and sustainability of these models, explore ways and means for ICT integration around these models. Particular emphasis should be given to safe scientific farming, technology transfer and market linkages along upstream and downstream value chain segments.

4. Promote extensive multi-agency public-private collaboration to ensure skills and knowledge, quality monitoring and certification, sound transportation logistics and storage facilities, strong support industries (e.g. packaging), physical market places/outlets, innovative financial services, and appropriate technologies.

5. Build consumer awareness and policy advocacy campaigns on safe and nutritious food. And take follow-up measures in order to build a healthy nation, with sound immunity.

This study is confident that G4G Market Engagement Model (G4G-MEM) will be the key to future agricultural success as it relates to safe food production and marketing, fair price to farmers and high quality nutritious agro-food to consumers. In short, G4G-MEM offers a pathway to nation food and nutrition security, and would be even more effective during this 'evolving regime of new normal'.

I. Financial Statement

I.1 Summary Statement of Expenditure (SoE) Combined

(In thousand Tk)

	Particulars/ Line Items	Year 1	Year 2	Year 3	Total Expenditure	Approved Budget
A.	Fund Received	9434	7258	4501		
BI.	Expenditure (Recurring)					
1.	1.1 Remuneration for Contractual Staff	1831	1175	1265	4271	4275
	1.2 Remuneration of Accounting / Typing Support Service	451	342	323	1116	1230
2	Research & Development (R&D) related cost	1816	1277	1290	4383	4661
3	Maintenance and repairing of lab./field equipment, etc.	9	14	58	81	90
4	Training	599	0	0	599	600
5	Workshop /Seminar/Meeting etc.	400	0	1	401	500
6	6.1Travel expenses (TA/DA)	972	641	666	2279	4983
	6.2 Vehicle hiring/oil & fuel	1773	1605	1631	5009	4719
7	Office supplies and contingency	249	210	267	726	786
8	Any other items (Bank charges)	8	7	4	19	0
9	Contractual Services	0	150	0	150	760
10	Overhead	223	635	446	1304	1304
	Sub-total B.I(1-9)	8331	6056	6100	20338	23908
B.II:	Non-recurring (Capital cost) Expenditure	0	0	0	0	0
10	Equipment & Appliances	590	0	0	590	592
B.II:	Sub-total B.II(10)	0	0	0	0	0
C	Grand Total Expenditure B.III(1-10)	8921	6056	6100	20928	24500
D	Unspent balance returned	0	0	149	149	0

Financial Progress: Expenditure made/ Fund received x100= 98.93 %

I.2 Summary Statement of Expenditure (SoE) BARI

(In thousand Tk)

	Particulars/ Line Items	Year 1	Year 2	Year 3	Total Expenditure	Approved Budget
A.	Fund Received	4053	2093	1109		
BI.	Expenditure (Recurring)					
1.	1.1 Remuneration for Contractual Staff					
	1.2 Remuneration of Accounting / Typing Support Service	144	112	70	326	402
2	Research & Development (R&D) related cost	196	393		589	707
3	Maintenance and repairing of lab./field equipment, etc.	0	0	45	45	45
4	Training	599	0		599	600
5	Workshop /Seminar/Meeting etc.	400	0	1	401	500
6	6.1Travel expenses (TA/DA)	483	237	208	928	3217
	6.2 Vehicle hiring/oil & fuel	1265	1074	926	3265	3149
7	Office supplies and contingency	167	138	181	486	488
8	Any other items (Bank charges)				0	0
9	Contractual Services	0	150	0	150	760
10	Overhead				0	0
	Sub-total B.I(1-9)	3254	2104	1431	6,789	9868
B.II:	Non-recurring (Capital cost) Expenditure				0	0
10	Equipment & Appliances	317			317	317
B.II:	Sub-total B.II(10)				0	0
C	Grand Total Expenditure B.III(1-10)	3571	2104	1431	7106	10185
D	Unspent balance returned			149	149	

Financial Progress: Expenditure made/ Fund received x100= 97.95 %

Bank Reconciliation Statement (BRS)

Name of Project: Market and Value Chain Studies of Fruits and Vegetables

Period Ending As of:

Name of Bank: BARI Branch
Sonali Bank, Gazipur
Bank A/C Number:

Bank A/C C Name: 0201402001058
BARI, Gazipur

	Amount BDT
1. Balance per Bank Statement 30.06.2020	213736.30
2. Deposits in Transit:	

Date	Slip Number	Amount

3. Outstanding Cheques:

Date	Cheque Number	Amount
31.05.2020	1128856	31200
30.06.2020	1128854	14000
30.06.2020	1128855	7875
30.06.2020	1128857	4200
30.06.2020	1128858	4200
01.09.2020	Pay order no. 994920 (Refunded to KGF)	148571.30
01.09.2020	Bank closing charge	3690
	Total=	213736.30

4. Adjusted Bank Balance (1+2-3)	213736.30
5. Book Balance as per Cashbook	00
Difference:	

Prepared by: ..... Chief Executive: .....

Name: ....

Sample Format-2

I.3 Summary Statement of Expenditure (SoE) CDCS

(In thousand Tk)

	Particulars/ Line Items	Year 1	Year 2	Year 3	Total Expenditure	Approved Budget
A.	Fund Received	5381	5165	3392		
BI.	Expenditure (Recurring)					
1.	1.1 Remuneration for Contractual Staff	1831	1175	1265	4271	4275
	1.2 Remuneration of Accounting / Typing Support Service	307	230	253	790	828
2	Research & Development (R&D) related cost	1620	884	1290	3794	3954*
3	Maintenance and repairing of lab./field equipment, etc.	9	14	13	36	45
4	Training				0	0
5	Workshop /Seminar/Meeting etc.				0	0
6	6.1Travel expenses (TA/DA)	489	404	458	1351	1766
	6.2 Vehicle hiring/oil & fuel	508	531	705	1744	1570
7	Office supplies and contingency	82	72	86	240	298
8	Any other items (Bank charges)	8	7	4	19	0
9	Contractual Services				0	0
10	Overhead	223	635	446	1304	1304
	Sub-total B.I(1-9)	5077	3952	4520	13549	14040
B.II:	Non-recurring (Capital cost) Expenditure				0	0
10	Equipment & Appliances	273			273	275
B.II:	Sub-total B.II(10)				0	0
C	Grand Total Expenditure B.III(1-10)	5350	3952	4520	13822	14315

Financial Progress: Expenditure made/ Fund received x100= 99.88 %

***Note: As CDCS pursued extensive R&D activities and BARI had unspent R&D budget, an amount of BDT 10,00,000 has been transferred from there to CDCS with approval from KGF. Hence the budget adjustment is made.**

CDCS Reconciliation with Bank Statement:

(In thousand Tk)

Fund received	13938
Expenses incurred	13822
Difference	116
Cash at Bank	116

J. Self Assessment of the Project

1. Have you been able to achieve all specific objectives of your project?

Yes. We have achieved all specific objectives of the project.

