# Accelerating Vegetable Productivity Improvement (AVPI)

# FINAL EVALUATION REPORT



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## Acronyms

AAPI	Accelerating Agriculture Productivity Improvement
AVPI	Accelerating Vegetable Productivity Improvement
BBS	Bangladesh Bureau of Statistics
BCIC	Bangladesh Chemical Industries Corporation
BMO	Briquette Machine Owner
DAE	Department of Agricultural Extension
DQA	Data Quality Assessment
FAO	Food and Agriculture Organization of the United Nations
FC	Field Coordinator
FDP	Fertilizer Deep Placement
FGD	Focus Group Discussion
FMO	Field Monitoring Officer
GAP	Good Agricultural Practice
GHG	Greenhouse Gas
GOB	Government of Bangladesh
ha	hectare
ICM	Integrated Crop Management
IPM	Integrated Pest Management
IR	Intermediate Result
IFDC	International Fertilizer Development Center
M&E	Monitoring and Evaluation
M&S	Mymensingh and Sherpur
mt	metric ton
NGO	Non-Governmental Organization
NPK	Nitrogen, Phosphorus, and Potash
SAAO	Sub-Assistant Agriculture Officer
SG	Strategic Goal
SWOT	Strengths, Weaknesses, Opportunities, and Threats
Tk	Bangladeshi Taka
UDP	Urea Deep Placement
UN	United Nations
USAID	United States Agency for International Development
WFA	Walmart Foundation Activity
WHO	World Health Organization

# Accelerating Vegetable Productivity Improvement (AVPI) Project Final Evaluation Report

## 1. Background

On August 23, 2016, the Walmart Foundation signed a contract with the International Fertilizer Development Center (IFDC) for the implementation of the "Accelerating Vegetable Productivity Improvement" (AVPI) project for the next two years. However, the project started its implementation in November 2016. Due to an issue with the dates listed on the original agreement, the project agreement period was unintentionally listed as shorter than two years, to be completed by February 2018. However, both IFDC and the Walmart Foundation discussed the issue, and an amendment was signed on August 14, 2017, extending the project period through December 2018. In November 2018, the AVPI project was extended for another three months through March 2019 with a no-cost budget extension.

Drawing upon the lessons learned from the implementation of the first phase of the IFDC-Walmart Foundation partnership between 2013 and 2015, and opportunities for further progress, the Walmart Foundation and IFDC designed the AVPI project to address poverty and food insecurity by empowering low-income women horticulture farmers with enhanced agricultural production technologies and improved market knowledge. AVPI consolidated and expanded the results of the 2013-15 Walmart Foundation-IFDC partnership in terms of the use of fertilizer deep placement (FDP) in horticultural production in the broader context of good agricultural practices (GAPs). In addition, the project also enhanced marketing knowledge and introduced a second innovative production technology to farmers (polynet houses with trickle irrigation for seedling raising and crop production). The project has benefited an estimated 38,000 women farmers<sup>1</sup> and their household members. Care is being taken to ensure local ownership so that project activities spur local technology adoption and improved practices that will be sustained by local actors.

The AVPI project partnered with private sector input dealers and retailers and women horticulture farmers to consolidate, deepen, and expand the results of the 2013-15 partnership between the Walmart Foundation and IFDC. The project also collaborated with the Government of Bangladesh's (GOB) Department of Agricultural Extension (DAE), although no Walmart Foundation funds flowed to any public sector entity.

# The goal of AVPI was to enhance rural women's empowerment, and the food security status of their families, by increasing their capacity to produce and market horticultural crops by:

- a. Increasing income from the sales of the vegetables and fruit that will be produced.
- b. Improving nutrition by increasing the home consumption of these products.<sup>2</sup>
- c. Increasing knowledge on the quality and marketing of horticultural products.

Achieving this goal results from carrying out a set of integrated activities to develop the demand and supply sides of technology provision and use through technology transfer and training, not through the subsidized distribution of inputs or assets. The project emphasized the provision of expertise, the creation of demand and willingness to pay, and the facilitation of a more robust

<sup>&</sup>lt;sup>1</sup> During the preparation of the AVPI proposal, the number 52,000 was considered based on the assumption that AVPI will also work in the Mymensingh and Sherpur (M&S) districts where the first phase of the IFDC-Walmart Foundation component was implemented. But the USAID-funded Accelerating Agriculture Productivity Improvement (AAPI) project dropped these two districts in 2015 as they were outside the Feed the Future zone of influence. Therefore, AVPI concentrated its work area only in Feed the Future districts, and the number of directtrained beneficiaries of AVPI decreased from 40,000 to 28,360, excluding the 11,640 trained farmers in M&S districts. AVPI conducted a census during winter 2016-17 to determine the current agriculture status of these 28,360 women farmers. A total of 21,892 farmers were found active in winter 2016-17. In addition, 16,000 new women farmers were being trained. Keeping the budget at the original level, the project management increased the number of new women farmers trained from 12,000 (as per project contract) to 16,000 since the number of earlier trained farmers had been reduced. Therefore, the number of AVPI direct beneficiaries will be 37,892 (21,892 + 16,000). <sup>2</sup> The incremental income will improve the nutrient intake by all family members. An International Food Policy Research Institute (IFPRI) study indicated that both in the Feed the Future zone and at the national level, on average, the amount of protein consumed increases with income. Looking at the results by gender, women in general consume less protein than men, although their intake increases with income. (Ahmed, A.U. et al. April 2013. The Status of Food Security in the Feed the Future Zone and other Regions of Bangladesh: Results from the 2011-2012 Bangladesh Household Survey, p. 84).

supply chain, using a market development and knowledge transfer approach that discourages heavy project subsidies or inputs. Furthermore, rather than placing the highest priority on the number of farmers adopting new technologies, the project sought both to increase the number of farmers adopting technologies and to increase the size of farmland covered by these technologies in order to achieve a greater income and empowerment dividend.

#### The objectives of AVPI were to:

- 1. Consolidate and enhance the benefits of the 2013-15 IFDC-Walmart Foundation intervention by expanding the use of FDP<sup>3</sup> and related GAPs.
- 2. Introduce and pilot a second improved vegetable production technology the use of polynet houses with trickle irrigation with participating women vegetable farmers.
- 3. Improve the market knowledge of women vegetable farmers and their access to market information.

The project targeted 24 upazilas (sub-districts) growing horticultural crops in 10 districts in southwestern Bangladesh and the southern coastal belt. Within these sub-districts, AVPI targeted 47 village clusters containing a total of 233 villages. These target villages were identified under the 2013-15 Walmart Foundation-IFDC partnership. **Appendix Table 1** provides a summary of the number of AVPI clusters and villages by region, and **Figure 1** is a map of AVPI districts.

<sup>&</sup>lt;sup>3</sup> FDP and urea deep placement (UDP) refer to the same basic technology. FDP involves the point placement of a large fertilizer pellet (up to 3.4 grams by weight) near the root zone of the plant. This reduces fertilizer nitrogen losses, increases crop uptake efficiency of the fertilizer, and is an environmentally friendly technology.



Figure 1. AVPI Districts in Bangladesh

#### **AVPI Impact Pathway**



Figure 2. AVPI Impact Pathway

Major successes were aimed at improving the sustainability of the project's impacts – toward technology transfer and continued use of technologies after the project has ended. Key achievements of AVPI can be summarized as follows:

*Through a specific focus on women, AVPI increased nutrition awareness*: AVPI addressed household nutrition by working directly with women, especially those involved in horticultural production, both at the homestead and field level. AVPI staff held discussions with men in the target areas to convince them that women's participation in project activities will benefit the entire family since women are involved in horticulture production. DAE field staff also supported AVPI staff in this area. Where necessary, AVPI staff also encouraged male family members of beneficiaries to attend events so that they could understand the importance of involving women in development activities. This allowed them to observe how AVPI is helping women by improving their knowledge, which ultimately increases their crop productivity and family income.

**Both women and men gained knowledge on GAPs**: AVPI educated women on GAPs through its farmer training programs and motivational meetings. Men also participated in the events. After attending these trainings and meetings, the women beneficiaries are now well-educated in horticultural production, and most of them are practicing GAPs and FDP technology in their crop production. AVPI field staff, while following up with the women beneficiaries, found that they also share their knowledge with male family members.

*Through AVPI vegetable marketing seminars, women increased their marketing knowledge and established linkages with market actors*: To improve women's knowledge on marketing and empower them in decision-making, AVPI included technical information on crop production and marketing in its farmer training module and organized vegetable marketing seminars. The seminars were used as a "matchmaker" to establish linkages between women producers and market actors and helped women beneficiaries learn more about post-harvest management and marketing. *Maintenance of briquette machines was improved among machine owners*: AVPI field staff provided support to briquette machine owners (BMOs) by linking them with local machinery workshops for managing the spare parts from those shops. They also linked them with other BMOs whose machines are out of order; spare parts from these machines are being used by BMOs who are running their business in full swing in various locations. In the 2017-18 winter season, more than 11 BMOs changed their spare parts with the assistance of AVPI staff. The AVPI project organized workshops cum operational training for BMOs and local mechanics prior to each vegetable season. The workshop helped establish linkages between machine owners and local mechanics, which play a key role in keeping machines in operation.

#### Women are benefiting from the improved availability of fertilizers used to make Guti products:

Often women BMOs faced difficulties in accessing raw fertilizer products to make FDP products – due to lack of market knowledge and access and access to input retailers. AVPI staff have requested that BMOs sell their products through retailers, and this will also increase their sales and profitability. The project organized workshops, which included BMOs and agro-input retailers, to motivate the retailers to sell *Guti* products in their shops, along with other items, so that women farmers can get *Guti* fertilizer near their farms. In general, the agro-input retailers are located close to farmers and their relationship is quite good. Many women farmers are purchasing *Guti* fertilizers from these shops.

#### Motivational meetings ensured previously trained women remained active in using GAPs:

During its first phase, the project trained more than 40,000 women farmers in vegetable production technologies. To bring the previously trained farmers under AVPI project activities and to keep them interested in GAPs, motivational training was held for early adopters and those who participated in Phase I. The project used these meetings to remind women of the benefits that they received by applying GAPs. A total of 350 motivational meetings were organized under AVPI with 17,500 total participants (50 participants per meeting) during the summer and winter seasons of 2017 and 2018.

				Year 1 and 2				
					Novem	ber 2016-O	ctober 2	018
Desult Indiactors	11	Total	Summer	Winter	Summer	Winter	Totol	0/ of Torrect
Technology	Unit	Target	2017	2017-18	2018	2018-19	lotal	% of Target
Transfor								
Farmer training	Batch	400	50	150	70	130	400	100%
Farmers'	Batch	400	1	130	1	130	400	100%
orientation for	Duten	•	1	1	1	1	•	10070
demo								
establishment								
Motivational	No.	350	50	150	50	100	350	100%
meeting with								
trained farmers								
Motivational	No.	10	2	4	2	2	10	100%
workshop and								
operational								
training of BMOs								
Field	No.	80	15	30	20	15	80	100%
demonstration								
Crop cuts from	NT	00	17	20	20		<i></i>	010/
> Demo plots	No.	80	15	30	20		65	81%
Farmers' field	NO.	128	28	50	30	1	108	84%
Field days	No.	50 *	10	25	10	1	46 *	92%
Design and		~					т Т	
leaflate flyers								
posters								
signboards flags								
promotional bags								
and caps								
Piloting Polynet								
Houses with								
Trickle Irrigation								
Farmers'	Batch	2		1		1	2	100%
orientation for								
demo								
establishment								
Field	No.	25		15		10	25	100%
demonstration								
Farmer training	Batch	25		15		10	25	100%
Field days	No.	25		15		5	20	80%

## Table 1. Goal Progression – Results at a Glance During the Life of the Project

				Year 1 and 2				
					Novem	ber 2016-O	ctober 2	018
		Total	Summer	Winter	Summer	Winter		
Result Indicators	Unit	Target	2017	2017-18	2018	2018-19	l otal	% of Target
Provide direct		*					*	
technical								
assistance to								
farmers in								
introducing								
polynet houses								
with trickle								
irrigation and FDP								
technology				-				1000/
Agro-input retailer	No.	5		3		2	5	100%
training								
Improving								
Farmer Access to								
Market								
Injormation	N.	1	1				1	1000/
Assessment of	INO.	1	1				1	100%
IFDC-walmart								
women vegetable								
and fruit farmers								
knowledge on								
market information	NT	1	1				1	1000/
Vegetable and fruit	NO.	1	1				1	100%
seedlings and								
saplings grower								
Survey	Na	1	1				1	1000/
Study on vegetable	INO.						1	100%
and fruit								
Market information	No	16	-	٣	- 2	2	16	1000/
vegetable	INO.	16	6	5	3	2	16	100%
marketing seminar								

## 2. Final Evaluation of the Project: Methods

## 2.1 Evaluation Methodology

IFDC followed the evaluation plan described in the AVPI proposal. The AVPI Monitoring and Evaluation (M&E) Plan was designed to demonstrate the extent to which the project has achieved its objectives and improved the livelihoods of rural women horticulture farmers. It defined the indicators that measure progress toward AVPI project objectives and the result indicators identified in the project document. The M&E Plan determined what data must be collected at what time, the methods of data collection, and how findings were to be analyzed and reported. Data on all activities were reported internally on a weekly basis. These weekly reports formed the basis for monthly reports to the Walmart Foundation. In the monthly reports, the project team included a beneficiary story, featuring a participating woman farmer or agro-input retailer who achieved gains because of project activities. These followed the general format established by the 2013-2015 grant between IFDC and the Walmart Foundation. The monthly reports informed the annual reports. The M&E system, therefore, was the basis for weekly, monthly, annual, and final evaluation reports to the Walmart Foundation. Field-level data were collected on regular intervals to monitor pre-established input and output indicators of the project. The data were duly processed, cleaned, and stored in the AVPI data management unit; outcome- and impact-level data were analyzed by a senior data management specialist and M&E specialist and evaluated to validate project results under the supervision of the project coordinator. In collecting data from the field, AVPI activity strictly adhered to the following five criteria of data quality assessment (DQA) developed under Phase I of the project: validity, integrity, precision, reliability, and timeliness.

There are few unique dimensions to AVPI activities, such as capturing or monitoring the following: (1) women's share/control of vegetable production; (2) women's control over income; (3) improvement in leadership quality; and (4) vegetable consumption by family. The AVPI project also required an extensive monitoring system as vegetable cultivation is intensive and harvesting takes place several times over the season, unlike rice. To ensure the inputs, outputs, and outcomes of this innovative activity were very well documented and understood, the project

conducted a follow-up survey of 100% of all trained farmers (focusing specifically on fertilizer use and area planted by crop).

## 2.2 Data Collection and Analysis

## 2.2.1 Data Collection Tools

AVPI used the following data collection mechanisms for regular reporting purposes. Each season, all field monitoring officers (FMOs) and field coordinators (FCs) attended a daylong training program before the start of the respective survey. The training program was conducted by the project manager. The training included a PowerPoint presentation, participatory discussion, group work, practical tasks, and a question-and-answer session by participants.

In compliance with the reporting requirements, a total of 40 deliverables were required through October 2018. All were submitted as planned.

- Workplans (2)
- Monthly Report (20)
- Semi-annual reports (1)
- Annual Report (2)
- Farmers Follow Up (Census) (1)
- Cluster Village Monitoring Survey (1)
- Crop Cut Reports (Farmers' Plots and demonstration plots)- 3 seasons
- Global Positioning System Point Data Collection
- Trained Farmer's Profile (1)
- Expense report (1)

In addition, although not a contracted deliverable, AVPI submitted two additional survey reports in the first year of AVPI implementation: (i) an assessment of women vegetable and fruit farmers' knowledge on market information; and (ii) a vegetable and fruit seedling and sapling growers' survey to better understand whether women are involved in seedling/sapling production and marketing. In addition, the project prepared 51 weekly reports on project performance during this period (November 2017-October 2018) to facilitate project oversight. AVPI also conducted a census of all trained farmers of the Walmart Foundation Phase I (2013-15).

### 2.2.2 Baseline and Impact Evaluation

*Baseline Information* – Although the strategy to measure AVPI's impact is based on information collected during the project's implementation, baseline information is also available from activities and surveys conducted during the 2013-2015 project period.

*Routine Internal Project Reporting and Monitoring* – Routine internal project reporting provided information on all performance indicators, as well as on most impact indicators. Internal reporting included weekly oral reports from FMOs through FCs on all relevant activities and achievements, depending on the season and available information, information collected by senior staff during supervision of activities, and information collected in monthly staff meetings.

*Special Studies* – In addition, AVPI also conducted special studies and surveys: three studies – two at the beginning of the project and another during the final phase of the project. These studies include a survey of beneficiaries, a farmer impact assessment, and a study of BMOs.

### 2.2.3 Definitions and Calculations for Major Indicators

- **Trainees**: The staff collected information on all the participating trainees through a register, which was then entered by the data management unit for recording and reporting monthly.
- Area planted is gathered for each crop from the village monitoring survey and the survey of all trained farmers. The figure was based on the farmer's plot size.
- **Production** is derived from crop cuts of selected crops from selected farmers' and demo fields each crop season at the time of harvesting. In addition to crop cuts, demonstration plots were also established at the farmers' fields to improve knowledge of FDP technology application and benefits. Constant supervision in the demonstration plots was carried out by FMOs, in consultation with project specialists to confirm actions. The progress of development at various stages of crop growth was also monitored regularly. The same methodology for crop cuts was also adopted in recording information from such demonstrations. Details about the conduct of the crop cuts and demonstration plots, along with sampling, were reported regularly in monthly, semi-annual, and annual reporting periods.

- Incremental yields arising from FDP technology are derived from crop cuts in farmers' fields. Each cut consisted of two samples one from an FDP field and another (as close as possible) from a broadcast urea field where the same variety of seeds was used as well as a similar soil type and equal number of plants. Vegetable crop cuts were recorded for each harvest/picking according to a prescribed format prepared by the project.
- Incremental vegetable production is calculated from the area of FDP coverage and the weighted average yield increments as measured by vegetable crop cuts in farmers' fields. Although more vegetable area was brought under FDP coverage, the incremental production was calculated only for nine crops (cabbage, cauliflower, eggplant, tomato, and potato in winter; bottle gourd, country bean, chili, and banana in summer).
- Increased value of vegetables produced by women farmers is calculated from the incremental vegetable production and the sales value of vegetables. From each pick/harvest of each crop, FMOs recorded the amount sold to the market and the value received by the farmers. After the final crop cut was completed, data were compiled in the Data Management Unit and the unit price was calculated by dividing total sales value of the crop by the total quantity sold. This value understates the total value as it was not calculated for all crops.
- Average incremental value per hectare is estimated by dividing the total incremental value of the nine crops by the total FDP area of the nine crops.
- Average gross margin per hectare is based on gross margins for each crop (using the sample crop cut survey data of the nine crops) weighted by the area under each crop. Gross margins are calculated both for FDP and broadcast technologies.
- Average incremental value per farm is estimated by dividing the total incremental value of the nine crops by the total FDP unique number of users of all crops.
- Urea saving is calculated from the crop cut data collected from farmers' fields. The difference in FDP use in kg/ha is calculated for each type of crop for fields receiving FDP versus those receiving broadcast urea. That savings is then multiplied by the number of hectares under FDP to derive total urea savings in metric tons, by crop.
- Value of urea saved is calculated from the urea saved, using the international market price. The Annual Plan set the target using the price of U.S. \$403/mt. The average Bangladesh Chemical Industries Corporation (BCIC) urea imported price was U.S. \$307/mt for

November 2016 to October 2018. This was used to calculate values of urea saved by growing the nine crops specified above.

The Government of Bangladesh (GOB) saving on urea subsidy is calculated based on the GOB subsidy level times the volume of urea saved due to project activities. The Annual Plan assumed a GOB subsidy of U.S. \$228/mt. However, the dealer price was lowered to Tk 14/kg, or U.S. \$169/mt. Using the import parity price reported in the value of urea saved, the subsidy on 1 mt of urea is U.S. \$138 (GOB import price of U.S. \$307/mt – GOB subsidized price of U.S. \$169/mt). Using this data, the savings on the urea subsidy for the six vegetables crops amounts to U.S. \$19,502, or U.S. \$0.020 million

## 3. Program Activities

## 3.1 Startup Activities

Startup activities commenced immediately following the signature of the agreement between IFDC and the Walmart Foundation, from November 2016 onwards. Early achievement of momentum in all field activities was due to IFDC's established presence and relationship in Bangladesh and its resolute promotion of FDP technology through the Accelerating Agriculture Productivity Improvement (AAPI) project and the Walmart-funded AVPI project (Phase I) from 2013 to 2015. The startup activities focused on (i) staffing, (ii) financial and administrative structures, and iii) partner and stakeholder relations.

## 3.1.1 Staffing

The project started its activities in November 2016. A total of 18 staff members were hired as members of the AVPI project team. Two field coordinators (FCs) and six field monitoring officers (FMOs) were assigned at the field level, including a regional office in Jessore (Khulna Division) and six district-level postings. The remaining staff members were assigned to a project office within IFDC's offices in Dhaka. To achieve the project goals and targets, the field staff were set up as close as possible to the project locations and beneficiaries. AVPI had its regional office in Jessore district, with headquarters in Dhaka. Under the guidance of the regional director of Asia, the AVPI project manager, gender specialist, and three M&E officers carried out their activities from the IFDC Dhaka office and made frequent visits in the field to oversee and monitor the work of field staff and interact with AVPI beneficiaries. Some of the activities, such

as the retailer training program and seminar on marketing, were implemented directly by the project manager and gender specialist with the assistance of field staff. Two FCs, six FMOs, and two junior horticulturists<sup>4</sup> were posted at the upazila (sub-district) level to carry out their activities smoothly and efficiently.

## 3.1.2 Financial and Administrative Structures

The financial and administrative structures of the project were set up, including opening bank accounts by the all-women staff, at the field level for conducting project activities smoothly.

## 3.1.3 Partner and Stakeholder Relationships

Partner and stakeholder relationships were established, including i) briefings for and commitment from the field officials of DAE and ii) securing agreement from Walmart Foundation on branding and marking promotional and other materials. Once these initial steps were underway, attention turned to carrying out the technical agenda of the project. To enable the same, a daylong orientation program for all AVPI staff members was organized to discuss AVPI goals, objectives, and results indicators during the month. Initial planning discussions were held, informing the drafting of the Year 1 annual work plan.

## 3.2 Training Programs for Women Farmers

Vegetables are planted throughout the year due to favorable agro-climatic conditions. Training programs under AVPI were initiated in the winter vegetable growing season of 2017 and continued through summer 2017, winter 2017-18, and summer 2018 seasons to achieve the targets and the necessary impact. Though the AVPI project started in November 2016, the winter season of 2016-17 started in August; therefore, AVPI could not undertake any farm activities during this major vegetable season. The actual farm activities of AVPI started in the summer of 2017. The summer horticulture 2017 crop was harvested during the reporting year, and the planting of the winter 2017-18 crop commenced in August 2017.

