FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

# FEED THE FUTURE BANGLADESH DIGITAL AGRICULTURE ACTIVITY SHUFOLA PILOT END LINE ASSESSMENT REPORT

AUGUST 2022

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## Acronyms and Abbreviations

| | |
|---|---|
| B2B | Business to Business |
| B2C | Business to Consumer |
| BDAA | Bangladesh Digital Agriculture Activity |
| DAI | Development Alternatives Incorporated |
| DF | Digital Frontiers |
| FGD | Focus Group Discussion |
| FTF | Feed the Future |
| GoB | Government of Bangladesh |
| IPs | Implementing Partners |
| KII | Key Informant Interview |
| MERL | Monitoring, Evaluation, Research, and Learning |
| mPower | mPower Social Enterprises Ltd. |
| PAE | Prantojon Agro Enterprise |
| SRS | Simple Random Sampling |
| ToC | Theory of Change |
| USAID | United States Agency for International Development |
| USG | United States Government |
| ZOI | Zone of Influence |
| ZOR | Zone of Resilience |

## EXECUTIVE SUMMARY

The FTF Bangladesh Digital Agriculture Activity (BDAA), in partnership with Prantojon Agro Enterprise (PAE) and mPower Social Enterprises Ltd. (mPower), rolled out a pilot to determine the effectiveness and efficacy of the digital tool, SHUFOLA, an agricultural weather-based advisory service tool developed by mPower Social Enterprises Ltd. that offers information on crop management practices. Based on the crop variety, growth stage, and weather conditions, farmers receive customized and actionable advisory through the following:

- SMS on basic or smart phones, which can be customized in local dialect if needed
- Voice messages on basic or smart phones
- Calls from a specialist from a call center (a feature that was incorporated after feedback from the Activity on user literacy rates during baseline)

SHUFOLA is a Business-to-Business (B2B) model that works with companies to deliver timely and accurate weather based agricultural advisory to farmers. The tool owner, mPower, works with private companies like PAE to customize a suite of advisory messages to users to ensure agricultural inputs are appropriately used and optimized for local conditions.

PAE is interested in increasing output quality with their farmers and are thus incentivized to deliver better, more efficient advisory through technology, as opposed to direct field agents. Through SHUFOLA, farmers subscribe to the service with their location, sowing date, and name of crop to receive personalized and timely seed management advice. Under this pilot, the cost of delivering SHUFOLA's services were estimated at US$6 per user[1] per crop and season[2], which for this pilot was a duration of 4.5 months. It should be noted that the cost per user decreases as the number of users grows.

Under this pilot, PAE, in partnership with BDAA, selected 500 participants from two sub-districts of the Barishal district who were actively engaged in mung bean cultivation. This pilot was carried out throughout the entire mung bean production process in the climate vulnerable geographic area of ZOI in Bangladesh.

For the endline assessment, 114 individuals were selected out of the 500 pilot participants, following systemic sampling procedure. The sampling considered age (youth and adult) and gender (female and male) representation in the pilot population. The endline assessment examined the effectiveness and usability of the SHUFOLA for the farmers as a weather-based advisory tool, and value proposition of private enterprises. Summary findings from the pilot performance assessment with recommendations are shared below.

***Knowledge on Crop Advisory Services:***

The assessment found that a significant proportion (89%) of sample participants of endline assessment had improved knowledge on the different types of advisory services provided by SHUFOLA, including methods to deliver services to farmers/growers.

***Accessibility of Services:***

To access SHUFOLA's services, farmers are required to have access to a mobile device and to have a basic level of digital literacy, including understanding how to use certain features on the phone such as opening and reading texts or listening to voice messages. The endline study found that around 81% of respondents had their own device and could operate it by themselves, while rest of the respondents

[1] mPower reported a total cost of $3,010 per crop per season for 500 pilot users (1US$= 93 Tk)

[2] Different annual crops are grown in different seasons of the year. Crops are grouped under the seasons in which are their major field duration: Rabi season period starts in mid-October and continues up to mid-March; Kharif 1 season duration mid-March to June and Kharif 2 season duration July to mid-October.

(19%) used family phones. Among sample pilot participants, 90% of respondents confirmed to have received services, either in text or voice message form, or both, throughout the season. However, both types of respondents (used own device and family phone) expressed a preference for interactive voice calls to enable them to seek clarification from service providers, which had been incorporated by mPower as an additional service, besides SMS and voice messages. The tool owners added this as an option based on the feedback generated from the Activity, considering the digital literacy observed of users (only 56% able to open and read message) during baseline study. Farmers mentioned that the main reason for this preference was the ability to interact with service providers to seek additional clarifications, and the ease in understanding the messages. Regarding preferred timing to receive SMS and voice calls, participants preferred their leisure periods (late afternoon to evening). On the other hand, 8% of respondents did not notice the messages because of lack of understanding of the SMS services, and 2% reported not receiving any messages. In the case of text messages, out of 90% message recipients, 50% of respondents were able to open and read out the message by themselves. Among those, 49% reported that the received messages were readable and understandable. In terms of age and gender, male (52%) participants were more advanced in opening and reading messages compared to female (42%) participants. The analysis found similar results for youth (69%) as compared to adults (45%).

***Relevance of Advice:***

More than half of the respondents thought that the crop management suggestions and proposed inputs for mung bean farming were mostly relevant in the local context except for a few cases. Similarly, most respondents (67%) reported that weather forecast, and alert messages were delivered in a timely manner.

***Delivery Preference:***

Regarding service delivery preferences, 59% of respondents mentioned that they preferred voice calls than with text messages, as voice delivery was easier to understand for all involved, especially for illiterate users. Respondents noted a preference for a combination of voice message and periodic contact by call centers, or the implementation of the three mediums together is preferred.

***Adoption of Services:***

More than half of the total respondents believed that SHUFOLA suggestions were mostly aligned with local weather conditions. Seventy-five percent (75%) of respondents applied **at least one advisory service** of SHUFOLA during mung bean cultivation this year. Among all advisory services provided by the tool, the most adopted services were weather forecast (58%) and pesticide application (58%), followed by land preparation (36%) and fertilizer application (11%). The least adopted service was seed treatment (1%) due to lack of supply of inputs, or inoculants, in the local market. The next lowest adopted service was found to be variety selection (2%), as variety related suggestions. For example, the variety called BARI-06 was not new to them. During baseline surveys, around 78% of participants were found to already use BARI-06 in mung bean cultivation.