2. Who is/are the target beneficiary group/s of your project output/result? Farmers/Policy makers/Agri. Business men/ Agro. Processors etc.

The prime beneficiary group of our project is Farmers. However, as the project involves the entire agro value chain, implementation of the G4G Inclusive Agribusiness Model ensures increased and equitable distribution of value among all the actors involved along the chain. This includes agribusiness men, procurement/processing organizations as applicable and importantly consumers.

3. How the project outputs/results obtained would benefit the target beneficiary group/s? and how these could be transferred to the that/those target group/s?

Outputs/Results	Application of the outputs/results
Agribusiness ecosystem dynamics & consumer beghavior map	The report on agribusiness dynamics from business competitiveness point of view is an extremely important tool to analyse and understand the over dynamics of the sector and helps the facilitators desing their interventions targeting the beneficiary groups effectively. Consumer behavior map provides with much insightful view of consumer perception, expectation, and dicision triggers of consumers from different segments. Thus it is quite helpful while designing the overall marketing and sales plan on any particular point. Updating of such consumer data is also useful in order to customize the safe food marketing design from any end including agro entrepreneurs.
G4G Safe Protocols & Manuals	The safe protocols and manuals directly help farmers and agro entrepreneurs by providing them with guidelines and protocols that are easy to understand and aopt at farmer and agro entrepreneur level. These are very handy and as hangled at their working areas, it works as a reminder of good practices they need to follow while producing safe items. Also such protocols helps build awareness in the community by attracting and sensitizing even non G4G farmers and value chain actors.
G4G Enterprise Engagement	All enterprises including farming, input, machinery, logistics, transportation, whole sale and retail etc. has been engaged with G4G group through MoU signing. Such engagement helps them all work together keeping G4G farmers and farming communities at the center. Facilitating organizations like DAE and its field offices, DAM, a2i and others have also been engaged and helps G4G farmers and agroin quality monitoring, farming support, market facilitation endevors, capacity building and beyond. As such consumer communities has also been engaged accordingly to promote and sell safe agro produce in respective communities.
G4G Model Agribusiness Center establishment	Till date six G4G Model Agribusiness Centers (G4G MAC) have been established at six different farming hubs including, Jhinaidah, Jessore, Bogra, Rajshahi, Bagerhat, Savar. The centers work as organizing and coordination points for all G4G members particularly for farmers as these are housed at the premises of G4G farming enterprises at different

	locations. Online and off line krishiaddas and face to face discussions takes place here regularly in a need based manner and members discuss problems, issues, business and beyond. These centers eventually will become the Centers of Excellence for farming communities through establishing strong G4G knowledge and technology network, G4G support network and G4G peer to peer network among others.
G4G Communication & Knowledge sharing	G4G farming communities are constantly communicated, coordinated and offered with advisory and incubation support. To facilitate such continued support few online platforms have been created and activated including G4G facebook group involving G4G farmers and agroentrepreneurs, G4G krishiadda platform, Farmers Academy knowledge sharing platform and FarmersEnd marketing and sales platform. Also there is Aamader, the specislized retail shop that would help farmers sell their sage produce.
G4G Entrepreneurship Incubation	In each farming hub, G4G farming enterprises have been identified and tagged to CDCS Entrepreneurship Lab. Through the lab the G4G entrepreneurs get incubation and advisory support on a continuous basis. Through more than a dozen market trial at different places and during different occasions, farmers and farming enterprises received incubation support from CDCS Entrepreneurship Lab.
Greater awareness among G4G farmers	Through extensive capacity building, communication, incubation, advisory support and several krishiaddas (both online and face to face), awareness has been built particularly at farming community level on production and handling of safe agro produce. As CDCS facilitated several market trials involving farming enterprises, they also received much exposure and incubation support in marketing and sales of safe agro produce.
G4G Farmer-Consumer Inclusive model building	Under G4G Inclusive Agribusiness Model building initiative on safe agro produce, all the relevant players have been integrated. Actions like G4G Community Farmers Market, G4G Mobile Farmers Market and G4G participation in weekend Farmers Market are extremely usegul in creating fruitful connection between farmer/agroentrepreneur and consumer. Other different channels and pockets that have been activated directly help all the players involved in the model get benefit accordingly.

4. Do you think that you have successfully completed the project outputs/results? Yes/No; If yes, please provide one page success story/communication brief of your project in simple language with relevant pictures where applicable.

Yes, project output has been successfully attained.

Imagine, a farming community adopts sound farming practices, harvests their safe and nutritious agro-produce, performs good postharvest practices, arranges the produce in good bulk packages, hires a truck, loads it, drives it to a designated consumer community hundreds of miles away, sells their produce directly to the final consumers at a higher price than that of regular sellers, and returns happily with handsome amount of sales proceed that they never thought of! Is it ever possible in Bangladesh?

Yes, this is one of the major achievements of a three-year long action research project on Market and Value Chain conducted by CDCS® and BARI with funding support from KGF. The output of the research – CDCS® G4G Inclusive Agribusiness Model (G4G-IAM) on safe food value chains – has started delivering!

Not only that, G4G farming communities have already established a good brand image such that consumers make advance booking and enquire about their next schedule, and wait eagerly until then! Inspired by market feedback, G4G farmer groups are making significant investment in technologies (e.g. hot water treatment plant)! Moreover, peer-to-peer farmer networking has reached to the height that one farmer group procures and sells other group's agro-produce in different market places. Such cross- marketing opportunities are not only creating new value propositions for G4G farming communities, but also are building important social capital.

A rapid assessment on the benefitiaries show that farming communities are getting 23% higher net return in tomato, 21% greater net return in Mango, 5.3% in Banana and 3.4% in bittergour on an average.