<sup>&</sup>lt;sup>4</sup> It may be noted that the project had one senior horticulturist/farming system specialist who died in August 2017. Therefore, the project management tried to replace this position with a senior horticulturist, but IFDC could not find a suitable candidate for such a short period of time and appointed two junior horticulturists with adequate experience working with IFDC.

#### 3.2.1 Identification of Villages

At the onset, the project management focused on identified potential vegetable-growing areas and selected 329 villages in 69 clusters comprising 33 upazilas in 12 districts in AAPI locations. The activity field supervisors and FMOs compiled a detailed profile of each village in late August and early September 2013. Information collected in the village profile included data for each village on the size of population, land resources, farmer tenure status, land under food grain crops, area under vegetables and fruits (by crop), availability of agriculture infrastructures (such as irrigation facilities), and community-based clubs and associations.

#### 3.2.2 Design and Implementation of the Baseline Survey

On the onset of the project, AVPI continued its village monitoring survey for winter 2016-17 to collect information on GAPs, including FDP application, by interviewing key informants during the period. AVPI also completed a census of all 28,360 women farmers trained during the IFDC-Walmart Foundation Phase I project in the Feed the Future zone to better understand their agriculture status and use of improved technologies, including FDP, in winter 2016-17. It may be noted that while conducting the census of the 28,360 trained farmers, 21,892 farmers were physically present in their original locations and another 6,468 could not be located. Therefore, of the 28,360 beneficiaries, 21,892, or 77%, cultivated horticultural crops in the 2016-17 winter season. According to villagers, the reasons for 23% of beneficiaries not cultivating crops were migration, marriage, death, and loss of vegetable fields. Therefore, based on the actual availability of the previous beneficiaries, the AVPI target and baseline information was updated accordingly.

#### 3.2.3 Training of Women Farmers

Distinct types of training were given to women farmers under AVPI, depending on the technology types and needs. The first type of training program was designed to improve farmer knowledge of vegetable crop management in general, with emphasis on increasing awareness and knowledge of FDP technology and use of good quality agro-inputs. The second type of training focused exclusively on *seedling management under polynet houses with trickle irrigation*.

The farmer training programs on GAPs and FDP technology were designed to improve farmers' knowledge of vegetable crop management in general with an emphasis on increasing awareness and knowledge of marketing and nutrition. A training module was also developed for farmer training. The training program continued for two days, with 3.5 hours each day either in the afternoon or in the morning to match the schedule of women farmers. Day 1 focused on the theoretical aspects of vegetable and fruit production and marketing, while Day 2 focused on practical demonstrations of FDP and GAPs application.

Training topics included: (1) human nutrition from vegetables and fruits; (2) soil fertility, balanced fertilizer use, and benefits of FDP technology; (3) fertilizer briquette rates and application methods for selected vegetable and fruit crops; (4) integrated pest management (IPM) practices; (5) land preparation, plant spacing, and planting/harvesting times for selected fruit and vegetable crops; (6) quality seed and variety selection for selected crops; (7) gender issues related to the marketing of vegetables and fruits; (8) practical demonstration of FDP application; and (9) trainee feedback/question-and-answer session.

In one batch, 40 women were trained by a sub-assistant agriculture officer (SAAO) of DAE as the resource person. In some instances, in the absence of a trained trainer, the AVPI FMO was the resource person. The FMO was responsible for the administration, according to guidelines set by the project. This arrangement helped build the farmer training into the mainstream of DAE field programs while maintaining accountability for the activity within the project. A total of 8,000 women horticulture farmers were trained in 200 batches during the reporting period from November 2017 to October 2018. Therefore, AVPI achieved its target of completing 400 batches of farmer training with a total participation of 16,000 women horticulture farmers. **Details of the training on GAPS and FDP can be found in Annex 4 of Year 2 annual report.** 

In addition, AVPI also completed 10 batches of training for women farmers on seedling raising and crop production under polynet houses with trickle irrigation using UDP and prilled urea with a total participation of 400 women horticulture farmers (Table 30, Year 2 Annual Report). The training topics included indoor discussion and interaction on the benefits and use of these technologies, followed by practical training near demonstration plots. In total, AVPI completed its target of 25 batches of farmer training on the use of polynet houses with trickle irritation with a total participation of 1,000 women horticulture farmers. **Details of the farmer training by upazila are provided in Appendix 18 of Year 2 Annual Report.** 

A total of 17,000 women were trained in the two-year project period, under AVPI Phase II alone. Of this, during Year 1, all 200 batches of farmer training programs on GAPs and FDP, targeting 8,000 women horticulture farmers, were completed; followed by training another 200 batches during the reporting period from November 2017 to October 2018. Therefore, AVPI achieved its target of completing 400 batches of farmer training with a total participation of 16,000 women horticulture farmers. The AVPI-trained women farmers have gained skills on the following technology packages for vegetable production:

- Importance of using quality seed for increased vegetable production.
- Transplantation of vegetables maintaining certain spacing from plant to plant and row to row for increased vegetable production.
- Characteristics of good soil and need for balanced fertilization for maintaining soil fertility.
- Good water management practices to avoid wastage of water.
- A comprehensive knowledge of FDP technology and the benefits of using the fertilizer briquette deep placement procedure.
- First-hand knowledge of the use of fertilizer briquettes in vegetables crops.
- Primary knowledge of nitrogen, phosphorus, and potash (NPK) briquettes.
- Overall awareness of the benefits of using UDP/FDP for increased crop production.
- Practicing IPM technology.
- Marketing of their products.
- Nutritional benefits of consuming vegetable crops and proper washing/hygiene of vegetables.
- Use of polynet houses for seedling nursery using trickle irrigation technologies.

## 3.3 Technology Demonstrations for Vegetables/High-Value Crops Targeting Women Farmers

FDP technology demonstrations were initiated at the beginning of the project with a "seeing is believing" approach to create awareness and achieve knowledge transfer – both critical to demand building for FDP technology in vegetables/high-value crops. In addition to promoting

the use of GAPs and FDP, new innovative technologies that aimed at improving water use or irrigation along with improved nursery management were also included during this phase. For example, polynet housing along with trickle irrigation technologies were demonstrated to farmers for further adaptation and use. The key components of technology transfer mechanisms in AVPI included the following.

# 3.3.1 Orientation Training for Vegetable Demonstrations and Polynet Housing with Trickle Irrigation Technologies

Orientation training is required to prepare the farmers to manage a demonstration. Four batches of orientation training programs were organized in 2017-18 and 2018-19 with the participation of 73 women horticulture farmers who, in turn, established FDP demonstration plots. The participants were selected by respective SAAOs (DAE) and FMOs (AVPI) based on the location of their land ownership, progressiveness, readiness to accept new, innovative technologies, and leadership role in the community. The women demonstration farmers' choices of crops include eggplant, potato, cauliflower, cabbage, taro, bitter gourd, teasel gourd, cucumber, and tomato. The number and location of the orientation programs are set to ensure every farmer involved in a demonstration can attend. The objective of the orientation training on FDP demonstration was to inform the demonstration farmers about the benefits and methodology of FDP application through PowerPoint presentations. After the presentation, theoretical discussion, and questionand-answer session, the participants took part in practical training in nearby fields. This included measuring and layout of the plot, raising beds, transplanting seedlings at the appropriate distances, and FDP application. AVPI completed four batches of orientation training during the project period, with a total participation of 73 women horticulture farmers who established FDP demonstration plots. Details of the demonstrations by crop and upazila are provided in **Appendix 8 of the Year 2 Annual Report.** 

During Phase II, innovative technologies were also introduced. AVPI organized one orientation training program in both years on the use of polynet houses with trickle irrigation for raising seedlings and crop production for women horticulture farmers who were selected to establish AVPI demonstration plots. The purpose of the program was to educate the female horticulture farmers about the benefits and application method of this technology. The polynet house or protected cultivation method will grow disease-free, good-quality seedlings because it reduces

weather damage and the amount of insecticides required. The trickle irrigation system during crop production will also reduce the cost of irrigation. A total of 20 women farmers participated in these orientation programs.

#### 3.3.2 Field Demonstrations

Technology results demonstration was one of the most important AVPI activities. AVPI demonstrated the results of FDP technology in selected vegetables. The demonstrations consisted of two plots, each measuring 200 square meters – one using FDP and the other broadcasting conventional urea, keeping all other inputs, such as seed and other fertilizers, and all other management practices the same. AVPI completed all 80 targeted demonstrations of selected crops (15 in summer 2017, 30 in winter 2017-18, 20 in summer 2018, and 15 in winter 2018-19). **Details of the demonstrations by crop and upazila are provided in Appendix 9 of the Year 2 Annual Report**.

AVPI also established 25 demonstration plots under polynet houses with trickle irrigation, which included seedling raising methods and crop production. This was a pilot program, and AVPI established the demonstration plots with eggplant. For the demonstration plots on seedling raising, there were two treatments: (1) seedling raising under polynet houses; and (2) seedling raising without polynet houses. For the demonstrations on crop production, there were also two treatments: (1) seedlings grown under polynet houses were transplanted in a separate plot under polynet houses with trickle irrigation and FDP and broadcast urea; and (2) seedlings grown without polynet houses were transplanted in a separate plot under polynet houses were transplanted in a separate plot under motion but with FDP and broadcast urea. **Details of the demonstrations by crop and upazila are provided in Appendix 16 of the Year 2 Annual Report**.

#### 3.3.3 Field Days

Field days were usually organized on the day of the crop cut of demonstration plots so that participating farmers can observe the method and results of FDP technology in the demonstration. They also shared their experiences through question-and-answer sessions with demonstration farmers as well as with AVPI senior staff, DAE field staff, and other stakeholders. A total of 1,800 participants attended the 36 field days, of which 1,455 were women farmers and 345 were male farmers. The DAE field officials, media personnel, briquetting machine owners, local leaders, and AVPI project officials also attended the programs. Appendix 12 of Year 2 Annual Report indicates the total number of field days organized by upazila through October 2018.

AVPI also completed 20 field days on polynet houses with trickle irritation demonstration with a total participation of 800 women horticulture farmers. **Details of the field days by upazila are provided in Appendix 19 of Year 2 Annual Report**.

#### 3.4 Training Program for Women Entrepreneurs

The purpose of the training program for women entrepreneurs was to ensure the development of the supply system to meet demand for multi-nutrient FDP products while increasing rural women's incomes and empowerment through the ownership of small agro-enterprises, i.e., the fertilizer briquette machine.

*Motivational meetings with BMOs - entrepreneurs*: Motivational workshop and operational training of BMOs was a daylong activity following a highly participatory method. The discussions and interactions highlighted the current fertilizer briquette (Guti) business and technical practices; reviewed the status of participating BMOs; encouraged more robust retailer network development; linked BMOs to local mechanics for machine maintenance; and supported the development of effective marketing techniques to increase the client base of each BMO. The program also includes group exercises and poster presentations on strengths, weaknesses, opportunities, and threats (SWOT) in carrying out their Guti business. The BMOs who were actively involved in briquette production and interested in continuing sustainable Guti businesses were selected for the motivational workshop and operational training. During the reporting period, AVPI completed all five targeted programs with 253 total participants. Therefore, AVPI completed all targeted 10 motivational workshops and operational trainings. **Appendix 5 of Year 2 Annual report provides the details of the training program through October 2018**.

In the current phase, there were 18 briquette producers located within AVPI project sites – this included both Walmart-funded women entrepreneurs as well as women BMOs funded by the AAPI project as well. All these women were trained entrepreneurs and are still producing and supplying FDP products in the communities where they are located. During the year 2017-18,

these entrepreneurs produced a total of 2,487 mt of briquettes; of which 489 mt of FDP products (~20%) were produced by women, who bought the machines and benefited through Walmart funding during Phase I of the project. During Year 2 of the project, AVPI women BMOs produced 632.50 mt of FDP products between November 2017 and October 2018. There are also several briquette machines located in AVPI cluster villages that are owned by other farmers, and they produced 2,740.90 mt during the same period. Therefore, a total of 3,373.40 mt of FDP products (3,176.90 mt *Guti* urea and 196.50 mt NPK briquettes) were produced between November 2017 and October 2018 by briquette machines in AVPI cluster villages. **Details of the BMOs and production can be found in Appendix 12 and 13 of Year 1 and 2 Annual reports, respectively**.

## 3.5 Awareness and Opportunity Identification Events and Meetings

These were a series of half-day events held in central locations designed to create awareness of FDP product business opportunities among women farmers and entrepreneurs.

#### 3.5.1 Motivational Meetings with Early Adopters (from Phase I)

This activity was used to maintain interest and encourage participation of early adopters. The project used farmer meetings as an effective way to remind women farmers of the benefits that they received in the earlier phase when they used GAPs, including FDP technology. The purpose was to affirm farmers' commitment to use GAPs, including FDP technology, in the new season. As the project proceeded, the number of farmers who used FDP grew to the point in which they were the majority. Motivational meetings became the key to sustaining the numbers of adopters. The meetings were easy to organize and inexpensive. AVPI completed all 350 motivational meetings targeted with a total participation of 17,500 beneficiaries. **Details by upazila are provided in Appendix 11, Year 2 Annual Report**. AVPI also completed 25 batches of training for 1,000 women farmers on seedling raising and crop production under polynet houses with trickle irrigation using UDP and prilled urea with a total participation of 400 women horticulture farmers. The training topics included indoor discussion and interaction on the benefits and use of these technologies, followed by practical training near demonstration plots.

# 3.6 Development and Dissemination of Technology Transfer and Promotion Materials

FDP technology education and promotion materials were developed and disseminated to women farmers, women staff of DAE, and women-owned/managed FDP product supply shops.

## 3.6.1 Stakeholder Meetings/Trainings

*Agro-Input Retailer Training* – AVPI organized two batches of agro-input retailer training programs. A total of 71 agro-input retailers and five BMOs attended the training programs. The program included theoretical discussion and presentations on the benefits and use of polynet and trickle/drip irrigation technologies followed by practical demonstrations of these technologies in the field. By introducing these technologies, AVPI expects that the attendee retailers/BMOs will ensure supply and provide the materials farmers need to implement this technology. AVPI also provided the contact information of the manufacturer of these materials to the participants. **As mentioned above, Appendix 6 of Year 2 Annual Report provides the details of the training program through October 2018**.

*Vegetable and Fruit Marketing Seminar* – To enhance the knowledge and practices of women farmers regarding market requirements, market information systems, the timing of sales, quality assurance, and creating linkages between producers and buyers, AVPI organized eight vegetable and fruit marketing seminars (**Table 33 of Year 2 Annual Report**). A total of 319 participants (139 female and 180 male) attended the programs, which included women horticulture farmers, market actors, district marketing officers, DAE officials, NGO representatives, and media personnel. Therefore, AVPI completed all targeted 16 vegetable marketing seminars with a total participants (276 female and 343 male) through October 2018. Findings of three surveys were shared among participants, followed by a group discussion on SWOTs and poster presentations. **Appendix 20 of Year 2 Annual Report provides detailed information on the market seminars**.

## 3.6.2 Publicity and Donor Recognition

AVPI is sharing information about project activities, including GAPs and FDP technologies, among beneficiaries and other stakeholders through leaflets, brochures, signboards, and flyers. These are being used in various activities, such as farmer training, motivational meetings with trained farmers, vegetable and fruit marketing seminars, field demonstrations, and field days. Materials were also distributed to representatives of integrated pest management (IPM)/integrated crop management (ICM) clubs and community leaders. A list of promotional materials prepared, printed, and displayed from November 2016 through October 2018 are presented in Appendix 13 and 14 of the Year 1 and 2 Annual Reports, respectively. During 2018, AVPI prepared three promotional videos on: (1) a successful woman farmer who is playing a key role in disseminating GAPs and FDP for crop production in the community; (2) a successful woman BMO who is running her briquetting business and earning good profits, ensuring the supply of fertilizer briquettes and motivating other farmers to use GAPs and FDP; and (3) overall AVPI project activities and results achieved. These videos are being shared with stakeholders of the AVPI project. The three videos have been posted on the IFDC website: https://wp.me/p4IvOU-4pk. They are also available individually on IFDC's YouTube channel: Video 1: https://youtu.be/7UiHIc538Nc Video 2: https://youtu.be/7Emgq9KKkipg Video 3: https://youtu.be/JeFjwGNI8Vo

#### 3.6.3 Media Coverage

The project regularly invites members of the electronic and print media to different events for wider coverage. The events are reported and broadcast on several television channels, in local/national newspapers, and online. Details on media coverage of AVPI are provided in **Appendix 14 and 15 of the Annual Report for Year 1 and 2, respectively.** 

## 3.7 Timeline of Activities

The following is a summary of major activities and timeline of project activities.

Activity/Event	Details	Date
Training programs for women farmers	Vegetables and fruits are planted throughout the year due to favorable agro- climatic conditions. Training programs under the AVPI project were initiated to catch the summer 2017 vegetable growing season to achieve early impact.	November 2016 – December 2018
Technology demonstrations for vegetables/high-value crops targeting women farmers	FDP technology demonstrations initiated in the summer 2017 vegetable growing season to allow for a "seeing is believing" approach to create awareness and achieve knowledge transfer – both critical to demand building for FDP technology in vegetables/high-value crops.	November 2016 – December 2018
Training programs – women entrepreneurs	These training programs targeted supply system development to meet demand for multi-nutrient FDP products.	November 2016 – December 2018
Awareness and opportunity identification events/ meetings	A series of quarter-day events were held at village-level AVPI locations; they were designed to create awareness of FDP product business opportunities among women entrepreneurs.	November 2016 – December 2018
Development/dissemination of technology transfer and promotion materials	FDP technology education and promotion materials were developed and disseminated to women farmers, DAE staff, and women- owned/managed FDP product supply shops.	November 2016 – December 2018

## 4. Goal Progression: Increasing Incomes for Rural Women (IR 1)

## 4.1 Impact on Individuals

Walmart Foundation Activities (WFAs) under Phase II (2017-18) of the AVPI project were to directly impact 16,000 trained farmers and indirectly influence and motivate the farmers trained during Phase I (2013-15), keeping them engaged in adopting and using GAPs and improving their earning capabilities through better capacity building and skills empowerment by:

• Increasing income from the sales of the vegetables and fruit that will be produced.

- Increasing household nutrition awareness and improving the home consumption of these products.
- Increasing knowledge on quality and marketing of horticultural products.

Although the Walmart Foundation Activities were able to capitalize on the momentum generated by 35 years of IFDC experience in Bangladesh, five years of the underlying USAID-funded AAPI project (2011-16), and AVPI Phase I (2013-15), the Walmart Foundation-funded intervention modality itself – targeting only women farmers in large numbers – is quite innovative, both for the implementer IFDC and for the conservative social context of rural Bangladesh. Great rigor has gone into gathering the input and output data and results documented throughout the project period. Efforts to evaluate the sustainability or long-term impact of the project on either individuals or communities have been limited to periodical, qualitative surveys. They should therefore be considered as thoughtful impressions, providing insights and guidance for future studies rather than statistically verifiable facts.

The goal of AVPI is *to enhance rural women's empowerment, and the food security status of their families, by increasing their capacity to produce and market horticultural crops*, which requires a concerted and coordinated approach toward achieving the three objectives stated above. To attain the objectives, several innovative activities were designed during implementation to reach the overall goal of the project. They included: i) technology introduction and knowledge transfer (rapidly increasing development, dissemination, and adoption of yield-enhancing technologies for rural women); ii) human capacity building; iii) increasing rural women's incomes through the sale of vegetables and ownership of small agro-enterprises and through improving access to and participation in markets; and iv) disseminating messaging that promotes consumption of a more diverse diet, including increased intake of micro and macronutrients sourced from vegetable and fruit products.

In short, based on the project evaluation as well as consultations with participants and stakeholders, the following are the key takeaways from the AVPI intervention:

• The project has achieved impact on women's knowledge and practices because of training in agricultural production, nutrition, and marketing.

- However, greater impact can be revealed if an approach is used combining agriculture, nutrition, marketing, and gender.
- Training husbands and wives in the household, or a whole-family approach, is key to more success.
- It is important to involve DAE field officials to reach and train women farmers to ensure the sustainability of project interventions.

Adoption of the FDP technology has been strong during the entire project life. Before the start of the Walmart Foundation Activities, the farm households interviewed had not used FDP on either their rice or vegetable fields (2012-13). All adopted the technology for their vegetable fields during the winter season 2013-14 after the project began. Three-quarters of the first round of trainees applied FDP to their vegetable crops again in the next season (summer 2014). Our village monitoring surveys conducted in winter 2014-15 further indicated that about 99% of trained farmers from winter 2013-14 used FDP on vegetables in the winter season of 2014-15. The trend continued during Phase II of AVPI from November 2016 onward. The cluster village monitoring surveys of winter 2017-18 and summer 2018 revealed that nearly 97% of all trained farmers used GAPs and 75% of farmers used FDP. Our focus group discussions (FGDs) with farmers indicated their strong preference to continuing the use of FDP as a regular part of their vegetable cultivation.

During final project evaluations of Phase I (July 2015), 85% of farmers reported that they had used FDP on more than three to four vegetable crops in their fields and continued to purchase briquettes, ranging from 10 kg to as much as 100 kg, with their own money from briquette manufacturers or input retailers. The current evaluations in 2019 reveal that 87% of direct beneficiaries have been using FDP for vegetable crops over the last six cropping seasons and have purchased briquettes from input suppliers with their own cash.

#### Rini Begum – Successful Vegetable Farmer



Rini Begum smiles in her country bean field

Rini Begum, 33, is a vegetable farmer of Bagdanga village, Sadar upazila, Jessore district. She and her husband grow seasonal vegetables on about 1 acre of land. Previously, they generated only a meager profit due to low crop productivity and had to take out a loan to meet family expenses.

Rini was desperate to learn how to improve crop productivity so she could pay back the loan. She attended a two-day Walmart-IFDC training program in 2014, where she learned about good agricultural practices (GAPs) and technology packages for vegetable production, including quality seeds, proper spacing, balanced fertilization, good water management, fertilizer deep placement (FDP), integrated pest management, and product marketing.

After the training, Rini and her husband began applying GAPs and FDP. They applied 15-20% less *Guti* fertilizer compared to broadcast application and increased their yield by 30%. Rini's confidence, as well as her family's income, grew. They paid off their loans and bought a television and a cow. Now they are saving money for a better future.

**Farmers perceived substantial gains in yields and production.** Project data documentation consistently indicates that both production and yields for the five popular vegetables tracked by the project increased substantially both in AVPI Phase I and II. Ninety percent of respondents perceived these yield differences in comparison to previous years, and 90-100% perceived yield differences in comparison to neighboring plots that used prilled/broadcast rather than FDP in the current year.

