Integrated Agriculture and Productivity Project

Impact Evaluation Endline Report

DEVELOPMENT IMPACT EVALUATION (DIME)

The World Bank

Funding for this study generously provided by the Global Agriculture and Food Security Program (GAFSP), the South Asian Food and Nutrition Security Initiative (SAFANSI), and the i2i program for impact evaluation. The views expressed do not necessarily reflect the U.K. government's official policies or the policies of the World Bank and its Board of Executive Directors.

Executive Summary

This report presents the endline results of the impact evaluation of the Integrated Agriculture and Productivity Project (IAPP), which studies the effect of IAPP's Technology Adoption component. The focus of this report is results from a randomized control trial of strategies for demonstrating new crops and improved varieties, and therefore most of the presented finding are crop-related outcomes. A second report, currently under preparation, will provide an analysis of the impacts of IAPP on a broader set of outcomes, such as fisheries, livestock, and food security.

The impact evaluation analysis uses baseline data, follow-up data from a survey collected two years after participants started receiving project activities, and endline data from a survey conducted in the final year of the project. This report concentrates on the boro (winter) season, when IAPP crop activities were most intensive.

We find that by the final year of the project, IAPP participant farmers achieved significant productivity gains, a distinct improvement from the midterm results. Farmers in the 'regular' treatment arm have 14% higher paddy yields than farmers in control villages. Efforts to promote improved varieties of seeds seem to be sticking: two years after the distribution of improved seeds, farmers in the 'regular' treatment villages are still significantly more likely to be growing an IAPP-promoted variety of paddy. They are significantly more likely to use compost and the improved technologies for paddy cultivation promoted by IAPP, which likely explains the persistent yield advantage.

In terms of adoption of new crops, we see that farmers with regular demonstrations are more likely than controls to be growing mustard at endline, and farmers in the self-demonstration groups are more likely to be growing both mustard and mung. We do not observe significantly higher rates of adoption of wheat or lentils in any treatment group. There are productivity gains for certain crops: farmers in 'regular' treatment have higher yields for lentil and mung, and farmers in 'shared' treatment have higher yields for wheat and mung. Yields for non-paddy crops, which were lower than expected at midline, are significantly higher at endline, which supports the hypothesis that there is a learning curve for new crops that affects productivity.

Productivity gains in the field are translating to gains for the households as well: total production and net yields are higher (though not statistically significantly so, which is unsurprising given the high level of variance in income data and the relatively small sample size). Farmers are producing significantly more of the crops promoted by IAPP, and farmers in the 'regular' treatment arm are commercializing a greater share of their harvest.

Overall, it is clear that outcomes have significantly improved since the midterm results. In terms of the different demonstration strategies tested, there is no clearly dominant strategy. Regular and shared treatments have greater impacts on productivity, but the self-demonstration leads to more experimentation with new crops. All three strategies should be considered designing future extension policies, depending on the intended objective.

Table of Contents

List of Tables and Figures

Appendix A: List of Tables and Figures, Endline

Appendix B: List of Tables and Figures, Adoption Year

Impact Evaluation Summary

Country Context

Bangladesh has achieved impressive growth and poverty reduction over the last two decades, but still faces many challenges. With a population of 161 million (in 2015), the country's poverty rate is at 31.5%.[1] According to an analysis by the 2010 Household Income and Expenditure Survey (HIES), approximately 41 percent of the population do not get the nutritional requirement of 2,122 kilo-calories per day.[2] At the country-level, 41 percent of children below age 5 are stunted due to chronic malnutrition.[3] However, according to the 2010 poverty assessment, poverty declined 1.8 percentage points every year between 2000 and 2005, and 1.7 percentage points every year between 2005 and 2010. Poverty decline has mainly been due to growth in labor income and change in demographics.

Nutrition, linked to agriculture, is essential for a changing demographic to perform well in the labor market in terms of productivity. Agricultural growth has shown encouraging trends. Starting from a low of around 2 percent in the 1980s, agricultural growth improved only marginally (to about 2.2 percent) in the 1990s but then accelerated sharply and steadily throughout the 2000s to peak at about 5 percent in the late 2000s. Although Bangladesh has increased agricultural productivity over the last few decades, yields are far below potential. The estimated yield gap for paddy corresponds to a potential production increase of 24 percent and 55 percent for the Boro and Aus seasons respectively. [4,5,6]

The government is pushing for increased use of productive technologies and more intensive agricultural practices to improve food security and sustain economic growth. To that end, the Ministry of Agriculture developed the Integrated Agricultural Productivity Project (IAPP), which sponsors research to develop improved crop varieties and promote adoption of improved varieties and production practices through a farmer field school approach (FFS).

[1] http://data.worldbank.org/country/bangladesh

[2] Bangladesh Bureau of Statistics, Ministry of Planning, 2010, "Bangladesh – Household Income and Expenditure Survey 2010."

[3] National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International. 2013. Bangladesh Demographic and Health Survey 2011. Dhaka, Bangladesh and Calverton, Maryland, USA: NIPORT, Mitra and Associates, and ICF International.

[4] The boro (winter) season is from roughly December to March. The aus (spring) season is from roughly march to June.

[5] A.H.M.M. Haque, F.A. Elazegui, M.A. Taher Mia, M.M. Kamal and M. Manjurul Haque. "Increase in rice yield through the use of quality seeds in Bangladesh," African Journal of Agricultural Research Vol. 7(26), pp. 3819-3827, 10 July, 2012. http://www.academicjournals.org/ajar/PDF/pdf2012/10%20Jul/Haque%20et%20al.pdf

[6] Sayed Sarwer Hussain. "Bangladesh, Grain and Feed Annual 2012," USDA Foreign Agricultural Service. http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Dhaka_Bangladesh_2-22-2012.pdf

Integrated Agricultural Productivity Project (IAPP)

IAPP is designed to improve the income and livelihoods of crop, fish, and livestock farmers in Bangladesh. The project started in 2011 and closes in 2016. It consists of four separate components:

1. Component 1: Technology Generation and Adaptation
2. Component 2: Technology Adoption
3. Component 3: Water Management
4. Component 4: Project Management

The project is located in eight districts: four in the south, and four in the north. In all, 375 unions (administrative areas) were selected to receive project activities.

The impact evaluation focuses on IAPP's Component 2 (technology adoption) for crops and fisheries.[7] IAPP's approach to technology adoption is adapted from the farmer field school (FFS) methodology. IAPP works with farmer groups (of around 20 people) to promote new technologies. For two years farmers receive training in the promoted technologies. In the first year of operation, the "demonstration year", IAPP promotes technologies through two main activities. First, a "demonstration farmer" in the group cultivates a promoted variety on a demonstration plot. This farmer is given all necessary inputs (seed, fertilizer, etc.) to grow the crop, along with training on improved production techniques. The rest of the group is trained in the promoted technologies. In the second year, the "adoption year", the rest of the group is encouraged to adopt the promoted technologies. These "adoption farmers" are given seeds, but must purchase other inputs themselves.

The following brief provides results from the endline round of data collection for the IAPP impact evaluation. It builds on an interim report produced in 2015, which shared midterm results (at the conclusion of the adoption year). This brief will focus on gains since the midline, primarily comparing Boro (winter) season 2014-15 (adoption year) and Boro season 2015-16 (endline survey year).[8]

[7] The Technology Adoption component also covers livestock, but this was not a focus for the impact evaluation. Therefore, the conclusions of this report are only generalizable to participants in the crop and fisheries activities of IAPP. IAPP aims to achieve new technology adoption of crops for 175,000 farmers, fisheries for 60,000 farmers, and livestock for 60,000 farmers.

[8] The Demonstration Plot Evaluation was implemented during Boro season, so this brief focus on project impacts in Boro season. However, impact evaluation from midterm survey rounds showed that Boro paddy yields were already quite high, with limited scope for improvement. The project subsequently turned its focus to other seasons (Aus and Amman) as they have more potential for yield increases, and promoted some shorter-duration varieties. The endline survey collected data on all seasons. A forthcoming report of the technology adoption evaluation will examine impacts in Aus and Amman seasons.

Evaluation Questions

The Impact Evaluation (IE) of IAPP contributes to understanding of technology adoption through two lenses. First, the technology adoption component is evaluated using a randomized phase-in of project villages, with a focus on crops and fisheries interventions (referred to as the "technology adoption evaluation"). Second, innovations in technology demonstration are tested through a randomized control trial to understand what approach to demonstration plots delivers best results (referred to as the "demonstration plot evaluation").

The demonstration plot evaluation is designed to test a fundamental question about technology adoption: to what extent can "learning by doing" increase technology adoption over "learning by observing"? It compares the relative effectiveness of single demonstration plots (the standard approach) to more distributed demonstration strategies that allow more people to experiment with new technologies. The demonstration plot evaluation focuses only on crops: adoption of new varieties of existing crops and cultivation of less-common crops.

The main evaluation questions are:

1. Does participation in an IAPP crop group lead to increased technology adoption, improved yields, and/or higher income?
2. Does sharing demonstration packages among many farmers (as opposed to a single farmer) lead to more technology adoption and higher yields?

The first question speaks to a desire to understand whether certain activities in IAPP were successful as planned. The second question seeks to understand whether the technology dissemination strategy promoted by IAPP can be improved upon.

This impact evaluation is led by the World Bank's Development Impact Evaluation Initiative (DIME), the agriculture Global Practice, and the government of Bangladesh's IAPP project implementation unit, in collaboration with external research partners: Yale University and the NGO Innovations for Poverty Action.

Motivation

Bangladesh invests in a large network of agricultural extension providers to increase the productivity of crops, fish, and livestock farmers. Under normal circumstances, local extension workers engage with farmers through scattered demonstration plots and irregular outreach. IAPP provides a more intensive strategy through the farmer field school (FFS) approach, where farmer groups receive bi-weekly courses and within-group technology demonstrations.

The farmer field schools are designed to increase technology adoption and therefore yields among their members and surrounding communities. However, there is little evidence of the effectiveness of this approach. The IAPP evaluation will rigorously evaluate the FFS approach to measure its effectiveness compared to the status quo extension method.

Even within the FFS approach, there are questions on how to best spur technology adoption within groups. In the **(1) standard demonstration plots**, demonstration farmers receive a specified "demonstration package", which is a complete package of seeds, fertilizer, and other inputs needed to effectively cultivate the crop being promoted.[9] The theory of change is that by observing and interacting with the demonstration farmer, other group members will learn about the new production process. Primarily, this is information about the availability of the demonstrated crop and an example of yields *under certain conditions*. However, farmers considering adopting a new farming process cannot tell how yields they observe on the demonstration plot will compare to yields they would get on their own fields due to differences in soil quality, input usage, cultivation knowledge, etc. In fact, it is well documented that yields on farmer's fields in Bangladesh rarely approach yields on demonstration plots.[10]

If demonstration plots do not provide a realistic indication of potential yields from new technologies, this is likely to affect technology adoption. Additionally, it might result in a situation where farmers adopt crops ill-suited to their land, resulting in welfare loss. One way to overcome this problem may be to simply have **(2) more demonstration farmers**: if farmer group members see more of their neighbors successfully growing a new crop,[11] they are more likely to gain accurate information on their chances of success. Further, this allows more members of the farmer group to 'learn by doing', improving the likelihood of their adopting the new crop. Foster and Rosenszweig, in a study on technology adoption during the green revolution in India, found that farmers' own experiences, and that of their neighbors, were important drivers of technology adoption and income.[12]

At the opposite end of the spectrum from traditional demonstration is **(3) complete decentralization**. Under this model, all members of the farmer group are encouraged to cultivate small 'demonstration' plots on their own land, essentially moving from 'learning by observing' to 'learning by doing'. All group members have an opportunity to learn how to cultivate the new crop, and get a more accurate measure of what the yields would be on their own farms. But demonstration plots are costly to support, requiring the project to invest in

---

[9] For example, a standard package for paddy included 16 kg of seeds, enough to cultivate approximately 0.7ha.
[10] Sattar, Shiekh A. "Bridging the Rice Yield Gap in Bangladesh". In Bridging the Rice Yield Gap in the Asia-Pacific Region. By Minas K. Papdemetriou, Frank J. Dent and Edward M. Herath. Food and Agricultural Organization of the United Nations Regional Office for Asia and the Pacific. Bangkok, Thailand. October 2000.
[11] Note that this "new crop" can be thought of as a different crop or simply a new variety of a previously cultivated crop.
[12] Rosenzweig, Mark R. "Learning by Doing and Learning from Others: Human Capital and Technical Change in Agriculture." University of Chicago Press. Journal of Political Economy, Vol. 103, No. 6 (Dec., 1995), pp. 1176-1209

seeds, fertilizer, advice, and other inputs. Given fixed amounts of funding, increasing the number of demonstration farmers requires having smaller plots, potentially giving up on economies of scale. It's not clear what the optimal number of demonstration farmers is. In addition, farmers may need additional incentives to participate in this scheme, given that they are not yet confident that the new crop will be an improvement over their old.