***Benefits of Using the Service:***

Participants believed that the advice on pesticide and fertilizer application, weather forecasts, and updated sowing techniques helped them to produce a better yield this year, which is around 0.84 MT per hectare (increased 17% of yield from last year). Several rain forecasts, especially during sowing and harvesting periods, were perceived as effective at reducing crop damage. Pest and disease alerts during production management were also perceived to be effective at reducing yield damage. Unfortunately, around 74% of respondents reported that although production was higher than previous years, due to unexpected tidal waves and heavy rainfall during the harvesting period, resulting waterlogging in the field impacted the overall production volume. The SHUFOLA currently does not offer advisory services related to natural disasters.

Only 26% of respondents reported to be able to harvest whole crops due to strong water drainage facilities at their pilot sites. This year, most farmers could harvest crops only two times, which was less than the three times in the previous year. Considering the situation, although this year production was high, due to waterlogging, production was reduced to around 0.71 metric tons/hectare (mt/ha) from 0.72 mt/ha observed during baseline data collection.

***Learnings and Recommendations:***

- Adult participants' digital literacy was much lower compared with youth participants (only 43% adults were able to read and 36% were able to understand messages, versus 81% of youth participants able to read and 75% able to understand messages). ***As such, youth could be the target users for SHUFOLA's advisory services, as they are quick learners and potential early adopters.***
- For delivering localized weather forecast paired with highly customized crop specific management advice, it is required to input crop specific sowing/planting date to optimize the accuracy of messages. Unfortunately, when registering for the service, the Activity learned that some farmers are not able to recall their date of sowing/planting within the service or enter inaccurate sowing dates upon subscribing. This required engaging SHUFOLA staff to call the users to collect and confirm accurate data from farmers, such as date of planting crops. This required additional resources and internal operational costs from the SHUFOLA team, which emphasized the importance of integrating a Call Center package into the service for PAE. Unfortunately, this is an additional cost and it increases the overall service fee, which may not be as attractive to companies like PAE who have more ***cost-competitive alternatives available in the market***.
- Under a **Business to Business (B2B) approach**, SHUFOLA is an ideal service for agro-input companies to deliver input-specific advisory services of their products to contract farmers[3]. The cost of SHUFOLA decreases significantly as the size of the user recipient group increases. As such, this service may not be as cost effective for processing and procurement companies that work with a limited number of local farmers (i.e., 100-500 users) to produce quality grain and outputs that align with their requirements. These companies provide close follow-up, management, and input support to the farmers. SHUFOLA may be more attractive and cost competitive for larger companies like input companies that work with thousands of farmers. Through this approach, paid advisory services may allow for opportunities to bring significant return for business growth to partners and incentivize the private sector. This approach may also ensure good quality grain as a premium product for consumers. Thus, this serves the mutual interests of the tool owners, private sector partners, and farmers.
- The tool owner presumed that the Business to Consumer (B2C) approach was not viable for SHUFOLA, as farmers are currently not willing or capable of paying for such advisory services. However, based on our study, we found that **farmers are willing to pay minimum amount (as per FGD, around US$0.50 per user) for SHUFOLA services**. Willingness to pay depends on several factors such as the commercial viability of selected crops, whether the selected crops are cultivated as chance crops[4] or as cash crops[5], and the perceived return on investment after the adoption of the tool's services. Most farmers who participated in the pilot cultivated mung bean as a

[3] Contract farming involves agricultural production being carried out on the basis of an agreement between the buyer and farm producers. Sometimes it involves the buyer specifying the quality required and the price, with the farmer agreeing to deliver at a future date.

[4] Chance crops are those that farmers grow mainly as subsistence crops to utilize fallow land during a specific period of time. Farmers will sell the remainder of these crops after their own consumption.

[5] Cash crops are those that farmers grow for commercial purposes with the aim of generating profit rather than for subsistence. Subsistence crops are those used to feed the farmer and the farmer's family members.

chance crop, so farmers were less interested in paying for additional services and were not able to make such return on investment from this crop.

## INTRODUCTION

In recent years, Bangladesh has faced low growth rates in agriculture due to global climate change, with rising temperatures making climate and weather conditions unpredictable and unstable. This is true especially for the south of Bangladesh, where mung bean serves are one of the major crops widely grown (on about 55,000 hectares of land) during the *robi* (winter) season. The mung bean production system, from sowing seed to harvesting and storage, is extremely sensitive to climate issues, especially unexpected rain, and drought.

Evidence suggests that in 2017, mung bean farmers lost a significant amount of their yield due to sudden heavy rainfall, with 60%-70% of crops destroyed just before harvest[6]. They faced similar challenges in 2019, in which farmers did not get optimum yield due to heavy drought, sudden tidal flow, and rainfall.

To explore adaptation processes that might mitigate these climate challenges, the Bangladesh Digital Agriculture Activity selected SHUFOLA, a weather-based solution developed by mPower Social Enterprise, to undergo the Activity's pilot process.

BDAA, in partnership with PAE and mPower, rolled out a pilot in January 2022 to examine the effectiveness and efficacy of SHUFOLA's weather-based agricultural advisory service tool during mung bean production in a climate vulnerable geographic area. The pilot took place in two sub-districts of the Barishal district, one of the major mung beans producing as well as climate vulnerable areas in Bangladesh. The pilot participants selected in association with BDAA, partner organizations (PAE and mPower) from two sub-district of Barishal district. In total, BDAA enrolled 500 farmers considering the below key criteria:

[6] Blue Gold program report 2017

- Smallholder farmers, targeting 49% youth (between 15 to 29 years) and encouraging women participation.
- Must have access to a feature/button phone.
- Willingness to share their mobile phone number.
- Interest in increasing agricultural yield (especially for mung bean) by applying SHUFOLA's weather and improved management practices.
- Only one participant per household to ensure no duplicate numbers

With those registered pilot participants, BDAA arranged a half-day orientation about the SHUFOLA service from the Activity and the participants were provided with free access to SHUFOLA from mid-January 2022 to June 2022.