#### Women's perception of their power to make decisions regarding input use on vegetable

**gardens.** According to the baseline survey, men held primary power over decisions to sell agricultural products (according to 93% of the respondents), to make crop choices (according to 83-90%), to purchase agro-inputs (according to 94-95%), and to determine the application rate of fertilizers (according to 93-97%). The marketing study conducted in February 2014 also confirmed the baseline observations, although women played a crucial role in seed saving/storage and joint decision making with regard to land and crop allocation as well in output sales, especially when sales occur at the farm gate premises. During the marketing study, more than 50% of AVPI WFA-trained women famers revealed that upon receiving the training, they were more equipped to make decisions on fertilizer applications, types, and key farm input

related decisions. The marketing study was conducted in the middle of the first season. The final evaluation in July 2015 found that a very high proportion of women (76% of first-year participants and 81% of current participants) participated in decisions about fertilizer use and general agro-input use in their households. The final evaluation took into account all four seasons of the project period. The final evaluations conducted for AVPI Phase II during March 2019 further reveal that decision making has significantly improved – as high as 82% for early adopters (direct participants). For the new participants, it is too early to determine the project's impact on decision making since they have undergone only two seasons. During the evaluations, about 65% responded that they shared knowledge with others in the communities; this was particularly the case among early adopters. This indicates the continued impact of Walmart training in improved decision making as well in influencing decisions regarding agro-input use among women in their communities.

#### **Bilkis Begum – Demonstration Farmer and Role Model**



Bilkis Begum celebrates after a good harvest from her cucumber demo plot.

In January 2017, the AVPI project selected Bilkis Begum as a cucumber demonstration farmer. The purpose of her demo plot was to compare the results of good agricultural practices (GAPs) using fertilizer deep placement (FDP) with those of farmers' practice using broadcast urea. AVPI organized a field day to show the difference in yield rates. Begum explained to her fellow farmers and neighbors that she had used less urea in her cucumber FDP plot and obtained a yield more than 100 kg greater. She showed that the cucumbers were larger and more uniform in the FDP plot and sold at a higher price.

Begum's husband assisted her with the demonstration plot setup, and her daughter helped pick the cucumbers. The entire

family was happy with the higher yields, and they plan to use GAPs and FDP on all 3 acres of their land. Nearby farmers were excited to see the results. Family and financial circumstances offered Begum the opportunity to step out of her traditional role as housewife. She demonstrated to others in her village the extent to which women can contribute with proper training. She is now a successful farmer who is helping lead other farmers to a better future.

**Women's participation in agricultural production and marketing.** Before analyzing women's control over incomes, it is important to clarify that women play a limited and conscripted role in agricultural production in general in Bangladesh. Unless they are poor, women are only modestly engaged in agricultural production and harvesting activities; they do

not typically make decisions related to procuring or applying inputs (such as fertilizers). The division of labor is vastly different for commercial vegetable production and homestead vegetable production.

The AVPI Walmart Foundation Activity during Phase I and II conducted marketing surveys and found that women are responsible for most production-related activities in homestead vegetable gardens. In commercial vegetable production, they contribute on a limit basis to seed preparation and saving, seed sowing and transplanting, harvest, and post-harvest activities. While 56% of the respondents in the interim impact survey said that they themselves applied FDP to winter vegetables (mostly on kitchen plots), many more said that their husband (73%) or another friend or family member (32%) applied FDP. As such, they played very little role in family decision making concerning crop production.

Surveys conducted during 2017-18 to assess the knowledge of IFDC-Walmart women vegetable and fruit farmers on market information also confirmed very low participation of women in decision making (<20% of those interviewed). Less than 15% were engaged in the marketing of crops or vegetables or engaged actively in the market. During the surveys, 83% of women farmers reported high input costs as their main constraint to selling their crops; this was followed by lack of knowledge of market demand (68%) and low sale price (67%). These women expressed interest in increasing their knowledge of market demand and prices.

During Phase II, the AVPI project made significant efforts to improve the participation of women in agricultural production and marketing-related activities. Activities included conducting (1) motivational workshops among the women entrepreneurs (BMOs); (2) agro-input retailer trainings; and (3) vegetable and fruit marketing seminars. These activities were included to improve women's knowledge and awareness of marketing-related issues and fill in gaps in marketing information; improve women farmers' access to markets and opportunities for selling their produce – through established input supplier networks; and improve access to technologies and other services related to agricultural production, such as polynet housing materials and irrigation equipment etc.

Motivational workshops and operational training of BMOs included the participation of service providers, such as mechanics involved in machine maintenance, input suppliers, DAE officials, and other farmers from local communities. Thus, the workshops and training served as a network platform and encouraged more effective partnerships and access for women. The agro-input retailer training was to ensure supply of fertilizers for FDP product manufacturing, especially among BMOs, and to demonstrate technologies and provide information of such technologies to meet farmer demands in their local communities. Vegetable and fruit marketing seminars were also included to enhance the knowledge and practices of women farmers regarding market requirements, market information systems, the timing of sales, quality assurance, and creating linkages between producers and buyers. AVPI completed all targeted 16 vegetable marketing seminars with a total participation of 619 participants (276 female and 343 male), which included women horticulture farmers, market actors, district marketing officers, DAE officials, NGO representatives, and media personnel through October 2018.

#### Dolly Begum – Proving Knowledge is Power



Dolly harvests bottle gourd to sell at a nearby market.

Dolly Begum, 42, is an AVPI beneficiary from Churamonkathi village of Jessore Sadar upazila in Jessore district. She farms 2.31 acres of her own land. In 2013, Dolly participated in a two-day IFDC-Walmart training program on vegetable production. After expanding her use of fertilizer deep placement and good agricultural practices, Dolly's crop production increased, but she did not get good returns from her vegetable crop sales because of her limited knowledge of marketrelated information.

Dolly's income from vegetables decreased drastically after her husband died in 2014. She was unable to go to the market regularly and was not up-to-date on market prices.

In March 2017, Dolly attended an AVPI seminar on vegetable and fruit marketing. She learned about post-harvest management and how to market vegetables to get a better price. The seminars established linkages between growers and buyers. After the seminar, Dolly started building her marketing network, and her bargaining power increased. She now sells vegetables for a much higher price. "My dream is one day I will be a role model for others as a good grower and vegetable marketer," said Dolly.

Since AVPI Phase II began its operations in November 2017, the project also conducted an analysis of AVPI women beneficiaries' knowledge on vegetable and fruit marketing during summer 2018. This was captured through a survey of sample farmers trained during summer
2018 and included 3,274 beneficiaries from 229 survey villages. The farmers were interviewed to obtain information on five parameters related to marketing: (1) knowledge of market location; (2) awareness of crop demand; (3) awareness of the supply situation; (4) knowledge of timing of premium price; and (5) knowledge of consumer preference on product quality. Results indicate that since the AVPI project started its implementation, direct beneficiaries' knowledge of marketing has increased in all five parameters. There was a significant and positive improvement among direct participants regarding knowledge about market locations (22% increase since 2017), followed by a 19% increase in knowledge of crop demand, and a 14% increase in knowledge of consumer preferences.

The final evaluation surveys conducted in March 2019 also confirmed the above findings. Nearly 94% of the direct participants interviewed had good knowledge about the location of the horticulture market, and 46% of respondents had good knowledge about consumer preferences and what type of crops are demanded in the market. Though most horticulture or vegetable crops are sold by their husbands in their household (only 12% of women were engaged in vegetable marketing in local markets), women have expressed interest in knowing the prices, demand, and other market-related information.

Number of women-owned enterprises related to FDP. Toward the end of Phase I (July 2015), 25 women entrepreneurs had been trained and were producing briquettes and serving their communities. In the AVPI Phase II (2017-18) area of operation, there are 18 BMOs owned by women in operation; they are producing moderate amounts of briquettes for sale in their communities. Of these, six are AAPI-funded entrepreneurs. Our final evaluation surveys conducted among 14 of these women entrepreneurs provided a few key insights toward sustaining their business operations:

- As of October 2018, each entrepreneur has produced and sold an average of 187 mt of briquettes in her community. In total, they have produced 3,400 mt since the start of their operations.
- Of the total, 21 started their operations in 2014 and the rest in 2015.

#### Shafiya Akhter – Rising Entrepreneur



Shafiya works in her Guti shop.

Shafiya Akhter, 39, is an AVPI entrepreneur in Kashkorra village of Alamdanga upazila, Chuadanga district. Her husband is an agro-input retailer and sells seeds, fertilizers, and pesticides. In 2015, Shafiya learned about the Walmart Foundation project implemented by IFDC. In addition to promoting the use of *Guti* urea and good agricultural practices, the project also facilitated the purchase of fertilizer briquetting machines for rural women entrepreneurs. During 2015, the project provided 80% of the machine's cost and the women entrepreneurs paid 20%. Shafiya consulted with her husband, and they decided to purchase a machine.

Shafiya attended a training for machine owners to learn how to make *Guti* fertilizer, maintain the machine, and handle the bookkeeping of their business. After the training, she gained a stronger role in her husband's shop, and it became a family business. Shafiya was the only woman briquette machine owner in her area. Soon, Shafiya and Abdul set up another shop. With increasing income, they were able to pay for their son's education and purchase low-cost furniture. "Now, everybody knows me," said Shafiya. "I am really turning into an entrepreneur."

During our rapid assessment among the entrepreneurs in March 2019, 72% reported higher sales for vegetables during winter than summer. This is primarily because the vegetables grown during winter require more fertilization than summer crops. Seven out of 14 entrepreneurs also improved their sales significantly by more than 68% (three improved sales up to 274%) since they began their operations and expressed increasing demand in the coming seasons. Five of the 14 women entrepreneurs interviewed also indicated that other women contacted them to start such entrepreneurial activities in their community. Most of those interviewed conducted all the business operations on their own, especially production of briquettes, labor management, finance and accounting operations management, and daily management of their shop. Yet machine maintenance and marketing were handled by their husbands or other male members in the family. Of the women who started their business operations in 2014, three of them have expanded their operations and have shops outside their homestead or communities near market centers; these are managed by male members in the family.

**Change in allocation of time to productive and/or domestic tasks vs. technology use.** The final evaluation surveys found that FDP application is viewed as more time-consuming than broadcasting urea; but the participants also realized that FDP only needs to be applied once rather than three or four times. Furthermore, because it dissolves more slowly and is inserted

close to the roots of the intended plant, FDP is less available for weeds; farmers often report they spend less time weeding. When asked whether, overall, which method of application takes more time, 63% said FDP versus 41% who said broadcast urea. Yet all respondents affirmed that the gains from using FDP on vegetables are worth the extra costs and efforts, especially with a yield increase of more than 30% in vegetables and cost saving of 8,000-10,000 Tk per acre. They also expressed that FDP has proven particularly useful and time and cost efficient, especially in vegetable crops very close to their homestead.

Discussions with women participating in demonstrations on polynet house technologies expressed higher savings in time and production of good quality seedling with less amount of time and space and found the technology extremely satisfactory. The technology also was very simple, and women found that they can manage the polynet houses efficiently, very close to their homestead, with minimum efforts.

Women's participation in training groups. By targeting and training 100% women farmers, the AVPI Walmart Foundation Activity built women's status as agricultural decision makers, which contributed to their control over resources and influence over family members. The Walmart trainings were different from traditional trainings offered through male DAE extension staff, which focused on imparting knowledge only on the technical aspects of using FDP. The project also provided inputs directly to women and increased their capacities in managing their own demonstration plots, thus improving their technical and managerial skills. As part of those trainings, project staff presented modules on gender and nutrition written in collaboration with AVPI gender and agricultural specialists, in consultation with Walmart staff. The FMOs used these modules to train both DAE staff and target farmers. Women farmers also expressed interest in acquiring more knowledge and ranked the type of knowledge they wished to receive. For instance, 40% of respondents wanted more information and knowledge on marketing aspects of horticultural crops; this was followed by improved household nutrition aspects (30%). They also expressed interest in training topics involving field crops other than rice and in new technologies, such as polynet housing for nursery management.

#### Nasima Khatun – Community Leader and Trainer



Nasima harvests her vegetables.

Nasima Khatun is a lead farmer in Joyrampur village, Chuadanga district. During 2014-2018, Nasima and 436 other women farmers in her village participated in a two-day IFDC-Walmart Foundation training on vegetable production.

After the training, Nasima joined the "CIG Women's Group." Group members that had participated in the AVPI training began discussing what they learned with non-trained farmers. They convinced all members to apply good farm practices. The group applied the techniques on 30 decimals of country bean using *Guti* urea and quality seeds. After receiving good results, the group members are now cultivating vegetables on about 230 decimals of land using *Guti* urea.

The farmers are actively involved in proper post-harvest management and have learned how to wash, grade, sort, and package vegetables without damaging the crops. They sold about 90% percent of their produce at premium prices in local markets and kept the rest for home consumption. As a result, their crop productivity and gross income have increased. Group members are becoming more independent – and their families are eating healthier food.

**Change in comfort levels in public speaking:** Women who engage in the project get a rare opportunity to speak in public during their two-day training, field days, and motivational and stakeholders' meetings. Through its series of stakeholder workshops and motivational trainings conducted during the project period, AVPI provided opportunities for participants to represent their communities in forums and speak in front of heads of district administration, deputy commissioners (who were the chief guests), and other officials from the Department of Agriculture. During the final evaluations, 67% of the women (vs. 48 % in the 2015 final evaluation) who participated in focus group discussions indicated that their ability to talk publicly or within their communities (outside their social system) has improved, particularly regarding vegetable production.

The AAPI WFA project aims to empower women by building their capacity to generate income and to ensure the food security of farm household. The project approaches this goal in two ways viz., (i) providing women farmers' knowledge (training) and access toward adoption of improved technologies such as FDP use in vegetables – leads to increased incomes and revenue and improved access to healthy, nutritious foods; and (ii) training and engaging a small number of entrepreneurial women in the production of that high-yielding technology, viz., briquettes of urea and NPK, thereby assuring its sustainable supply, thus improving the role of women in the Bangladesh rural economy.

Progress toward the realization of results from two-year project activities has been well documented in project reports. Those results have been supplemented with information drawn from the interim impact assessment conducted in July 2014, final evaluation qualitative surveys in July 2015 and from project M&E systems (Appendix 1 tables). In this section we start with the outputs and outcomes leading to increased incomes for rural women. Those related to nutrition are presented in Section 4, followed by the strategic goal of women's empowerment in Section 5.

A brief summary of challenges faced by the project implementation along with success components of the project is presented in Section 6. Lessons learned from implementation of the project along with few key conclusions are discussed in Section 7.

## 4.2 Accelerated Development, Dissemination and Adoption of Yield-Enhancing Technologies for Rural Women (IR 1.2.1)

The major focus of the project is on training 40,000 Bangladeshi women in the use of FDP to attain higher yields, higher incomes and better nutrition. To accomplish this, the project trains extension agents who, in turn, train farmers using demonstration fields, classroom techniques and printed materials; this technical dimension is complemented with a social campaign to raise awareness at family and community level concerning the technology itself, as well as the role of women in agricultural decision-making, marketing and spending.

## 4.2.1 Strengthening Agricultural Extension Services

Assuring wide-scale dissemination and uptake of a technology requires building the capacity of the national systems with the mandate and structure capable of reaching huge numbers of rural women during the course of the project, as well as sustaining the activity after the project ends. For this reason, AAPI WFA is implemented in close collaboration with DAE to develop new training modules on the use of FDP for vegetables, gender and nutrition.

Table 4 shows the outcome and output indicators related to strengthening agricultural extension services. Overall, the progress toward this goal is on track. Trained extension agents worked closely with project staff to train the women farmers. They supported project staff in holding 1,000 training sessions, reaching 40,000 female farmers. They participated in six meetings to orient female demonstration fields and contributed to establishing 100 such fields across the project zones. Trained agents then worked with AAPI WFA staff to organize 100 field days and assist with crop cuts.

The only striking shortfall was in the number of extension agents trained. As AAPI WFA lacked funds for DAE training, only during Year 1, three trainings were financed and carried out by AAPI (Table 1). Under AAPI, 384 DAE agents were trained, 109 for WFA, of which 34 (9%) were women. This was a far from the project target of training 1,000 male and 100 female extension agents planned; the project did manage to train approximately the same share of women as planned (9% versus 10%). As agents are hired by the government, there is little the project can do in its short existence to increase the gender ratio. However, it should be noted that the USAID funded AAPI trained more than 3,000 DAE extension agents who and many of them also served the purpose of AAPI WFA programs in addition to AAPI.

With DAE officials engaged only during Year 1, it is difficult to judge how lasting an impact AAPI WFA will have on the capacity of the DAE to continue to promote this technology. At the end of Year 1, a qualitative assessment among community stakeholders was conducted to know the effectiveness of AAPI WFA training to DAE agents. The community stakeholders expressed the following:

- In general, AAPI WFA significantly strengthened DAEs in terms of the agent's knowledge on how to establish demonstration plots, how to use FDP for vegetables and how to use training materials for FDP for vegetables.
- Modest impacts on the agent's use of training materials on nutrition and the number of women trained.

However, they felt that it also added significantly to the agent's workload and to community respect for these agents. They saw minimal changes due to activity on the number of male

farmers trained, the use of farmer-to-farmer trainings and financial resources for extension services. Stakeholders also expressed concern that the implementation of the extra activities imposed by AAPI WFA might increase the agent's workload without a corresponding increase in the resources needed to expand the activity.

The final evaluations, though, were not able to conduct a separate feedback from community stakeholders. It was very well noticed among the farmer group discussions that extension agents continued participation in advising women farmers, especially toward adoption of FDP in vegetables in their farms. Also the stakeholder consultations conducted at the district headquarters periodically provided the level of knowledge gained by the DAE agents and how they benefited through participation in WFA project activities.

The final evaluation of WFA also found that DAE agents continued to work with the project's field staff during the motivational field visits and participated significantly in motivational meetings to identify women farmers and organize outreach activities. Motivational field visits allow farmers in a new area to visit and exchange views with those in areas that show the benefits of FDP technology. Normally, about 40 women farmers, along with DAE sub assistant agriculture officer (SAAO) and the upazila agriculture officer (UAO) of DAE, are taken from an area that is new to FDP technology to an area where FDP technology is widely adopted. Therefore, the visits can occur only when there is something to show and learn. Motivational meetings are also becoming the key to sustaining the numbers of adopters.

According to series of stakeholder workshops conducted during project period, DAE officials who participated extensively in those workshops reported that after the AAPI WFA training programs they were able to integrate gender to possible extent in their training programs and found it very useful.

	Desult Indiantons	Cumulative Achievement (July 26, 2013-July 25, 2014)			ent 014)	Due gue ga	Comments	
	Result Indicators	Unit	LOP Target	Year 1 actual	Year 2 actual	% of Target	Progress	Comments
1	IR 1.2.1: Rapidly increase develo	pment, o	dissemina	tion and ac	loption of	yield-enh	ancing technolo	gies for rural women
	Outcome Indicators							
2	DAE and other trainers will gain experience in preparing and presenting training to women recipients with a focus on gender issues	No.		75 male 34 female	NA	8% male	This activity was taken up during Year 1 only from WFA. However AAPI has trained > 3,000 extension agents who also served in WFA areas.	This particular activity was not envisaged as a part of original project proposal. Hence any achievement in this will be an added value to the project implementation. As AAPI/WFA lacked funds for DAE training, a limited number of trainings were conducted by AAPI. According to Stakeholder Workshop proceedings, DAE officials report having integrated gender in their training programs. Community stakeholders felt that AAPI/WFA significantly strengthened DAEs in terms of the agent's knowledge on how to establish demonstration plots, how to use <i>Guti</i> urea for vegetables and how to use training materials for <i>Guti</i> urea for vegetables; it also added significantly to the agent's workload, and to community respect for these agents.
3	Number of women farmers who have applied new technologies	No.	40,000	19,778	20,222	100%	On track	Includes all 4 seasons winter 2013/14; summer 2014; winter 2014/15 and summer 2015

## Table 2. Progress Toward Strengthening Agricultural Extension Services

	Result Indicators	∐nit	(,	Cumulativ July 26, 20	ve Achiever 13-July 25,	ment , 2014)	Progress	Comments		
	Result Indicators	Cint	LOP Target	Year 1 actual	Year 2 actual	% of Target for LOP	11051055	Comments		
	Output Indicators									
	Activity: Training programs for wome	n farmer	s							
4	Identification of villages and collection of information on all villages	Set	1	1	N/A	100%	On Track	No comment		
5	Women vegetable production villages established	No.	335	329	329	98%	On Track	The actual is slightly below target due to difficulties finding additional villages in the target zones that had significant vegetable cultivation.		
6	Women farmers trained on FDP technology (e.g., directly impacted)	No.	40,000	20,040	19,960	100%	On Track	This included 4 seasons (2 summer and 2 winter) of 2013/14 and 2014/15.		
7	Number of farmers training sessions	Batch	1,000	501	499	100%	On Track	No comment		
8	Training sessions for trainers such as DAE field officials, FMOs and FSs	No.	3	3	N/A	100%	On Track	This is outside the project target. No comment		
	Activity: Technology demonstrations for	or vegeta	vegetables/high value crops targeting women farmers							
9	Farmers' orientation for demonstration establishment	Batch	6	3	3	100%	On Track	No comment		
10	Women farmers' established demonstration plots	No.	100	50	50	100%	On track	No comment		
11	Field days	No.	100	41	59	100%	On track	No comment		
12	Crop cuts from demo plots	No.	100	33	61	94%	On track	Six crop cut of summer vegetable was continuing till the writing of the report and therefore could not be included here.		
13	Crop cuts from farmers' fields	No.	100	50	80	130%	On track	Note that this covered five crops in the winter season and four crops in the summer season.		
	Activity: Awareness and opportunity id	dentificat	tion events							
14	Motivational field visits	No.	20	10	10	100%	On track	Altogether, 939 women and 229 men (1,168) participated in these 20 field visits in the two-year project period.		

15	Motivational meeting with trained women farmers	No.	42	20	22	100%	On track	Altogether, 1897 women and 297 men (2,194) participated in these 42 motivational meetings in the two-year project period.
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#### 4.2.2 Building the Production Capacity of Women Farmers

Meeting the objective for technology dissemination (IR 1.2.1) requires building the production capacity of women farmers, in this case by teaching them about FDP and providing them with initial starter-kits (10 kg/ participant) so they could use it to understand how the technology works and make decisions based on their observations. Table 5 shows the outcome and output indicators related to training 40,000 women during two years of the project.

**Participation**: At the end of the first year, 40,000 female farmers had been trained and benefitted directly by the project. All direct participants (women farmers) surveyed in the FGDs expressed that they had benefited from the training and fertilizer kits given to them. All have been able to visit one of the project's demonstration fields to see the difference between the performances of FDP versus broadcast urea. There were a total of 100 demonstration fields all run by women in their own fields were established during the project period. The project also accomplished spillovers to women farmers not directly involved in the funded activities, i.e., indirect beneficiaries. IFDC's experience under AAPI is that each farmer directly trained by the project is associated with four more farmers who indirectly benefit from project activities. During the trainings, the women farmers are encouraged to share their knowledge of FDP with their extended family and neighbors. The village monitoring survey after the first season showed that already 37,678 women used FDP in their family plots, which means that the AAPI Walmart Foundation Activity trained farmers have each shared with at least one other family. Through winter 2014-15 (after three seasons), the village monitoring surveys have reported nearly 81,723 women farmers have used FDP technology in vegetable crops. This figure, while very impressive, is considerably below the 160,000 target in the proposal, which was set based on the AAPI experience of 1:4 ratio of direct and indirect beneficiaries in rice farming. As observed during the interim and final impact assessment and also in the baseline and vegetable marketing surveys conducted during the project period, it could be seen that Bangladeshi women do not play the same role as men in farming and marketing, and thus the spillovers are more modest.