Description of Demonstration Approaches

The demonstration plot evaluation determines which approach to crop demonstration will lead to most farmers adopting improved technologies in the following season. The three different demonstration approaches tested are:

1. **Regular demonstration plots:** The status quo in IAPP. One demonstration farmer is chosen for each type of technology introduced into the group (1-4 crops). These demonstration farmers receive a 'package' of free seeds, fertilizer, and training. The selected farmers cultivate the promoted crop in the first year, and the rest of the group is expected to learn from them. In the second year, all farmers are encouraged to grow the crop. They are offered free seeds, but no inputs or special training.
2. **Shared Demonstration Plots**: Each demonstration 'package' (seeds, fertilizer, and training) is shared by two to four group members. Where possible, the selected farmers create demonstration plots on contiguous patches of land (see figure 1 for a schematic). They are encouraged to work together to capture economies of scale. As in the demonstration plot intervention, demonstration farmers receive free seeds, free inputs, and training, but these resources are spread over more farmers.

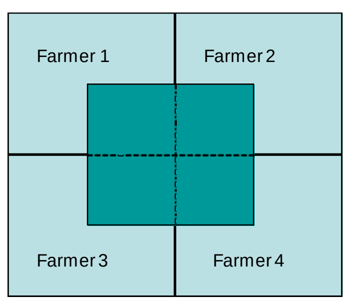


Figure A 1: Shared Demonstration Plot – Dark green represents shared area of technology demonstration

3. **Incentives for self-demonstration:** All members of the farmer field group are offered the opportunity to grow the promoted variety in the first year. Each demonstration 'package' is shared by all farmers who wish to participate. In the first year, farmers are encouraged to grow the new crop on a small parcel to test it out. Farmers who agree to do so receive an additional guarantee: if the promoted variety does not perform as well as the old variety, they receive a small cash payment of Bangladeshi taka 1000 ($12.3).

The primary purpose of this payment is to signal to the farmers that the extension providers are confident that the new seed will outperform the old. To see whether the payment should be given out, the research team identified reference farms in each village at the beginning of the season that grew traditional varieties of the promoted crop. If output on the reference farm is higher than output of the promoted variety, the farmer receives his small payment.[13] These payments were made by DIME's research partner, the NGO Innovations for Poverty Action (IPA) using their core research funding.

Evaluation Design

The demonstration plot evaluation is a randomized control trial concentrated in two districts, Rangpur and Barisal. Within these districts, 220 villages took part in the evaluation. The demonstration plot evaluation in Rangpur was conducted only for Paddy. In Barisal, it was conducted for paddy, wheat, mung, lentil, mustard, and sesame.

The villages were randomly allocated into five treatment arms:

1. **Long-term control (20 villages)**: IAPP activities begin in 2016. Until then, villages receive standard normal services from the government.
2. **Short-term control (36 villages)**: IAPP activities began in 2014 (all with standard demonstration approach). Until then, villages received normal extension services from the government.
3. **Regular demonstration plots (54 villages):** IAPP project activities started in 2012. All villages have the standard demonstration approach.
4. **Shared demonstration plots (56 villages):** IAPP activities began in 2012. All villages have demonstration plots shared among multiple farmers, as described above.
5. **Incentives for self-demonstration (54 villages):** IAPP activities began in 2012. Instead of demonstration plots, all farmer group members were offered incentives to adopt the new crop variety, as described above.

The short-term and medium-term impact of the various treatment arms on variables of interest is captured by comparing outcomes for each treatment group with the control groups. Data was collected before and after the project was rolled out in the short-term control villages in 2014; analysis was provided in the form of preliminary and interim reports. The final round of data collection was done in 2015, comparing each treatment group to the long-term control group to assess long-term impacts. This endline report focuses on the final IE analysis. The midterm analysis includes both short- and long-term controls. The endline analysis includes

[13] Measurement was done during the seeding phase, which gives a good prediction of the harvest, and was conducted by IPA under DIME supervision. For data analysis purposes, yields are measured post-harvest using household surveys. Since the surveys are not tied to the payouts, there should be no incentive to misreport. Additionally, farmers have to sign contracts saying they will cultivate the new crop to the best of their abilities, and this is monitored by the FFS. To the extent that it is observable, farmers will not be able to receive a payout if they purposefully try to obtain poor yields on their demo plots.

only long-term controls, as the short-term controls began IAPP activities shortly after the midline was completed.

Data and Sampling

The impact evaluation draws on data from four rounds of household surveys, and administrative data on group membership and demonstration status. The household surveys contain detailed data on household characteristics, agricultural production, livestock, fisheries, household socioeconomic status, and nutrition outcomes.

For the analysis in this report, we use a panel dataset constructed from three rounds of household surveys: baseline (2012), midline round 2 (2014), and endline (2015).[14] The sample is restricted to the 1,732 unique households present in each of the three survey rounds, in Barisal and Rangpur districts. Details on the complete sampling strategy are included in the appendix.

We use the concept of "shadow" demonstration villages and farmers for much of the analysis. A control village was considered a shadow demonstration village for a certain crop if local agricultural officials stated that the village would demonstrate this crop when they began IAPP activities. Similarly, we designated "shadow" demonstration farmers in each control group; these were farmer groups most likely to demonstrate when IAPP began in their village.

Table 1 shows the allocation of the sample across treatment arms.

Table 1: Data Sample

Survey Round		Total	Control	Regular Treatment	Shared Plot Treatment	Incentives Treatment
Baseline	Households	1732	220	830	349	333
	Villages	102	14	46	21	21
Adoption Year (midline round 2)	Households	1732	220	830	349	333
	Villages	102	14	46	21	21
Endline	Households	1732	220	830	349	333
	Villages	102	14	46	21	21

Interpreting Charts

In the charts that follow, we compare outcomes in our three treatment groups to those in the control group. While presented as comparisons of means, the graphs are actually based on the results of regressions. The regression specifications are explained in detail for each regression in the appendix, but in general they are ANCOVA regressions, including all three treatment

[14] A midline round 1 survey was done in 2013, however, the scope and sample were more limited, as it focused specifically on the activities of the assigned demonstration farmers.

dummies and baseline value of the dependent variable as independent variables. The regressions also include district fixed effects; standard errors are clustered at the village level.

In the charts, the leftmost column of each cluster is the measured value of the mean of the outcome variable in the control group. Additional columns represent the treatment effect for treatment groups, and are constructed by adding the estimated treatment effect to the control mean. The height of the bar is near the actual mean of the outcome variable for the treatment group, but will be slightly different due to the controls in the regression.

The bars represent the 95 percent confidence interval of the treatment effect. When control mean is outside of the error bars, this means that the treatment effect is greater than zero with at least 95 percent statistical confidence. Confidence of treatment effects is also represented with stars. One, two, and three stars mean the treatment effect is statistically different from zero with 90 percent, 95 percent, or 99 percent confidence respectively.

For each chart there is a corresponding regression table in the appendix section. The number referencing of these tables can be found in the 'Notes' section of each chart. Appendix A and B list the tables for endline and midline round 2 survey years, respectively.[15] The discussion of each chart is supplemented by a comparison of means from endline and adoption survey years provided in relevant tables in Appendix A and B.

The demonstration plot evaluation was conducted on paddy in Rangpur and Barisal, and for the other IAPP promoted crops (wheat, mung, lentil, mustard and sesame) in Barisal only. Any chart analyzing the demonstration plot evaluation for paddy includes both Barisal and Rangpur; and for other crops only include Barisal.

[15] Note that results from the midline survey were shared in the 2015 brief. They are recalculated here for exactly the same sample as used in the endline analysis.

Impact Evaluation Findings

Agricultural productivity

As the primary development objective of IAPP is to enhance agricultural productivity, the first focus of the analysis is on crop yields. We collected detailed household survey data on agricultural production (self-reported), disaggregated by crop and by plot. The analysis shows that **IAPP achieved significant yield gains for paddy, wheat, lentil and mung.** We do not observe a positive impact for mustard, but adoption in the control areas is very low, and so we interpret all mustard results cautiously.

In calculating IAPP crop yields, we restrict to mono-cropped plots. Table 2 shows the share of mono-cropped plots, by crop. We see that for the primary crops considered for the analysis - paddy, wheat, lentil, and mung – most are mono-cropped.

Table 2: Share of mono-cropped plots, by crop

Crop	Mean	St. Dev.	Min	Max	N
Paddy	0.997	0.044	0	1	1002
Wheat	0.989	0.107	0	1	261
Lentil	0.903	0.286	0	1	298
Mung	0.945	0.219	0	1	407
Mustard	0.785	0.407	0	1	233
Sesame	0.734	0.445	0	1	64

Paddy yields

The main crop grown by IAPP participants is paddy, and improving paddy yields is a main goal of IAPP. We first look whether project activities increased paddy yields for treatment groups during Boro season at the time of the endline survey, and then check how average paddy yields for the various treatment arms in endline compare to adoption year.

Figure 1 shows the effect of project activities on rice yields for all treatment groups. We find a **significant increase in yield for paddy in the regular treatment group, an increase of approximately 14% compared to the control group**. At midline, we observed yields in the regular treatment arm 6% above the control, so the endline shows the **yield gains attributable to IAPP are persistent and in fact increasing over time**.

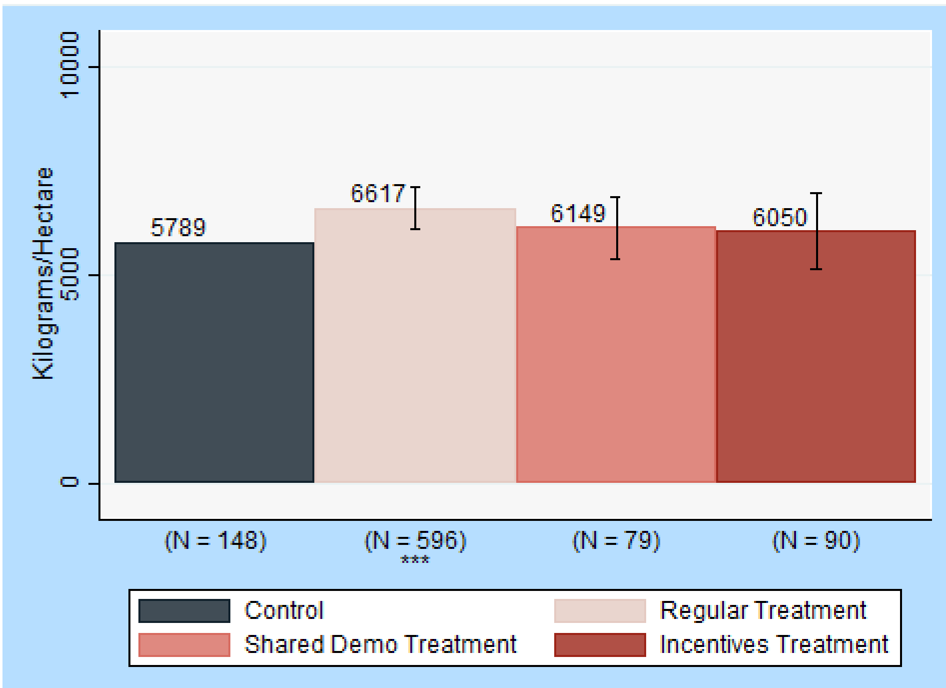
The 'regular' demonstration treatment outperforms both shared and incentives treatments, neither of which significantly increase paddy yields compared to the control at endline. Examining progress from midline to endline, we see that yields stayed fairly constant in the control group (increasing less than 2%), but increased for all treatment arms.[16]

[16] For mean comparison, please refer to Appendix A – Table 1, and Appendix B – Table 1.

Yields for other IAPP crops

Appendix A Table 1 includes yields for five other crops promoted by IAPP: wheat, mung, lentil, mustard, and sesame. **IAPP had a large positive impact on yields for lentils and mung for farmers in the 'regular' treatment arm:** lentil yields were more than two-thirds higher than farmers in the control villages, and mung yields were 28% higher**.** The 'shared demo' treatment increased yields for mung as well, and also for wheat: wheat yields were one-quarter higher than in control villages.