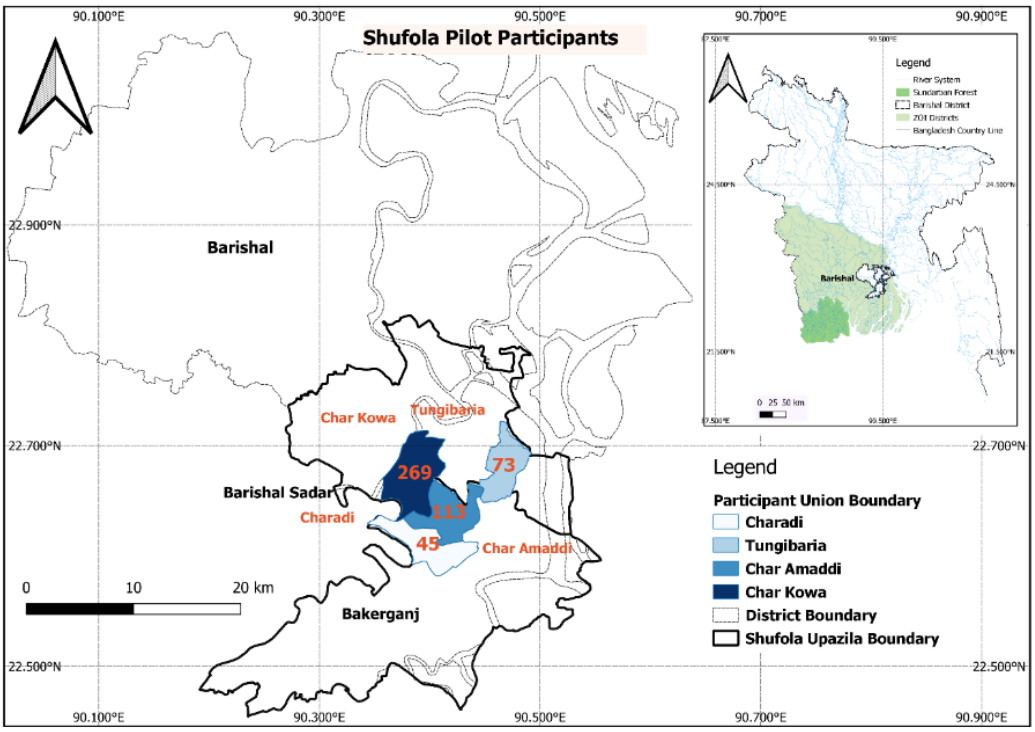



*Figure 1: SHUFOLA Pilot participants Map*

BDAA conducted baseline data collection for the pilot during the second week of January 2022. As per pilot protocol, the endline assessment was conducted in the second week of June 2022. All the pilot participants are selected from Barishal Sadar and Bakergonj Upazila under Barishal District. From the baseline study found that 53% of selected participants comes from Char Kaowa union, 22% from Char Amaddi, 14% Tungibaria and 11% from Charadi. Considering youth and gender, 17% participants were below 30 years (youth) and 29% were female. In terms of education 36% selected participants were below junior class, 18% don't have formal education and rest of percentage (46%) have junior and above education.

## 1.1 Objectives of the Endline Study

- To understand the effectiveness and usability of the SHUFOLA app as a weather-based advisory tool.
- To understand the cost-effectiveness of SHUFOLA for PAE.
- To gather recommendations for SHUFOLA, especially regarding the process of deployment.

## 2 STUDY METHODOLOGY

The endline study used a mixed methods approach consisting of a quantitative survey and qualitative inquiries. Data collection was comprised of four methods: (a) a questionnaire survey using the Kobo platform, (b) focus group discussions (FGDs), (c) case stories, and (d) key informants' interviews (KIIs). Through FGDs and KIIs, BDAA captured intended and unintended outcomes regarding use of the tool. Results and lessons learned were communicated with BDAA's partners to inform management decisions and to improve the tool.

### 2.1 SAMPLING PLAN

For sampling framework preparation, the Activity listed down all the pilot participants ordered by geographical location, age, and gender. Since Activity has a comprehensive list of pilot participants including all the information details without any sampling cluster, so for quantitative survey, the Activity considered single-stage design with systemic selection of participants. For the one-stage design with systemic selection of participants, it is essential that there be comprehensive, complete, and up-to-date participants frame (consisting of the complete list of participants within all implementation clusters, like union, age, and gender).

In general, there are two ways to sample participants directly using one stage of sampling: systematic sampling and simple random sampling (SRS). For complete list of participants is ordered by cluster and a subset of the participants (geo location, age, and gender) have been selected using a fixed interval across the entire list (systematic sampling).

The formula for calculating the initial sample size for the estimation of indicators of totals is given by:

$$n_{initial} = \frac{N^2 X Z^2 X S^2}{MOE^2}$$

Where,

Z = critical value from the normal probability distribution (95% confidence level: 1.96)

N = total number of estimated participants (access outreach)

S = standard deviation of the distribution of participants data (0.41)

MOE = margin of error (5%)

*Considering 5% non-response rate

| Total Population (N) | Standard deviation (S) on digital literacy (from Literacy Study) | Acceptable % of error (p) | Margin of Error (MOE)=p*N | Confidence level CI | Critical Value (Z) | Initial Sample Size ($n_{initial}$) | Adjust factor require or not (5% of $n_{initial}$ |
|---|---|---|---|---|---|---|---|
| 500 | 0.3 | 5% | 25 | 95% | 1.96 | 138 | 25 |

| Adjust factor for ninitial/N>=0.05, (1/(1+ninitial/N)) | if sample size is greater than 5% of population size then adjustment required otherwise no adjustment required. | Design effect (DEFF) as per def | Sample size with DEFF | Adjusted nonresponse (1/0.95), as per def (5% nonresponse rate, response rate of 95% is assumed) | Adjusted Sample size 3 (with non-response) and final sample size | Final Collected sample |
|---|---|---|---|---|---|---|
| 0.783333668 | 108 | 1 | 108 | 1.05 | 114 | 114 |

For an in-depth understanding of what did and did not work well, BDAA conducted nine KIIs and two FGDs with 6-7 direct participants per FGD.

A total of nine KIIs were conducted with the Executive Director and one staff member of PAE, two representatives of mPower, and five mung bean farmers, to get their in-depth understanding on SHUFOLA advisory services and the tool owner's point of views regarding the sustainability of the service.

Two FGDs were held with around 12-14 direct users. Participants were selected from two different sub districts, or upazilas, for piloting. Priority was given to areas nearby which reduced costs surrounding transportation and timing.

# 3 Key Findings

## 3.1 Endline Participant Demographics

PAE was engaged for the endline evaluation as a partner in the two sub-districts of Barishal within the FTF ZOI.

Under the pilot, 500 participants who cultivated mung bean this year received orientation from BDAA, and among those, 114 participants were considered for the survey. In the end, 100 respondents (88%) were available during the survey, while the remaining 14 (12%) were not available in their home during survey data collection.

Two-thirds (67%) of the respondents were male and one-third (33%) of respondents were female. The majority (84%) of the respondents were adult, while the rest (16%) were youths.