Raised bed vegetable cultivation in Bhola – Eggplant applied with Guti urea on bunds

Watermelon field applied with UDP in Bhola

**Technology Adoption**: Adoption of FDP has been very strong during the entire project period. Of the 40,000 plus trained farmers, almost 94% of them adopted the technology till winter 2015 (Table 6). This is a remarkable achievement in the sense that before the project started, the farm households interviewed had not used *Guti* on either their rice or vegetable fields or in their kitchen gardens. Before the start of the WFA activities, the farm households interviewed had not used FDP on either their rice or vegetable fields. All adopted the technology for their vegetable fields during the winter season 2013-14, since the project began. Nearly three-quarters of the first round of trainees again applied FDP to their vegetable crops in the next season (summer 2014); many of those who reported not using FDP did not actually plant vegetables during that particular season. Our village monitoring surveys conducted in winter 2014-15 further indicates that nearly 99% of trained farmers from the winter 2013-14 used FDP on vegetables in the winter season of 2014-15.

The continued adoption of FDP use in vegetables was also found between II and III batch of trainees, which came out strongly during our focus group discussions conducted in July 2015 for final evaluation. The group discussions conducted among Year 1 trainees during final evaluations in July 2015 also confirmed higher and continued adoption of FDP in vegetables since training. Nearly all of them interviewed had continuously used FDP in the subsequent seasons, with 89% of them also adopted FDP in their rice fields.

The final evaluation surveys (sampled FGD participants) conducted among 2013/14 trained farmers (who were also interviewed during the interim evaluation), found that more than 85% of participants continued adopting *Guti* in their rice and vegetable cultivation since receiving training, i.e., for more than three seasons of continued adoption.

This is very important, as it clearly shows the technology in question is a success and has higher impact, which resulted in continued adoption (Table 5). The women farmers expressed satisfaction in terms of *Guti* technology usage, in which they could see a visible impact in terms of increased yields, improved vegetable quality and income compared to previous years (Tables 5 and 6).

	Katrikidia	Patibila	Shahapur	Mean
A. Adoption of <i>Guti</i> > 2 seasons				
Use in rice	63%	100%	100%	88%
In vegetables	100%	76%	81%	86%
Will be using in the next season in				
vegetables	100%	81%	88%	89%
B. Benefits of <i>Guti</i> application				
More yield	92%	95%	88%	91%
Vegetable quality good	88%	81%	75%	81%
More income	67%	71%	63%	67%

Table 3.Continued Adoption of Technologies (> 2 seasons) Among Participants<br/>(n=61)

Indications are strong that these farmers will make FDP a regular part of their vegetable cultivation. While they received 10 kg of the super granules gratis the first season, that enticement ended for the second and subsequent seasons. About 85% reported buying an average of four to five additional kilograms of FDP to complement the free kit in the first season, and ten kilograms in the second season (summer 2014). During final project evaluations (July 2015), 85% of them reported that they have been using FDP in more than three to four vegetable crops in their fields with continued purchase of briquettes, ranging from 10 kg to as high as 100 kg with their own money from briquette manufacturers or input retailers.

#### Better Yields and Income through Bitter Gourd Harvests

**Parvin Begum,** a farmer of Jessore region, received training in the 2014-15 winter vegetable season, in Year 2 of AAPI WFA, for growing vegetables with a package of technologies including UDP. She



received 10 kilograms (kg) of urea briquettes (popularly known in Bangladesh as Guti) from the training program in her fertilizer kit along with two applicators for deep placement of urea briquettes for the 40 members of her training batch. After training, she decided to apply a part of the *Guti* urea in a small piece of her ash gourd land on a test basis. She applied 4 kg of urea briquettes in 7 decimal of ash gourd land. She stored the remaining 6 kg *Guti* urea in an airtight polythene bag. She was happy to see her net return of Bangladeshi Taka (BDT) 3,500 from

this small piece of land. She thinks the increased yield from the *Guti* urea applied plot has brought her more income. She received a total of 300 pieces of ash gourd from the *Guti* urea applied plot, of which 250 were sold at BDT 7,500. The remaining 50 pieces she kept for her own family's consumption and distributed among her neighbors and relatives. This test result encouraged Parvin to use *Guti* urea in her summer vegetable crops.

In summer 2015, she decided to apply *Guti* urea in her bitter gourd plot that she transplanted April 1, 2015. She purchased 4 kg of *Guti* urea from a fertilizer retailer shop. Together with the *Guti* urea she stored during winter season, she applied 10 kg to her 14 decimals of bitter gourd land, according to the recommended dose she learned from the training program. She, in the meantime, received BDT 1,430 by selling 65 kg from two pickings, while her total cost of production was only BDT 4,350. Parvin expects she will get another 680 kg of bitter gourd from her *Guti* urea applied plots. According to her estimate, she can sell these 680 kg at BDT 13,600 within the next three months. She hopes incremental yield will fulfill her expectations. She has a plan to use *Guti* urea in her upcoming crop (winter vegetable 2015-16).

**Yields**: The per-hectare gains to the use of FDP relative to broadcast urea are substantial, ranging from 14 to 28 percent per hectare for the sampled winter 2013/14 and 9 to 23 percent in 2014/15 vegetables crops. These gains far exceed the project target by 100 to 166 percent, depending on the crop (Table 6). These yield computations are derived from crop cuts in farmer fields. Each cut consists of two samples – one from an FDP field and the other (as close as possible) from a broadcast urea field which used the same variety of seeds and has a similar soil type and equal number of plants. Though in the project areas more vegetable crops (18 to 20 crops) have been

recorded using *Guti* fertilizer because of resource constraints, the crop cuts have been reduced to cover only key crops in winter (cabbage, cauliflower, eggplant, potato, tomato, bitter gourd, chili, country bean and banana) and in summer (cucumber, teasel gourd, bottle gourd, ash gourd and taro). These crops accounted for more than 60 percent of the area planted in that season. The FGDs conducted among participants during interim and final evaluation also found that as much as 90 percent reported a major boost in vegetable yields after using *Guti* for vegetables compared to the previous seasons where it was not used.

**Area**: In vegetable areas under improved technologies, though below the target, moderate success has been achieved within this very short span of the project life. The village monitoring surveys conducted through Winter 2014/15 indicate that 5,698 ha came under *Guti* technology for the three seasons of the project (summer 2015 not included); this is 71 percent of the project target. Several factors contribute to this gap (Table 6). First, while partial adoption was very high (99 percent), full adoption takes time. It would be surprising even after only one training these farm households put 100 percent of their vegetable area under FDP. Furthermore, to cover 8,000 ha of vegetable crops would require 2,400 mt of urea. The project provided 10 kg of FDP to each participating farm; this works out to 400 mt, or about 17 percent of total needs. While farmers reported complementing this amount with their own purchases on the market, they did not purchase enough to reach the 8,000 ha target. Note, this did not include area under summer 2015, and if the summer 2015 season would have been included the performance would be much better.

**Production**: Incremental vegetable production is calculated from the area of *Guti* coverage and the weighted average of yield increments as measured by vegetable crop cuts in farmers' fields. As of July 2015, production was only 72 percent of expectation due to: (i) the inclusion of data from only three seasons (excluding summer 2015) and (ii) the lack of yield information for the other crops apart from 14 crops where intensive crop cuts have been conducted. If all of these crops were included, production would be much greater.

**Fertilizer Use**: The project monitors urea savings, which are calculated from the crop cut data collected on farmers. Farmers saved 543 mt of urea after three seasons during the second year of

the project period (excludes summer 2015); this was only 76 percent of the targeted 717 mt because of the reduced area planted and exclusion of summer 2015 vegetable season described above. The value of these savings was somewhat closer to target (76 percent) due to an increase in the cost of fertilizer, and thus the value of fertilizer savings.

**Overall**: In general farmers definitely perceived great yield, production and value gains from the use of FDP. Indications are strong that these farmers will make FDP a regular part of their vegetable cultivation. Final evaluation FGDs among project participants indicated that 50 percent reported that neighbors showed a keen interest in the yields and quality of their *Guti*-related vegetable production. The interim evaluation results further indicated that the community stakeholders identified a strong positive impact of the project on farmer awareness of the advantages of FDP use for vegetables.

The AAPI WFA March 2014 study on "Improving Women's Access to Vegetable Marketing in Bangladesh" determined that women are generally responsible for most production-related activities in the homestead vegetable garden. In commercial vegetable production, they contribute on a limit basis to seed preparation and saving, seed sowing and transplanting, harvest and post-harvest activities. While 56 percent of the respondents in the interim impact survey said they themselves applied FDP to winter vegetables (mostly on kitchen plots), many more said their husband (73 percent) or another friend or family member (32 percent) applied the FDP. As such, they played very little role in family decision-making concerning crop production.

In the final evaluation surveys of 2015 this has improved significantly especially toward participation in application of FDP in vegetable crops; 82 percent of the women in our focus group discussions responded positively; and 59 percent of them indicated their husbands participation and less than 20 percent of them used other family members or others (including hired labors) toward application of FDP in vegetables. However, this proportion was more visible among communities where the distance between farm and home is of shorter distance. In other communities, where the farm-home distance is larger, the participation of women was at 60 percent or less.

Table 4.	Building the	Production	Capacity	of	Women	Farmers
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	Pocult Indicators	Unit	Cu (Jul)	ımulative y 26, 2013	Achievem -July 25, 2	ent 2015)	Progress	Comments
	Result Indicators	Omt	LOP Target	Year 1 actual	Year 2 actual	% of Target LOP	Trogress	Comments
1	IR 1.2.1. Rapidly incre	ase develo	opment, di	sseminati	on and ad	option of y	vield-enhancing techno	logies for rural women
	<b>Outcome Indicators</b>							
2	Number of women farmers who have applied new technologies	No.	40,000	19,778	35,607	94%	On track	Includes all 4 seasons of the project life (2 winter + 2 summer crops); some women used <i>Guti</i> in more than one crop.
3	Increased yield of vegetables	mt/ha	1 to 10	3.24 to 16.64	1 to 7.2	100- 166%	Significantly above expectations	Incremental vegetable yields on farmers' fields ranged from 1 mt/ha to 16.64 mt/ha across the 14 different vegetable crops. The farmers have used FDP in many other vegetable crops that the project was unable to monitor due to a lack of resources to conduct the labor intensive crop cuts.
4	Incremental vegetable production	mt	60,000	14,857	13,875	72%	Moderate	Incremental vegetable production for the 10 major crops monitored by the project through winter season achieving 72% of the AAPI WFA target. Note the results from Summer 2015 are not being included here. Including the 2015 summer vegetable the achievement will be 100%.
5	Vegetable area under improved technologies or management practices as a result of Walmart assistance	ha	8000	2,269	3,429	71%	Moderate	5,698 hectares (ha) of vegetables area were covered by FDP technology through direct beneficiaries of the project through winter 2015 season (only 3 seasons and not included summer 2015). Other farmers also used FDP technologies in these communities, viz., 'indirect beneficiaries.'

	Dogult Indiactors	T lusid	Cu (July	umulative y 26, 2013	Achievem -July 25, 2	ent 2015)	Drogragg	Comments
	Result indicators	Unit	LOP Target	Year 1 actual	Year 2 actual	% of Target LOP	rogress	Comments
6	Urea savings	mt	1075	270	543	76%	Moderate	The FDP method of applying urea saved between 89 and 221 kg/ha, depending on crop. Total urea saved was 543 mt valued at U.S. \$0.22 million during the two-year project period among the direct beneficiaries. This does not include summer 2014/15 season, which would have improved the urea savings and value of urea saved.
7	Value of urea saved	million U.S. \$	0.43	0.12	0.22	76%	Moderate	Same logic as above.
8	Government of Bangladesh (GoB) saving on urea subsidy	million U.S. \$	0.19	0.07	0.13	100%	Above expectations	Although urea savings for farmers were below expectations (due to measurement issues), savings for GoB soared because the cost of the subsidy on urea soared from \$177/mt to \$277 mt. Through the two-year project period until July 2015, the Government of Bangladesh saved U.S. \$0.13 million by not having to subsidize the 543 mt of fertilizer that would have been needed to fertilizer these vegetables using broadcast, rather than FDP, urea.
	Activity: Training prog	grams for	women fa	rmers				
9	Women farmers trained on FDP technology (e.g., directly impacted)	No.	40,000	20,040	19,969	100%	On track	40,009 women have received training in fertilizer deep placement, nutrition, and gender empowerment.
	Activity: Technology d	emonstra	tions for v	egetables/	high value	e crops tar	geting women farmers	
10	Farmers' orientation for demo establishment	Batch	6	3	3	100%	On track	No comment
11	Women farmers' established demonstration plots	No.	100	50	50	100%	On track	No comment

	Pasult Indicators	Unit	Cumulative Achievement (July 26, 2013-July 25, 2015)			ent 2015)	Progress	Comments	
	Kesuit multators		LOP Target	Year 1 actual	Year 2 actual	% of Target LOP	Trogress	Comments	
12	Field days	No.	100	41	59	100%	On track	No comment	
	Activity: Awareness an	nd opportu	inity ident	tification e	events				
13	Motivational field visits	No.	20	10	10	100%	On track	Altogether, 939 women and 229 men (1,168) participated in these 20 field visits in the two-year project period.	
14	Motivational meeting with trained women farmers	No.	40	20	22	105%	On track	Altogether, 1897 women and 297 men (2,194) participated in these 42 motivational meetings in the two-year project period.	

## 4.3 Increased Sales of Fruits and Vegetables (IR 1.2)

The AAPI WFA project did not directly focus on increasing the capacity of women farmers to sell vegetables; this is reflected in Figure 1 on impact pathways, which lacks activities-related marketing and marketing-related output variables (Table 7). However, the WFA activities lead to certain marketing outcomes, such as farmers realizing increased yields due to improved technology use can be measured in terms of value of the incremental production, overall and per hectare. Consistent with the under-reporting of production due to a lack of yields data for about one third of cropped area, the total value of production is 73 percent of target for three seasons during the project period. When analyzed for only those 10 crops included in crop cuts and analysis for which we have yield data, this percentage soars to 119 percent, above expectations on per hectare basis.

The four AAPI WFA surveys (Final, Interim, Marketing and Baseline surveys) give a greater sense of what may be happening to vegetable sales and incomes.

- The final evaluation FGDs among Year 1 participants reported selling 50-78 percent of their vegetable produced, earning between 15,000 Tk and 75,000 Tk. This was an almost 70 percent increase over their revenues from previous years, on the same fields before WFA intervention. The responses of Year 2 participants were slightly less as they just experienced one season after their training. Though more than 75 percent of them indicated selling their vegetables, the revenue realized was around 30,000 to 45,000 Tk.
- According to the interim impact surveys conducted in July 2014, covering only one season, farmers reported selling between 68 and 87 percent of their vegetable produce, earning between 18,000 and 36,000 Taka. The great majority (88 percent) said this was a significant increase over their vegetable revenues in previous seasons on those same plots, and all were either moderately or very satisfied.
- However, the role of women in these sales is fairly small. The March 2014 marketing study (Improving Women's Access to Vegetable Marketing in Bangladesh) showed that men are not only responsible for the purchase of agricultural inputs, but they are also responsible for the sale of vegetable produce. Although women are not highly engaged in commercial

vegetable production, they do play a bigger role in post-harvest activities such as selling at the farm-gate or transactions with friends or neighbors.

- According to the baseline survey, respondents reported that they worked more for the postharvesting practices for the vegetables and fruits (73 percent) than various practices of production and harvesting (31 percent) in FTF districts. Similarly, in M&S districts, the higher proportion of the female respondents worked for post-harvesting practices for the vegetables and fruits (93 percent) than various production and harvesting practices (59 percent).
- The interim study conducted among community stakeholders provided very significant picture regarding the impact of the project. The AAPI WFA project in general was perceived to have greatly increased vegetable marketing for men. The results were positive, but much smaller for women. Community groups felt that the program had increased income from vegetable sales significantly. This increase has been somewhat more for men than for women, although women's income is increasing due to production gains for ash and the other gourds they sell. The quantity of processed vegetables is also increasing, yet again more for men than for women.

			(J	Cumulative uly 26, 2013	Achievemen -July 25, 201	t 5)					
	Result Indicators	Unit	LOP Target	Year 1 actual	Year 2 actual	% of LOP Target	Progress	Comments			
1	IR 1.2. Increase sale of fr	uits and veg	etables								
	Outcome Indicators										
2	Increased value of vegetable and other crops	million U.S. \$	9.4	2.22	2.34	73%	Moderate	Total for direct beneficiaries and therefore equivalent to the total increased income for farm households' direct beneficiaries. Data for a subset of crops for 3 seasons only. Summer 2014/15 not included.			
3	Average incremental value per hectare	U.S. \$	580	1,312	751	119%	Greatly surpassed	Data up to Winter 2014/15 only (3 seasons)			
4			Output Indicators								
	Output Indicators           N/A         No sales activities were envisioned in the proposal; thus, there are no output indicators										

## Table 5. Progress Toward Increased Sale of Fruits and Vegetables

## 4.4 Increased Ownership of Small Agro-Enterprises (IR 1.1)

Two project activities focus on increasing female ownership of small agro-enterprises – in particular, of the briquette makers that turn prilled urea into FDP granules. During the project period, it aimed to identify 25 female operators, provide them with small-subsidized briquette makers (80 percent) as well as the technical and business training to establish and operate their enterprises successfully. Progress toward this objective is complete (Table 8). The project management adopted a conscious policy of giving more attention to the appropriate selection of rural women entrepreneurs who will continue this business on an ongoing basis even after the project gets terminated.

*Key Highlights:* The outcomes of these activities are quantified as increases in (female) small business operators selling fertilizer briquettes and providing related services.

- By the end of the second year, the project had held four technical and four business trainings for briquette makers and trained targeted 25 rural female operators.
- To ensure adequate support for those women, the project also trained a second person from each household, typically a husband or son, to operate the machines. In total, the project trained 28 men on both types of training.
- The briquette selling results were 100 percent of target (25), while the service provider results were 115 percent met (144/124).
- All these 25 entrepreneurs have produced and sold 1,013.03 mt of fertilizer briquettes till July 2015. All 25 machine owners are still in operation and are producing moderate amounts of briquettes for sale in their own communities.
- It should be noted that (18/25) 72 percent of the briquette entrepreneurs also are farmers, who underwent AAPI-Walmart technical training on the use of FDP in vegetables cultivation.
- As of June 2015, our records indicate that on an average each entrepreneur has produced and sold 41 mt of briquettes in their communities. In total they have produced 1,013 mt from the start of their operations.

During the final evaluations of July 2015, the AAPI WFA study team interviewed nine out of 25 (36 percent) trained briquette makers to get an indication of their experience with the program to date. As the entrepreneurs are still at the earlier stages of their business operations (just over 10 + months) and at different stages of business establishment (3 months to 16 months of operation), the results may not provide the complete picture of the entrepreneurial sustenance and revenue making nature. The survey covered key aspects of the status of business operations, marketing activities, accounting, and the constraints faced in the business operations along with their decision-making nature.

*Status of business operations:* Of the entrepreneurs, 21 of them started their operations in 2014 and the rest in 2015 seasons. (Of the nine interviewed, 7 in 2014 and 2 in 2015). 44 percent of the interviewed were registered retailers and the rest were unregistered. About 56 percent of the interviewed entrepreneurs indicated that they made significant investments in their briquette business since they purchased and installed the machine. Most of such investments went in to improving the appearance of the shop entrance/premises, with an average investment of around 1,989 Tk/shop.

*Supply*: On an average each machine owner in our sample operated for 25.1 hrs during I season and 22.4 hrs during II season; which works out to 6.6 to 6.9 hours of machine operation per day. The average production of *Guti* urea was about 95.8 mt in I season and 1,123 mt during the II season. All of them were sold in both seasons. The *Guti* NPK averaged at 11 mt and 100 mt during first and second season, respectively, and all of them were sold. None had faced any problem acquiring the necessary inputs to date (prill urea, spare parts, diesel fuel, bags or a secure shop for operations). None of them reported having encountered major production problems yet. 85 percent of the sampled entrepreneurs sourced their prilled urea and BCIC dealers and the rest from input retailers. The average purchase price of prilled urea was about 497 Tk/50-kg bag.

#### Woman Entrepreneur Succeeds Partnering with Husband

This is a story about Rinku Rani of the Bhola district, a woman who had remarkable success producing fertilizer briquettes for local marginal and small farmers. Rinku Rani is a housewife and a mother of two school-going children aged 17 and 12. Her husband Taposh Kumar Dey was a farmer who later became an operating partner of the family fertilizer briquette production business. She participated in a farmer's training program organized by the AAPI Walmart Foundation Activity (WFA), wishing to initiate a change in herself so that she could find a way to contribute to the family income. Rinku was glad that she could participate in this training program, balancing her household work with the AAPI WFA training schedule before the winter vegetable season of 2013-14. Rinku received 10 kilograms (kg) of *Guti* urea in a fertilizer kit from the training. They had to buy another 20 kg of *Guti* urea to apply in their plots. Both Taposh and Rinku were happy with the yield and the income from the garden. Rinku and Taposh wanted to share their good fortune with neighboring farmers. The family began to publicize the technology among the neighboring families, and they continued to advocate for *Guti* urea ever since their introduction to the technology.



Both Rinku and Taposh were interested in *Guti* urea and wanted to establish a small family business. The AAPI WFA project facilitated the process of owning a briquette machine, sharing 80 percent of the cost. The project linked them with local fertilizer dealers for the supply of raw materials through the local agriculture extension office. AAPI WFA also linked them with the supply network through the local fertilizer retailers. The project continued to support them with guidance and necessary advice when necessary. Since the machine's installation on June 6, 2014, Rinku produced 250 metric tons (mt) of *Guti* urea through May 2015. Assuming a net profit of 1 Taka (Bangladeshi currency) per

kilogram, their total profit was Taka 250,000 in one year. Rinku and Taposh are satisfied with the fertilizer briquette production business and their income. Now they can comfortably spend on their children's education and nutritious food for the family. In addition to briquette production, the family is continuing their vegetable production with *Guti* urea. Their vegetable fields are serving as demonstration plots for many neighboring farmers. The village farmers are easily motivated seeing their vegetable gardens.

Recently, Rinku and Taposh have leased about an acre of land to increase their vegetable area. Rinku always wanted to own and raise a cow. This was finally possible with earnings from the *Guti* fertilizer shop. Their next plan is to rebuild their house with bricks!

*Production cost*: Of the nine entrepreneurs interviewed, all of them produced *Guti* urea, and only three produced *Guti* NPK and 2 *Guti* MoP. The mean level of *Guti* urea produced was around 73,759 kg valuing at 1,155, 706 Tk (U.S. \$15,500). The three entrepreneurs produced around 119 kg/shop of *Guti* NPK; the two owners produced 108 kg of *Guti* MoP each.