The final output of the research project is G4G inclusive agribusiness model (G4G-IAM) for production and marketing of safe food. The model helps reduce unnecessary intermediaries from the chain and thereby offers more benefit to farmers as well as consumers with fair price and quality produce. Generally speaking, the model has two derivatives: (a) shortened value chain and (b) direct access to end consumer. It also offers the opportunity to get technologically integrated, depending on both end preparedness. The first derivative of the model, shortened value chain, allows farer groups to send their produce directly to distant urban wholesaler (bypassing all local intermediaries) from whom network retailers and others can buy. The second derivative, direct to end consumer, is its best form. Depending on the economies of scale and scope, there exists no intermediary at all between farmer groups and final consumers. The model achieved this feat through CDCS® G4G Community Farmers' Market, G4G

Weekend Farmers' Market and G4G Mobile Farmers' Market. And this success came even in the context of COVID-19 pandemic. This proves the robustness of the model.

Having said that stakeholder engagement and strong collaboration is the hallmark of the model. G4G-IAM requires active collaboration among all agricultural market actors, market facilitators and market regulators. The success of the model has relied most on this approach.

From sustainability perspective, the project has successfully created, equipped and activated a host of initiatives and brands. These include, but not limited to the following: (i) G4G Agribusiness Groups, (ii) G4G Agribusiness Center, (iii) G4G Community Farmers' Market, (iv) G4G Mobile Farmers' Market, (v) G4G Weekend Farmers Market, (vi) G4G Enterprise Network, (vii) *aamader*, specialized retail shop, and (viii) *FarmersEnd*, marketing e-platform. The project also equipped the Farmers Academy, knowledge and technology dissemination e-platform.

On 16th and 17th of May, 2020, Channel I –Maati O Manush program and the news Daily Bonik Barta covered the news on G4G Community Farmers Market initiative run under G4G Inclusive Agribusiness Model. The news is posted below.

করোনায় কৃষিপণ্যের বিপণন

নতুন মডেলে জিফোরজি কমিউনিটি কৃষক বাজার

নিজস্ব প্রতিবেদক ■

নভেল করোনাভাইরাসের কারণে সৃষ্ট পরিস্থিতিতে কৃষিপণ্যের বিপণনে নতুনত্ব এনেছে জিফোরজি কমিউনিটি কৃষক বাজার। এটি মূলত একটি অন্তর্ভুক্তিমূলক ব্যবসায়িক মডেল। যার মাধ্যমে কৃষক সরাসরি তাদের উৎপাদিত পণ্য ভোক্তাদের কাছে পৌঁছাতে পারছেন। এতে ভোক্তা যেমন নিরাপদ ও সাশ্রয়ী মূল্যে পণ্য পাচ্ছেন, তেমনি কৃষকও প্রচলিত দামের চেয়ে বেশি পাচ্ছেন। এখানে মধ্যস্বত্বভোগীদের স্থান না থাকায় কৃষক ও ভোক্তা উভয়েই লাভবান হচ্ছেন। আর করোনাকালীন কৃষকদের স্বাস্থ্য সুরক্ষা এবং বিপণনের জন্য যাবতীয় ব্যবস্থা করে দিচ্ছে সেন্টার ফর ডেভেলপমেন্ট অ্যান্ড কমপিটিটিভ স্ট্র্যাটেজিজ (সিডিসিএস) ও বাংলাদেশ কৃষি গবেষণা ইনস্টিটিউট (বারি)। এ গবেষণায় সহায়তা করছে কৃষি গবেষণা ফাউন্ডেশন (কেজিএফ)।

জানা গেছে, কৃষি সম্প্রসারণ অধিদপ্তর, কৃষি বিপণন অধিদপ্তর ও এটুআইয়ের সহযোগিতায় এবং সিডিসিএসের সার্বিক তত্ত্বাবধানে কৃষক গাজীপুরে সমরাস্ত্র কারখানায় লকডাউন কর্মকর্তা ও কর্মচারীদের জন্য নিরাপদ কৃষিপণ্য নিয়ে আসছেন এবং সরাসরি ভোক্তার কাছে বিক্রি করছেন। এখানে ঝিনাইদহের কোটচাঁদপুরের কৃষকরা তাদের পণ্য নিয়মিতভাবে বিক্রি করতে পারছেন। এতে কৃষক যেমন তার নিরাপদ পণ্যের ভালো মূল্য পাচ্ছেন, তেমনি ভোক্তাও সতেজ এবং গুণগত মানের পণ্যের জন্য কিছু অতিরিক্ত মূল্য দিতে আগ্রহ প্রকাশ করছেন। সামনের দিনে দেশের অন্য বাণিজ্যিক জেলাগুলোয় এ পদ্ধতি সম্প্রসারণ করা হবে।

এ বিষয়ে সিডিসিএসের ব্যবস্থাপনা পরিচালক ফারজানা মোরশেদ বলেন, সিডিসিএস জিফোরজি কমিউনিটি কৃষক বাজার চালু করা অত্যন্ত চ্যালেঞ্জিং ছিল। বিশেষত কভিড-১৯ পরিস্থিতিতে, সব পক্ষের নিরলস প্রচেষ্টায় এ বাজার স্থাপন ও বাস্তবায়ন সম্ভব হয়েছে। সিডিসিএস সামনের দিনগুলোয় এ মডেলটি নিয়ে আরো ব্যাপক আকারে কাজ করার পরিকল্পনা গ্রহণ করেছে। তবে এটি কোনো একক কর্তৃপক্ষ দ্বারা সমাধান সম্ভব নয়, এক্ষেত্রে সব পক্ষের সম্মিলিত প্রয়াস অত্যন্ত গুরুত্বপূর্ণ। উদ্ভূত কভিড-১৯ পরিস্থিতিতে এই মডেলের বাস্তবায়নের উদ্যোগ নেয়া হয়েছে।

জানা গেছে, কভিড-১৯ পরিস্থিতির কারণে দুর্বল সাপ্লাই চেইন ও স্থবির বাজার ব্যবস্থার ফলে কৃষকরা কৃষিপণ্যের ন্যায্যমূল্য পাচ্ছেন না। একদিকে উৎপাদন এলাকাগুলোয় কৃষিপণ্যের উদ্বৃত্ত সরবরাহ, অন্যদিকে বড় শহরগুলোয় চাহিদার স্বল্পতা ও পরিবহনের অব্যবস্থার কারণে কাঁচামালের মূল্য অসহনীয় পর্যায়ে হ্রাস পেয়েছে। এই পরিস্থিতি গোটা জাতিকে সামগ্রিকভাবে খাদ্য ও পুষ্টি সংকটের দিকে ঠেলে দিচ্ছে। এ অবস্থায় উৎপাদন ও বিপণনের জন্য একটি টেকসই ব্যবসায়িক মডেল অত্যন্ত প্রয়োজন। নিরাপদ খাদ্য উৎপাদন ও বাজার ব্যবস্থা উন্নয়নে সুদূরপ্রসারী লক্ষ্য সামনে রেখে তিন বছর ধরে একটি অন্তর্ভুক্তিমূলক নতুন ব্যবসায়িক মডেল উদ্ভাবনের জন্য ফলিত গবেষণায় নিয়োজিত রয়েছে সিডিসিএস ও বারি।

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5. Please describe briefly the outcome/benefit and likely impact of your project on the productivity, policy, society, economy and environment.