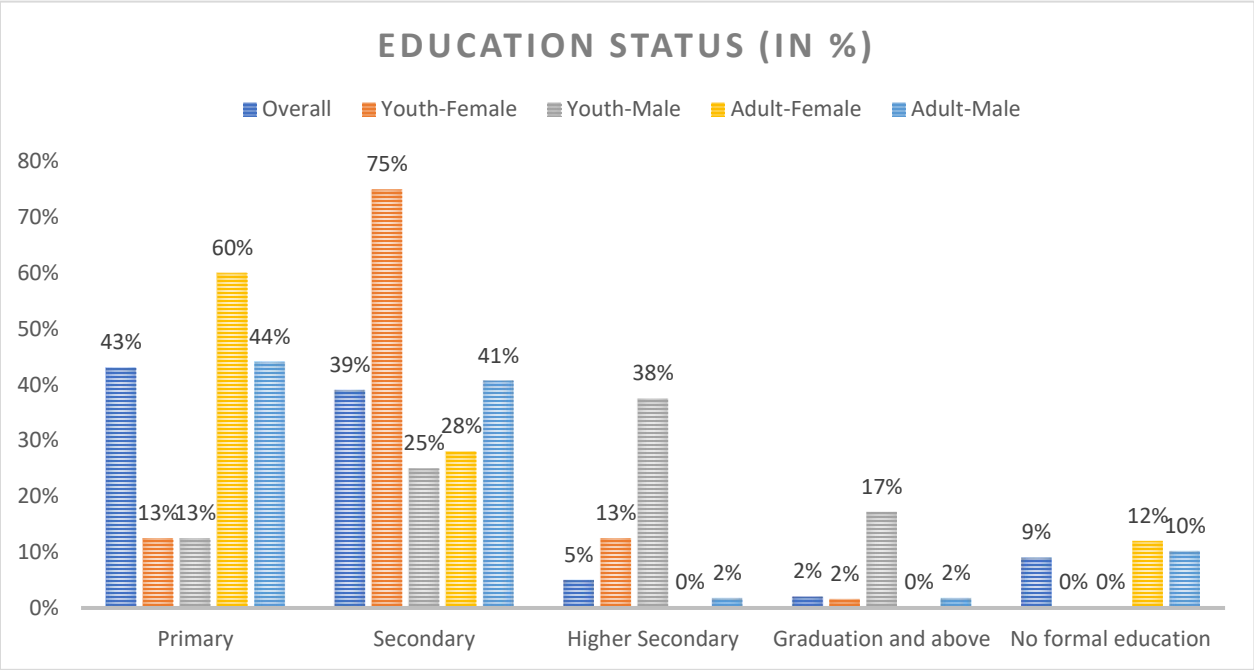



*Figure 2: Education Status of Sample Pilot participants*

Respondents' education levels varied from primary to post-graduation. According to the data, most participants completed primary level education (43%) and secondary school education (39%). Only 2% were at the graduation or post-graduation education level. The remainder (9%) did not receive any formal education, and they could not read or write. Considering age, youth comparatively had high levels of education, 88% youth-female and 63% youth-male completed secondary and higher secondary education; interestingly only 17% youth-male completed graduation, for others (youth-female, and adult-male) it was found only 2%. Around 12% adult-female, 10% adult-male found no formal education. In the case of female participants, most completed primary and secondary school (87%), while the remainder (9%) did not receive any education.

All respondents cultivated mung bean this year, with an average of 15 years-experience in farming. Most farmers were small holders and cultivated mung bean on 0.31 hectares (average) of land this year. In terms of variety, 83% of farmers cultivated BARI-6, characterized by large grain and high yield (during baseline it was 78%), among them 74% cultivated only BARI-6 and 10% farmers cultivated Sona mung- a local variety, characterized by small grain and taste. Around 16% of these farmers cultivated multiple varieties of mung bean in the pilot area.

## 3.2 Participants' Knowledge

The survey assessed the pilot participants' knowledge of the technical advice provided by SHUFOLA. SHUFOLA provided guidance on best seed-to-seed crop management practices as well as actionable advice on bad weather conditions. Around 89% of respondents retained knowledge on various topics. 80% of respondents could remember pest and disease related information, followed by rain alert (75%), land preparation (48%), and fertilizer application information (31%).

Least remembered advises are seed treatment process with inoculant and benefits (4%), grain preservation (8%) and harvesting technique or timing (18%).

## 3.3 Accessibility

Respondents all had access to a mobile phone (either a basic phone or smartphone), as evaluated during the endline survey. However, respondents, or those receiving SHUFOLA services, did not always have ownership of the phone. 81% of respondents owned a device, while the remaining respondents used a family phone. Device ownership was the same for both youth and adults (81%). On the other hand, female ownership of a device was lower (61%) as compared to their male counterparts (95%).

Tool owner mPower delivered the service in three modes: 1) SMS, also known as text message, 2) prerecorded one-way voice call with the same content of SMS, or 3) two-way remote consultation with an agent or call center so that pilot participants would be able to follow up. This third service option was made available after BDAA noted the digital literacy status of pilot participants during baseline study.

Access to services was also discussed at the beginning of the survey, and it was found that 90% of respondents confirmed receiving either text or voice messages or both throughout the season. 8% (8 respondents) did not notice any SMS or voice calls from the service. Those that did not receive any SMS or voice call cited reasons such as lack of comfort to carry or use a phone, lack of interest in the service, or phones being operated by other family members at the time who ignored such calls or text messages. The remaining 2% confirmed not receiving any calls or text messages due to a change in phone number or wrong phone number input during registration at the beginning of the pilot.

Of those 90% who received the service, 70% used their own phone and 20% used a family phone. Respondents who used a family phone to receive services were mostly informed within a day. Only 1% of respondents were never informed about the delivery of any text or voice call.

Among the survey respondents, preferred modes of receiving the service were discussed, and results are shown in the below figure. Respondents were more comfortable with voice calls over text messages. Voice delivery was easy to understand for all, especially for those who are illiterate. A combination of voice message and periodic contact by call center or implementation of all three modes of contact were preferred by respondents. Regarding timing to receive SMS and Voice call, respondents preferred to receive messages during their leisure period, typically late afternoon to evening.