Of the total cost of production, labor and fuel (diesel) were accounted for the highest proportion. On an average each owner spent about 17,355 Tk (U.S. \$235) toward labor and 17,959 Tk (U.S. \$250) for fuel. Packaging cost averaged at 4,500 Tk (\$60); the machine maintenance costs were averaged around 800 Tk (\$12). In addition, three owners paid an average rent of about 1,325 Tk (\$20/month) toward a shop in the main market along with few other expenses toward office and transportation averaging \$30 per month.

*Income*: The briquette shop owners sold on an average of 1,641 kg of *Guti* urea (min. of 98 kg to max of 6,000 kg/shop) at an average price of 18 to 20 Tk/kg. Each woman entrepreneur also produced 53 kg of *Guti* NPK and sold at an average price of 25-27 Tk/kg. Most of them sold directly to farmers in their own communities; on an average each entrepreneur sold to 500 farmers, covering three to four village communities. However, it was evident that most of these women entrepreneurs have just begun their operations, and only six out of 25 entrepreneurs have completed two seasons. It is too early to predict their revenue stream based on their current levels of production.

*Use of sales income*: Most of the entrepreneurs used the income derived from their *Guti* sales in their shop toward the following: 67 percent of the women reported that they utilized this sales incomes toward household expenses (nearly 4,500 Tk); 33 percent of them utilized the money for school expenses for children (1,750 Tk); 56 percent of them also used the money for family medical expenses (averaged at 2,875 Tk); 22 percent invested back in business toward expansion (purchase of inputs – 2,889 Tk average) and 33 percent of women interviewed used substantial part of their income earnings toward purchase of jewelry, fish ponds construction and loan repayment (averaged at 17,375 Tk).

*Demand*: Each reported having conducted a cost analysis to evaluate returns per 50-kg bag of *Guti* produced (150 Taka in each case).<sup>5</sup> Sixty-seven percent of them expressed concern about adequate demand and requested that the project (i) continue to train farmers to use *Guti*, (ii) install many more demonstration plots and (iii) help build relations between fertilizer dealers,

 $<sup>^{5}</sup>$  In theory, each urea briquette producer is supposed to charge an additional 50-100 Tk/50-kg bag and therefore 1-2 Tk/kg.

retailers and farmers. Nearly 50 percent of them also indicated their concern over shortage of prilled urea and NPK and thus higher prices to procure them. During the *Boro* 2015/2016 season on an average each entrepreneur was expected to improve their sales up to 10 to 15 mt of *Guti* urea and 2.5 mt of *Guti* NPK.

*Perspectives on the AAPI WFA trainings and as briquette manufacturer*: All of them reflected positively about the practical, hands-on nature of the trainings, though three of nine interviewed felt that trainings were too short. They also wanted to learn more about how differing urea qualities might influence their output and market assessment tools. During our rapid assessment among nine entrepreneurs in July 2015, 60 percent of them reported higher sales during winter for vegetables than in summer vegetables. This is primarily due to demand for vegetables grown during winter require more fertilization than summer crops. Seven out of nine entrepreneurs also improved their sales significantly by more than 65 percent (up to 250 percent in two cases) since they began their operations and expressed increasing demand in the coming seasons. Five of the nine women entrepreneurs we interviewed also indicated that other women in their own communities to start such entrepreneurial activities in their community contacted them.

As a women entrepreneur they faced few constraints, which are mostly marketing related, operation of machines. 67 percent of the women reported that with existing socio-cultural environment, it is difficult to participate in market related activities, and they are very dependent on men in their household. Most of them interviewed conducted all the business operations on their own, especially production of briquettes, managing labor, managing finance and accounting operations, daily management of shop on their own. Yet the machine maintenance and marketing were taken care by their husbands or other male members in the family.

Of the 25 women who started their business operations in 2014, three of them have expanded their operations by having shops outside their homestead or communities in to market centers, which is managed by their male members in the family. Forty-five percent of the owners expressed that investing in increased machine utilization would be their primary objective toward business operations in the coming years, as they all are under-utilizing their capacity at the moment. They (85 percent of them) also realized that the importance of investing in market

promotion related activities such as farm demonstrations and field days are important toward business expansion in future.

			Cum	ulative	Achieve	ment		
			(July 2	26 2013	.Inly 25	2015)		
	Result Indicators	Unit	LOP Targe t	Year 1	Year 2	% of LOP Target	Progress	Comments
1	IR 1.1. Increased ownership o	f small	agro-ente	erprises				
	Outcome Indicators							
2	Increase in small business operators selling fertilizer briquettes – <b>female briquette</b> <b>producers</b>	No.	25	14	11	100%	On track	No comments
3	Increase in small business operators selling fertilizer briquettes – <b>female service</b> <b>providers</b>	No.	124	120	22	115%	Surpassed	
4	Output Indicators							
	Activity: Training programs f	for won	nen entre	preneur	<b>S</b>			
5	Training sessions for briquette producers	No.	4	2	2	100%	On track	Combines technical and business trainings
6	Rural entrepreneurs trained as fertilizer briquette dealers (female)	No.	25	14	11	100%	On track	No comments
7	Fertilizer briquette machines sold at 80% subsidized rate	No.	25	16	9	100%	On track	No comments
	Activity: Development/dissem	ination	of techno	ology tra	nsfer a	nd promo	tion materials	5
8	National launch workshop	No.	1	0	0	N/A	N/A	Canceled at Walmart Foundation
9	Motivational workshops for stakeholders	No.	12	6	6	100%	On Track	776 participants (340 women and 436 men) participated in 12 stakeholder workshops
10	Media & Communications	N/A	N/A	N/A	N/A	N/A	Continuou s	Print media, local newspapers, national news papers online articles, television broadcasts.
11	Training Materials	N/A	N/A	N/A	N/A	N/A	Continuou s	Distributed: 4,490 booklets (different crops), 1,289 training bags, 3,926 writing pads.
12	Brochures/Handouts/publicati ons/signboard	N/A	N/A	N/A	N/A	N/A	Continuou s	Distributed: 49,990 flyers, 415 signboards; 4,853 project profiles (in English & Bangla)

 Table 6.
 Progress Toward Increased Ownership of Small Agro-Enterprises

#### Technical Outreach to Participants of AVPI

AVPI shared information about the project activities and FDP technology among the beneficiaries and other stakeholders through leaflets, brochures, sign boards and flyers. These technical and outreach materials were used in various activities, such as stakeholder workshops, motivational tours, farmer training programs, demonstrations, field days, and public handouts. Materials were also distributed to representatives of IPM/ ICM clubs and community leaders. Principle examples of such promotional and instructional materials include the following (**details are presented in Appendix 14 of the Year 2 Annual Report**):

- Activity signboards: As a promotional activity and to make people aware of AVPI, 164 signboards were made for clusters and 102 signboards for demo plots; all were installed in strategic locations such as marketplaces near cluster villages.
- 2. Banners at all AVPI-sponsored events and project sites: These large, attractive banners prominently displayed partner logos (as per the Branding and Marking plan). Depending on the audience, they were in English or Bengali.
- 3. Informational brochures on the general objectives and components of AVPI: This included project profiles in English and Bangla, and they were distributed to different stakeholders.
- 4. Success stories, case studies, and lessons learned that result in best practices within the targeted locations of the Walmart Foundation were highlighted through different media forums.
- 5. Training of farmers and key project partners, such as DAE and private entrepreneurs in fertilizer briquette supply, and regular updates on the details of the Walmart Foundation and its successes.
- 6. Best practices published and disseminated through occasional newsletters, white papers, and other print and electronic media, including newspaper articles.
- General and specialized technical information was made available through the publication of brochures that were distributed in the input stores, at demonstration days, and training programs.
- 8. Signboards for briquette shops (18) were also prominently displayed in all the shops.
- 9. Indicator boards (that give directions to where the shops are located) for briquette shops owned by women (18).

- 10. As a promotional feature, during key trainings with stakeholders, the project also provided all the materials related to the project (training materials, brochures, etc.) in a training bag, made exclusively for the purposes of the project. Bags were distributed over the project period.
- 11. In addition, project flyers with a summary of the project objectives were given to 50,000 individuals who participated directly and indirectly in the project as a part of extensive communication outreach.

## 4.5 Summary: Increased Incomes for Rural Women (IR 1)

As illustrated in Figure 1 on impact pathways, two objectives directly contribute to the goal of increasing incomes for rural women (IRs 1.1 and 1.2), with another playing a critical supporting role (IR 1.2.1). The data in Table 9 track progress toward this goal; the focus is increased incomes from vegetable production; there are no indicators at present to track revenues from briquette production. Yet the total production of briquette entrepreneurs since they started the units is given in Appendix table. From our final evaluation surveys among nine sampled briquette entrepreneurs, it was evident that on average the owners realized gross revenue of around 30,000 Tk (\$420) from selling *Guti* urea alone, since they started their operations.

- The number of people benefiting from AAPI WFA includes 40,000 farmers, and 25 briquette producers.
- The average incremental income for participating farm households was \$164, calculated as the total incremental value of the ten crops by the total number of unique *Guti* users on 10 selected crops during winter and summer season.

	Result Indicators	Unit	(J	Cumulative July 26, 2013	Achievem 3-July 25, 2	ent 014)	Progress	Comments			
	Result indicators	Cint	LOP Target	Year 1	Year 2	% of LOP Target	110gress	Comments			
1	IR 1. Increase rural women's in	ncomes throu	gh the sale of	vegetables a							
	Outcome Indicators										
1	Total increased income of farm households	U.S. \$ (mil)	9.4	2.22	2.34	73%	Moderate	Total for direct beneficiaries and therefore equivalent to the total increased income for farm households' direct beneficiaries. Data for a subset of crops for 3 seasons only. Summer 2014/15 not included.			
2	Average incremental income per farm (female)	U.S. \$	115	102	164	143%	Surpassed	No comments			
3	Output Indicators										
4	Number of rural households benefiting directly from Walmart intervention	No.	40,025	20,056	20,000	100%	On track	Combines farmers and briquette makers but not extension agents			
5	Number of individuals who have received Walmart supported short-term agricultural sector productivity or food security training	No.	40,159	20,177	19,984	100%	On track	Combines farmers, briquette makers and extension agents			

#### Table 7. Progress Toward Increased Incomes for Rural Women

## 5. Goal Progression: Improved Nutrition for Rural Women and Their Families (IR 2)

#### 5.1 Impacts Related to Improving Nutrition

One of the key outcomes of the overall goal of the project is to improve awareness on household nutrition aspects, thus influencing participants to increase consumption of vegetables and improve dietary diversity of their households. As stated in the proposal, it is not practical for IFDC to monitor detailed nutrition-focused indicators considering the short timeframe proposed for the AVPI Walmart Foundation Activity. The project did include few a measures of consumption and nutrition – in terms of who makes the consumption decisions in the household – during baseline and final evaluation surveys.

According to the baseline survey conducted in 2013 (AVPI Phase I is the baseline), 51% of the respondents in 12 districts stated that the wife makes the decisions about the foods the family is served, followed by both husband and wife (37%), husband only (11%), and other female members (1%). According to the same survey, 79% of the respondents stated their husband took more food and nutritious food than other family members, followed by other male members including sons (17%), and finally other female members including daughters/wives (2% and 2%) in 12 districts. About 96% of respondents stated that the male members of the family (husband and other male members of the family) consumed more food and more nutritious food than female members of the family.

Focus group discussions among women participants (50 direct and 30 indirect) of the AVPI project revealed that, since the AVPI project began, almost all of the direct participants expressed increased consumption of fruits and vegetables and diversified foods in their households; the indirect participants' consumption also improved significantly by 90%. Among the direct participants, those benefiting the most were children, followed by adults.

As part of their two-day technical training, women farmers received instruction on nutrition. The module focused on good nutritional practices for themselves and their families. It provided information on the value and sources of different vitamins, as well as safe food handling and

how to prepare a balanced diet. This module was extremely popular with trainees, perhaps because, as indicated above, it spoke to one of their core competencies. The final project evaluation found that women from these villages were able to recollect and follow a few key recommendations learned during the trainings. More than 60% of surveyed direct participants practiced increased consumption of fruits, eggs, lentils, and iron-rich foods (78% of participants), such as greens/leafy vegetables (94%), in their diet; almost all of the direct participants prewashed their vegetables before cooking, washed their hands, and engaged in other healthy cooking habits they learned in the training programs.

To attain the second goal of improving nutrition by increasing the home consumption of these products as well as improving dietary diversity, AAPI WFA worked with nutrition and gender specialists to develop innovative training modules and teach these concepts to DAE agents. Those agents then included instruction on nutrition and gender balanced decision-making in the course of the two-day technical training sessions held for the 40,000 women farmers. The nutrition module focused on good nutritional practices for themselves and their families. It provided information on the value and sources of different vitamins as well as safe food handling and how to prepare a balanced diet.

#### 5.2 Increased Quantity and Diversity of Home Consumption (IR 2.1)

The project's second goal is to attain improved nutrition by increasing the home consumption of vegetables as well as improve dietary diversity of the participant households. As stated in the proposal, it is not practical for IFDC to monitor detailed nutrition-focused indicators considering the short timeframe proposed for the AAPI Walmart Foundation Activity or through its related AAPI project, which is fundamentally an agricultural technology scale-up project and not a health or nutrition project. The project did include few measures of consumption and nutrition – in terms of who decides the consumptions decisions at the household in its baseline, interim and final evaluation surveys to understand the perceptions of participants of WFA activities. The nutrition model was in general very popular with trainees.

According to the baseline, 51 percent of the respondents in 12 districts stated the wife makes the decision for family food serving followed by both husband and wife (37 percent), husband only (11 percent) and other female members (1 percent). Similar trends were estimated on the family members' decision for family food serving in FTF districts and M&S districts. According to same survey, 79 percent of the respondents stated their husband took more food and nutritious food than other family members followed by other male members including son (17 percent) and finally other female members including daughter/wife (2 percent and 2 percent) in 12 districts. About 96 percent of respondents stated that the male members of the family (husband and other male members of the family) consumed more food and nutritious food than female members of the family). More or less similar trends were estimated in FTF districts and M&S districts.

Focus group discussions among women participants during final evaluation provided a somewhat diversified picture across Year 1 (2013/14) vs. Year 2 participants (2014/15). 68 percent of Year 1 participants indicated increased consumption of vegetables since WFA training and more than 50 percent among them also responded toward eating diversified diets. These proportions were higher among the Year 2 participants with almost all of them increased their vegetable consumption with 79 percent of them increased their diverse dietary habits in the household since training.

Similar higher proportion of responses were also recorded during Year 1 interim impact study, where 100 percent of women responded that their family now eats more vegetables than before the training; 90 percent report that they consume a more diverse diet.

\* Note Year 2 participants have completed 4 seasons of vegetable cultivation vs. the Year 1 – who completed only 2 seasons. The interim study covered only one season winter 2013-14.

As part of their two-day technical training, women farmers received instruction on nutrition. The module focused on good nutritional practices for themselves and their families. It provided information on the value and sources of different vitamins, as well as safe food handling and how to prepare a balanced diet. This module was very popular with trainees, perhaps because, as indicated above, it spoke to one of their core competencies.

Ninety percent report that they consume a more diverse diet. Likewise, they all responded that the benefits from these actions accrued to all family members, and had a hard time distinguishing who, within the family, might have benefited the most. Community stakeholders interviewed during interim assessment of the project also felt that the project had somewhat increased food quantities, and these impacts were about the same on men and women. They also felt that the quality of diets had improved and diversified, with a somewhat greater gain for men than for women. This is consistent with data from the AAPI WFA baseline survey, whereby 96 percent of respondents stated that the male members of the family (husband and other male members of the family) consumed more food and more nutritious food than female members of the family.

### 5.3 Changes in Nutritional Status (IR 2.1.1)

The one outcome variable related to nutritional status was that "the nutrition of participating families will increase due to access to greater dietary diversity and incomes." This is estimated based on the number of trained women (40,000) with an average family size of five (=200,000). Responses from final and interim evaluation FGDs also confirm that almost most of the trainees (>90 percent of the sample) interviewed recalled and adopted key nutrition recommendations of the training module. Likewise, they all responded that the benefits from their action accrued to all family members, and had a hard time distinguishing who, within the family, might have benefited the most. For instance, both interim and final project evaluation found that women from these villages were able to recollect and follow few key recommendations learnt during the trainings, they are:

- Almost all the participants recollect the key nutrient content of fruits and vegetables they consume in their household
- 60 percent of Year 1 women farmers and 89 percent of Year 2 Walmart participants reported serving more vitamin A and C foods such as fruits and leafy green vegetables, and adding more proteins such as eggs and lentils
- Significant proportion of women (80-93 percent) also remember to washing vegetables before cutting and wash rice before cooking
- Higher proportion of women also practices personal hygiene practices such as washing hands before eating.

	Participant Category	> 3 (20	seasons sii 13/14 BAT	nce training CCH)(n=61)	1 or 2 seasons since training (2014/15 BATCH)(n=33)				
		Katrikidi	Patibil	Shahapu		Bhagerpar	Nogorchur		
	Villages	a	a	r	Mean	а	а	Mean	
1	Pre-Washing								
	rice/vegetables before								
	cooking	88%	81%	75%	81%	100%	87%	93%	
2	Types of nutrition in								
	vegetables (vitamins,								
	etc.)	63%	67%	50%	60%	78%	100%	89%	
3	Washing hands prior to								
	eating /feeding	92%	86%	75%	84%	67%	73%	70%	

 Table 8.
 Adoption of 'Nutritional Recommendations' Among Participants After

 Training

# 6. Goal Progression: Women's Empowerment (SG 1)

## 6.1 Impact on Community

The project targets individuals to a greater extent than communities. Indicators and targets are expressed at the individual rather than at the community level. That said, there are a few specific activities that either directly seek to strengthen community institutions or transmit the results of the interventions to a larger community group. The project prepares many new producers (women) to use innovative, cost-efficient technologies, such as FDP and polynet houses for healthy seedlings with water-efficient methods, such as trickle irrigation, to grow a nutritionally rich and financially rewarding set of crops (fruits and vegetables). These efforts are expected to yield substantial gains at a larger level, beyond individuals at the level of farm communities where they are located, when several of the individual farm households begin using such technologies.

The AVPI project in Bangladesh was initiated in 2013 to improving productivity of vegetable crops through several capacity-building initiatives and technology transfer mechanisms during its first phase. As many as 40,000 women were provided short-term training directly in more than 350 farming communities in Bangladesh. As outlined in above sections, every rural woman trained at the local community level, in turn, reached out to two other women in sharing the
knowledge and information they gained from project initiatives. Thus, the project gained wider outreach in terms of direct and indirect beneficiaries, impacting 100,000 rural women in Bangladesh. In order to sustain the effects or momentum gained during Phase I of AVPI (2013-15), several efforts were implemented during Phase II (2017-18) so that the impacts gained at the individual level from early adopters could be effective and also influence others in the local communities. After two years of project implementation, we can credibly describe, based on the direct impact on individuals involved in the project (above), and document the mechanisms and extent to which project interventions spill over to a larger community of farm families benefiting indirectly (below). We can also trace how, if those spillovers become large and sustained, projects such as this can have an important influence on many dimensions of community wellbeing.

#### 6.1.1 Impact Through Indirectly Trained Farmers

Under the current project design, the key to generating community-level impacts was to uplift as many women farmers, and their families, as possible. While the AVPI project in its second phase targeted many farmers in an operational sense, i.e, directly training 16,000 farmers (in GAPs and other technologies such as FDP, polynet houses, improved irrigation methods, nutrition, and marketing information, etc), the outreach is substantially low when compared to reaching 22 million farmers nationally. To expand the reach of the project to other non-project areas and farmers, AVPI included a few specific activities to create extensive spillovers across communities:

- The project aimed at re-tooling or providing motivational training to "early adopters" or farmers who were trained during Phase I of the project (28,360 direct beneficiaries), thus increasing the reach of direct beneficiaries up to 44,360 women farmers at the end of 2018. This was done through motivational meetings of early adopters designed to cover beneficiaries from Phase I. In addition, in order to reach a wider network of farmers in creating awareness of the new technology on polynet houses for nursery management and raising seedlings using GAPs, 1,000 women farmers were selected from 250 cluster villages to gain knowledge to be shared among their local communities.
- Demonstration fields were also organized to expose untrained farmers to the technology and compare yields, costs, and revenues between similar fields treated with FDP versus prilled urea. Demonstrations also introduced new technologies aimed at improving water

use efficiency through trickle irrigation methods along with polynet houses for nursery management for vegetable production. During the project period, 105 such demo fields were established at the selected villages and often attracted the interest of whole communities to see the results. The demo fields were also used by DAE officials to demonstrate the effectiveness of new technologies for other farmers in the communities, thus improving the outreach extensively. In addition, field days were organized around these demonstration plots to share results; these were attended by DAE field officials, media personnel, briquette producers, local leaders, and other development project staff. A total of 1,800 participants attended the 36 field days, of which 1,455 were women farmers and 345 were male farmers. AVPI also completed 20 field days on polynet houses with trickle irritation demonstration with a total participation of 800 women horticulture farmers.

- 3. Stakeholder meetings were conducted regularly on the use of FDP technologies and other GAPs, including nursery management techniques (polynet houses and trickle irrigation methods) along with market-related information on vegetable crops. For instance, to enhance the knowledge and practices of women farmers regarding market requirements, market information systems, the timing of sales, quality assurance, and creating linkages between producers and buyers, AVPI organized 16 vegetable and fruit marketing seminars with a total participation of 619 (276 female and 343 male) through October 2018. The participants included women horticulture farmers, market actors, district marketing officers, DAE officials, NGO representatives, and media personnel. This was used as a vehicle to seek the commitment of participant-stakeholders to supporting the project goals of rolling out the technology while facilitating women's empowerment beyond individual farm households, extending the benefits to farming communities.
- 4. AVPI also organized agro-input retailer training programs in the communities to create awareness among the dealers on new input technologies, such as the use of polynet and trickle/drip irrigation technologies, followed by practical demonstrations of these technologies in the field. This was also used as a forum to ensure access to a supply of raw material for FDP products (briquette making) and provide marketing or sales points for women BMOs or entrepreneurs through these agro-dealers who are serving the local population in their own communities. Seventy-one agro-dealers from three districts (five

upazilas) were trained during AVPI Phase II to enhance access to fertilizer products through BMOs as well as to create awareness of new technologies in their own communities. As each input supplier serves an average of 500 farm households in and around their communities, the AVPI messages are expected to reach an additional 35,500 farmers annually in those communities.