G4G interventions – e.g. training, handholding, incubation, brand building, market exposure, market linkages, and direct market access by farmers through several channels – have left profound impact on the farmer groups that could withstand extremely high demand of the research project. The successful farmer groups have started reaping the benefit. For example, in just three weeks of operation (that too under COVID-19 crisis), farmer groups participating in the implementation of G4G Community Farmers' Market model sold some 15-20 tonnes of agro-produce and fetched about BDT 3 million. And, inspired by such success, now they themselves have started making adjustment in their business and operations model.

More importantly, they have started making significant investment in farming and postharvest management technologies (e.g. establishment of hot water treatment plant for fruits and vegetables primarily targeting Mango). Moreover, the farmers have started networking not only with forward market traders in distant wholesale points, but also with other farmers and farmer-groups. Mentionable that such ***peer-to-peer (P2P) networking*** and business transactions at the farmers' level was beyond the envisaged goal of this research project. These are but a few signs of impact that the project is leaving behind.

Crop	% Change in cost production cost	% Change in sales price	% Change in net sales return
Tomato	↓ 16.3%	↑ 25%	↑ 23%
Mango	↑ 39.5%	↑ 20.8%	↑ 21%
Banana	↑ 0.9%	same	↑ 5.3%
Bittergourd	↓ 7.9%	same	↑ 3.4%

The table above shows a crop specific benefit picture of G4G farmers after following G4G safe protocols and getting engaged under G4G inclusive agribusiness Model. In most of the cases, application of safe protocols lower chemical fertilizer use and pesticide use thereby lowering the cost of production. However, use of bio pesticide like pheromone trap, mango bagging and others increase the production cost in cases. But finally farmers enjoy higher net return from the sale of safe agro produce. ***The increased net return for farmers ranges from 23% to 3% on an average.*** Thus safe production and marketing under G4G Inclusive Agribusiness Model helps earn higher return for farmers and ensures greater benefit in the long run.

From environmental point of view, safe production technologies are always environment friendly and have positive impact on the nature and productivity in the long run. By ensuring greater engagement at different stakeholder levels and increased value share for all the actors, once scaled, G4G Inclusive Agribusiness Model bound to bring sustainable benefits from economic point of view.

Also, as it has a built in focus on safe food production, inclusiveness, sustainability and competitiveness, keeping farmer at the center, and empowering them through enhanced capacity, exposure and branding, the the model is bound to generate greater impact in the coming days.

K. Acknowledgement

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L. Endorsement

Head of Applying Organization/Authorized Person (Lead Agency)

Name:

Signature:

Seal:

Date:

[Note:

I. For coordinated projects, activity plan and progress report (physical, technical and financial) should be given component wise and coordinator will summarize where necessary.

II Statements within [ ] are the guidelines/instructions which must be followed during report preparation.

III. Two copies (spiral binding) of the draft project completion report with a soft copy need to be submitted to KGF fifteen (15) days before the completion of the project duration]

Annex 1
End Line Report

Market and Value Chain Studies of Selected Fruits and Vegetables with Special Reference to Food Safety and Postharvest Losses in Bangladesh -An End Line Survey Report

1.0 Introduction

Fruits and vegetables are very important for human diet, especially for vitamins and minerals. Both production and consumption of fruits and vegetables in Bangladesh has been increased manifolds (HIES, 2019). In 2017-18, it produces around 4512 and 13605 thousand metric tons of fruits and vegetables (including potato) per year, respectively (BBS, 2019). Majority of the fruits and vegetables farmers concern with poor technology and low quality inputs, produce unsafe vegetables due to imprudently use of pesticides, and adopt poor postharvest practices. In addition, due to seasonal glut and the absence of proper marketing system, a huge amount of the harvested produce gets wasted every year. All these critical factors make fruits and vegetables production and their business costly and unsafe. Hasan (2010) reported that postharvest loss of fruits and vegetables in Bangladesh ranged from 23.6 to 43.5%, which accounts for an annual loss of Tk.34420 Million. The baseline survey report of this project showed that the total postharvest losses of mango, banana, tomato and bitter gourd were 25.87, 23.47, 25.43 and 26.53% respectively (Matin, 2018).

The Bangladesh Agricultural Research Institute (BARI) has developed a number of postharvest technologies and food safety measures for fruits and vegetables in order to reduce postharvest loss and make foods healthy for human consumption. Unfortunately, the technologies are mostly unknown to the producers, traders and even consumers of fruits and vegetables in Bangladesh. Therefore, the scientists of BARI in association with CDCS, launched a project titled *Market and value chain studies of selected fruits and vegetables with special reference to postharvest losses and food safety in Bangladesh* in order to make stakeholders of the value chains of fruits and vegetables aware on postharvest losses and food safety issues. Moreover, one of the crucial objectives of the project is to develop a suitable marketing model through which both produces and consumers will be financially benefited with healthy produces and the traders will get normal profit minimizing postharvest losses and costs of marketing. There is a need to evaluate the performance of the project since the project activities have been completed in the recent past. Therefore, an attempt was made to evaluate the short-term impacts such as stakeholder's benefits, suitability of the proposed model, and bottlenecks of the project through conducting Focus Group Discussion (FGD).

02. Methodology

The project deals with four crops (two fruits & two vegetables) namely mango, banana, tomato and bitter gourd and its activities were done in the four districts namely Bogura and Rajshahi for tomato, Bogura and Jessore for bitter gourd, Jhenaidah and Rajshahi for mango, and Bogura and Jhenaidah for banana. At the beginning of the project, the farmers of the aforesaid crops were given hands-on training on scientific cultivation and crop management technology in order to produce safe products and reduce postharvest loss. Again, the project formed some cohesive groups of farmers-cum-traders at different districts and provided them necessary training on postharvest processing and handling for marketing their safe produces to the end users at different selected selling points/hubs. Therefore, the present FGDs were conducted in the three districts namely Bogura, Rajshahi and Jhenaidah covering aforesaid crops.