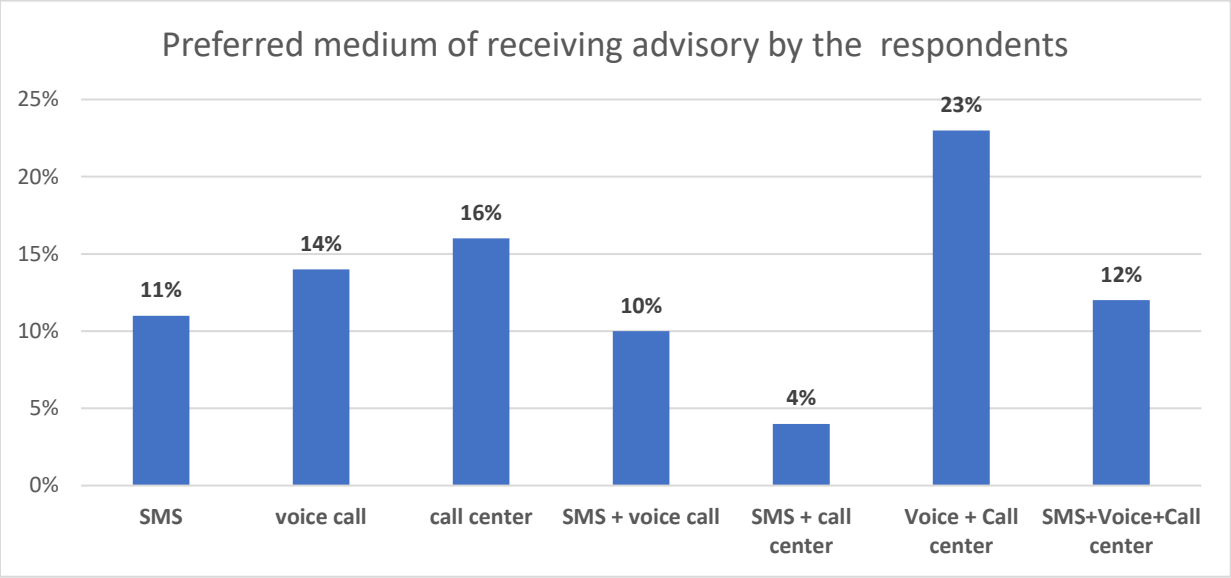



*Figure 3: Preferred medium of receiving advisory service*

The endline survey asked respondents to open messages from their phones and read out loud the content of the messages. 49% of respondents could open and read the messages by themselves, while 41% could not open or read out loud due to lack of literacy, eyesight issues for elderly respondents, or discomfort with digital technology. According to the data, those who could open the messages (49%) could also read out (49%) and understand the content of those messages (42%). youths (69%) were more likely to access and understand the content of the messages as compared to adults (45%). In terms of gender, fewer female participants (44%) were able to understand the message when compared to male participants (63%). Overall, male and youth participants (88%) were more comfortable and familiar with text-based advisory services. Similar investigation was performed to check the acceptance of voice call and data found that 70% of respondents understood the content of the advice delivered by voice call in comparison to text message (49%).

The graph below illustrates data regarding accessibility, readability and understandability by age and gender. youth-Male performed better in every category as compared to other participants. Interestingly, youth-Female participants' mobile access was found to be low, but with respect to operations such as message opening, reading, and understanding messages, performance was found to be significantly higher.

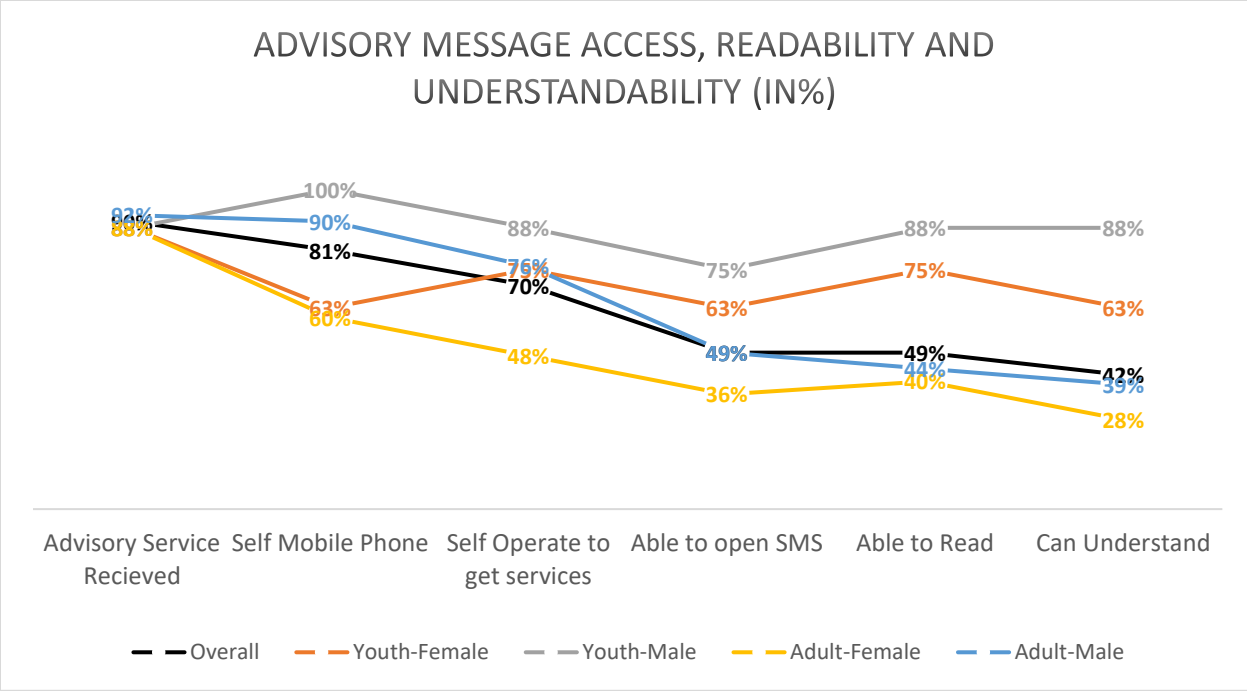



*Figure 4: Accessibility, Readability and Understandability (in %)*

## 3.4 Factors Leading to Adoption

According to the data, 76% of respondents applied some of the advice given to their mung bean field production. Application of recommendations among youth-female and youth-male are almost same in percentage (75%), whereas for adult-female, it is only 68%, which is less than adult-male (80%). Among the rest of the respondents, around 10% did not receive or notice the messages and around 14% did not apply any recommendations/suggestions. Reasons for not applying included non-actionable recommendations which failed to align with usual practices, suggested messages were not relevant with timing to adopt the suggestion, delay in receiving advisories, lack of input resources, and lack of ability to make decisions (especially female farmer). The below figure shows types of recommendations and the percentage of respondents who applied those in their field. Recommendations related to rain forecast (58%) and pesticide application (58%) were more useful and applicable than other types of recommendations. Land preparation, pest and disease, fertilization application, and sowing technique-related advisories were also applied by respondents.