- 5. IFDC's experience under AVPI Phase I is that each farmer directly trained by the project is associated with four more farmers who indirectly benefit from project activities, i.e., farmer-to-farmer trainings. During the trainings, the women farmers are encouraged to share their knowledge of FDP with their extended family and neighbors. The AVPI cluster village monitoring surveys conducted after winter 2017-18 and summer 2018 seasons reveal that a total of 89,016 women farmers used GAPs and 52,352 used FDP in both winter 2017-18 and summer 2018 vegetable seasons. The unique number of women farmers using GAPs is estimated to be 51,991 and that of FDP users is 30,486, calculated using the Bangladesh Bureau of Statistics (BBS) cropping intensity. This indicates that the ratio of expanding GAPs and FDP technology through direct beneficiaries is 1:1.61 and 1:1.26, respectively.
- 6. Instructional signage and brochures (250,000 promotional materials) were distributed widely to bring visibility to the project. AVPI shared information about project activities, including GAPs and FDP technologies, among beneficiaries and other stakeholders through leaflets, brochures, signboards, and flyers. These were used in various activities, such as farmer trainings, motivational meetings with trained farmers, vegetable and fruit marketing seminars, field demonstrations, and field days. Materials were also distributed to representatives of integrated pest management (IPM)/integrated crop management (ICM) clubs and community leaders.
- AVPI developed new training materials and trained extension agents who are responsible for reaching out to more farmers beyond Walmart Foundation beneficiaries. For example, each sub-assistant agriculture officer serves about 500-1,200 farm families, distributed in an average of three villages.

#### 6.1.2 Extension Services

A major focus of the project was to create an enabling environment around the trained women to ensure the sustainability of the activity after the project ends. For this reason, the Walmart Foundation Activities were implemented in close collaboration with the DAE to develop new training modules on the use of FDP for vegetables, gender, and nutrition. In addition, DAE staff were also regularly trained through stakeholder trainings on how to teach farmers from those modules. DAE agents also worked with the project's field staff to identify women farmers and organize outreach activities. It should be noted that this activity was beyond the scope of the WFA proposal; considering the value it adds to the project, the activity was continued throughout the project period, with very minimum cost implications associated, and on a collaborative and a partnership mode. It is early to judge how lasting an impact AVPI will have on the capacity of DAE to continue to promote this technology, but initial signs are positive. In focus group discussions held informally during several stakeholder or motivational meetings during the project, community stakeholders scored the degree to which the extension services had been strengthened by the AVPI Walmart Foundation Activity interventions. The respondents perceived that extension services had already been strengthened in the following dimensions:

- Agent's use of training materials on nutrition
- Agent's use of training materials on gender
- Number of male farmers trained
- Financial resources for extension services

The same groups already perceived that the project had a major positive impact on the DAE in terms of:

- Agent's knowledge on how to establish demonstration plots:
- Agent'' knowledge on how to use FDP for vegetables
- Agent' use of training materials for FDP for vegetables
- Use of farmer-to-farmer trainings
- Community respect for extension agents

Also, the stakeholder consultations conducted at the district headquarters periodically provided the level of knowledge gained by the DAE agents and how they benefited through participation in WFA project activities.

# 6.1.3 Private Sector and Civil Society

One obvious community impact resulting from the project is the strengthening of the private sector's ability to fill a profitable niche in the fertilizer supply chain through the production and distribution of FDP products. Although the establishment of 25 briquette-making operations sounds modest, each machine can produce at least 2-3 mt of FDP per day or 500-700 mt of FDP a year. As of now the entrepreneurs have produced on average of 45 mt/facility for one complete season of operation. All the women entrepreneurs have had a modest start since they began their operations in mid-2014, and the signs of sustainability are robust; they have produced more than 1,000 mt of briquettes and sold all of them in their own communities. Most of the entrepreneurs who began their operations during Phase I continued to operate (with < 10 % dropouts). From interviews during the final evaluation, it was apparent that demand for briquettes in their communities is on the rise and that modest improvement in the supply of or access to basic materials for FDP production through agro-dealers would further enhance their capacities. Care was also taken to link the existing BMOs in the project areas with the local agro-dealers and input suppliers. For this purpose, separate motivational trainings were conducted with the agrodealers and BMOs to create such networking opportunities. We expect that in the next few years, these enterprises, which are currently very new and small, will form a vibrant part of the agrodealer industry, though innovative partnerships with existing dealers and briquette makers.

#### 6.1.4 Additional Yields and Revenue

AVPI Walmart Foundation Activity farmers trained around 16,000 farmers during the two years of the project, and those farmers in turn produced 9,500 mt of additional vegetables worth U.S. \$1.95 million. This equals about 1.6 mt and \$82 of gross revenue per farm household. This did not include the benefits accrued through indirect beneficiaries of the project, i.e., the additional 40,000 women who also adopted FDP in vegetable cultivation. Overall, we can estimate that the project has created additional vegetable production worth about U.S. \$20 million. Thus, potentially enormous quantities of both produce and cash are flowing through the economy, with the likelihood of noticeable impacts in project zones. In particular, the increase in the demand for FDP could stimulate the market for both FDP and prilled urea (as there are suggestions that farmers use both on vegetables). The impact on fertilizer prices would depend on the government's management of its fertilizer subsidy; however, the increase in demand could

stimulate demand of the incipient group of FDP producers. Demand could also rise for complementary inputs such as seed, land, and labor.

# 6.1.5 Changing Social Norms

Over time, projects such as the AVPI Walmart Foundation Activity, in concert with other social and economic trends in Bangladesh, will open opportunities outside the home for women to contribute to family incomes and even earn their own money. Currently, even though they do not actually bring much cash into the family economy, women report contributing to financial decision making in the household. The degree varies depending on the type of decision (less in production decisions, more in consumption decisions). As women's technical and financial contribution grows, it is expected to have positive influence on women's empowerment.

Projects such as the AVPI Walmart Foundation Activity offer small but important opportunities to show women in a different light, chipping away at long-established barriers. The trick is to push gently ahead on many fronts at the same time. As described in the preceding section, individual project beneficiaries gain competence and status, and through that, feel more capable. The project also works at the community level to change the context around these enriched women. For example, the project's stakeholder workshops draw participants from a wide array of groups associated with agricultural crop production, such as women farmers, private enterprises dealing with agricultural inputs, fertilizer briquette producers, Bangladesh Chemical Industries Corporation (BCIC) fertilizer dealers, retailers, irrigation pump owners, market management committee members, school teachers, mosque imams, union council members (women), and representatives from non-governmental organizations. Each return to his or her sphere of influence with a slightly larger perspective on the role and power of women.

# 6.1.6 Other Community-Level Impacts

FDP creates "more with less." It is much more efficient than prilled urea because less urea is lost to the environment. Farmers' field crop cut data indicate that it ranged between 16% and 33% for the six vegetable crops. The actual amount of urea saved was about 38-102 kg/ha. Overall, data from the entire project period show that 883.7 mt of urea was saved in shifting to FDP. Taken to scale, the adoption of FDP in place of prilled urea means total fertilizer use will decrease, creating savings for consumers (split between farmers and government, depending on

the design of the fertilizer subsidy program). In addition, the savings in urea represent a reduction in the amount of chemicals contaminating Bangladesh's water and air. IFDC is also monitoring and attempting to quantify the potential gains from minimizing the overuse of urea on the environment in terms of greenhouse gas emissions for rice paddy in Bangladesh. The results from the research are promising, especially the reduction in GHG emissions in using FDP technology in rice cultivation. In addition to FDP technologies, using polynet houses with trickle irrigation technologies is also expected to add value to input use efficiency, especially when it is scaled out as extensively as FDP technologies.

As indicated in Figure 1, the ultimate goal of the AAPI WFA project is to empower women; in this particular case, it is accomplished through providing access to rural women in Bangladesh to a promising technology to increase their food security, economic benefits and personal power from cultivating vegetables. In the proposal, IFDC agreed to measure changes in selected indicators from the Women's Empowerment in Agriculture Index (WEAI) relative to a baseline. The project measured specific indicators to measure women's empowerment (Table 8). Some of these are tracked in the course of project monitoring, while others are informed by the interim and final evaluation among sampled participants through FGDs.

Women farmers will increase participation in leadership roles in community groups, associations and other organizations: According to the baseline, 33 percent of the women farmers have membership in an NGO or are an IPM club member, common interest group member, ICM club member/cooperative society member, organized market group member, NGO group leader, school management committee member/Salish committee member or market management committee member. As shown in Table 8, IFDC estimates that 10,000 women have taken on increased leadership roles during the entire life of the project. The results have been calculated based on the information that at least 25 percent of the farmers trained in the two years have become IPM/ICM/common interest group (CIG) members, thus improving their leadership roles in the community. When questioned in July 2014 during interim evaluations, women's focus groups felt the project had elevate their status in their families and communities. Community stakeholders felt like it was too early to speak of changes in women's leadership status. The final evaluations in July 2015 found that 38 percent of women interviewed, indicated

participation in other NGOs sponsored development programs in their communities since trained through WFA.

Female farmers will become empowered to participate in family resource allocation decisions along with their male family members. AAPI WFA set a goal of empowering 100 percent of the trained women farmers in this manner. No formal instruments are being used to track this type of empowerment. The interim study indicated in most cases both husband and wife make joint spending decisions, most funds went to household purchases (children's education, food, investments in the next season's cropping), and at least on the surface, there was minimal frustration with the system.

Before analyzing women's control over incomes, it is important to clarify that women play a fairly limited and conscripted role in agricultural production, including vegetable production. Unless very poor, women are only modestly engaged in agricultural production and harvesting activities; they do not typically make decisions related to procuring or applying inputs (such as fertilizers). The division of labor is very different for commercial vegetable production and homestead vegetable production.

According to the baseline, decisions related to family resource allocation, control of family income and type of expenditures selected rest predominantly with the man. 86 percent of respondents claimed that their husband took decision on the family resources allocation; joint decisions by husband and wife constituted 13 percent while wife only was only 1 percent. Likewise, 97 percent of respondents in the FTF districts reported that their husbands controlled the family income with 2 percent both husband and wife and 1 percent wife only. In the M&S districts, 95 percent of the respondents reported that their husbands controlled the family income, with 2 percent both husband and wife and 3 percent wife only. Sixty-nine percent of the respondents in FTF districts stated that their husbands determine the nature of household spending, followed by joint decision-making (30 percent) and wife only (1 percent). The figures for the M&S districts were very similar: 82, 15 and 3 percent, respectively.

Interestingly, the focus group discussions from market study and subsequently interim and final evaluations also indicated a less dire picture than these statistics from the baseline survey.

The discussions held with women during our market study indicated that the income earned through homestead animal/poultry production is retained and controlled by women, often contribute toward household production and consumption related expenses.

"We make decisions to sell or consume eggs and milk; we keep the money to ourselves; but mostly we spend this money on children's school fees, books; men also get money from us for production activities. It's not easy to live by farm income alone."

[Women in Char Afsal village, Bhola]

What emerged from these discussions is a culture of joint decision making over family's financial resources between husband and wife. While each gender has its domain of influence – food production and marketing for him and food management and preparation for her – women are typically entrusted with protecting and spending the family's funds according to a consensus plan. When asked how they might get more control over these resources, they gave a subtle set of responses:

"We are happy with the present situation of consensus decision-making, which avoids quarrels. Since husbands generally accept advice, why do we need more control?

"Our men usually 'hand over' or 'keep' the money only with us."

Women's perception of their power to make decisions regarding input use on vegetable gardens: The AAPI Walmart Foundation Activity marketing survey determined that women are generally responsible for most production-related activities in the homestead vegetable garden. In commercial vegetable production, they contribute on a limit basis to seed preparation and saving, seed sowing and transplanting, harvest and post-harvest activities. While 56 percent of the respondents in the interim impact survey said they themselves applied FDP to winter vegetables (mostly on kitchen plots), many more said their husband (73 percent) or another

friend or family member (32 percent) applied the FDP (Table 11). As such, they played very little role in family decision-making concerning crop production.

In the final evaluation surveys of 2015 this has improved significantly especially toward participation in application of FDP in vegetable crops; 82 percent of the women in our focus group discussions responded positively; and 59 percent of them indicated their husbands participation and less than 20 percent of them used other family members or others (incl. hired labors) toward application of FDP in vegetables. However, this proportion was more visible among communities where the distance between farm and home is of shorter distance. In other communities, where the farm-home distance is larger, the participation of women was at 60 percent or less.

According to interim assessment during the mid project, however, 98 percent of the women interviewed felt that the training allowed them to be more involved in making fertilizer-related decisions in their families; as the training extended beyond just the application of the FDP, 80 percent reported their involvement in making decisions related to other agricultural inputs also increased. When asked whether other villagers seek their advice on the FDP technology, 54 percent responded in the affirmative. Therefore, the training to women farmers will have some positive effects on their power to make decisions. In focus group discussions, community stakeholders failed to achieve consensus on how the project is influencing decision-making in fertilizer or other agricultural input, feeling it is too early to determine.

**Increased participation in vegetable sales:** According to the March 2014 marketing survey, men are not only responsible for the purchase of agricultural inputs but also responsible for the sale of vegetables produce. Although women are not highly engaged in commercial vegetable production, they do play a bigger role in post-harvest activities such as selling at the farm gate or transactions with friends or neighbors.

# Tasleema Begum, a farmer with an eye on the market ...

Tasleema Begum from Manikdihi village in Jessore Sadar is a Walmart trainee who manages both vegetable production and marketing in her farm. She grows Vegetable crops like eggplant, cauliflower, pointed gourd, field crops like pulses, mustard and rice. She has been trained in the use of *Guti* urea application during the 2013 winter season. As part of her training, she received 10 kg of UDP granules from the program, which she applied for eggplant grown in her 0.5 bigha land (1 bigha=1,338 sq.m). Tasleema harvested additional 5-6 mounds (40 kg/mound) of eggplant and used one less bag of urea (50 kg/bag) due to Guti urea use compared to previous seasons.

Tasleema usually participates as a direct retailer in the local, weekly markets (7 mile bazaar), selling small lots of vegetables during 'market days.' If the volumes are large enough, then she rents a van and sell the produce in the local market (3 km away) through bepharis. She uses mobile phone to contact traders in the markets to get price updates frequently. She gets advice on crops from DAE officials and also from neighbors in the community.

In her opinion currently many women could not participate effectively in the vegetable markets due to less awareness on the functioning of markets, trader types and prices. Any program that targets to improve women's skills on crop budgeting, access to market information and improved negotiating skills will have a positive impact on the farm income. The final evaluation indicates that 54 percent of trained women now engage in sale of vegetables at their farm gate through village traders along with their husbands or family members. In our focus group discussions, it was evident that 27 percent of them also engaged in negotiating with traders at their farm-gate, especially toward sale of vegetables.



Women's perception of their control over the income generated from vegetable sales/ briquette sales: In general, women reported making joint decisions concerning how to spend

vegetable funds. In the baseline, decisions related to family resource allocation, control of family income and type of expenditures selected rest predominantly with the man. Eighty-six percent of respondents claimed that their husband made decisions on the family resources allocation; joint decisions by husband and wife constituted 13 percent while the wife only was only 1 percent. Both interim and final evaluations indicate that 22-25 percent of women reported sole control

over spending decisions related to the funds she made herself, versus 73 percent jointly with husband and 9 percent solely husband. For vegetable funds earned from sales conducted by other family members, decisions were made jointly (76 percent) or solely by the husband (24 percent).

**Women's participation in training groups**: By targeting and training 100 percent of women farmers, AAPI WFA builds their status as agricultural decision-makers' increases, which contributes to their control over resources and influence over family members. The project also provides inputs to the women and finds skilled women to manage demonstration plots, thereby increasing their credibility. The extension staff, who are mainly men, focus on imparting knowledge on the technical aspects of using FDP. As part of those trainings, project staff presented modules on gender and nutrition. The FMO teaches these modules to both DAE staff and target farmers.

The gender and nutrition modules were immensely popular with female farmers, who expressed a deep hunger for information and learning, perhaps linked to the relatively high level of literacy, on the order of 78 percent, with little spread between men and women.

**Change in comfort levels in public speaking**: Women who engage in the project get a rare opportunity to speak in public during their two day training, field days and motivational and stakeholders meetings. WFA through its series of stakeholder workshops (12 number) conducted during the project period provided opportunities for participants to represent their communities in forums and speak in front of heads of district administration, deputy commissioners (who were the chief guests) and other officials from department of agriculture.

During our final evaluations, 48 percent of the women who participated in focus group discussions indicated their ability to talk publicly or within their communities (outside their social system) have improved substantially especially with regard to vegetable production.

### Encouraging Women' Voices Through Stakeholder Workshops of AAPI-Walmart Project

12 Stakeholder Workshops were held under AAPI Walmart Foundation Activities during its two-year project period. Stakeholder workshops were district based and held where project activities are being implemented. All the workshops were inaugurated by the Deputy Commissioner (DC) as chief guest and chaired by the deputy director (DD) of Department of Agricultural Extension (DAE) of respective districts. The venue of the workshop was deputy commissioner's (DC) office Conference room in 10 districts, one in Circuit House Conference Room and one in Deputy Director, DAE office. The workshop participants were selected from different segment of the society related with agriculture crop production such as farmer, private enterprises dealing with agriculture inputs, fertilizer briquette production, Bangladesh Chemical Industries Corporation (BCIC) fertilizer dealers, retailers, seed & pesticides retailers irrigation pump owners, market management committee members, mosque imams, school teachers, trained birth attendant, union council members (women) and representatives from non-government organizations (NGOs).

SWOT ANALSYIS IN GROUPS

#### A VIEW OF THE STAKEHOLDER WORKSHOP



The objective of organizing stakeholder workshop by AAPI WFA is to inform the local level stakeholders about the Walmart Activity of AAPI and motivate them and seek their commitment to support the women for expansion of fertilizer deep placement (FDP) technology in their vegetable crops and also to create awareness among them for facilitating women empowerment in farmers' family.

The stakeholders' workshops provided women farmers opportunity to come out of home and locality, scope for visiting places which they never been. They have participated in a forum with highly professional people and manner. Women participants were very emotional to seat in front of Deputy Commissioner, the administrative chief of a district, felt proud to speak out of their issues in such a big forum through group discussion and presentation of the findings in front of big group. Some of the women participants said that this is first time they are sitting with men in same group for expressing opinion and men are listening and noting points on the posters. Some women said, they have never

been to out of their village, some were very happy to meet women came from other village/upazilas. They thought this visit is their greatest honorable visit so far and this will be remembered for life long.

STRENGTH	WEAKNESS
Overall Economic development	• Lack of women entrepreneur
• Fulfillment of nutrition requirement	Women have less access to resources
• Self-dependency and financial independence	• Limited involvement with economic activity
• Women taking constructive role in decision	Family barrier
making	• Lack of knowledge/skill for <i>Guti</i> urea use
• Increased participation of women in	• Marketing problem of <i>Guti</i> (not available)
agricultural production	
OPPORTUNITY	THREAT
Participate training organized by	Limited mobility
Government and NGOs	Social and family obstructions
• Training on <i>Guti</i> urea generating more	Religious superstition
women interested on vegetable cultivation	• Lack of support from husband/family
• Technology and agricultural inputs are	Social barrier
available	Pressure of domestic responsibilities
• Women's access to inputs	Religious misconception
• Increase skill/capacity of women in	
agriculture activities	
• Improve nutrition of family, income	

# EXAMPLE OF TYPICAL SWOT ANALYSIS DISCUSSION OUTCOMES

**Number of women-owned enterprises related to UDP**: Toward the project end (July 2015), 25 women entrepreneurs are trained and are producing the briquettes, serving their communities. The first batch of 14 and the second batch of nine briquette producers are closely monitored and supported to do everything possible to foster their success. All 25 machine owners are still in operation and are producing moderate amounts of briquettes for sale in their own communities. Our final evaluation surveys conducted among nine of such women entrepreneurs provided few key insights toward sustaining their business operations:

- As of June 2015, our records indicate that on an average each entrepreneur has produced and sold 41 mt of briquettes in their communities. In total they have produced 1,013 mt from the start of their operations.
- Of the entrepreneurs 21 of them started their operations in 2014 and the rest in 2015 seasons.

**Women's ownership and access to productive assets related to UDP**. According to the baseline, women do not farm. A little more than a quarter of the adult male population in rural areas is engaged in farming; the involvement of female members of the households in farming

was reported very minimal in the project areas (on the order of 1 percent). (Other common occupations were service, business, labor, housewife or no occupation).

Likewise, the baseline established that women tend not to own land. About 97 percent of households were headed by a male family member (husband) and only about 3 percent were headed by a female member (wife). Out of 970 female respondents, 15 percent owned land. Average land area was estimated at 38.55 decimals per household (HH) in FTF districts and 63.55 decimals/HH in M&S districts with an average of 46.10 decimals/HH across the 12 districts.

Kitchen gardens are very small and rare. According to the baseline, out of a total 970 interviewed farm households, only three households reported that they had organized homestead gardens, with their average area being about 188 square feet. According to the impact survey, all of the trained farmers responding claimed to have a kitchen garden before the project. The market study of 2014 also found in their interviews that less than 10 percent of women have any kind of ownership with regard to land or any assets in the household. However, the interviews further confirmed that women have more control over the income earned at the homestead than from crops and activities at the main field, usually controlled by men. The homestead activities include kitchen or homestead vegetable farming; poultry, livestock and fishpond within the premises of the household.

Though it is unlikely that WFA activities alone would have a significant or sustained impact on individual women, the training through WFA activities have motivated and provided information, skills and knowledge, which they've never experienced before.

**Change in allocation of time to productive and/or domestic tasks and change in satisfaction of leisure time available**. It takes more time to apply FDP than broadcast urea; but FDP only needs to be applied once rather than three or four times. Furthermore, because it dissolves more slowly and is inserted very close to the roots of the intended plant, FDP is less available for weeds; farmers often report they spend less time weeding. When we asked whether, overall,

which method of application takes more time, 32 percent said FDP versus 68 percent who said broadcast urea.

The final evaluations in July 2015 also found that 36 percent of them indicated more time needed for FDP application in vegetables than broadcast. Yet all respondents affirmed that the gains from using FDP on vegetables are worth the extra costs and efforts. The focus group discussions conducted among community stakeholders during interim evaluations found the impacts of FDP on leisure time for each gender were highly mixed. Men seemed have slight gains leisure time, while women seem face slight losses.

			Cumulative Achievement			nent				
	Result Indicators	Unit	(July	26, 2013	-July 25, 2	2014)	Progress	Comments		
		cime	LOP Target	Year 1 actual	Year 2 actual	% of LOP Target	Tigress			
1	SG1 Women's Empowerment									
2	Outcome Indicators									
3	Women farmers will increase participation in leadership roles in community groups, associations and other organizations	No.	10,000	5,010	5,000	100%	On Track	1. The results have been calculated based on the information that at least 25% of the farmers trained in the first year have become IPM/ICM club/CIG members, thus improving their leadership roles in community. 2. The Impact Study indicates that women feel strongly that the training increased their stature in the community and gave them solid ground to speak publically about a topic they master.		
4	Female farmers will become empowered to participate in family resource allocation decisions along with their male family members	No.	40,000	N/A	12,811	32%	Ongoing	During final evaluation, respondents indicated in most cases both husband and wife make joint spending decisions, most funds went to household purchases (children's education, food, investments in the next season's cropping). Respondents did frequently comment on their appreciation for the discussion in the gender module on how they might control the incomes they make. 32% of trained women households based on (sampled) final evaluation results indicated that they make own decisions on farm and household since training.		