A total of three FGDs were conducted with project and non-project farmers and traders together. In each FGD, in total 8-10 farmers and traders cultivating or trading similar type of crop were selected as participants. FGDs were done for collecting qualitative and quantitative data regarding awareness development, improvement of current state of knowledge, impact on pre- and post-harvest activities, demonstration effect of training, financial benefits of the farmers, reduction of postharvest losses, and constraints to safe food production and marketing at farm level. The FGD checklist was developed, pre-tested and finalized before doing the FGDs. A discussion guide was prepared prior to the commencement of the FGDs. The guide comprises the general format of the discussions and the techniques that were used to elicit responses. It is noted that the discussion guide is merely a guide, which is flexible and subject to variation and alteration in the field. In addition to a moderator in FGD, there was a note keeper who recorded comments and observations of the FGDs. A voice recorder was also used to record whole discussion in order to recall necessary issues.

Collecting data through FGD at Bogura

Collecting data through FGD at Bogura

Collecting data through FGD at Jhenaidah

Collecting data through FGD at Rajshahi

03. Results and Discussion

3.1 Awareness Towards Safe Food Production

Safe food production through organic farming has been identified as one of the strategies for sustainable agriculture. The extent of farmer's awareness and perceptions on safe food production influences these strategies. Most farmers are not aware of the importance of organic farming due to many reasons. The main reasons for not practicing organic farming include: no guarantee for the protection of farms from the exploitation of the big merchants (68.9%), oversight of the violations of standards and legislations and prevailing of poor rules to hold violators accountable (68%), lack of qualified and skilled labor on organic farming practices (63.9%), and weak consumer demand (27%) for organic products (Al-Zaidi and Shalaby, 2013). They found positive significant (0.01) correlation between farmers' perception towards organic farming as the dependent variable and factors like: basic profession, the degree of satisfaction with the farm work, and training.

In the group discussion, most of the participated farmers stated that their level of awareness towards producing safe fruits and vegetables has been increased to a great extent due to participation in the training programs and the close supervision of Bangladesh Agricultural Research Institute (BARI) - Center for Development and Competitive Strategies (CDCS) project personnel. All participated farmers believed that appropriate measures should be taken to keep fruits and vegetables safe for the consumers. They mentioned different measures such as use of various IPM methods (i.e. pheromone trap, *Bistop*, kill insects by hand, etc.), application of proper dose of pesticides, use organic pesticides, use of organic fertilizers, harvest produces after 7 days of applying pesticides, and use of *Bt* variety. The trained mango and tomato farmers were more aware of producing and marketing safe produces compared to banana and bitter gourd farmers due to getting better market and premium price of their produces.

However, some of the farmers, those who received training on safe fruits and vegetables production, still reluctant to adopt safe food production measures due to their higher dependence on traditional practices.

3.2 Awareness Towards Safe Food Marketing

As a result of capacity building and direct wholesaler and consumer exposure through several market trial exercises and participation in those events by project farmers and agro entrepreneurs, the groups are much aware of the demand of safe food at market end. They are also much aware of consumer preference, expectation and willingness. In fact, two of our groups are constantly supplying safe agro produce to consumer communities even during COVID. Though them other groups are also interested to participate any such endeavor if their operation is deemed profitable.

3.3 Improvement of Farmers' Current State of Knowledge

The participated farmers of FGDs stated that their level of knowledge regarding safe food production and marketing increased to some extent due to participating in the training programs and the close supervision of BARI-CDCS project personnel. Higher level of knowledge has been attained on benefit of fruit bagging, packaging and post-harvest loss reduction measures. Medium to high level of knowledge has been achieved by the respondent farmers on beneficial insects, appropriate dose of pesticides and fertilizers in fruits and vegetables production. However, medium level of understanding has been stated by some farmers regarding identification of diseases and adulterated pesticides (Table 2).

Table 1. Comparative status of farmer's knowledge or understanding

Particulars	Before training	After training
1. Awareness on safe food production	Low	Medium to high
2. Knowledge of beneficial insects	Very low	Medium to high
3. Knowledge on identification of diseases	Very low	Medium
4. Knowledge on proper dose of pesticides	Low	Medium to high
5. Knowledge on identification of adulterated pesticides	Very low	Medium
7. Determination of proper fertilizer dose	Low	Medium to high
6. Knowledge on benefit of fruit bagging	Unknown	Very high
8. Knowledge on proper packaging	Low	High
9. Knowledge on post-harvest loss reduction measures	Medium	High
10. Receiving premium price for safe produce	Not received	Received to some extent

Source: FGD, 2020

3.4 Impact on Pre- and Post-harvest Activities at Farm Level

Pre- and post-harvest activities of vegetables and fruits include fertilization, crop protection, mode of harvesting, sorting and grading, washing and cleaning, packaging, transportation, and retailing. Table 2 revealed the impact of training programme and close monitoring of BARI-CDCS project personnel on different pre and post-harvest activities of fruits and vegetables production. Currently, they are doing chemical treatment before sowing seeds of vegetables including tomato and bitter gourd. In the past, they used a huge amount of in-organic fertilizers and less organic fertilizers in vegetables cultivation. This scenario has been changed sharply due to their greater awareness. Now they started producing vegetables with organic fertilizers and applying less amounts of chemical pesticides.

In the past, they could not imagine the production of vegetables without the use of pesticides and applied a lot of pesticides to protect their crops from insects-pests infestation. Nevertheless, they have reduced the frequency of pesticide use and use *pheromone trap* and IPM strategies for producing fruits and vegetables. The mango farmers of Rajshahi (Baneshwar) and Jashore (Kotchadpur) opined that they applied pesticides 6-8 times per season and now they are using only 2-3 times per season. Nevertheless, they are using synthetic bags/poly bags in protecting mango and banana from insect-pest infestation. This result is quite comparable with the study conducted by Miah and Hoq (2018).

Harvesting of crops at the right time and in the right way maximizes crop yield and minimizes crop losses and quality deterioration. Most of the respondent farmers harvested vegetables in the afternoon by hand picking.

The assemble markets in the study areas usually sit early morning and ends by 1:00 PM that might be the reason of harvesting vegetables in the afternoon of the previous day of selling. For mango harvest, most trained farmers use *Tusi* (a kind of manual harvesting equipment) in the case of long tree and use hands for picking mangoes for short trees. It is also opined that mango growers give more emphasis on safe harvest than before. Harvesting containers are also important to protect crops from mechanical damage and contamination. Different types of containers were reported to use during harvesting of fruits and vegetables. Respondent farmers usually assemble harvested vegetables on plastic sheet, mat and sometimes on open ground for sorting, grading and packaging. They also give more emphasis on this issue than before for protecting damage and contamination.