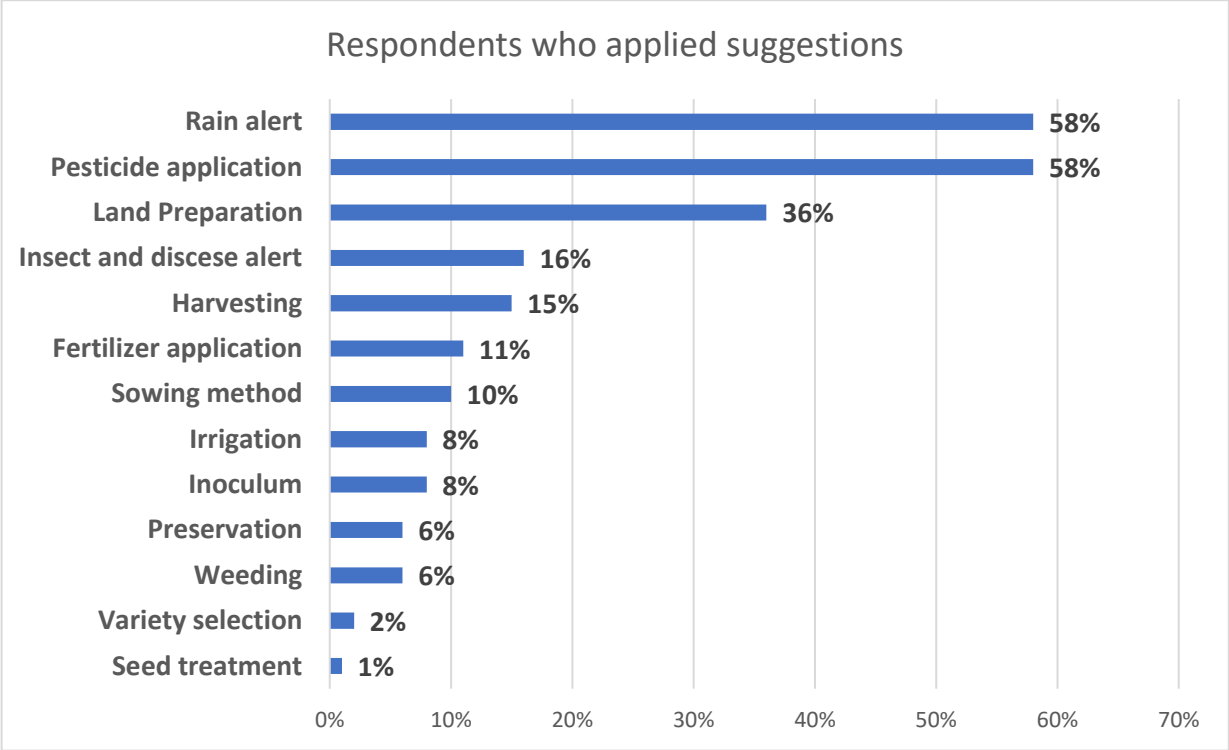



*Figure 5: Respondents who applied suggestions*

**Relevance:** BDAA analyzed data obtained in the survey to determine whether the advisories provided were relevant within the local context. The figure below shows that more than half of the respondents thought that crop management-related recommendations and input name recommendations related to mung bean farming were relevant in the local context.

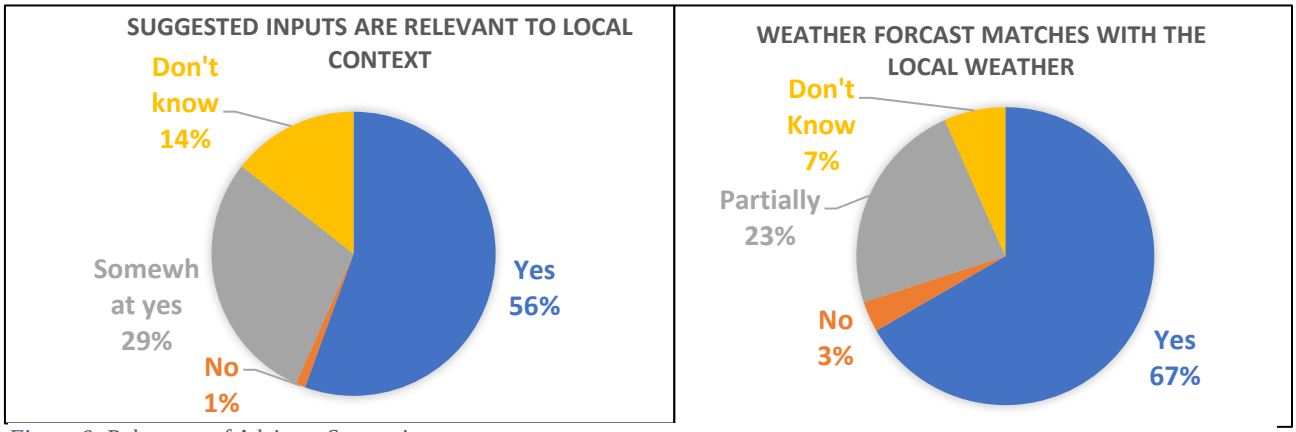



*Figure 6: Relevancy of Advisory Suggestions*

Similarly, localized weather forecasts and recommendations related to delivery time (with respect to growth of the crop) were also relevant to at least 67% of respondents. Only 5% to 6% of respondents reported a mismatch between the forecasts and the actual weather in their localities. Therefore, weather forecasts proved to be reliable and delivered in a timely manner for the majority of the farmers.

## 3.5 Results

Ninety percent (90%) of respondents confirmed to have access to the services, with 89% of total respondents having knowledge about the services. 76% of all respondents applied the recommendations to their mung bean fields and more than half (55%) of the total respondents believed that the recommendations aligned with their usual practices. To this point, benefits of using the services were analyzed. According to data, 74% of total respondents reported benefitting from the service. Respondents benefited when they were able to protect their crops from damage (35%) through timely weather updates, manage time in a better way and plan for input application (36%), increased yield (17%), and enhanced confidence in mung bean cultivation (23%). In some cases (5% reported), participants were able to reduce production costs by using inputs in a timely manner as well.

While exploring how these benefits affected individual respondents, information regarding land preparation, pesticide and fertilizer application, weeding, irrigation, and harvesting was received well ahead of time. This helped farmers in planning and implementing these inputs and actions in a timely and organized manner. Respondents believed that advice on pesticide and fertilizer application, bad weather forecasts, and updated sowing techniques helped them to have a better yield this year. Similarly, several rain forecasts during sowing and harvest periods, as well as pest and disease alerts, happened to be effective to save yields from damage. Additionally, a few respondents applied rain forecasts to save production costs by rescheduling pesticide, irrigation, and fertilizer applications in their field. In the end, 74% of respondents reported not being able to harvest crops either fully or partially due to waterlogging from tidal water or heavy rainfall.