# Table 9. Progress Toward Women's Empowerment (SG 1)

			Cumulative Achievement						
	Result Indicators	Unit	(July 26, 2013-July 25, 2014)			2014)	Progress	Comments	
			LOP Target	Year 1 actual	Year 2 actual	% of LOP Target	0		
5	Women's perception of their power to make decisions regarding input use on vegetable gardens	N/A	No target set	No target set	No target set	N/A	Ongoing	The Impact Study suggests women feel a boost of credibility due to the AAPI/WFA, which they hope to maintain; it also shows that men's decision-making power has grown even more than women's.	
6	Increased income for women as a result of vegetable sales	U.S. \$	115	102	164	143%	On track and surpassed	No comments	
7	Women's perception of their control over the income generated from vegetable sales	N/A	No target set	No target set	No target set	N/A	Ongoing	In the farmer survey, women reported making joint decisions for spending vegetable funds. In focus group discussions used for the qualitative marketing study and interim and final impact study, respondents indicated in most cases (> 50%) both husband and wife make joint spending decisions, especially on household purchases. The final evaluation also had specific questions on women participation in ag-input purchases and fertilizer use; 62% women responded favorably toward participation in fertilizer use decisions vs. 48% for over agro-inputs use.	
8	Change in comfort levels in public speaking	N/A	No target set	No target set	No target set	N/A	Ongoing	The stakeholder meetings conducted through WFA at the district/upazilas provided a platform for the women to share their ideas and experience among a larger group, outside their communities.	
9	Women's ownership and access to productive assets related to FDP	N/A	25	16	9	100%	On track	No comments	

			Cumulative Achievement (July 26, 2013-July 25, 2014)			ent 2014)	-		
	Result Indicators	Unit	LOP Target	Year 1 actual	Year 2 actual	% of LOP Target	Progress	Comments	
10	Change in allocation of time to	N/A	No	No	No	N/A	N/A	Too early to derive any conclusions	
10	tasks		set	set	target set				
11	Change in satisfaction of leisure		No	No	No		N/A		
		N/A	target	target	target	N/A		Too early to derive any conclusions	
			set	set	set				

# 7. Analysis of Challenges and Successes

# 7.1 Challenges

AVPI created wide-scale awareness among women farmers on the benefits of using FDP technology to produce vegetable crops and on improving their families' nutrition by increasing the home consumption of vegetables. However, there are issues that cannot be overlooked. Some relate to the design and implementation of the program itself, while others relate to the larger social context.

# 7.1.1 Implementation challenges

During the first phase of the Walmart Foundation Activity, IFDC employed only women field officials to work with women, but they faced problems in traveling into remote villages with public transport as most of them did not know how to drive motorcycles. Therefore, they had to spend a long time moving from one place to another using public transport, such as cycle rickshaw, public bus, baby taxis, etc. Therefore, IFDC decided to appoint men to work in the field with the women beneficiaries during AVPI. However, it was not easy to work with women farmers initially. In general, the rural society is conservative, and there are also social barriers for women to take part in development activities.

During the implementation of the project, AVPI experienced a few such challenges and took measures to overcome those challenges. Some of the major challenges faced by AVPI included:

• All-Women Beneficiaries: AVPI field-level staff were men because of remote field-level movement and communication. At the beginning, it was a challenge for the male staff to have contact with women beneficiaries and bring them into project activities. So, AVPI field staff first engaged local men and women leaders, as well as the heads of family members, who were mainly men, by organizing informal and formal meetings to make them aware that women's economic empowerment is directly linked to the inter-related problems of food insecurity and poverty. Rural women are disproportionately affected by malnutrition as well as by poverty as a direct result of their disempowerment.

- Lack of Technical Knowledge on GAPs by Women Farmers: Women farmers' technical knowledge on GAPs is limited, although they are engaged in many horticultural crop production-related activities. It was observed that women are more inquisitive learners compared to men, and they spread their knowledge more quickly to their family members and neighbors compared to men.
- Lack of Knowledge and Participation on Post-Harvest Management and Marketing: The baseline survey found that the knowledge of women beneficiaries on post-harvest management and marketing of products was exceptionally low. Male members are primarily engaged in marketing and making decisions. The project achieved all the targets set forth by the donors at the end of the two-year period; however, the challenge of linking women farmers into vegetable markets and marketing activities is still far from achievable. The project management also found it challenging to address this, as in the current farming context, women continue to have limited roles to play either in production-related or in market-related activities, due to social and cultural norms.
- Maintenance of Briquette Machines: Two of the four briquetting machine producers have closed their workshops because of family responsibilities and a few other women entrepreneurs face difficulties, especially in handling mechanical problems of the machine. For example, they face significant challenges in replacing major spare parts once the machine is broken and parts of the machine are under repair.
- Availability of *Guti* (Briquettes) Fertilizer: Availability of *Guti* products is an issue for some women farmers as no machines are located near their farms. They must walk long distances to buy *Guti* products.

# 7.1.2 Contextual Challenges

**Gender inequity**: In rural Bangladesh, women's contribution to agriculture-related activities is not as explicit and restricted in many ways due to social norms. One problem that has attracted concern is gender inequity. In the rural areas, women often play a pivotal role in agriculture, especially in post-harvest activities, in addition to their family roles. But two important factors prohibiting their large-scale participation are (1) their right to agricultural land, which is mainly owned by adult men, and (2) absence of women entrepreneurs as BCIC fertilizer dealers. Bringing women into the mainstream activities was the AVPI approach. **Invisible Role of Women in Vegetable Production and Marketing**: The market study conducted in 2014 summarized various factors that limit the role of women in vegetable production and marketing. Among various factors, cultural norms against women engaging in agricultural production activities on family fields, including vegetable fields, played a major role. For the most part, the women transferred their newly acquired knowledge and fertilizer kits to their husbands. Many, but not all, were able to go to the family plot to monitor crop progress, and/or used some of the FDP on their very small kitchen plots.

Some women farmers were not allowed to join the training by their conservative husbands. The division of labor is different for commercial vegetable production compared to homestead vegetable production. In general, women are responsible for most of the production-related activities in homestead vegetable cultivation. However, in commercial vegetable cultivation, men are responsible for most of the production-related activities. Women are involved mainly in seed saving, harvest, and post-harvest activities, though their contribution is substantial in planting and weeding operations also.

Additionally, women's contribution to the creation of market value remains highly invisible because of their absence at the end market chain where the value is realized. Likewise, acceptance of women entrepreneurs can be slow. Villagers call the business by the husband's name, not the woman's name. However, some positive changes are taking place with regard to women's role in agriculture and their contribution beyond "as laborers" to "farm managers." Engaging women in briquette production through the project has been quite successful and requires more careful planning in integrating women into market-related activities also.

**Sustainability**: The sustainability of the technology, in a broader sense, means that the number of FDP women farmers and volume of urea briquette production will not decline from previous seasons/years where there were project interventions. It may be noted that urea briquette use and production was established in such a way in the project area that they will expand on their own to reach the natural limits defined by agronomic and economic returns to urea briquette use.

Another factor relating to the sustainability issue is the active participation of DAE in expanding the technology in its own programs. A challenge, however, was to ensure that the project reached the threshold of training to trigger widespread adoption. Do we need to train in large numbers to ensure adoption or, in other words, will smaller targets with more focus on trainings, training of trainer activities, and continued extension ensure the necessary diffusion of the technology? As this project was unique, involving only women farmers, it was important to know what kind of investments were needed in terms of capacity building, training materials, and other mechanisms to ensure a sustained impact in the communities with maximum spillover.

# 7.2 Successes

As part of the final impact study, the most successful elements of the program were compiled from stakeholders, field staff, and project management staff and are summarized below.

- This project is unique in that it aimed at extensively building skills and technology use among women and women entrepreneurs within a noticeably brief period. AVPI directly trained more than 15,000 women and benefited more than 80,000 participants (indirect beneficiaries).
- 2. Training farmers: Trainees voiced appreciation for: i) the nutritional dimensions, ii) increased knowledge and use of new technologies such as FDP use; and iii) the participatory approach, which gave each of them a chance to publicly ask questions and give opinions in front of strangers. Participation of women in such technical trainings also elevated their status among family members, especially to their husbands and in the community where they lived. The perception of men and family shifted regarding women's capacity, ability, and knowledge in using *Guti* in vegetable cultivation.
- 3. The project's ability to influence women extensively through the introduction of specific training modules on household nutrition and habits generated lots of interest among participants. This is highly reflected in continued adoption of a few key lessons on habits related to daily hygiene, simple nutrition facts, and cooking methods.
- The project in general improved the mobility and exposure of women beyond their households to fields through their participation in stakeholder forums and motivational field visits – by traveling outside the communities where they live.

- 5. Capacity strengthening of extension services through training of extension agents. This was the first time agents of DAE were trained to use FDP on vegetables and their first time training women farmers (gender module).
- 6. The project made a major foray into incorporating women into participating in farm labor and farming enterprises (briquette manufacturers) within the context of existing social and cultural norms.
- 7. Establishing demonstration fields were successful because they i) allowed trainees and the community at large to see the impacts of using FDP for vegetables and inspired great interest among villagers and ii) provided opportunities for greater interaction with others in community, and iii) the signboards were important for attracting villagers.
- 8. Holding field days: Field days held at harvest time were one of the most effective parts of the program because large numbers of people could see for themselves the distinct yield differences resulting from FDP versus broadcast urea. Also, attending field days provided women the opportunity to interact with people outside their communities, such as DAE officials, farmers from other villages, etc.
- 9. Holding motivational meetings is a great method of follow up with trained farmers periodically and farmers really liked these meetings as it allowed them to ask follow-up questions and re-affirm their commitment in the use of improved practices. Their ability to participate and voice their opinion either in motivational meetings or stakeholder forums has improved.
- 10. Ensuring an adequate supply of FDP to farmers: Through training women entrepreneurs and assisting them in setting up businesses in their communities, the project improved farmers' access to inputs.
- 11. Identifying briquette producers and providing them machines: Community stakeholders and especially farmers in the communities identified this as a wonderful way to involve women in agriculture, provide a means to generate income in their own communities, and also improve access for other women in the community toward input purchase and use, considering the current social norms.
- 12. Continuous monitoring of project results through innovative approaches, such as village monitoring surveys and the periodic motivational meeting with trained farmers was a success because it provided useful information to project management for improving implementation;

and provided feedback on results to farmers, which further motivated the farmers toward technology use.

- 13. Maintaining high visibility: The widespread use of signboards on demo fields and in local markets piqued interest and contributed to the pride felt by trainees and briquette producers; likewise, the new flyers were an effective tool for providing follow-up information. The project also invited members of the electronic and print media to different events for extensive coverage of the project.
- 14. The uniqueness of this project was through involving community-level traditional leaders and other government agencies (DAE) from the beginning who were also supportive of women's participation in learning and adoption of modern technologies within the context of existing cultural norms of the society.

# 8. Lessons Learned

In the agriculture sector of Bangladesh, the formal participation of women is not widely recognized, although women play multiple formal and informal roles in the agriculture sector. Here, we have outlined some of the key lessons learned during the two years of AVPI project implementation.

Women Farmers Need More Skilled Training and Follow-Up Visits: The women famers are more progressive than anticipated. However, they need more skilled training in managing their farm products. Unfortunately, there are very few projects that are exclusively educating and training women farmers in improving their crop productivity, income, and nutrition and then empowering them. Walmart Foundation deserves thanks as this is the only organization in Bangladesh that is exclusively working with women farmers and, with implementation by IFDC, producing impressive results for Bangladesh. The women farmers need proper training on improving their crop productivity, especially of horticultural crops, which is their domain at the homestead level and in the field. They also need some follow-up discussions after the training to clarify many issues related to crop productivity that they face while applying their skills in the actual field. AVPI staff are regularly playing a key role for these women farmers, visiting them regularly even after providing training. **Women Farmers Disseminate Their Skills Faster Than Men**: During the implementation of AVPI, project field staff, through informal discussions, found that women share their knowledge not only with their male family members but also with their neighboring women farmers. They spread the message faster than male farmers.

Women's Knowledge Has Improved on Vegetable Production and Nutrition: Through farmer training, the AVPI intervention has improved women's knowledge on fruit and vegetable production practices, nutrition, and market information. After the training was completed, the women farmers were requested to complete an evaluation form; most of the women agreed that their knowledge on each subject fulfilled their expectation, indicating that their skills and knowledge have improved. However, they informally requested for a follow-up visit by AVPI staff to further improve their confidence. In their homestead gardens, crop diversity has increased with application of GAPs and FDP technology. Their knowledge on nutrition has also improved not only in terms of food intake but also on health hygiene.

**Families' Diets Have Improved**: Most trained women farmers during the informal meetings and during crop cuts and field days admitted that after AVPI intervention, their crop productivity has increased and, therefore, their income has increased. As a result, many of them admitted that their dietary diversity has improved.

**Women Are More Empowered**: Informal discussion with women revealed that they are more empowered across all AVPI interventions. They can share their suggestions with their husbands and other family members, and most of them also take part in the household and agriculturerelated decision-making process together with their husbands and other family members. The AVPI beneficiaries admitted that the attitude of male partners is gradually improving. Many women recognized that they make important contributions to the community.

Associate Male Farmers: Although AVPI direct beneficiaries are women, the male family members are encouraged to participate in most activities, and it is helpful for them to make decisions jointly. It also helps women to participate smoothly/confidently in different activities

and improve work abilities. Allowing the female BMOs to bring their husbands to the trainings has added value toward establishing and running successful enterprises, as the husbands were able to provide more insights toward marketing and operational procedures, due to their external exposure.

**Women Entrepreneurs**: Overcoming sociocultural, educational, and financial challenges in creating women-run *Guti* fertilizer business establishments in rural Bangladesh requires collaboration at all levels – family, community, government, NGOs, and other private businesses. Private initiatives are crucial for greater acceptance and entrepreneur development for these women.

Women's Knowledge Has Improved on Market Information: Knowledge on marketing is limited for women farmers. It is not easy for them to communicate with market channels, because their male family members primarily handle it. AVPI vegetable marketing seminars played a key role to link these groups of women with different market actors and improve their capability in post-harvest management to receive better income of their crop sales. The women farmers now communicate with market actors through mobile phones and sometimes through visiting the marketplace with other family members. The changing of livelihoods and socioeconomic scenarios of AVPI women beneficiaries is visible. The AVPI intervention has improved the knowledge of direct beneficiary women farmers on vegetable markets.

**Designing Activities in the Context of Social Aspects**: Implementing a gender-transformative project requires greater attention to, and appreciation for, the distinctions of social and cultural aspects. Although the lesson is not new, it again emerges as an important finding from AVPI implementation: it is critical to understand the gender roles along the given value chain in all their difficulty. In the case of vegetable production and marketing in Bangladesh, women's participation is limited. Enabling participation of women in the use of improved agricultural technologies through capacity building will produce significant, multiple impacts (improved nutrition, income, yields, etc.) at the farm household level.

As a result, a little accommodation in project implementation can make an enormous difference toward successful participation of women in rural communities. For instance, the following have led to successful participation of women in large numbers over a short period of time: designing trainings to match women's schedules, providing childcare facilities, allowing their male family members to attend, conducting training very close to their locations, using more visual and pictorial materials, demonstrations, training using women mentors or extension agents, and using hands-on teaching techniques. Therefore, in short, the following are four important takeaways from the AVPI intervention:

- 1. The project has achieved impact on women's knowledge and practices because of training in agricultural production, nutrition, and marketing.
- 2. However, greater impact can be revealed if an approach is used combining agriculture, nutrition, marketing, and gender.
- 3. Training husbands and wives in the household, or a whole-family approach, is a key to more success.
- 4. It is important to involve DAE field officials to reach women farmers and train them considering the sustainability of project interventions.

# 8.1 Recommendations

This section reflects most of the mid-term changes made during the entire project period considering the observations from the project management team and evaluations towards better implementation.

**Improving Visibility and Messaging for Greater Impact**: It is important that projects of this nature should expand its communication strategy beyond traditional means of reporting, meetings, and other related means. It is required since the project is of very short period, to create wider impact, broaden media coverage for extensive adoption: use TV, advertisements, newspapers, video shows, and open sky show (village projectors); design the media outreach to include several sets of audience including men, women, youth and entrepreneurs. For instance, for men, signboards can be put in gathering places like tea stalls, marketplaces with clear, bold messages and pictorial representation is required; and to reach young, youth population involved in agriculture, it's necessary to reach through mobile media etc.,

# 9. Conclusions

Bangladesh has one of the highest rates of malnutrition in the world, according to food and Agriculture Organization (FAO) of the United Nations (UN). For the women of Bangladesh, malnutrition is a particularly devastating affliction, as nutrition-related health issues are often passed to their offspring. More than half of pre-school age children, ~ 9.5 million, are stunted and underweight. These undernourished children, if they survive past age five (46% do not), are highly susceptible to health-related issues and poor psychological development that will affect them for a lifetime.

Nutritious calories are often unavailable or too expensive for the 70% of the nation's population that lives in rural, poverty-stricken areas. According to FAO, Bangladeshis consume about 2,250-2,500 calories a day; while this is enough to avoid starvation, about 1,700 of those calories come from rice, which does not contain a vast array of vitamins and minerals. As little as 126 grams (g) of fruit and vegetables, on average, are consumed daily – far below the minimum 400 g recommended by FAO and the World Health Organization (WHO). Exclusive of other foods, these primarily rice-based diets are fueling a "hidden hunger" epidemic.

The Walmart Foundation-funded AVPI project emphasized technology diffusion and support systems specifically tailored for rural women, starting from Phase I of their funding, since 2013 onwards. Towards the end of Phase I, the project had achieved 100% of its target of training 40,000 small-scale women farmers to cultivate fruits and vegetables using FDP technology. Due to the female-centric nature of the Walmart Foundation component, the project utilized trainers and extension agents in the project area to help women farmers overcome hurdles in production, finance, market integration, and nutrition.

During Phase II of Walmart Foundation funding (November 2016 – December 2018), the efforts achieved during Phase I were further enhanced with the following results achieved:

 45,038 women have received training in FDP, nutrition, and gender empowerment, which includes 17,000 newly trained women farmers along with motivational and re-tooling training given to AVPI Phase I participants.

- 8,253 ha of vegetable area was covered by FDP technology through direct beneficiaries of the project through winter 2018-19 season. During winter 2016-17, the direct beneficiaries adopted FDP technology on 765 ha. In addition to direct beneficiaries, other farmers also used FDP technologies in these communities and are termed as "indirect beneficiaries." Our village monitoring surveys indicated that a total of 9,349 ha of vegetable area was under FDP technologies, which included indirect beneficiaries.
- Incremental vegetable production for the 15 major crops monitored by the project through summer season 2018 and reported in AVPI annual report for the period November 2017-October 2018 was 52,652 mt, achieving 148% of the AVPI target. Note the results from winter 2018-19 are not being included here.
- Incremental vegetable yields on farmers' fields ranged from 2.97 mt/ha to 9.82 mt/ha across the 15 different vegetable crops. The farmers have used FDP in many other vegetable crops that the project was unable to monitor due to a lack of resources to conduct the labor-intensive crop cuts.
- The incremental value of these vegetables and other crops was U.S. \$8.92 million, which, when divided by total FDP area (for each crop), is an average of U.S. \$891/ha. The average incremental income per farm through summer 2018 season was U.S. \$372, or 186% increased from target of U.S. \$200.
- The FDP method of applying urea saved between 38 and 143 kg/ha, depending on crop. Total urea saved was 833.70 mt, valued at U.S. \$0.29 million during the two-year project period among the direct beneficiaries.
- Through the two-year project, the Government of Bangladesh saved U.S. \$0.16 million by not having to subsidize the 833.70 mt of fertilizer that would have been needed to fertilize these vegetables using broadcast urea rather than FDP.
- With the project impact of direct beneficiaries on women farmers alone estimated at more than U.S. \$9.21 million (e.g., incremental value of yields and reduced cost for fertilizer) and expenditures during the two years totaling only U.S. \$1.2 million, the project has achieved a benefit cost ratio of 7.68:1.

(Further discussion and documentation of all these results can be found in the Walmart Foundation Annual Reports of Year 1 and 2.) Experience from our previous projects, including implementation of Walmart-funded AVPI Phase I (2013-15) and USAID-funded projects, suggests that **for every woman directly trained**, **two additional women** will adopt the technology, in the case of Bangladesh rural communities. For instance, AVPI cluster village monitoring survey results further show that a total of 89,016 women farmers used GAPs and 52,352 used FDP in both winter 2017-18 and summer 2018 vegetable seasons.

To improve the utilization of FDP among women, in addition to training women in FDP use, the AVPI project also aimed in developing a private sector, women-led local supply system to provide FDP to farmers in the communities. As seen above, the FDP use on vegetable crops continues to expand, and the women entrepreneurs are expected to position themselves for success as briquette manufacturers and dealers. During Phase I, the project assisted 25 women beneficiaries to purchase and install briquette machines in their communities. They all received business and technical training and began their operations successfully in their communities. The women continued to operate in their communities during Phase II to supply FDP products along with non-AVPI briquette producers.

Helping women improve the productivity of more nutritious, high-value products such as vegetables and fruits was aimed at improving family income as well as household nutrition levels and providing diversified diets to the primarily rice-based diets in Bangladesh. The AVPI project was designed exclusively for women farmers and provided them opportunities to realize their potential as skilled farmers and entrepreneurs and contributed significantly to gender equity in the country. Women empowered through such initiatives are expected toward have greater involvement in family resource and business decisions, thus positively impacting family income and household nutrition.