Figure 1: Paddy Yields for Different Treatments, Endline Survey Year, All Farmers



Notes: This figure shows the difference in paddy yields between control and the three treatment groups, for the Boro season 2015-16 (the endline survey year). Included in the regressions are all villages in treatment groups where paddy was demonstrated, as well as control villages where district officials stated paddy would be demonstrated there once they begin IAPP. Only villages in the districts of Rangpur and Barisal are included. Only farmers who harvested paddy during the Boro season are included, and yield is calculated only for mono-cropped plots. This figure corresponds to appendix A - table 1.

Adoption of Crops and Varieties Promoted by IAPP

We next examine whether participants were more likely to adopt the crops and varieties promoted by IAPP, focusing on paddy, wheat, mung, lentil, mustard, and sesame. Overall, we find that IAPP caused statistically significant increases in the adoption of promoted varieties of paddy, and cultivation of mung and mustard.

Paddy

In Figure 2 we focus on regular treatment groups, and explore adoption of IAPP-promoted varieties over time. The outcome variables are a yes/no indicator for whether farmers adopt any paddy variety promoted by IAPP, and a yes/no indicator for whether farmers adopt the specific variety demonstrated in their village. [17] In all cases, we consider farmers to have adopted a variety if they use any of that variety on any of their plots.[18] At baseline, 68% of farmers in control villages cultivated IAPP-promoted varieties, and adoption was not significantly higher in any of the treatment villages. At the end of the adoption year, we observed that **IAPP had a significant, positive impact on adoption of the promoted paddy varieties in the regular treatment group** compared to control group; farmers who were provided with seeds ("adoption farmers") were 19 p.p. more likely to adopt. The endline data shows the adoption gap was fully sustained in subsequent years, when farmers were responsible for procuring their own inputs.

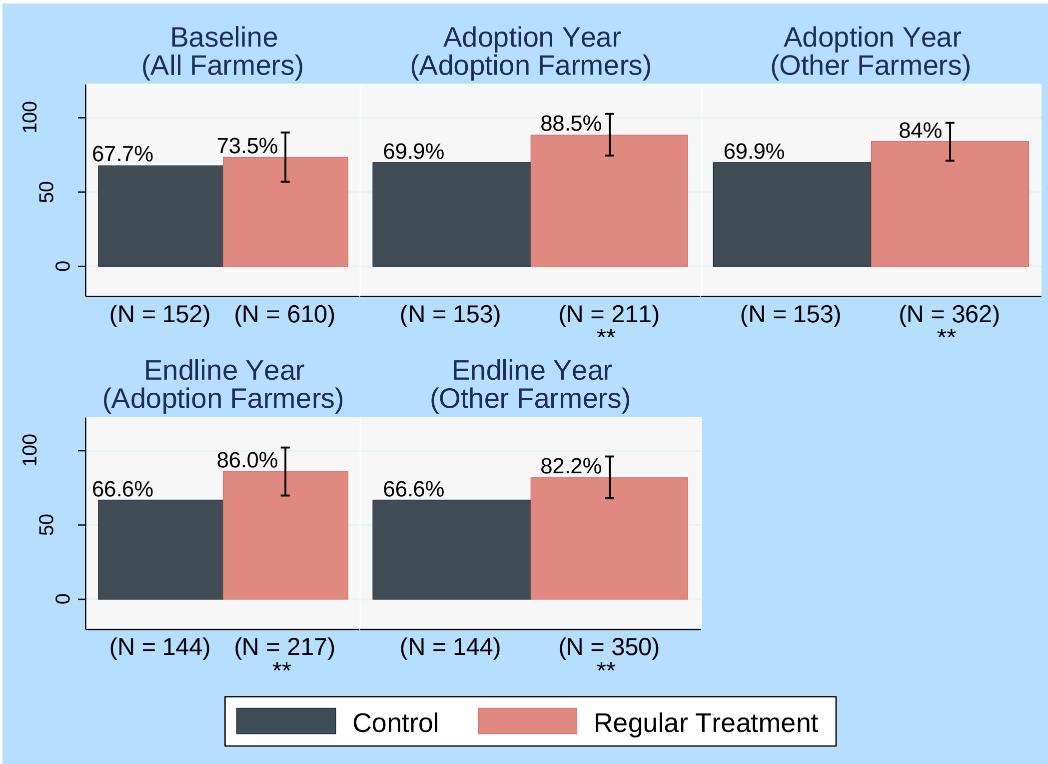
We observe significantly higher use of IAPP varieties at endline by both adoption farmers (farmers that received seeds in year 2 of the project) and other farmers in the regular treatment group (approximately 19 p.p. and 16 p.p. more than control group, respectively). Overall, this provides evidence that **IAPP's approach effectively spurred adoption of paddy varieties, those effects spilled over to other farmers over time, and adoption gains persisted through endline.**

---

[17] While farmers were encouraged to demonstrate the exact IAPP variety demonstrated in their village, in practice this variety was sometimes not available or was no longer recommended by IAPP.

[18] Differences in the variety promoted from that demonstrated are detailed in the "IAPP Adoption Distribution Monitoring Report 2014", prepared by DIME.

Figure 2: Paddy Adoption (of any IAPP Variety) Over Time, Regular Demonstration Treatment, Endline Survey



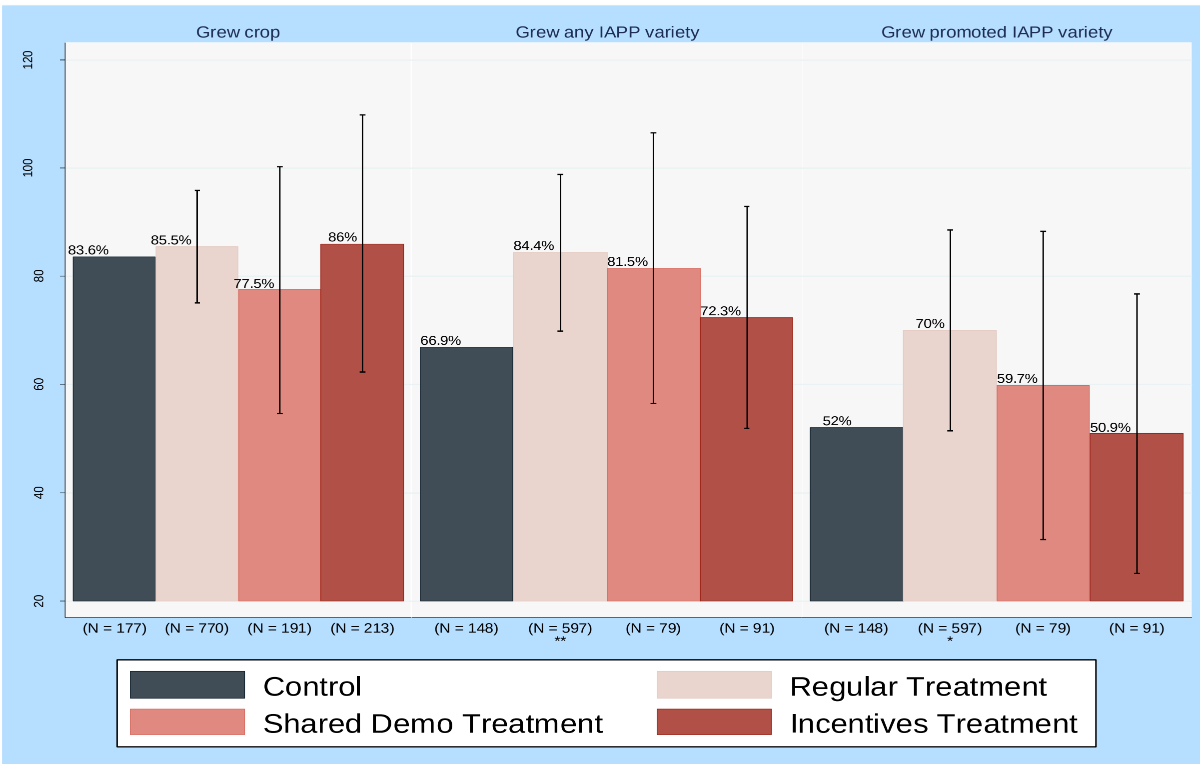
Notes: This figure shows adoption of IAPP-promoted varieties of paddy at baseline, during the adoption year (midline), and during the endline survey year. Results are for Boro season in each period. Households are considered to adopt an IAPP variety if they cultivate any IAPP variety. We include all farmers that grew any paddy, who are either in paddy demonstration villages or in shadow paddy demonstration villages. Adoption farmers are farmers that received inputs from the project during the adoption year. Adoption farmers and other farmers are compared against the same controls. This figure corresponds to appendix A - table 2. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

In Figure 3, we consider adoption of paddy in the three treatment groups at the endline. First, we explore whether farmers are more likely to grow paddy at all. For a commonly-grown crop like paddy, we do not expect to see much effect for this measure, but we include it for comparison as this is the primary indicator for the other, less commonly grown, crops. Second, we analyze whether farmers adopt any variety of paddy promoted by IAPP. Finally, we look at whether farmers adopt the exact variety of paddy that was demonstrated in their villages. Note that all variety measures are self-reported, and therefore will contain error, so we interpret the variety-specific results with caution.

Two-thirds of farmers already cultivated paddy at baseline, and, as expected, we do not find that IAPP had a significant impact on the likelihood of cultivating paddy. However, when we look at cultivation of the specific varieties promoted by IAPP, we see that **all farmers**

participating in IAPP are more likely to report cultivating any IAPP variety of paddy than control groups, with this difference being significant in the regular treatment group (an 18 p.p. increase compared to the control group). Moreover, these farmers are typically cultivating the exact variety of paddy demonstrated in their village.

Figure 3: Adoption for Paddy at Endline, by Treatment Group



Notes: This figure shows adoption of IAPP varieties of paddy during the Boro 2015-16 season. Households are considered to adopt a specific crop/variety if they grow any of that crop/variety. The leftmost set of columns shows adoption of paddy, with the regression restricted to treatment villages where paddy was demonstrated, as well as control villages where district officials stated paddy would be demonstrated there once they begin IAPP. The center and rightmost set of columns are restricted to the same demonstrations, but only for households that cultivated paddy. The center column shows adoption of any IAPP variety of paddy, while the rightmost column shows adoption of the exact variety of paddy that was demonstrated in the village. Only villages in the districts of Rangpur and Barisal are included. This figure corresponds to appendix table 3. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

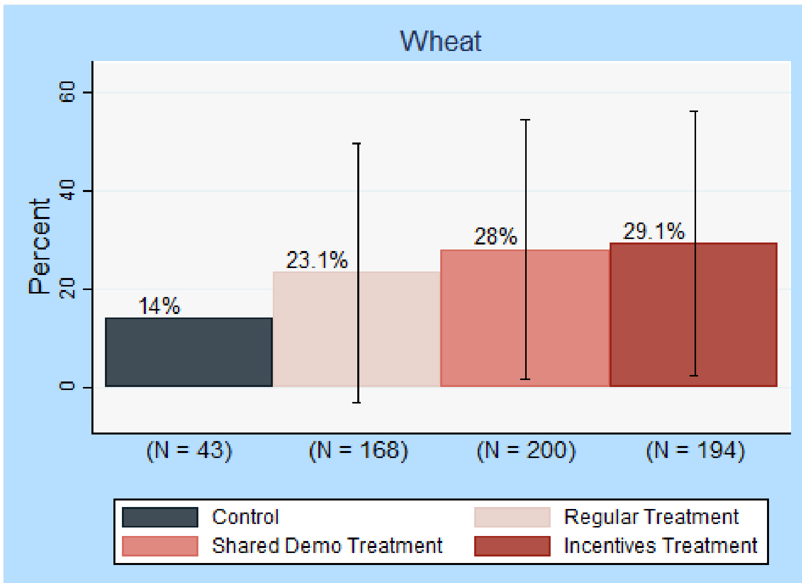
Mung

Adoption of mung has been high (above 80%) among control group farmers since baseline, as shown in Appendix A Table 3. The treatment group doesn't show any significant increase in adoption over the control group in any survey year. Interestingly, when comparing to treatment group farmers in baseline, both the treatment 'adoption farmers' and 'other farmers' show an increase in adoption in following survey rounds. Even stronger is the increase in mung adoption among 'adoption farmers' from adoption year to endline, roughly 35 p.p. This indicates that IAPP has been effective in directing farmers to the benefits of considering new crops.

Wheat

In Figure 4, we consider wheat adoption across all three treatment groups. **Adoption of wheat is higher in the regular, shared and incentives treatment groups than control group, but none of the differences are significant**. Overall, we observe that adoption of wheat has been increasing for all groups, including the control, in every survey round since the baseline. Gains for the treatment group tend to be higher, but improvements in the control do not allow attribution of wheat adoption to IAPP.