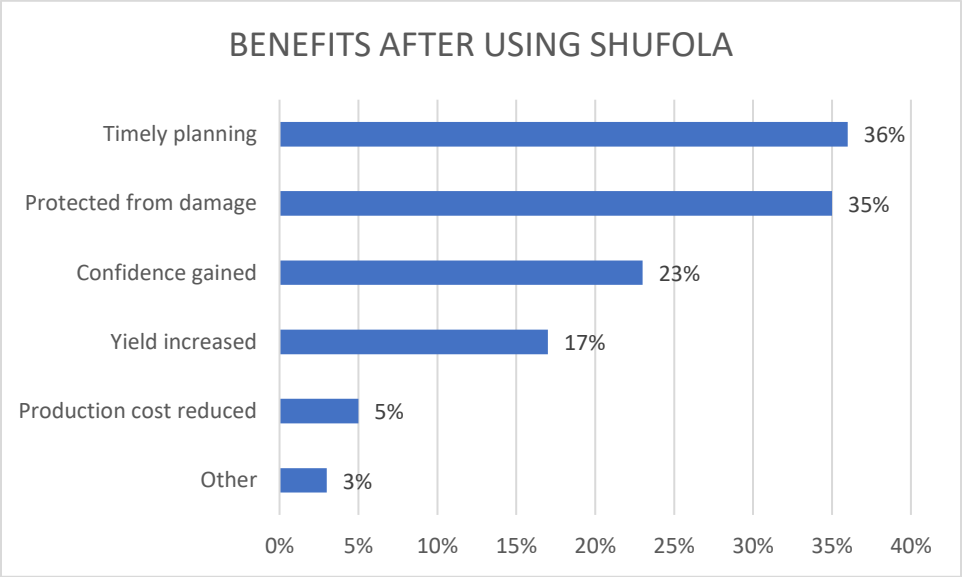



*Figure 7: Benefits after using SHUFOLA*

Survey data collection found that the average cultivated land for mung bean was 0.31 hectare, with land size cultivated by youth (0.23 hectare) to be significantly less than land size cultivated by adults (0.32 hectare). No deviation was found regarding gender. Production costs for respondents varied from $176 USD[7] to $278 USD per hectare, with average production costs at $228 USD per hectare (6% less than last year). Considering gender and age, male-youth farmers reported higher production costs of $278 USD per hectare, while female-youths, and female-adult reported significantly lower production costs at $196 USD and $176 USD per hectare, respectively. The variation of production cost is mostly

[7] 1 USD=85 Tk.

influenced by cost of seed, with a certain number of farmers either receiving seeds from Prantojon free of cost or using the previous year's seeds.

74% of respondents reported damaged to either partial or full crops due to waterlogging from tidal waves (44%) or heavy rainfall (33%), or pest attacks (16%). Only 26% reported being able to harvest whole crops due to water drainage facilities at their sites. This year, most farmers were able to harvest crops only twice, while in the previous year they were able to harvest three times. Considering all these situations, respondents predicted in their KIIs that this year's production would be higher than it turned out to be. Waterlogging allowed for 0.71 mt/ha in production, while 0.72 mt/ha was predicted during baseline data collection. It should be noted that for waterlogging damage, the SHUFOLA application did not provide any suggestions as a part of precautionary measures, so mung bean farmers were not able to harvest the expected amounts, though plant growth was high.

Around 51% of respondents reported that they had yet to sell their products, while 40% of respondents reported that they sold grain to their local market and 9% reported selling to aggregators. From this analysis, the data reflected that most of the farmers were waiting for increases in market prices. At the same time, Prantojon had also not started to procure grain, as they were waiting for the fall of market prices.

**Farmer's willingness** to pay for SHUFOLA services are dependent on several factors, such as whether selected crops are cultivated as commercial crops, or whether they are slated for home consumption. Farmers prefer to receive attractive return on investment to bear additional costs for services, and it depends on how services like SHUFOLA impact mung bean production. Farmers primarily cultivated mung bean as a chance crop for home consumption and therefore, as only surplus production was sold in local markets, farmers were less interested in paying for additional services.

***Tool Owner's Perspective*:**

SHUFOLA services were delivered in an automatic manner using a configurable web platform. Farmers' information, advisory contents, weather data, sowing dates, and other crop information were input into the platform. A background algorithm then generated a daily list of farmers with specific recommendations determined by the elapsed days after sowing. These recommendations were delivered in the form of text or voice messages. According to the tool owners, the SHUFOLA web platform is crop agnostic and can be scalable to any part of Bangladesh or beyond with a specific number of crops.

Tool owners also suggested that the B2C approach was not viable for SHUFOLA, as farmers are not willing to pay enough to cover the cost of the service. Thus, tool owners are looking for the right private organizations under the B2B approach. Under the B2B approach, tool owners preferred agro-input companies and procurement companies, or those who follow appropriate contract farming methods to get better quality grain as potential users of the tool. The tool owner also emphasized that the number of targeted growers was a factor in reducing subscription fees, as subscription fees could gradually be decreased if the number of service recipients increased.

Improvement areas of the tool/service were identified as follows: the tool owner can consider the local soil and climatic conditions before preparing advisory messages. These messages could include short duration variety recommendations providing appropriate fertilizer doses, pesticide doses, and precautionary messages to save crops from waterlogging issues. Service delivery timing was also found to be very important in adopting the service.

***Private Sector Perspective:***

As per the management of PAE, SHUFOLA services reduced staff engagement costs by US $141/month during the pilot. However, that amount in cost reduction was not sufficient to justify the subscription fees.

Since SHUFOLA combines localized weather forecast with crop specific management practice based on planting date to generate highly customized agricultural advisory in the form of actionable advice for individual smallholder farmers, ***specific sowing/planting date of specific crops are pre-requisite to get accurate advisory message***. Unfortunately, farmers are usually not able to specify their date of sowing/planting. This would require private enterprises to engage with staff to get accurate date of planting through in person discussion with individual farmers. So, less possibilities to reduce staff engagement in managing farmer. ***As a result, the operational costs of private enterprises may not be possible to reduce drastically, which was one of the major constraints for procurement companies (contract farming) to incorporate such advisory services.***

Since crop production increased, and early warning advisory helped farmers reduce crop damage, PAE set mung bean collection targets at 20% more than last year. Additionally, PAE recognized some additional benefits such as enhancing company branding by sending promotional messages and special day greetings to contract farmers, along with regular service-related messages. PAE later considered offering these promotional initiatives by undertaking SMS bundle packages from local Telcom operators, as because PAE realized that SHUFOLA advisory service is not covering business promotional issues and not cost effective for limited number of farmers either. Besides regular crop management advisory service, it is necessary to include branding promotional messages for creating private sector interest on SHUFOLA service.

# 4 RECOMMENDATIONS

Recommendations were gathered through quantitative data analysis and qualitative discussions with relevant stakeholders, as summarized below.