Sorting and grading play significant role in getting higher price of fruits and vegetables and reduce postharvest losses. No standard of grading of fruits and vegetables is available in the study areas. However, the respondent farmers generally sort defect fruits and vegetables (i.e. insect infested, over mature, ripe, odd size, cut, broken, etc.) from good ones. In most cases, they sell these sorted low quality produce at lower price and high quality produce at higher price.

Good packaging is very much important for maintaining product quality, transport to distant places, and reduce postharvest losses. Respondent farmers usually use different types of containers as convenient to them for packaging and transporting their produces. In the past, mango, bitter gourd and tomato farmers used bamboo basket and plastic/jute sac, but currently they use plastic karate as packaging container. The prices of selected vegetables vary to some extent by its freshness, but not influenced widely due to the use of packaging containers.

Table 2. Pre-harvest and post-harvest activities taken by respondent farmers after receiving training on safe food production and marketing

Pre- and post-harvest activity	Actions taken before training	Actions taken after training			
		Fruits		Vegetables	
		Mango	Banana	Tomato	Bitter gourd
Seed treatment	Not done	Not done	Not done	Done	Done
Fertilization	Use in-organic & organic fertilizers	Use in-organic & organic fertilizers	Use in-organic & organic fertilizers	Use much organic fertilizers	Use much organic fertilizers
Crop protection	Use plenty of pesticides	Use pheromone trap, bagging, less pesticides	Use less pesticides, Bagging,	Use less pesticides, Pheromone trap	Use less pesticides, Pheromone trap
Crop harvest	Apply traditional method	Use *Tusi*, hand picking, keep on plastic sheet or jute sac	Apply traditional method	Hand picking, keep on plastic sheet or jute sac	Hand picking, keep on plastic sheet or jute sac
Grading	Not graded	Graded	Graded	Graded	Graded
Packaging and transportation	Jute sac, bamboo basket, traditional method	Plastic karate	Traditional method	Plastic karate	Plastic karate

Source: FGD (2020)

Usually, the producers of mango, tomato and bitter gourd do not need to transport their produces from field to the distant markets. *Beparis* perform this activity in the early harvesting period due to higher price of these produces. However, a group of organized mango farmers in Jashore district (Kotchadpur) who were given training on safe produce production and marketing transported mangoes from local areas to distant markets (Dhaka, Gazipur) through plastic karate as packaging container.

3.5 Impact on Postharvest Activities at Traders' Level

At trader level, those who have been brought under G4G umbrella, are much aware of the safety protocols. G4G traders have been provided with orientation and sensitization workshops on quality maintenance practices and G4G quality control parameters have been elaborated so that they may practice the same and follow safety parameters accordingly.

3.6 Demonstration Effect of the Training Program

A good number of training program on producing safe fruits/vegetables and crop protection has been provided among fruits (mango & banana) and vegetables (especially tomato & bitter gourd) farmers in the study areas. At present, they become more aware of the importance of producing safe fruits and vegetables much better than before and started producing fruits and vegetables accordingly. They claimed that many fruits and vegetables farmers around their residences who were not participated in the training program are also become much aware of the importance of producing safe fruits and vegetables due to perceiving their activities and advice.

3.7 Financial Benefit of the Participated Farmers

The trained farmers who produced selected fruits (mango and banana) and vegetables (tomato and bitter gourd) following the scientific techniques of cultivation (improved practice) provided in the training program could reduce a substantial amount of cost in production and received higher benefits (in most cases) to some extent. It is important to mention here that the safe food/products growing farmers (improved practice adopters) used very less or no amount of pesticides and higher amounts of organic fertilizers in their crop fields.

3.7.1 Impact on productivity and profitability of vegetables

Tomato: The cost of production of safe tomato (variety: *Minto*) under improved practices was estimated at Tk. 191611 per hectare which was 16.3% lower than the production cost incurred under traditional cultivation practice. Farmers of improved practices could save this amount through using lower amount of chemical fertilizers and pesticides. However, they received about 14.6% and 22.9% higher gross and net return from safe tomato production respectively, although it produced 8.3% lower yield (Table 3). The reason of the lower production of safe tomato was less use or no use of pesticides resulting a good number of tomatoes were infected by insects and pests. Most safe tomato producers could sell their produce at higher price to terminal markets (specific shops/supper markets of Dhaka and Gazipur) through middleman traders (*Bepari*) in the early stage of production and regional markets (specific shops/super markets of Bogura and Rajshahi) in the middle and later stage of production. On an average they received higher price of Tk. 5.0 per kg.

Table 3. Comparative scenario of costs and returns of vegetable production

Cost and return	Tomato (Tk/ha)		Bitter gourd (Tk/ha)	
	Traditional practice	Improved practice	Traditional practice	Improved practice
A. Cost of production	**2,29,035**	**1,91,611 (-16.3)**	**2,17,809**	**2,00,593 (-7.9)**
Land preparation	11976	11976	13473	13473
Human labour	33682	33682	52394	52394
Seed/seedling	11227	11227	6736	6736
Weeding	31436	31436	31436	31436
Manure & fertilizer	56136	44909 (-20.0)	48652	43412 (-10.8)
Irrigation	28442	28442	8982	8982
Pesticides/Pheromone trap	29939	3742 (-87.5)	18712	6736 (-64.0)
Land use cost	26197	26197	37424	37424
B. Gross return	**10,77,820**	**12,35,000 (14.6)**	**7,18,540**	**7,17,440 (-0.2)**
Production (kg)	53891	49400 (-8.3)	35927	35872 (-0.2)
Price (Tk/kg)	20	25 (25.0)	20	20
C. Net return (B-A)	**8,48,785**	**10,43,389 (22.9)**	**5,00,731**	**5,16,847 (3.2)**

Note: Figures in the parentheses indicate percent increase (+) or decrease (-) over before practice

Bitter gourd: In case of bitter gourd, the cost of safe produce production under improved practices was estimated at Tk. 2,00,593 per hectare which was 7.9% lower than the production cost spent for traditional bitter gourd production. Safe bitter gourd producers could also save this amount through using lower amount of chemical fertilizers and pesticides. On the other hand, they received about 3.2% higher net return from safe bitter gourd production mainly due to lower cost of production. The productivity of safe bitter gourd production was little bit lower (0.2%) compared to traditional bitter gourd production (Table 3). Due to the less use of pesticides, some bitter gourds were infected by insects-pests resulting lower yield. Most safe bitter gourd producers in the study areas could not sell their safe produce to terminal markets (Dhaka, Gazipur) with premium price. They had no special market for safe bitter gourds at all. Generally, they sell bitter gourd to both distant and local middleman traders (*Bepari*) throughout the production period.