Figure 4: Adoption of Wheat in Different Treatment Groups, Endline Survey Year

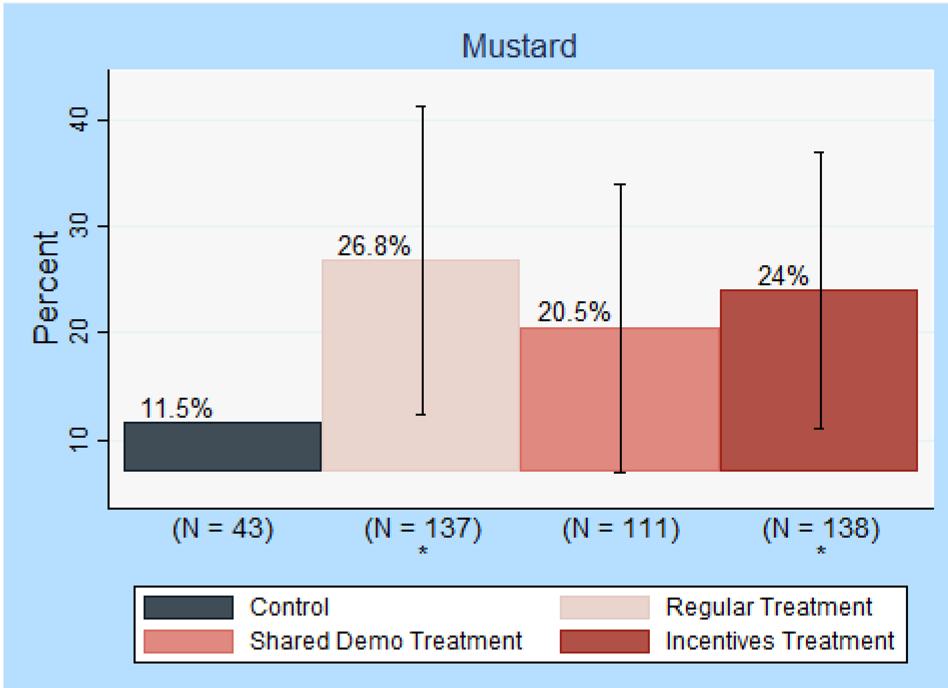


Notes: This figure shows adoption of wheat during the Boro 2015-16 season, restricted to Barisal district. Households are considered to adopt a specific crop/variety if they grow any of that crop/variety. The regression is restricted to treatment villages where wheat was demonstrated, as well as control villages where district officials stated wheat would be demonstrated once they begin IAPP. This figure corresponds to appendix table 3. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Mustard

Figure 5 shows adoption for mustard. **We observe large increases in adoption of mustard compared to the control, ranging from 107% increase in self-demonstration villages to a 131% increase in regular treatment villages.** The shared plot treatment villages also see large gains, but the sample is small and differences are not statistically significant.

Figure 5: Adoption of Mustard, Endline



Notes: This figure shows adoption of mustard during the Boro 2015-16 season, restricted to Barisal district. Households are considered to adopt a specific crop/variety if they grow any of that crop/variety. The regression is restricted to treatment villages where wheat was demonstrated, as well as control villages where district officials stated wheat would be demonstrated once they begin IAPP. This figure corresponds to appendix table 3. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Lentil

As with wheat, we see that cultivation of lentils is more common in all the treatment villages than the control villages, but the differences are not statistically significant. Adoption statistics are found in Appendix A Table 3.

Use of Improved Inputs and Technologies

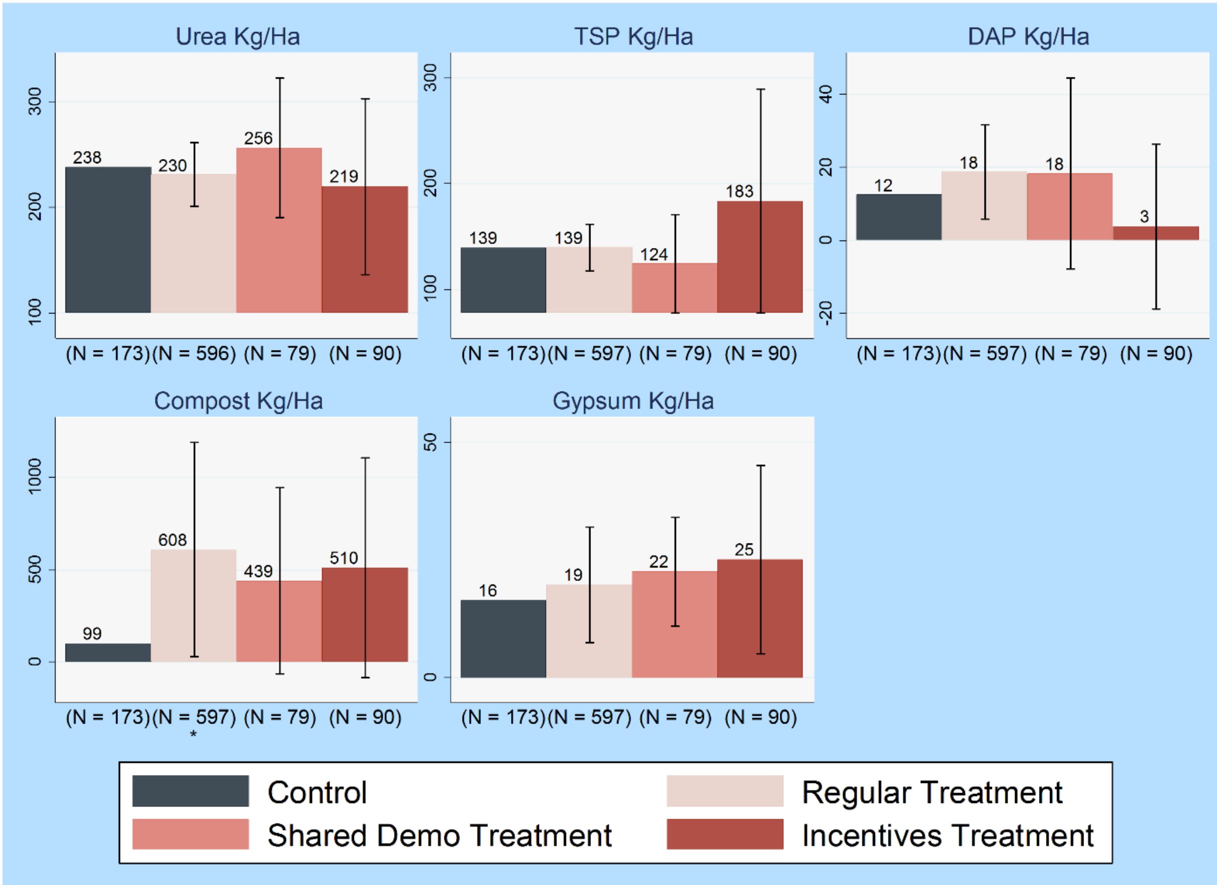
To better understand the drivers of the agricultural productivity gains, in this section we explore use of inputs and improved technologies. First, we look at correlations between input use and crop yields to get a basic idea of whether increases in any input from the average farmer are likely to impact yield.[19] The details of this analysis are in Appendix A Table 8. We separate the analysis by crop, and see that different combinations of inputs correlate with higher yields for the various IAPP crops.

For paddy, use of urea and new seeds is correlated with higher yields, while other soil additives had insignificant or even negative correlations. Utilizing paid labor and irrigation also correlates with higher paddy yields. For wheat, only use of TSP is correlated with higher yields. For lentil, usage of TSP and DAP is correlated with higher yields, as are utilizing labor and irrigation. For mung, use of MOP and manure are associated with higher yields, as are paid labor and irrigation. For mustard, use of vitamins and irrigation correlate with higher yields. We interpret these correlations cautiously; it is possible some inputs are negatively correlated with yields because they are applied on less fertile plots, but we do not have a way to control for soil quality. We do not observe significant positive correlations between use of the technologies introduced by IAPP (line planting, vermicomposting, and double transplantation) and yield gains.

Next, we analyze the use of various fertilizers in treatment groups compared to control groups. The focus is on paddy, as it is the most widely adopted crop and thus provides sufficient observations for analysis of use of specific types of inputs and technologies. Results are shown in Figure 6. We see that use of urea, TSP, DAP, and gypsum inputs are not statistically different in treatment groups compared to control. Treatment groups are significantly more likely to use fresh seeds, and use more compost (with the difference only being significant for the regular treatment group compared to the control). When comparing the use of fertilizers in endline to adoption year, fertilizer usage has dropped in endline year for each of urea, TSP, DAP, and gypsum. Only for compost has usage increased at endline.

[19] We do not report on whether farmers are using the “correct” amount of input, as that is not easily captured without a detailed model of plant growth and will vary across villages.

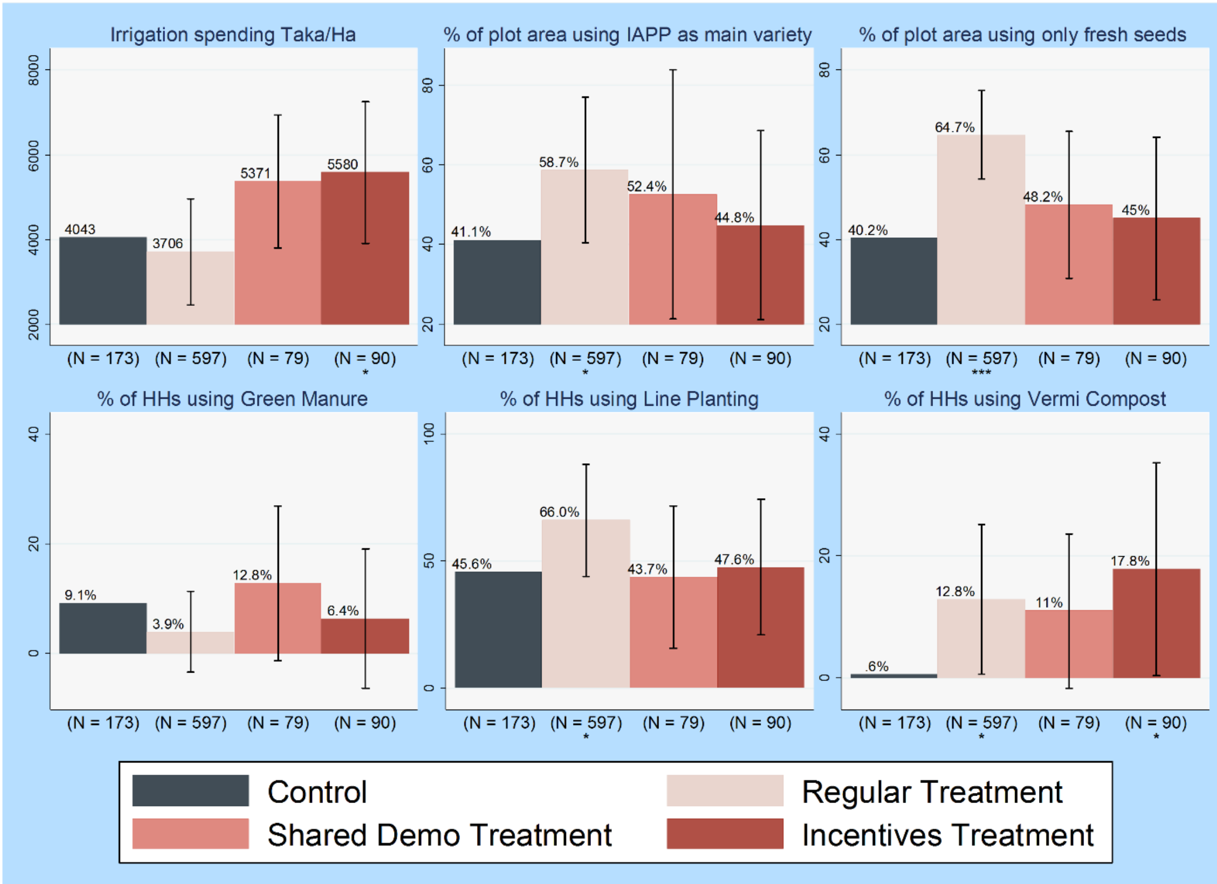
Figure 6: Fertilizer Use for Paddy, Endline Survey Year



Notes: This figure details input use for plots that cultivated paddy during the Boro 2015-16 season. The sample is all households that cultivate paddy and are located in paddy demonstration villages (or shadow demonstration villages). Although, only villages in the districts of Rangpur and Barisal are included. The unit is the amount of input use (in kg) per hectare. Households that cultivate paddy but did not report use of an input are included in the analysis, with their use of the input set to zero. Households that only reported use of input in a unit not convertible to kg are not included in the regression. This figure corresponds to appendix table 4. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

In Figure 7, and Appendix A Table 7, we examine use of technologies promoted by IAPP. We find that 'regular' treatment groups are significantly more likely to use IPM, vermi-compost, and the alternative wet/dry method for paddy, than farmers in control groups. Farmers in the self-demonstration treatment are also significantly more likely to use vermi-compost. Overall, when comparing input usage between endline and adoption year, generally technology usage drops in endline year (except for use of fresh seeds), which raises the concern that technology adoption gains may not be sustained.