# Appendix 1. Number of AVPI Walmart Activity Districts, Upazila, Clusters and Villages by Regions

Districts	Upazila	Union	Block	Cluster No.	Village No.	Village Name
					1	Laupala
Bagerhat		Baruipara	Azoddha	1	2	Katrikdia
	<b>D</b>	1			3	Bagdia
	Bagerhat Sadar				4	Jatrapur
		<b>-</b>	<b>T</b>		5	Chapatola
		Jatrapur	Jatrapur	2	6	Binagati
					7	Komorpur
			Muradsafiullah		8	Muradsafiullah 1
			Guptomunshi	_	9	Muradsafiullah 2
		Purbo Ilisha	Purbo Char Ilisha	2	10	Purbo Char Ilisha
			Char Ananda	- 3	11	Char Ananda
		р.:	Rajapur	_	12	Rajapur
		Rajapur	Shampur		13	Shampur
			Charsamaya-1		14	Charsamaya-1
		Charsamaya	Charsamaya-2		15	Charsamaya-2
	Bhola Sadar	5	Char Chifuli		16	Char Chifuli
		A 1' NT	Ali Nagar Kachari		17	Ali Nagar Kachari
		Alı Nagar	Sachia		18	Sachia
		Shibpur	Shibpur	- 4	19	Shibpur
			Ratanpur		20	Ratanpur
		Dhonia	Nobipur		21	Nobipur
			Nasirmajhi		22	Nasirmajhi
			Dhonia		23	Dhonia
		Kachia	Kachia		24	Kachia
			Daria	_	25	Daria
			Chockdus		26	Padda Monosha
<b>D1</b>			Fulkachia	5	27	Fulkachia
Bhola		Kutuba	Lurimpur	_	28	Lurimpur
	Burhanuddin		Chotomanika		29	Chotomanika
			Kutba Sagla		30	Kutba Sagla
			Boro Manika		31	Boro Manika
		D 1411	South Batamara	_	32	South Batamara
		Boro Mainka	Kuralia	6	33	Kuralia
			Noth Batamara	_	34	Noth Batamara
					35	Zinnagar
		Zinnagar	Uttarmadraz	7	36	Word No. 7
		U			37	Word No 9, South
					38	Ward No-1
		Char Madraz	Char Afzal		39	Ward No-2
				0	40	Ward No-3
	Char Fasson			8	41	Ward No-7
		Aoaspur	Aslampur		42	Ward No-7
		F	Aoaspur		43	Ward No-8
			L		44	Ward No-4
		Aminabad	Kulsumbag	9	45	Ward No-3
			isuisuinoug		46	Ward No-1
					47	Ward No - 1
	a contract of the second s	4			4	

Districts	Upazila	Union	Block	Cluster No.	Village No.	Village Name
		Omorpur	Aligao	10	48	Ward No - 2
		7.		11	49	Ward No - 1
		Zinnagar	Dokhin Fassion	11	50	Ward No - 2
					51	Baradi
					52	Enayetpur
					53	Gopalnagar
					54	Notidanga
		Baradi, Kumari	Baradi, Notidanga,	10	55	Boalmari
		& Jahela	Shampur & Jahela	12	56	Pardurgapur
			•		57	Shampur
					58	Majargoda
					59	Rowaguli
	Alamdanga				60	Jahala
	0				61	Belgati
					62	Kedarnagar
					63	Kashipur
		<b>DI ID II</b>			64	Puamari
		Belgati, Dowki	Belgati, Binodpur &	13	65	Binadpur
		& Jamjami	Modhupur		66	Dowki
					67	Modhupur
					68	Goshvilla
					69	Sohagpur
			Khajura & Haiderpur		70	Begnagar
					71	Khajura
					72	Naforkandi
					73	Sukdia
	Chuadanga Sadar			14	74	Baliakandi
Chuadanga		Padmavilla		14	75	Chandipur
Ũ					76	Hogoldanga
					77	Kusodanga
					78	Pirodkhali
					79	Nimtola
					80	Shahapur
		Kutubpur			81	Boalia
					82	Shahabnagar
					83	Sombonagar
			Shahapur & Kutubpur	15	84	Doppoi
		_			85	Mohammadjumma
					86	Sindhurai
					87	Kutubpur
					88	Murtujapur
		II1:	Joyrampur &	16	89	Joyrampur
		HOWII	Loknathpur	10	90	Dudtatila
	Dhammhada		-		91	Keshobpur
	Dnamurnuda	Dhamurhuda	Dhamurhuda	17	92	Porapara
					93	Dhamurhuda
		Jorampur	Bishnupur	18	94	Bishnupur
					95	Gugrogachi
	libonnagar	Andolhamic	Nishtintopur, Paka &	10	96	Nidhikanto
	Juonnagar	Alluoibafia	Andolbaria	19	97	Paka
					98	Bazdia
					99	Andolbaria

Districts	Upazila	Union	Block	Cluster No.	Village No.	Village Name
			Cation tal.		100	Parkul
	Bagarpara	Darazhut	Satiantala	20	101	Bodhopur
	•		Dhokhin Shrirampur		102	Rustumpur
					103	Patibila
			Datibila		104	Niamotpur
			Faublia		105	Muktadoh
					106	Hayetpur
	Chougacha	Datibila		21	107	Purahoda
	Chougacha	1 ationa		21	108	Teghori
			Purahoda		109	Rustumpur
			1 urunouu		110	Bishanathpur
					111	Bhabanipua
					112	Sadipur
					113	Natuapara
			Habiatpur		114	Lawkhali
				22	115	Haviatpur
Jessore		<b>TT</b> 1 1	D. WILL		116	BaraHaviatpur
		Habiatpur	Bara Habiatpur		117	Shabajpur
					118	Baniaghat
				22	119	Manikdihi
	Jessore Sadar		Mathurapur	23	120	Mathurapur
					121	Samspur
		Churamonkathi	Bagdanga		122	Bagdanga
					123	Jugachia
			Churamonkathi	24	124	Islampur
					125	Doltadongo
					120	Abdulpur
					127	Badkhana
			Dodkhana	25	120	Barbaknur
		Codkhali	Воакпапа		129	Godkhali
	Jhikorgacha	Godknan			130	Benjali
			Fatehpur		131	Fatenur
					132	Kawria
				26	133	Raiapur
		Panisara	Rajapur		135	Mohinikathi
		Panisara		20	136	Baziatala
			Borni		137	Raghunathpur
			2000		138	Mohesherchada
					139	Goshnagar
					140	Norendropur
	Kaligonj	Niamotpur	Niamotpur	27	141	Niamotpur
					142	Mosiardara
					143	Boloramkpur
<b>T1</b> · 1 1					144	Kusna
Jhenaidah		Kushna	Kushna	28	145	Galimpur
					146	Bokshipur
	IZ . ( .1 1	Carla da ma	I and a	20	147	Boloramnagar
	Kotchandpur	Subdarpur	Joydia	29	148	Joydia
					149	Narayanpur
					150	Lokhukundu
					151	Baliadanga
					152	Khalishpur

Districts	Upazila	Union	Block	Cluster No.	Village No.	Village Name
					153	Belaghat
					154	Borjapur
		Fotepur & SBK	Potepur, Purundopur	30	155	Goalhuda
			& Knansnpur		156	Fotepur
	Moheshpur				157	Joguohuda
			Agomaua		158	Azampur
		Azampur &	Azampur, Diddadharnur &	21	159	Maladharpur
		Pourashava	Diudadilaipui &	51	160	Garadaria
			rourasilava		161	Kokildari
					162	Mirzapur
	Shoilokuna	Mirzənur	Mirzanur	2	163	Kanapukuria
	зпопокира	winzapui	Winzapui	2	164	Sherpur
					165	Rajnagar
					166	Titna
					167	Ranai
Khulna		Khornia	Titna		168	Angerdoh
					169	Mesagona
	Dumuria			33	170	Khornia
	Dumunu		Bayersing	55	171	Mothbaria
			Dujeronig		172	Kulbaria
		Atlia	Chuknagar		173	Chuknagar
					174	Chakundia
			<u> </u>	24	175	Boratdia
	Gangni	Shaharbati	Shaharbati	34	176	Shaharbati
		Dhankhola	Garadob	35	1//	Garadob
					1/8	Azan
		Amjhupi & Kutubpur	Gopalpur & Subidpur Suvorajpur Bamunpara & Amdah	36	179	Sampur
					180	Uttar Shalika
				37	101	Sublapur
					182	Mononorpur
	Mahamma				183	Suversiour
Maharnur	Sadar			38	185	Teroghoria
Menerpur		Kutubpur			185	Shoilmari
					180	Rudronagar
					188	Ramunnara
		Amdah		30	180	Bondar
		Amuan		39	190	Chaksamnagar
					191	Monakhali
			Monakhali &		191	Biswanathpur
	Mujibnagar	Monakhali	Riswanathpur	40	192	Vabanipur
			Diswanatiput		194	Shibpur
					195	Adomkathi
					196	Dholohar
					197	Bhramonkathi
			Dholahar		198	Rajapur
					199	Kathura Kathi
Piroipur	Nesarabad	Utohor Kuriana		<i>A</i> 1	200	Horihor Kathi
JP wi	esarabad	S-BSi Isuriunu			201	Gindakathi
					202	Andhakul
			Kuriana		203	Adabary
					204	Kuriana
					205	Utghor
	1	1	1	L	1	

Districts	Upazila	Union	Block	Cluster No.	Village No.	Village Name
					206	Bastukathi
					207	Muslimpara
			Maalimmaa		208	Santikathi
			Mushmpara		209	Kahairkathi
					210	Mahmudkathi
					211	Madra
					212	Jalokathi
		Jolabary	Madra	42	213	Jamura
		-			214	Jinuhar
					215	Jousher
					216	Natapara
				43	217	Hatatpara
		Jamalpur	Natapara Nalia		218	Hatimohon
	Baliakandi		1		219	Guptalakhandia
					220	Bri-Magura
		Nababpur	Indurdi	44	221	Dilalpur
					222	Indurdi
					223	Kathurakandi
			Barat - 1	45	224	kashim Nagor
Rajbari			Barat - 2		225	Gopalbari
5		Barat	Barat - 2		226	Savar
			Barat - 3		227	Bhabodia
			Barat - 4		228	Nayonsur
	Rajbari Sadar		Barat - 4		229	Warakanda
			Shahid Wahabpur - 1		230	Dhuldi Joypur
		C1 - 1 ' 1	Shahid Wahabpur - 2		231	Rampur
		Shahid	Shahid Wahabpur - 2	46	232	Sadipur
		wanabpur	Shahid Wahabpur - 3		233	Gouripur
			Shahid Wahabpur - 4		234	Baro Nurpur
					235	Mahmudpur-N
	0.411				236	Mahmudpur-s
Satkhira	Satkhira	Alipur	Mahmudpur	47	237	Ghola
	Sadar	*	*		238	Talbaria
					239	Gangunia
# Appendix 2. Results Tables from the IFDC AVPI WFA Proposal

#### Appendix Table 1. Result Indicators

Parameters	Target	Achieved – LOP		
*Women Directly Impacted	40,000	40,000		
*Men Directly Impacted	0	127		
*Total People Impacted	200,000	200,000		
*Women Indirectly Impacted	160,000	80,000 to 100,000		
*Men Indirectly Impacted	N/A	N/A		
*Total People Indirectly Impacted	800,000	400,000		
*Women Trained	40,000	40,034		
*Men Trained	0	127		
*Total People Trained	40,000	40,161		
*Women's Access to Financial Resources	Not applicable	Not applicable		
*Men's Access to Financial Resources	Not applicable	Not applicable		
*Total People with Access to Financial Resources	Not applicable	Not applicable		
*Household Income	235	164		
*Household Income Total	9,400,000	2,034,000		
*Hectares under improved management	8,000	12,050		

	Target	Achieved LOP	Name of Indicator Given on Walmart Website
			Top 5 Outputs
Output 1	40,000	40,034	Women farmers trained on UDP technology
Output 2	25	25	Rural entrepreneurs trained as fertilizer briquette dealers (female)
Output 3	100	100	Women farmers' established demo plots
Output 4	335	329	Women vegetable production villages established
Output 5	40,000	40,000	Increased income of farm households
			Top 5 Outcomes
Outcome 1	10,000	10,009	Women farmers will increase participation in leadership roles in community groups, associations, and other organizations (assume 25% of UDP trainees)
Outcome 2	40,000	12,811	Female farmers will become empowered to participate in family resource allocation decisions along with their male family members. (32% of trained women households)
Outcome 3	100,000 Male 100,000 Female 200,000	200,000	Nutrition of participating families will increase due to access to greater dietary diversity and income to purchase supplemental foods (assuming a family size of five with 50% females and 50% males).
Outcome 4	1,000 Male 100 Female 1,100.00 Total	109	DAE and other trainers will gain experience in preparing and presenting training to women recipients with a focus on gender issues.
Outcome 5	149 Female	75	Increase in small business operators selling fertilizer briquettes and servicing (25 briquette producers and 50 service personnel), 100% female.

#### Appendix Table 2. Evaluation Plan Table from the Proposal

			R	esults Tar	gets
					End of
Indiaator	Unito	Pasalina	Voor 1	Voor 2	Project
Vegetable and fruit area under	ha	$\sim 4.900$ (over	rear i	rear z	Result
improved technologies or	IIa	two seasons -			
management practices as a result		Winter +	c 500	0.000	0.000
of Walmart assistance		Summer	6,500	9,000	9,000
		– per year			
		seasons)			
Number of women farmers and	No.	~ 21,892	29,892	37,892	37,892
others who have applied new					
Number of individuals who have	No	~ 28 470	36 715	44 945	44 945
received Walmart supported	110.	20,470	50,715	,)5	
short-term agricultural sector					
productivity or food security					
training*					
Number of rural households	No.	Same as	Same as	Same as	Same as
benefiting directly from Walmart		above	above	above	above
Interventions	mt/ho	1 to 16 5	1 to 17	1 to 17	(Dapanda
fruits	IIIt/IIa	1 to 10.5	1 to 17	1 to 17	upon
ii uito					vegetable and
					season)
Incremental vegetable and fruit	mt	~ 28,700	33,000	35,500	35.500
production		,	,	,	,
Increased value of vegetable and	US \$	~ 4 56	6.0	9.5	95
fruits	million	4.50	0.0	7.5	7.5
Urea savings	mt	~ 540	730	990	990
C C					
Value of urea saved	U.S. \$	~ 0.22	0.29	0.40	0.40
	million				
GoB saving on urea subsidy	U.S. \$	~ 0.13	0.17	0.24	0.24
A	million	<b>C</b> 00	720	040	940
Average incremental value per ha	U.S. \$	~ 088	/ 30	840	840
farm	U.S. Þ	~ 104	1/3	200	200
% change in market knowledge	%	TBD	10%	20%	20%
			increase	increase	increase

#### Appendix Table 3. Results Indicators for AAPI WFA (Proposal Table 1)

#### Appendix Table 4. AVPI Activities

		Year 1	Year 2	Total
Activities	Unit	Number	Number	Number
Technology Transfer				
Farmer training	Batch	200	200	400
Farmers' orientation for demo establishment	Batch	2	2	4
Motivational meeting with trained farmers	No.	150	200	350
Motivational workshop and operational training of BMOs	No.	5	5	10
Field demonstration	No.	40	40	80
Crop cuts from				
Demo plots	No.	15	65	80
> Farmers' field	No.	28	100	128
Field days	No.	10	40	50
Design and develop technical leaflets, flyers, posters, signboards, flags, promotional bags, and caps	Continuous			
Media/Communications	Continuous			
Piloting Polynet Houses with Trickle Irrigation				
Farmers' orientation for demo establishment	Batch	1	1	2
Field demonstration	No.	15	10	25
Farmer training	Batch	15	10	25
Field days	No.	9	16	25
Provide direct technical assistance to farmers in introducing polynet houses with trickle irrigation and FDP technology	Continuous			
Agro-input retailer training	No.	3	2	5
Improving Farmer Access to Market Information				
Assessment of IFDC-Walmart women vegetable and fruit farmers' knowledge on market information	No.	1		1
Vegetable and fruit seedlings and saplings grower survey	No.	1		1
Study on vegetable and fruit market information	No.	1		1
Vegetable marketing seminar	No.	8	8	16

### **Project Monitoring Tables: Year One & Two**

Appendix Table 5. Results Achieved Against Targets from November 2016 to October 2018

						Total Achievement							
0			Total				No	vember 20	16-October	2018			
ы. #			Results		Winter	Summer	Winter	Summer	Winter		% of		
#	Result Indicators	Unit	Target	Baseline	2016-17	2017	2017-18	2018	2018-19	Total	Target	Remaining	Remarks
1		Vegetabl	e and fruit a	area under i	mproved te	echnologies	or manage	ement praction	ces as a result	of			
		Walmart	assistance <sup>a</sup>										
	A. GAPs application	ha	9,000	3,679	3,150	2,678	6,865	4,885		11,750	131%		
	a. Improved quality of seed/seedling	ha			3,150	2,678	6,865	4,885		11,750			
	b. Improved seed variety	ha			3,137	2,675	6,839	4,873		11,712			
	c. Line transplanting	ha			2,863	2,576	6,603	4,654		11,257			Latest Two
	d. Balanced fertilizer application	ha			2,278	2,103	5,702	3,991		9,693			Seasons
	e. Integrated pest management (IPM) method used	ha			1,639	1,662	4,813	3,118		7,931			
	f. Polynet house	ha					2.09	0.76		2.85			
	B. FDP application	ha	9,000	3,679	765	1,434	4,364	3,157		7,521	84%	1,479	
2		Number (	of women f	armers and	others who	have appli	ed new tec	hnologies					
	A. GAPs application	No.	37,892	21,892	19,786	19,331	27,574	27,564		32,335	85%		
	a. Improved quality of seed/seedling	No.			19,786	19,331	27,574	27,564		32,335			
	b. Improved seed variety	No.			19,708	19,313	27,494	27,470		32,238			
	c. Line transplanting	No.			18,586	18,549	26,850	26,569		31,290			Latest Two
	d. Balanced fertilizer application	No.			15,329	15,520	23,610	22,670		27,048			Seasons
	e. IPM method used	No.			10,974	12,217	18,588	16,293		20,287			
	f. Polynet house	No.					316	271		316			
	<b>B. FDP</b> application (unique number of farmers)	No.	37,892	21,892	7,063	11,877	21,322	20,019		24,167 <sup>b</sup>	64%	13,725	
3	Number of individuals who have received Walmart-supported short-term agricultural sector productivity or food security training	No.	44,945	28,470		2,096	6,190	2,950	5,332	45,038	100%	(93)	Cumulative
4	Number of rural households benefiting directly from Walmart intervention (women farmers)	No.	44,378	28,378		2,000	6,000	2,800	5,200	44,378°	100%	-	Cumulative

			Total				No	_					
SI. #	Result Indicators	Unit	Results Target	Baseline	Winter 2016-17	Summer 2017	Winter 2017-18	Summer 2018	Winter 2018-19	Total	% of Target	Remaining	Remarks
5	Increased yield of vegetables and fruits	mt/ha	1 to 17	1 to 16.5		2.79 to 3.84	2.12 to 9.82	2.97 to 6.18		2.97 to 9.82	297% to 58%		
6	Incremental vegetable and fruit production	mt	35,500	21,559		1,390	20,571	9,132		52,652	148%	(17,152)	Cumulative
7	Increased value of vegetables and fruits	U.S. \$ million	9.50	3.43		0.25	3.29	1.95		8.92	94%	0.58	Cumulative
8	Urea savings	mt	990	405		28.44	259.27	140.99		833.70	84%	156.30	Cumulative
9	Value of urea saved	U.S. \$ million	0.40	0.16		0.009	0.080	0.043		0.29	73%	0.11	Cumulative
10	GOB savings on urea subsidy	U.S. \$ million	0.24	0.10		0.004	0.034	0.02		0.16	67%	0.08	Cumulative
11	Average incremental value per hectare	U.S. \$	840	688		624	874	922		891	106%	(51)	Latest Two Seasons
12	Average incremental value per farm	U.S. \$	200	164		59	233	208		372	186%	(172)	Latest Two Seasons
13	Change in market knowledge	%	20				10-21	11-22			100%		

Source: Trained Farmers' Sample Survey, Winter 2017-18 and Summer 2018; Cluster Village Monitoring Survey, Summer 2017, Winter 2017-18 and Summer 2018; Farmers' Field Crop Cut.

Notes: All the result targets and achievements are shown for AVPI locations.

a. The FDP-applied area and GAP area are from the Cluster Village Monitoring Survey, Winter 2017-18 and Summer 2018.

b. It may be noted that some women farmers are using FDP technology in more than one crop. Field reports indicate that most women have used FDP technology in two to three crops. Therefore, the

unique number of farmers for these crops have been calculated using the Bangladesh Bureau of Statistics (BBS) cropping intensity.

c. This includes only trained farmers from Phase I (28,360) + new trained farmers (16,000) + briquette machine owners (18).

## Appendix Table 6. Activities Accomplished Against Targets for the Period November 2016-October 2018

				N	lovember	2016-Octob	er 201		
Desult Indiactors	Unit	Total	Summer	Winter	Summer	Winter	Total	% of	Domoining
Technology Transfer	Unit	Target	2017	2017-16	2010	2010-19	Total	Target	Remaining
Farmer training	Batch	400	50	150	70	130	400	100%	
Farmers' orientation for demo	Batch	400	1	150	1	130	400	100%	
establishment	Daten		1	1	1	1	-	10070	
Motivational meeting with	No.	350	50	150	50	100	350	100%	
trained farmers									
Motivational workshop and operational training of BMOs	No.	10	2	4	2	2	10	100%	
Field demonstration	No.	80	15	30	20	15	80	100%	
Crop cuts from									
Demo plots	No.	80	15	30	20		65	81%	15
> Farmers' field	No.	128	28	50	30		108	84%	20
Field days	No.	50	10	25	10	1	46	92%	4
Design and develop technical		*					*		
leaflets, flyers, posters,									
signboards, flags, promotional									
bags, and caps									
Piloting Polynet Houses with									
Trickle Irrigation									
Farmers' orientation for demo	Batch	2		1		1	2	100%	
establishment									
Field demonstration	No.	25		15		10	25	100%	
Farmer training	Batch	25		15		10	25	100%	
Field days	No.	25		15		5	20	80%	5
Provide direct technical		*					*		
assistance to farmers in									
introducing polynet houses									
with trickle irrigation and FDP									
technology									
Agro-input retailer training	No.	5		3		2	5	100%	
Improving Farmer Access to									
Market Information									
Assessment of IFDC-Walmart	No.	1	1				1	100%	
women vegetable and fruit									
farmers' knowledge on market									
information									
Vegetable and fruit seedlings	No.	1	1				1	100%	
and saplings grower survey									
Study on vegetable and fruit	No.	1	1				1	100%	
market information									
Vegetable marketing seminar	No.	16	6	5	3	2	16	100%	

Source: AVPI Database.

\* Continuous activities.

		Janua	January-October 2017			2017-Octob	er 2018	Total			
SI.	Description of			Closing			Closing			Closing	
#	Material	Purchased	Distributed	Balance	Purchased	Distributed	Balance	Purchased	Distributed	Balance	
1	Farmer ID	32,000	16,870	15,130		15,130		32,000	32,000		
2	Booklet	3,500	1,480	2,020		1,879	141	3,500	3,359	141	
3	Flyer	50,000	27,190	22,810		22,454	356	50,000	49,644	356	
4	Project Profile	50,000	14,340	35,660		35,104	556	50,000	49,444	556	
5	Leaflet – Manob Pusti	37,500	11,400	26,100		25,549	551	37,500	36,949	551	
6	Leaflet - Matir	37 500	11 400	26 100		25 540	551	37 500	36.040	551	
	Unborata	57,500	11,400	20,100		25,549	551	57,500	50,949	551	
7	Leaflet – Unnata Krishi	37,500	11,400	26,100		25,549	551	37,500	36,949	551	
8	Leaflet – Sobji O Phal	37,500	11,400	26,100		25,549	551	37,500	36,949	551	
9	Umbrella				180	162	18	180	162	18	
10	Signboard – Demo	67	67		35	35		102	102		
11	Signboard – Lebel	114	114		50	50		164	164		
12	Yellow Fabric Bag				1,000	709	291	1,000	709	291	
13	Yellow Flag				10,000	9,700	300	10,000	9,700	300	
14	Cap				2,500	2,041	459	2,500	2,041	459	

#### Appendix Table 7. Inventory of Promotional Materials Produced, Distributed, and Displayed Through October 2018