3.7.2 Impact on productivity and profitability of fruits

Mango: The management cost of mango production (variety: *Asshina*) included the costs of land preparation, human labour, manures & fertilizers, irrigation, pesticides, poly bag, and land use cost. The average cost of production under improved practice was Tk. 298645 per hectare which was much higher (39.5%) than the cost incurred under traditional practice. Under improved practice, the trained mango farmers applied less pesticides, used pheromone traps, and a reasonable number of farmers used poly bags (for covering mango) in order to protect mango from insect-pest infestation and make them fresh and attractive. However, the mango producers who followed improved practice used higher number of labour, spent much on manure, fertilizer and irrigation, and used pheromone traps and poly bags. For these reasons the cost of mango production under improved practice was much higher than that of traditional practice. Again, the improved practice required higher number of labour and more cost (25% higher) due to bagging of mango, use higher amount of manure & fertilizer, and higher number of irrigation (Table 4).

The average yields of *Asshina* mango were 56.89 ton and 53.89 ton per hectare under improved and traditional practice respectively. This increased yield (5.6%) was attributed to less infestation and less postharvest loss. The average gross and net returns were estimated at Tk.15,64,335/ha and Tk.12,65,690/ha under improved practice which were 16.1% and 11.7% higher than the corresponding gross and net returns derived from traditional practice. The increased gross return was mainly due to getting higher price of bagged mangoes (looking fresh, bright colour and spotless) and higher yield (Table 4).

Table 4. Comparative scenario of costs and returns of fruit production

Cost and return	Mango (Tk/ha)		Banana (Tk/ha)	
	Traditional practice	Improved practice	Traditional practice	Improved practice
A. Cost of production	**214067**	**298645 (39.5)**	**246999**	**249246 (0.9)**
Land preparation	7485	7485	7485	7485
Human labour	59879	74848 (25.0)	56136	48652 (-13.3)
Sucker	--	--	14970	14970
Manure & fertilizer	18712	22455 (20.0)	52394	52394
Irrigation	4491	7485 (66.7)	37424	37424
Pesticides, pheromone & bagging	48652	111524 (129)	3742	13473 (260)
Land use cost	74848	74848	74848	74848
B. Gross return	**1347275**	**1564335 (16.1)**	**703580**	**729964 (3.7)**
Production without bagging (kg)	53891	42664	35179	8795
Production with bagging (kg)	-	14221	-	26384
Price of normal fruit (Tk/kg)	25	25	20	20
Price of bagging fruit (Tk/kg)	-	35	-	21
C. Net return (B-A)	**1133208**	**1265690 (11.7)**	**456581**	**480718 (5.3)**

Note: *Figures in the parentheses indicate percent increase (+) or decrease (-) over before practice*

Fruit variety = Asshina (mango) & Sabri (banana); No. of fruit tree/sucker per bigha = 20 Nos. (mango) & 350 Nos. (banana); bagging of fruit 25% (mango) & 75% (banana), Average weight of mango = 1 kg/piece, Price of bag = Tk.6.0 (mango) & Tk.5.0 (banana) per bag

Banana: The cost of banana production (intensively cultivated variety: *Sabri*) included all kinds of costs incurred for human labour, mechanical power, sucker, manure, fertilizers, irrigation, pesticides, poly bag, and land use

cost. The average cost of production under improved practice was Tk. 249246 per hectare which was slightly higher (0.90%) than the cost incurred under traditional practice. Some trained banana farmers used poly bags for covering banana bunch (*Kadhi*) in order to protect banana from insect-pest infestation that required extra cost. Hence, the cost of bagging and pesticides was 260% higher for improved practice of banana cultivation. However, it incurred about 13.3% less labour cost which was due to less application of pesticides (Table 4).

The average yield of banana was 35.18 ton per hectare under both practices. No yield difference was reported between traditional and improved practice. The average gross as well as net return were estimated at Tk. 7,29,964/ha and Tk. 4,80,718/ha under improved practice which were about 3.7% and 5.3% higher than the corresponding gross and net return of banana cultivation under traditional practice. This variation was mainly due to getting higher price of bagged banana (looking fresh and spotless).

3.8 Financial Benefits of the Traders

At the distant markets where G4G farmers are directly linked to wholesale or retail traders, they report that the quality of the safe G4G produce is better than the other vegetables available in the market and thus, based on quality, these are sold at higher price to retail buyers. Also at places the retail buyers' pre-order those produce beforehand and once it enters the market immediately goes out of stock due to high demand.

3.9 Impact on Post-harvest Loss Reduction at Farm Level

Generally three types of postharvest losses such as biological, chemical, and mechanical are found at farm level. Pest and disease infestations are biological postharvest losses. Visible external contamination of fruits and vegetables with pesticides, toxics and unpleasant flavor produces by pathogens are chemical postharvest losses. Different types of injuries and bruises occurred during harvesting are mechanical postharvest losses. Miah and Hoq, (2018) identified different factors such as damage by insect, rotten damage, cleaning, grading, and transportation which were responsible for postharvest loss of vegetables at farm level.

Majority of the fruits and vegetables farmers opined that the rate of post-harvest losses has been reduced due to adopt several pre- and post-harvest reducing measures. Some tomato and bitter gourd farmers stated that previously the post-harvest loss was 4-5 kg per maund, whereas at present it is only 2-3 kg per maund. Mango producers stated that the highest post-harvest loss occurred mainly due to insect-pest infestation, spoilage, and improper harvesting. Their opinion suggests that the post-harvest loss of mango has reduced to 5-6% from 10-12% due to taking different measures.

3.10 Impact on Post-harvest Loss Reduction at Trader's Level

As depicted earlier, postharvest loss has also come down at trader level since traders have been trained to follow quality maintenance protocols under all circumstances. Due to shortened value chains by bypassing stakeholders, and much care extended while handling the produces post-harvest loss has been reduced at traders' level.

3.11 Constraints to Safe Food Production and Marketing

- ✓ Most farmers used to produce fruits and vegetables under traditional system.
- ✓ Indiscriminate use of pesticides in fruits and vegetable production.
- ✓ Less publicity in favor of safe fruits and vegetables.
- ✓ No separate market for safe fruits and vegetables at regional levels.
- ✓ The level of consumer's awareness towards safe fruits and vegetables are very low.
- ✓ No certification facility exists at local level for available safe vegetables for growing trustiness of the consumers.
- ✓ No assurance of getting premium price for safe fruits and vegetables for encouraging farmers.
- ✓ No cost-effective safe packaging system for fruits and vegetables.
- ✓ No cost-effective safe and quick transportation system for fruits and vegetables.