Figure 7: Technology use for Paddy, Endline Survey Year



Notes: This figure details technology use for plots mono-cropped with paddy during the Boro 2015-16 season. The sample is all households that cultivate paddy plots and are located in paddy demonstration villages (or shadow demonstration villages). Although, only villages in the districts of Rangpur and Barisal are included. The plot share variables are measured as the percentage of area cultivating paddy that uses IAPP/fresh seeds. The remaining variables are dummy variables that take the value of 1 if the household used the technology. This figure corresponds to appendix table 4. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Additional Harvest Outcomes

This section explores the effect of IAPP on harvest outcomes aggregated across crops. This is important because IAPP may cause farmers to switch crops, and the effects of this change will not be captured by studying each crop separately. To do this, each crop is assigned a price based on the median reported selling price in its region,[20] and the value of harvest is calculated for each household by summing the harvested value of all of their crops grown during the Boro season. While the price does not include all potential benefits and risks of growing a certain crop, using the price allows us to analyze whether farmers are moving to more valuable crop mixes.

Figure 8 shows the difference between control and treatment groups for the total harvest value, net yield (in Bangladeshi taka/ha)[21], total earnings from crop sales (in Bangladeshi taka), and commercialization (earnings as a % of total production). **We observe that IAPP participants have higher harvest values, yields, commercialization, and earnings than farmers in the control group, though high levels of variance in the data mean that only the difference in share of harvest commercialized is statistically significant.** Commercialization increases by 8 p.p. for farmers in the regular treatment, a 20% gain over the control.

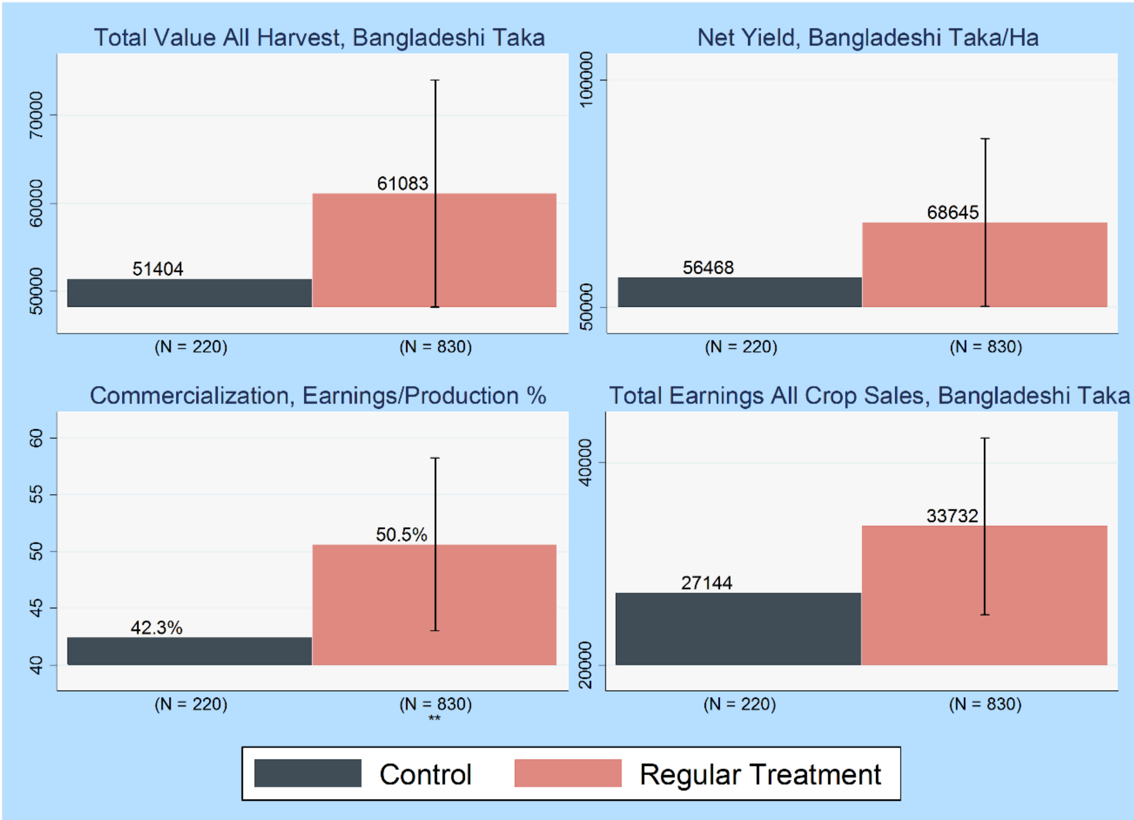
Appendix A Table 5 includes the details for these and related outcomes. We see that farmers in the regular treatment groups are earning more from the specific crops promoted by IAPP. The difference is statistically significant and economically meaningful: value of production of these crops is nearly 30% higher compared to the control.

In addition to the gains relative to the control group, we also note that these indicators are improving for the regular treatment group over time. Total value of IAPP harvest, total values of all crop earnings, and commercialization increasing all are higher in the endline compared to the adoption year. **This provides strong evidence that by endline, IAPP farmers have shifted to a more profitable crop mix.**

[20] Districts in the north and south of the project area have separate prices.

[21] Net yields in this calculation do not include shadow cost of household labor.

Figure 8: Outcomes for All Crops, Endline Survey Year

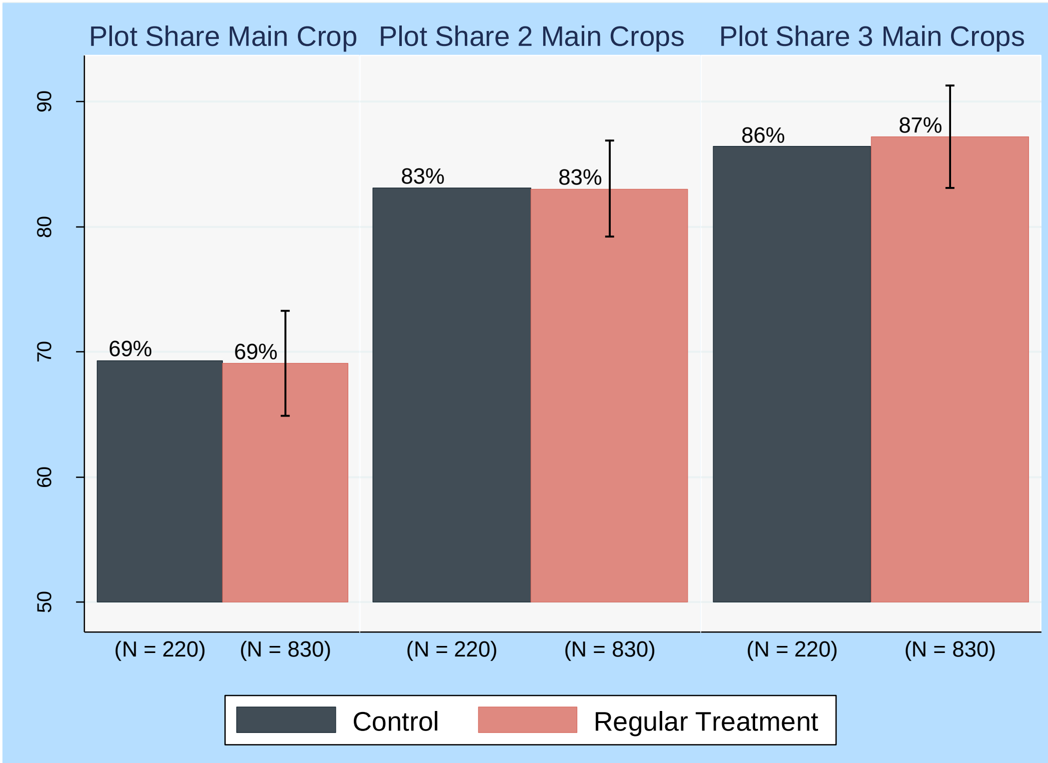


Notes: This figure shows changes in yields, harvest value, and total earnings. Total harvest value (in Bangladeshi taka; 1 Taka is equal to about .013 USD at the time of writing the report) is calculated by multiplying the harvest amount of each crop by the median price in the region for that crop. Net yield (in Bangladeshi taka/ha) is the total harvest value minus input costs (including labor) per hectare. Commercialization is calculated as the total earnings divided by the total production and is a measure on how much a household produces for its own production and for economic return. Total earnings (in Bangladeshi taka) is the amount made from selling crops. This figure corresponds to appendix table 5. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Crop Mix

As seen in the previous section, total harvest value, earnings, and commercialization increase in the treatment groups, and this is likely due to changing the crop mix. First, we look at whether crop diversification increases, which can have positive effects on soil health and resilience (neither of which we measure directly as part of this study). We find that the average number of crops grown at endline is significantly higher for both the regular and self-demonstration treatments (see Appendix A Table 7). As shown in Figure 9, however, farmers are not changing the share of land dedicated to their primary crops, implying that they are trialing new crops on smaller areas of land.

Figure 9: Diversification, Endline Survey Year



Notes: This table presents three measures of diversification in Boro season 2015-2016. The first set of columns shows the percentage of all cultivated land within a household dedicated to the mono crop with the highest percentage of cultivated land. If a household cultivates only one crop, this measure is 100 percent. The second and third set of columns repeats this analysis for the top two and three most cultivated crops in the household. All estimates come from and ANCOVA regression. This figure corresponds to appendix table 7. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Next, we analyze changes in crop composition by considering the share of a farmer's field dedicated to each crop. To find the effect of IAPP on crop mix, we look at the differences in the share of land dedicated to each crop across our treatment groups. This measure includes all respondents (even those who don't grow a specific crop), so it should reflect both the intensive and extensive margins of changing the crop mix.

Appendix A – Table 6 shows the differences for the six main IAPP crops (paddy, wheat, mung, mustard, lentil, and sesame). We see that cultivation of all IAPP crops increases for the regular treatment group, compared to the control. However, the gain is only statistically significant for mustard, and results are more mixed for the shared plot and self-demonstration treatments. At midline, we saw significantly higher shares of wheat in the treatment groups, but observe that by endline the control group has increased wheat production enough to make that gap no longer statistically significant.

The analysis implies that farmers in endline are shifting to mustard, compared to other IAPP crops. When looking at the median prices, mustard is priced around 18 -20 BG Taka/kg higher than wheat, and farmers spend more paid and unpaid labor days on wheat than mustard in adoption year, so the shift towards mustard contributes to the increase in profitability observed in the previous section.[22]

Table 3 lists the different crops promoted by IAPP, along with their median harvest value per hectare. We calculate three measures of yield. Gross yield is the total value of harvested crops (in Bangladeshi taka) per hectare. Net yield is the total value of crops harvested minus the amount spent on inputs for that crop, but not accounting for unpaid (including household) labor. Net yield (including unpaid labor) also accounts for unpaid labor by assigning a price to this labor based on the shadow cost of the agricultural labor market, which is estimated at Bangladeshi taka 200 /day. This estimate is the median reported value of daily wages in the survey, but is likely an overestimate of the actual opportunity cost of household labor, since casual agricultural work is frequently unavailable. The table shows that in general paddy provides the most value per hectare, both gross and net.