## 4.1 PRIVATE SECTOR

- Digital literacy was much lower among adult users (only 43% able to read and 36% able to understand messages) compared to youth participants (81% able to read and 75% able to understand message). Addressing digital literacy must be a key consideration when designing and expanding services for adult users. Youth, on the other hand, can be targeted as potential high/early adopters of the tool, as they have higher levels of digital literacy.
- During the pilot, the highest yield increase observed was a 17% increase[8], mainly where the users did not experience any weather-related problem during the season such as flooding or excessive rainfall. To make the business case for SHUFOLA at its current price point, the service can be targeted to groups of farmers who are engaged in medium to large scale production, who have measures to mitigate effects of weather conditions such as flash flooding on the yield.
- Among the 152 women participants of the pilot, around 70% adopted the service. However, once women participants started using SHUFOLA, the technical understanding and farming knowledge the gained from it empowered them within their household and the community, and they gained greater trust in their decision making in farm activities. Therefore, the private sector actors can encourage more women's participation in adopting this advisory service by creating more inclusive delivery methods, such as delivery of service in a time suitable for women users, and increasing access to mobile devices and digital literacy resources for women.

## 4.2 TOOL OWNERS

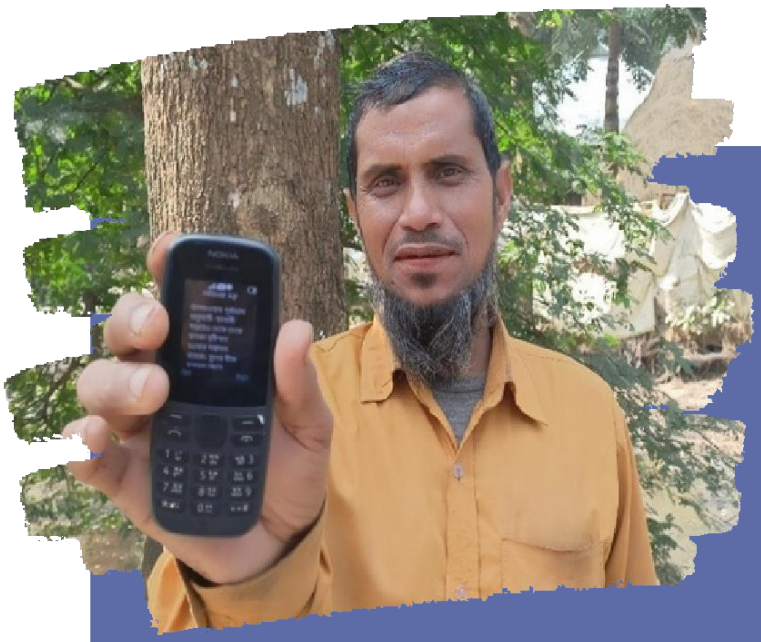
- Integrating SHUFOLA call center services in the pilot had a large impact for the farmers. This helped farmers gain confidence in the service and it helped them adopt the advisory services from SHUFOLA. Therefore, the tool owner may consider adding this call center service as a regular service feature.

[8] Among around 26% pilot participants

- The tool owner may consider agro-input companies to be most commercially viable for a service like SHUFOLA. Input companies usually have a large customer base, they can add promotional contents to the advisory services, and they would be in a better position to justify the additional cost of such a service through the resultant increase in revenue.
- To make such advisory services available for both smart and feature phones, tool owners can consider SMS, IVR and call center-based services to supplement the app-based messages. This could also attract private sector partners as these channels would mean additional ways to streamline promotional content.

## ANNEX: CASE STORIES

**CASE 01**



Karamat Ali, a 50-year-old rural farmer from the Diar Char village was a participant of the SHUFOLA tool pilot. He cultivates rice, lentils, wheat, and several other plants. This year, he cultivated mung bean and wheat simultaneously in two crop fields, growing wheat for the for time this year on his 36 decimals of land. He received SHUFOLA weather advisory SMS and suggestions and followed all the advice provided. When he received information through SMS it would rain in a few days. he planned accordingly to harvest his wheat.

In April, the region received a heavy rainfall alert from SHUFOLA as an advisory for mung bean farmers. Based on this advisory, Ali decided to harvest his wheat early. As a result, he got 6.5 pounds of quality grain, which he would not have collected if he had waited a few weeks. His son, Imam, helped him utilize the SHUFOLA services, as Ali cannot read.

**CASE 02**

***"After getting benefits, now they listen to my advice which I get from SHUFOLA service and give value to my opinion so that I feel empowered when my husband gives me priority"***

Lima Akhter, a 24-year-old female from the Sadar upazilla, was one of the beneficiaries of the SHUFOLA pilot. She studied up to secondary school. She has lived with husband, a driver, and in-laws for more than 4 years. Before her marriage, she had no experience in agriculture, but now has started helping her family with farming. As she is educated and can read and write, she has been able to receive information from SHUFOLA and started providing support and information to her family regarding mung bean cultivation.

This year, her family cultivated mung bean and shifted their sowing dates based on SHUFOLA's recommendations. As a result, they experienced better yield. She received SHUFOLA weather advisory messages regularly on her phone and immediately disseminated this information to her family so that they could take immediate action.

Her family members depended on her for these messages, which made her feel more empowered and experienced in mung bean cultivation. She hopes to continue to receive these services and is willing to pay for them.

**CASE 03**

Abul Bashar, a 30-year-old rural mung bean farmer from the Dinar village, participated in the SHUFOLA pilot with PAE. He has commercially cultivated mung bean since 2010. mung bean cultivation is very much dependent on weather, and uncertainties from weather events such as drought, rainfall, tidal flow, and cyclones have significant impact on crop cultivation. Access to information, technology, and knowledge on modern mung bean farming has been a challenge for farmers in Barishal, and therefore dissatisfaction with harvest has been common among farmers in this area.

Bashar usually follows traditional methods to cultivate mung bean, but this year he received SMS and voice messages from SHUFOLA during the season. As per the advice of the SHUFOLA messages, Bashar used 200 gm of inoculum (microbial) for his 4 kg of mung bean seeds on 30 decimals of land this year. He noted that the growth of the mung bean plants, and pods have been noticeably better this year, with the plants looking healthier and more robust.

As the region is experiencing drought, Bashar reported that the mung bean plants in his inoculum-treated field withstood the water shortage much better than those of neighboring farmers. In terms of harvest, Bashar received 25 kg of mung bean from his 30 decimals of land. In comparison, he received 8 kg of mung bean from the rest of his 20 decimals of land where he did not use the microbial. He appreciates the value of the advice he received from SHUFOLA.