4.0 Recommendations

The study of fruits and vegetable production and supply chains in relation to safe and quality produces are complex and dynamic issues. It encompasses various aspects of production, marketing, and consumer's behaviour towards safe fruits and vegetable production, marketing and consumption. Based on the findings of the study, a number of measures are needed to produce safe and quality fruits and vegetables and marketing the same for the consumers.

1. Fruits and vegetables farmers should be motivated to adopt Good Agricultural Practices (GAP) (i.e. use of improved variety, disease free seedlings/saplings, less use of pesticides, use of more organic and less chemical fertilizers, use of sex pheromone traps as well as bio-pesticides etc.), providing hands-on training, diseases resistant variety, *Bt* variety, IPM technologies, bio pesticides, and premium price of organic vegetables. The Department of Agriculture Extension (DAE) should play a key role in this regard.
2. The scientific and technical know-how of cultivating safe fruits and vegetables should be disseminated to the respective growers. BARI in collaboration with DAE may arrange regular training and demonstration programs addressing these issues.
3. Awareness toward safe fruits and vegetables production, marketing and consumption should be developed among different stakeholders in the supply chain, and consumers for developing a real safe supply chain of fruits and vegetables in Bangladesh. In this regard, technical know-how and technology related to postharvest management and nutrition should be disseminated through TV, radio, billboard, video, meeting, brochure and mobile phone apps.
4. Farmers have no or little bargaining power for ensuring fair price of their safe produces. In this situation, farmers should be organized through cooperative marketing society for selling their safe produces to the consumers.
5. The stakeholders in the supply chain should be motivated for packaging of fruits and vegetables after proper sorting and grading (i.e. separate spotted, injured, and semi-spoiled produce from good ones). In this regard, a short-term training on post-harvest packaging and handling of produces may be provided to the respective stakeholders.
6. A small percentage of traders have been using plastic crates as packaging as well as transportation materials. Therefore, all players in the selected fruits and vegetables supply chain must be motivated to use insert able plastic crates for packaging. To achieve this goal government should provide subsidy to the manufacturing company, so that the user can afford with lower price.
7. Chain stores and specialized stores are becoming a very good avenue for availing fruits and vegetables in urban markets of Bangladesh. Therefore, safe fruits and vegetables may be marketed through chain and specialized stores for getting premium price.
8. For safe fruits and vegetables marketing, alternative methods of reaching out to customers may include: direct online sales, f-commerce, fair, tours.
9. Branding plays a key role in attracting consumers for safe produce. If safe produces can be certified, then the consumers will be much more likely to buy them. Therefore, the available safe fruits and vegetables should be certified by some authority for developing consumers' confidence on safe produces. There are some government and non-government authorities (e.g.CAB) who supposed to take care food safety issues. Government monitoring system should be strengthened for ensuring safe produce marketing for the consumers.
10. Continuous research is essential to mitigate diverse problems prevailing in the fruits and vegetables supply chain in Bangladesh. Therefore, BARI and Agricultural Universities in Bangladesh should strengthen their existing capacity in terms of postharvest research and development.

References

Al-Zaidi, A. A. and M. Y. Shalaby (2013). Farmers' awareness on the importance of organic farming as sustainable agriculture in the Qassim region, Kingdom of Saudi Arabia. *Arab Gulf Journal of Scientific Research* 31(4):300-307, January 2013.

BBS (2019). Yearbook of Agricultural Statistics-2018 (30th series), Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning Government of the People's Republic of Bangladesh.

Hassan, M.K. (2010). Final Report- Postharvest Loss Assessment: A Study to Formulate Policy for Loss Reduction of Fruits and Vegetables and Socio-Economic Uplift of the Stakeholders (Funded by USAID and EC & Jointly implemented by FAO and FPMU of MoFDM). p. 189.

HIES (2019). Final report on *Household Income and Expenditure Survey* 2016. Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning Government of the People's Republic of Bangladesh.

Matin, M. A. (2018). Market and value chain studies of selected fruits and vegetables with special reference to postharvest losses and food safety in Bangladesh. Baseline survey report submitted to Krishi Gobeshona Foundation (KGF), AIC Building (3rd Floor), BARC Campus, Farmgate, Dhaka-1215, Bangladesh

Miah, M. A. M. and M. S. Hoq (2018). Assessment of postharvest losses and marketing performances in selected vegetable supply chains in Bangladesh. Project Implementation Unit, National Agricultural Technology Program-Phase II, Bangladesh Agricultural Research Council (BARC), New Airport Road, Farmgate, Dhaka-1215, Bangladesh

Annex 2

List of MoUs Signed

	Organizations
MoU with Public Sector	1. Department of agriculture Marketing (DAM) 2. a2i (represented by ASPIRE Ltd.
MoU with Private Sector	1. Lal Teer 2. Partex Agro 3. GME Agro 4. Ispahani Agro Ltd
MoU with G4G Farming Enterprises	1. Kotchadpur, Jhenidah: সলেমানপুর দক্ষিন পাড়া পুরুষ সি আই জি - ফসল সমবায় সমিতি লিঃ 2. Gabtoli, Bogura: আকন্দ পাড়া আই সি এম কৃষক সমবায় সমিতি 3. Mollarhaat, Bagerhaat: পুলিয়া কৃষিপণ্য সংগ্রহ ও বিপণন কেন্দ্র 4. Baneshor, Rajshahi: বিসমিল্লাহ্ ট্রেডাস 5. Gobindogonj, Gaibandha: মের্সাস জুঁই এন্টারপ্রাইজ 6. Jashore: মেসার্স আরবি এন্টারপ্রাইজ 7. Charghaat, Rajshahi: শিবপুর পূর্বপাড়া আই সি এম যুব সমবায় ক্লাব 8. Jhenidah: হাট গোপালপুর কৃষি পণ্য সংগ্রহ বিপণন কেন্দ্র
MoU with G4G Trading and other enterprises	1. Janata Engineering (Farm Equipment & Machinery) 2. MS. Jononi Enterprise (Transportation) 3. Dhaka: Nadia Enterprise (Wholesale) 4. Dhaka: Md. Sohel (Wholesale) 5. Gulshan, Dhaka: Krishok Bangla Agro Products (Retail)