Table 3: Harvest Values of Different Crops, Endline Survey

Crop	Region	Median Yield (Kg/Ha)	Median Sales Price (BG Taka/Kg)	Median Gross Yield (BG Taka/Ha)	Median Net Yield (BG Taka/Ha)	Median Net Yield Including Opportunity Cost Of Unpaid Labor (BG Taka / Ha)	Median Total Labor Days (days / Ha)	Number Of Households Growing Crop
Paddy	North	6525	15	114187	70555	54383	139	639
	South	6920	17.5	103806	62523	44948	135	362
Wheat	North	3955	22.5	79090	54101	38265	103	83
	South	2397	20	53925	29066	9157	99	175
Lentil	North	1607	53.3	85681	82530	49905	163	1
	South	786	53.3	41942	32680	15571	87	272
Mung	North	528	60	31698	12082	-19882	157	4
	South	744	60	44661	38051	20285	87	384
Mustard	North	1412	40	47078	32551	20563	72	85
	South	989	40	39545	25704	4123	87	100

Notes: This table presents the median harvest value for the main IAPP crops in Boro season 2015-16, for the full sample (all treatment groups and control). The harvest value is calculated by multiplying the yield in Kg/Ha by crop price. Prices are calculated based on median reported sales prices in our survey data when the sample is large enough, while prices from other regions are used if small sample sizes. Prices are reported in Bangladeshi Taka (1 Taka = .013 USD at the time of writing). The median net yields are the harvest value minus cost of inputs, divided by plot size for that crop. The second median net yield includes the opportunity cost of paid labor. The opportunity cost of labor (200 Bangladeshi taka per day) is the median price for paid labor reported by the HHs during adoption year. This is most likely an overestimation; it is not certain members of the HH would get that wage if they worked for pay instead of on their farms. This helps explain the negative values in median net yield that include opportunity cost for unpaid labor. Labor days per hectare includes all labor days spent from planting to post-harvest processing and includes paid labor as well as all types of unpaid HH labor (male, female, and child labor days).

[22] Refer to Table 2 for endline year results. Also, refer to Appendix B – Table 8 for adoption year results.

Appendix A

Sampling

The Baseline Household Survey was implemented in all eight project districts: Rangpur, Kurigram, Nilfamari, and Lalmonirhat districts in the North and Barisal, Patuakhali, Barguna, and Jhalokathi districts in the South.

Two districts (Rangpur and Barisal) are included in the demonstration plots evaluation. 110 villages were sampled in each district. The baseline survey was conducted concurrently with the IAPP group formation (for the DPE districts, the baseline occurred just before group formation). Of the total IAPP group members, 15 were randomly selected for the baseline survey.[23] The sample is representative of farmers who were eligible for participation in IAPP and were part of the initial IAPP group formation.

Specification Details

The regression specification used for all results is an ANCOVA specification, described by the following equation:

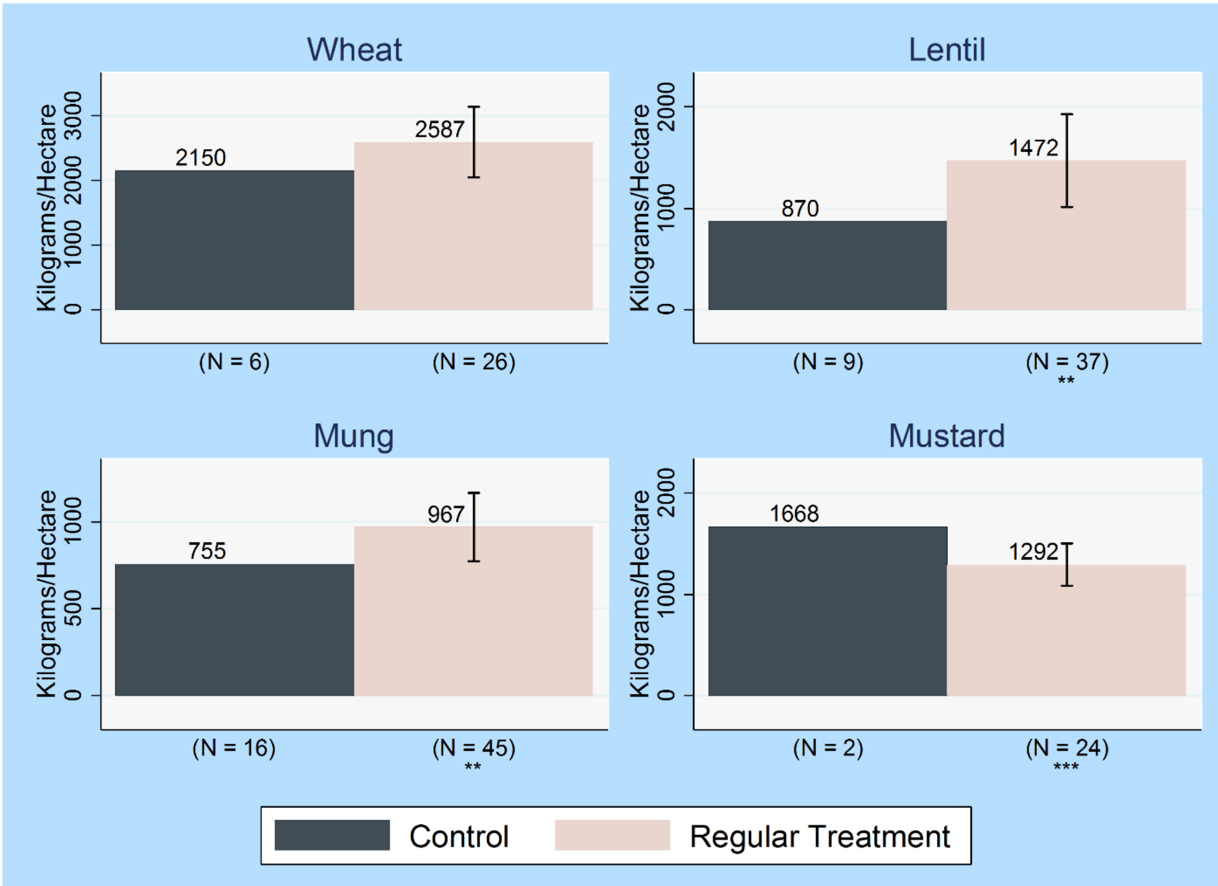
$$Outcome_{i,t} = \alpha + \beta_1 Treat_i + \beta_2 Outcome_{i,t-1} + \beta_3 Controls + \varepsilon_{i,t}$$

The control variables consist of dummies signifying whether baseline data was unavailable and a set of district dummies. If the observation did not have a valid measure of outcome variable at time t-1, the lagged outcome is set to zero (and its effect on the outcome is absorbed by a dummy). The error term is assumed to be correlated across villages but otherwise iid, so the specifications cluster standard errors at the village level.

[23]A miscommunication led to sampling the wrong farmer group (a group that had previously existed, not the new group formed by IAPP) in eight treatment villages and 12 control DPE villages. These villages were dropped for the purpose of the baseline analysis. However, the sample was redrawn during follow-up surveys.

KG Yields

Appendix A - Figure 1: Yield All Crops (Kg/Ha), Endline Survey Year



Notes: This figure corresponds to appendix table 1 and shows the difference in crop-specific yields between control and the regular treatment group, for the Boro season 2015-16 (endline survey year). All specifications are ANCOVA. Included in the regressions are all villages in regular treatment where paddy was demonstrated, as well as control villages where district officials stated paddy would be demonstrated once they begin IAPP. Only farmers who harvested the crop during the Boro season are included, and yield is calculated only for mono-cropped plots. Villages in Barisal district are included. Only Lentil yield for regular treatment group is significantly different than the control group.

Appendix A - Table 1: Crop Specific Yield (Kg/Ha) – IAPP Crops, Endline Survey Year

	Yield (Kilograms per Hectare)				
	Paddy	Wheat	Lentil	Mung	Mustard
Regular Treatment	827.2***	436.9	602.5**	211.9**	-375.8***
	[268.21]	[279.29]	[233.99]	[100.08]	[107.23]
Shared Demo Treatment	360.2	560.2*	-109.3	295.4**	-66.87
	[385.67]	[301.35]	[92.72]	[140.65]	[279.57]
Incentives Treatment	261.1	465.2	144	87.49	-363.0**
	[463.62]	[277.27]	[113.77]	[121.41]	[154.11]
Lag of Dependent Variable	0.133***	0.0146	0.321**	0.00939	-0.175
	[0.04]	[0.18]	[0.14]	[0.10]	[0.20]
Baseline Mean	5756.8	2374.2	618.6	543.1	1239.5
Baseline Number of Observations	852	12	60	86	10
Control Mean	5789.8	2151	870	755.6	1668.3
Control Number of Observations	148	6	9	16	2
Control Standard Deviation	1324.6	1164.4	429.7	409.3	262.2
Total Number of Observations	913	127	127	220	62

Notes: These results correspond to figure 1 in the main text, and figure 1 in the appendix. Yield calculations included mono-cropped plots only. All regressions are ANCOVAs and only households in villages where the respective crop was demonstrated (treatment) or shadow demonstrated (control) and actually grew the crop during the endline survey year are included in the sample. All regressions contain fixed effect for districts, and standard errors are clustered at village level. In some cases the lag of the dependent variable is not available due to some farmers not cultivating crops at baseline, or missing cultivation data. In these cases the lag variable is set to zero. The regression also includes dummies that take the value of 1 if the household did not cultivate crops at baseline. Villages in the district of Barisal and Rangpur districts are included for Paddy, and only Barisal district for other crops. Results are for Boro season 2015-16. All variables are winsorized on the 99 percent level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

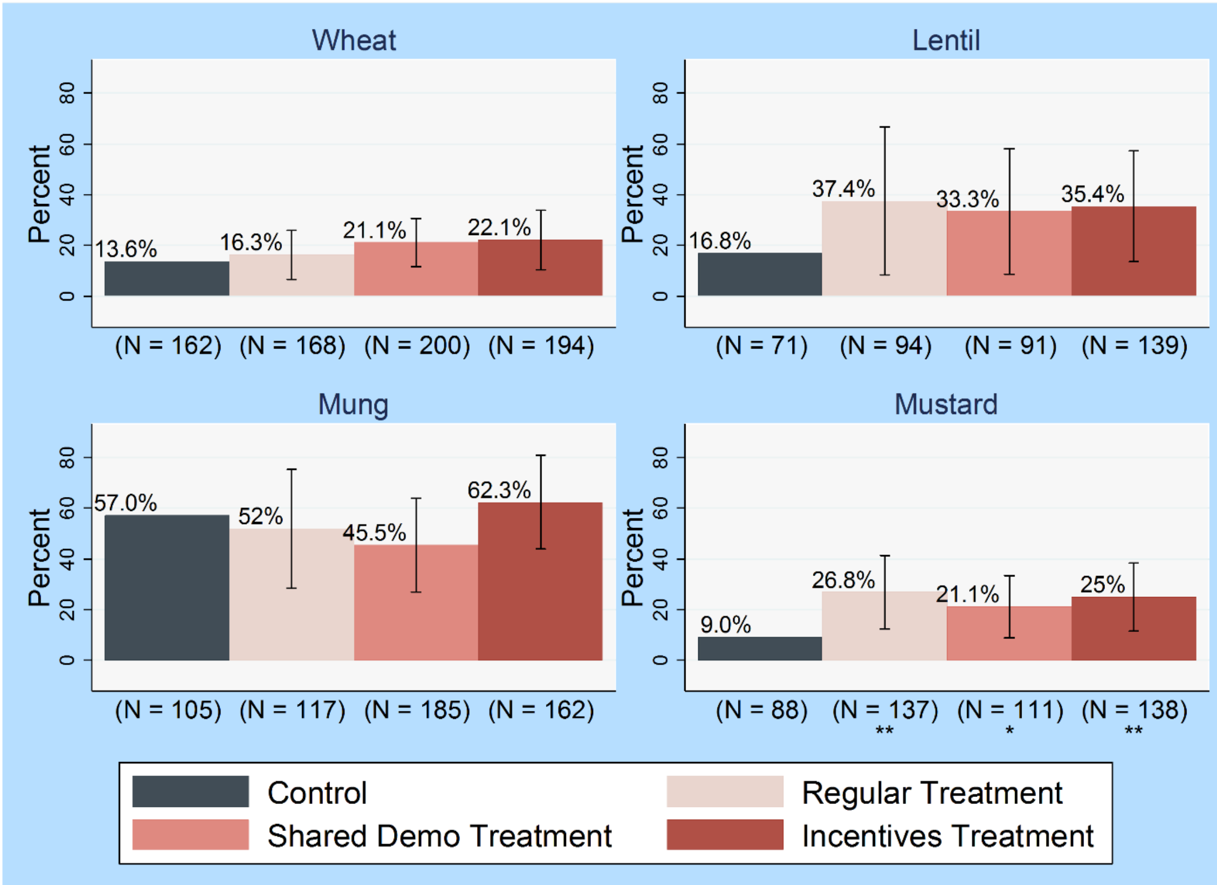
Adoption

Appendix A - Table 2: Adoption of Paddy and Mung

	Adoption of IAPP Paddy Varieties				
	Baseline	Adoption Year		Endline Survey Year	
	All Farmers	Adoption Farmers	Other Farmers	Adoption Farmers	Other Farmers
Regular Treatment	0.057	0.186**	0.141**	0.194**	0.155**
	[0.09]	[0.07]	[0.06]	[0.08]	[0.07]
Lag of Dependent Variable		0.170***	0.169***	0.186***	0.150***
		[0.04]	[0.03]	[0.07]	[0.03]
Control Mean	0.678	0.699	0.699	0.667	0.667
Control Number of Observations	152	153	153	144	144
Control Standard Deviation	0.469	0.46	0.46	0.473	0.473
Total Number of Observations	762	364	515	361	494

Notes: These results correspond to figures 2 and 4 in the main text. The baseline regression is an OLS regression and the other regressions are ANCOVAs. Only households in villages where paddy or mung respectively were demonstrated (treatment) or shadow demonstrated (control) and grew paddy during the respective year are included in the sample. Demonstration farmers in control villages are "shadow" demonstration farmers that community facilitators claimed would have demonstrated the crop had the demonstration taken place in this group, and who were also part of the baseline survey. Adoption farmers are farmers that received inputs from the project during the adoption year. Adoption farmers and other farmers are compared against the same controls. Results are for Boro season, 2015-16. Villages in districts of Rangpur and Barisal are included for paddy, and only villages of Barisal are included for mung. All regressions contain fixed effect for districts and standard errors are clustered at village level. All ANCOVA regressions have dummies identifying households not surveyed at baseline and those that did not cultivate paddy at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Appendix A - Figure 2: Adoption of Other Crops



Notes: This figure shows adoption of IAPP varieties of wheat, lentil, mung, and mustard. Households are considered to adopt a specific crop if they grow any of that crop. The regression restricted to treatment villages where the crop was demonstrated, as well as control villages, where district officials stated the crop would be demonstrated once they begin IAPP. Villages in Barisal district are included. Results are for Boro season, 2015-16. This figure corresponds to appendix table 3. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Appendix A - Table 3: Adoption – Five IAPP Crops, Endline Survey Year

	Paddy			Wheat	Lentil	Mung	Mustard
	Grew Crop	Grew Any IAPP Variety	Grew Promoted IAPP Variety	Grew Crop	Grew Crop	Grew Crop	Grew Crop
Regular Treatment	0.0186	0.175**	0.180*	0.0925	0.0767	0.0417	0.152*
	[0.05]	[0.07]	[0.09]	[0.13]	[0.14]	[0.11]	[0.07]
Shared Demo Treatment	-0.0614	0.146	0.0773	0.141	0.0388	-0.0321	0.0884
	[0.12]	[0.13]	[0.15]	[0.14]	[0.11]	[0.09]	[0.07]
Incentives Treatment	0.0243	0.0552	-0.0117	0.152	0.0566	0.145*	0.124*
	[0.12]	[0.10]	[0.13]	[0.14]	[0.10]	[0.07]	[0.07]
Lag of Dependent Variable	0.502***	0.203***	0.281***	0.546***	0.346***	0.344***	0.240*
	[0.06]	[0.03]	[0.05]	[0.09]	[0.05]	[0.07]	[0.12]
Control Mean	0.836	0.669	0.52	0.14	0.289	0.842	0.116
Control Number of Observations	177	148	148	43	38	19	43
Control Standard Deviation	0.371	0.472	0.501	0.351	0.46	0.375	0.324
Total Number of Observations	1351	915	915	605	362	483	429

*Notes:*These results correspond to figure 3 and figure 5 in the main text as well as appendix figures 2. Seed variety data was only collected for paddy in baseline. All regressions are ANCOVAs. Only households in villages where the respective crop was demonstrated (treatment) or shadow demonstrated (control) for the 'Grew Crop' regression. For the other regressions, the sample is also restricted to households that actually grew the crop. Villages in districts of Barisal and Rangpur are included for paddy, and only villages of Barisal are included for other crops. Results are for Boro season, 2015-16. All regressions contain fixed effect for districts and standard errors are clustered at village level. All ANCOVA regressions have dummies identifying households not surveyed at baseline and those that did not cultivate the crop at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Use of Improved Inputs and Technologies

Appendix A - Table 4: Input Usage on Paddy Plots, Endline Survey Year

	Urea per Hectare	TSP per Hectare	MOP per Hectare	Gypsum per Hectare	Zinc per Hectare	Borax per Hectare	Lime per Hectare	Compost per Hectare	Manure per Hectare	FYM per Hectare	NPKS per Hectare	Pest Solid per Hectare	Pest liquid per Hectare	Phere-mones per Hectare	DAP per Hectare	Ammonia per Hectare
Regular Treatment	-7.535	0.158	-1.032	3.295	1.063	-0.165	0.102	509.4*	916.7	-1130.6	0.0515	1.013	-13.78		6.267	0.0158
	[15.40]	[11.40]	[7.78]	[6.28]	[0.69]	[0.43]	[0.10]	[297.20]	[2045.25]	[1222.00]	[0.18]	[0.93]	[116.01]		[6.58]	[0.02]
Shared Demo Treatment	17.82	-15.23	12.83	6.074	0.331	-0.472	-0.0142	339.8	1602.3	-784.6	-0.146	-0.105	46.64		5.817	0.013
	[33.64]	[23.77]	[16.34]	[5.92]	[1.10]	[0.44]	[0.30]	[257.43]	[2957.93]	[881.44]	[0.67]	[2.15]	[191.06]		[13.31]	[0.01]
Incentives Treatment	-18.66	43.96	-16.5	8.58	0.888	-0.359	0.448	411.6	1898.4	-679.3	0.821	-0.705	-28.32		-8.705	0.0149
	[42.39]	[54.13]	[14.86]	[10.21]	[1.33]	[0.50]	[0.32]	[304.14]	[3546.76]	[803.59]	[0.79]	[2.04]	[228.49]		[11.51]	[0.02]
Control Mean	238.4	139.4	94.32	16.46	1.377	0.846	0	99.19	2949.5	1168.8	0	3.215	356.4	0	12.44	0
Control Number of Observations	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173
Control Standard Deviation	128.6	91.48	76.63	37.17	5.469	3.622	0	660	9313.1	12852.2	0	8.812	1079	0	51.54	0
Total Number of Observations	938	939	939	939	939	939	939	939	938	939	939	939	939	939	939	939

	Vitamins per Hectare	Potassium per Hectare	Paid Labor Days per Hectare	Unpaid Labor Days per Hectare	Irrigation Spending per Hectare	Used Irrigation	% Plots with IAPP Variety	% Plots with FreshSeed	Interaction FreshSeed and IAPP Variety	Used Green Manure	Used Line Planting	Used IPM	Used Vermi-Compost	Used Double Transplant	Used Dapog	Used Alternative Wet/Dry Method
Regular Treatment	0.39	1.185	3.195	-0.0673	-337.1	0.0565	0.176*	0.245***	0.201***	-0.0533	0.205*	0.219***	0.123*	0.05	0.00289	0.0427***
	[0.45]	[4.21]	[6.47]	[4.37]	[638.14]	[0.05]	[0.09]	[0.05]	[0.05]	[0.04]	[0.11]	[0.07]	[0.06]	[0.05]	[0.00]	[0.01]
Shared Demo Treatment	0.193	-3.477	1.956	-0.967	1328.5	0.0411	0.114	0.0802	0.180**	0.0356	-0.0199	0.0301	0.104	0.00696	0.0138	0.0212
	[0.60]	[6.57]	[8.40]	[6.86]	[801.88]	[0.07]	[0.16]	[0.09]	[0.08]	[0.07]	[0.14]	[0.07]	[0.06]	[0.05]	[0.01]	[0.01]
Incentives Treatment	-0.833	1.062	-0.27	1.873	1537.0*	0.0842	0.0364	0.0482	0.028	-0.0284	0.019	-0.145	0.172*	0.0736	0.0191	0.0239
	[1.66]	[10.24]	[8.35]	[7.57]	[855.06]	[0.14]	[0.12]	[0.10]	[0.08]	[0.06]	[0.14]	[0.10]	[0.09]	[0.07]	[0.02]	[0.02]
Control Mean	1.235	7.025	28.24	28.75	4043.3	0.671	0.411	0.402	0.191	0.0925	0.457	0.59	0.00578	0.15	0	0
Control Number of Observations	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173
Control Standard Deviation	4.041	25.57	29.25	24.76	3811.2	0.471	0.425	0.462	0.334	0.291	0.5	0.493	0.076	0.358	0	0
Total Number of Observations	939	939	939	939	939	939	939	939	939	939	939	939	939	939	939	939

Note: These results correspond to figure 7 and figure 8 in the main text. All regressions are only on crop instances where paddy was grown. Variables are kg per hectare for regressions with 'per hectare' the regression title. Variables are dummy variables (take the value of 1 for yes and value of 0 for no) for regression with “used” in the title. All other regression has percent as their unit. All regressions contain fixed effect for districts and standard errors are clustered at village level. These regression only include Barisal and Rangpur districts during Boro season 2015-16. All continuous variables are winsorized on the 99 percent level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively. Fresh Seed varities are those that are acquired from an NGO, IAPP or government project, and not acquired from "bazar retailer", "a seed multiplication village", "recycled seed from another farmer", and recycled seed from own farm." Inputs and Technology Definitions: TSP - Triple SuperPhosphate (a great phosphorous fertilizer); MOP - Muriate of Potash or Potassium Chloride ; FYM - Farmyard manure ; NPKS - Mixed fertilizer of Nitrogen, Potassium and Phosphorous; DAP - Diammonium Phosphate, widely used phosphorous fertilizer ; Green Manure - a fertilizer consisting of growing plants that are plowed back into the soil ; Line Planting - a technique in which weeds around a crop are taken out to allow crop's healthy growth ; IPM - an ecosystem-based strategy that focuses on long-term prevention of pests ; VermiCompost - the process of composting using various worms ; Double Transplant - a small field area is transplanted to let seedlings grow which are then transplanted all over the field ; Dapog - a bed is prepared for seedling to grow which are then transplanted all over fields - no soil is used in the dapog bed hence the seedlings become established early ; Alternative Wet/Dry Method - a water-saving technology that farmers can apply to reduce their irrigation water use in rice fields without decreasing yield.

Agricultural Outcomes

Appendix A - Table 5: Farm Total Agriculture Outcomes, Endline Survey Year

	Total Value All Harvest (BG Taka)	Net Yield (BG Taka/Ha)	Gross Yield (BG Taka/Ha)	Total Earnings All Crop Sales (BG Taka)	Total Input Spending (BG Taka)	Total Plotsize (Ha)	Harvest Value IAPP Crops (BG Taka)	Commercialization (Earnings/Production)
Regular Treatment	9679.1	12177.3	8876.4	6587.4	-257.5	0.0761**	10338.5***	0.0824**
	[6583.38]	[9399.86]	[10381.57]	[4469.29]	[1949.11]	[0.03]	[3523.34]	[0.04]
Shared Demo Treatment	6591	12901.2	8127.5	1420.6	-669.7	0.0478	8352.5*	-0.0112
	[8629.70]	[12879.85]	[14417.47]	[5520.90]	[2194.31]	[0.05]	[4509.39]	[0.06]
Incentives Treatment	2888.5	4896.1	44.43	968.5	-1487	0.0561	4400.1	0.0013
	[8254.75]	[12228.11]	[13797.06]	[5469.23]	[2078.47]	[0.05]	[4307.72]	[0.06]
Lag of Dependent Variable	0.495***	0.169***	0.233***	0.550***	1.052***	0.586***	0.696***	0.102**
	[0.05]	[0.05]	[0.05]	[0.05]	[0.11]	[0.04]	[0.05]	[0.04]
Baseline Mean	45424.4	64301	76273.4	18992	7021.7	0.588	32838.2	0.388
Baseline Number of Observations	1636	1636	1636	1636	1636	1636	1432	1636
Control Mean	51404.4	56468.6	94916.7	27144.8	20551.9	0.524	35670.5	0.424
Control Number of Observations	220	220	220	220	220	220	197	220
Control Standard Deviation	47484.6	56492.1	63064.6	34399	17780.3	0.347	32420.3	0.353
Total Number of Observations	1732	1732	1732	1732	1732	1732	1495	1732

Notes: These results correspond to figure 8 in the main text. All variables are aggregates of all crops on all plots of the household in Boro Season 2015-2016. Districts are Rangpur and Barisal. All regressions are ANCOVAs, contain fixed effect for districts and standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. All variables are winsorized on the 99% level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90%, 95%, or 99% respectively.

Crop's Share of Total Cultivated Area

Appendix A - Table 6: Individual Crop's Cultivated Areas as a Share of Total Area, Endline Survey Year

	Boro	Wheat	Lentil	Mung	Mustard	Sesame
Regular Treatment	0.00248	0.0037	0.00717	0.014	0.0156*	0.000705
	[0.03]	[0.02]	[0.01]	[0.01]	[0.01]	[0.00]
Shared Demo Treatment	-0.0258	-0.00612	-0.0108	0.0389	0.014	0.00287
	[0.05]	[0.02]	[0.01]	[0.03]	[0.01]	[0.00]
Incentives Treatment	-0.0484	-0.00196	0.00398	0.0211	0.0112	0.00246
	[0.04]	[0.02]	[0.01]	[0.02]	[0.01]	[0.00]
Lag of Dependent Variable	0.476***	0.623**	0.187***	0.405***	0.0788	0.106
	[0.04]	[0.25]	[0.04]	[0.04]	[0.06]	[0.09]
Control Mean	0.547	0.0305	0.011	0.0352	0.0112	0.000274
Control Number of Observations	220	220	220	220	220	220
Control Standard Deviation	0.353	0.117	0.0527	0.141	0.0547	0.00406
Total Number of Observations	1732	1732	1732	1732	1732	1732

Notes: These results correspond to figure 9 in the main text. Plot share is calculated as the mono plot area dedicated to a certain crop, divided by total cultivated area in Boro season 2015-2016. The value is set to zero if a household did not grow the crop. All regressions are ANCOVAs, contain fixed effect for districts, standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Appendix A - Table 7: Diversification of Crops, Endline Survey Year

		Share Of Total Cultivated Area For:			
	Number of Crops	Main Crop	2 Main Crops	3 Main Crops	4 Main Crops
Regular Treatment	0.874**	-0.00492	-0.00238	0.00665	0.00949
	[0.43]	[0.02]	[0.02]	[0.02]	[0.02]
Shared Demo Treatment	0.846	-0.00283	-0.00967	-0.00669	0.000378
	[0.52]	[0.03]	[0.02]	[0.02]	[0.02]
Incentives Treatment	1.341**	-0.0159	-0.00283	0.0164	0.0257
	[0.59]	[0.02]	[0.02]	[0.02]	[0.02]
Lag of Dependent Variable	0.373***	0.295***	0.232***	0.195***	0.240***
	[0.05]	[0.03]	[0.04]	[0.06]	[0.09]
Control Mean	5.959	0.693	0.831	0.864	0.875
Control Number of Observations	220	220	220	220	220
Control Standard Deviation	3.495	0.236	0.219	0.213	0.212
Total Number of Observations	1732	1732	1732	1732	1732

Notes: These results correspond to figure 10 in the main text. Number of crops is the number of types of crops grown by the household, two instances of the same crop is counted once. The share of the main crop(s) area of total cultivated area includes monocropped crops. All regressions are ANCOVAs, contain fixed effect for districts, standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90%, 95%, or 99% respectively.

Crop Model

Appendix A - Table 8: Crop Production Model

	Yield (Kilograms per hectare)				
	Boro	Wheat	Lentil	Mung	Mustard
Paid labordays	0.0259**	-0.0164	0.226***	0.132***	0.0727
	[0.01]	[0.05]	[0.06]	[0.03]	[0.06]
Unpaid labordays	-0.00661	0.0142	0.178***	0.190**	0.091
	[0.02]	[0.06]	[0.06]	[0.09]	[0.11]
Input of Urea	0.0324*	-0.0286	-0.0364	0.00591	0.0146
	[0.02]	[0.04]	[0.03]	[0.02]	[0.03]
Input of TSP	0.013	0.0643*	0.0778**	-0.0398	0.0125
	[0.01]	[0.04]	[0.04]	[0.03]	[0.04]
Input of MOP	0.0078	-0.0371	0.00149	0.0789***	-0.00016
	[0.01]	[0.03]	[0.03]	[0.03]	[0.04]
Input of Gypsum	0.0073	0.00522			-0.0502
	[0.00]	[0.03]			[0.05]
Input of Zinc	0.0101	0.0344			0.0486
	[0.01]	[0.06]			[0.09]
Input of Borax	-0.000487				
	[0.03]				
Input of Compost	0.00686				
	[0.00]				
Input of Manure	0.000822	-0.00399	0.00444	0.0285***	0.00711
	[0.00]	[0.01]	[0.02]	[0.01]	[0.02]
Input of Solid Pest	0.000435	0.00537	0.0255	0.089	0.0429
	[0.01]	[0.03]	[0.07]	[0.06]	[0.08]
Input of Liquid Pest	0.000958	0.0193	0.0609	-0.0226	-0.00801
	[0.00]	[0.02]	[0.05]	[0.02]	[0.03]
Input of DAP	0.0146	0.0620*	0.0880**	0.0686**	0.0301
	[0.01]	[0.03]	[0.04]	[0.03]	[0.04]
Input of Vitamins	-0.000832	0.0282			0.271**
	[0.01]	[0.06]			[0.13]
Input of Potassium	0.0038	0.0184			-0.0835
	[0.02]	[0.05]			[0.08]
Irrigation Spending	0.00565	0.0231	0.0943*	0.00926	0.0528**
	[0.01]	[0.03]	[0.05]	[0.02]	[0.02]
Used Irrigation	0.0415*	0.19	0.636***	0.484***	0.179
	[0.02]	[0.14]	[0.19]	[0.15]	[0.13]
Green Manure	-0.115*	-0.0361	0.178	0.121	0.0198
	[0.06]	[0.11]	[0.26]	[0.12]	[0.16]
Line Plant	0.0255	0.0796	-0.0914	0.0686	0.139
	[0.03]	[0.10]	[0.15]	[0.10]	[0.14]
IPM	0.0318	-0.13	0.00566	-0.0842	-0.0364
	[0.03]	[0.10]	[0.13]	[0.10]	[0.12]
Vermi Comp	0.0477	-0.0187	-0.129	-0.119	-0.0793
	[0.03]	[0.10]	[0.21]	[0.22]	[0.15]
IAPP Main	0.0342	-0.0798	-0.0488	-0.0098	-0.444**
	[0.05]	[0.21]	[0.39]	[0.16]	[0.21]
Fresh Seed	0.110**	0.122	-0.0287	-0.204	0.0269
	[0.04]	[0.11]	[0.14]	[0.16]	[0.17]
Double Transplantation	-0.0435*				
	[0.03]				
Interact	-0.0513	0.267	0.377	0.218	0.601**
	[0.05]	[0.22]	[0.35]	[0.25]	[0.28]
R-squared	0.104	0.209	0.239	0.157	0.182
Total Number of Observations	997	253	265	371	183

Note: This production model explains the effect on crop yield by several inputs and technology usage. Amount variables are converted through price to the most commonly used unit for that input. All variables except technology usage dummies and plot share percentages are logged. Only households that grew the crop are included and only mono-cropped crop instances are used for the yield calculations. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Appendix B

KG Yields

This appendix contains similar tables as in appendix A but for the adoption year (midline round 2) sample. The data sample represents 1,732 households from Barisal and Rangpur districts in Boro season 2014-15. For further data sample restrictions of each table please refer to the 'Notes' section beneath each chart.

Appendix B - Table 1: Crop Specific Yield (Kg/Ha) – IAPP Crops, Adoption Year

	Yield (Kilograms per Hectare)				
	Paddy	Wheat	Lentil	Mung	Mustard
Regular Treatment	332	44.32	-191.8	69.86	219.3
	[199.36]	[280.30]	[267.24]	[177.83]	[210.04]
Shared Demo Treatment	-78.78	106.4	-152	75.75	255.8
	[491.24]	[197.00]	[290.04]	[110.36]	[381.77]
Incentives Treatment	-670.1	68.06	-161.2	-34.71	296.1*
	[519.70]	[274.29]	[251.40]	[97.42]	[164.17]
Lag of Dependent Variable	0.276***	-0.279	0.117	0.0885	-0.229
	[0.05]	[0.32]	[0.13]	[0.19]	[0.27]
Baseline Mean	5702.8	1918.5	708.7	505.9	1666
Baseline Number of Observations	890	10	60	98	6
Control Mean	5702.6	1677.1	813.6	654.5	683.8
Control Number of Observations	158	2	14	18	5
Control Standard Deviation	1424.3	624.2	680.6	643.4	426.7
Total Number of Observations	954	141	156	233	81

Notes: Yield calculations included mono-cropped plots only. All regressions are ANCOVAs and only households in villages where the respective crop was demonstrated (treatment) or shadow demonstrated (control) and actually grew the crop during the adoption year are included in the sample. All regressions contain fixed effect for districts, and standard errors are clustered at village level. In some cases the lag of the dependent variable is not available due to some farmers not cultivating crops at baseline, or missing cultivation data. In these cases the lag variable is set to zero. The regression also includes dummies that take the value of 1 if the household did not cultivate crops at baseline. Villages in the district of Barisal and Rangpur districts are included for paddy, and only villages of Barisal are included for other crops. Results are for Boro season of 2014-15, adoption year. All variables are winsorized on the 99 percent level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Adoption

Appendix B - Table 2: Adoption of Paddy and Mung[24]

Midline results included in Appendix A – Table2

Appendix B - Table 3: Adoption – Five IAPP Crops, Adoption Year

	Paddy			Wheat	Lentil	Mung	Mustard
	Grew Crop	Grew Any IAPP Variety	Grew Promoted IAPP Variety	Grew Crop	Grew Crop	Grew Crop	Grew Crop
Regular Treatment	-0.0304	0.177***	0.281***	0.195***	-0.0168	-0.0898	0.064
	[0.04]	[0.06]	[0.08]	[0.07]	[0.14]	[0.11]	[0.08]
Shared Demo Treatment	-0.0735	0.143	0.277**	0.209***	-0.0621	-0.173*	0.0151
	[0.09]	[0.12]	[0.14]	[0.08]	[0.12]	[0.09]	[0.07]
Incentives Treatment	-0.00349	0.113	0.236*	0.333***	0.0746	0.0666	0.1
	[0.10]	[0.13]	[0.14]	[0.07]	[0.10]	[0.05]	[0.06]
Lag of Dependent Variable	0.573***	0.217***	0.262***	0.363***	0.244***	0.419***	0.231**
	[0.06]	[0.03]	[0.04]	[0.11]	[0.05]	[0.05]	[0.09]
Control Mean	0.893	0.696	0.506	0.0465	0.447	0.947	0.209
Control Number of Observations	177	158	158	43	38	19	43
Control Standard Deviation	0.31	0.461	0.502	0.213	0.504	0.229	0.412
Total Number of Observations	1351	954	954	605	362	483	429

Notes: Seed variety data was only collected for paddy in baseline. All regressions are ANCOVAs. Only households in villages where the respective crop was demonstrated (treatment) or shadow demonstrated (control) for the 'Grew Crop' regression. For the other regressions, the sample is also restricted to households that actually grew the crop. Villages in districts of Barisal and Rangpur are included for paddy, and only villages of Barisal are included for other crops. Results are for Boro season, 2014-15, adoption year. All regressions contain fixed effect for districts and standard errors are clustered at village level. All ANCOVA regressions have dummies identifying households not surveyed at baseline and those that did not cultivate the crop at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

[24] Refer to Appendix A – Table2

Input Usage

Appendix B - Table 4: Input Usage on Paddy Plots, Adoption Year

	Urea per Hectare	TSP per Hectare	MOP per Hectare	Gypsum per Hectare	Zinc per Hectare	Borax per Hectare	Lime per Hectare	Compost per Hectare	Manure per Hectare	FYM per Hectare	NPKS per Hectare	Pest Solid per Hectare	Pest liquid per Hectare	Phere-mones per Hectare	DAP per Hectare	Ammonia per Hectare
Regular Treatment	14.26	26.53*	18.68*	18.47***	2.464***	0.682**	-0.00193	155.2**	-596.1	-81.38	0.675	0.76	0.588**		10.09	0.00212
	[17.67]	[15.05]	[10.77]	[6.81]	[0.92]	[0.31]	[0.77]	[69.95]	[561.66]	[80.60]	[0.80]	[0.88]	[0.27]		[6.18]	[0.00]
Shared Demo Treatment	-1.891	-1.203	6.706	10.47	-0.461	0.476*	0.0947	211.5	-256.9	-52.06	0.491	4.291*	0.762		13.64	0.00425
	[34.68]	[23.58]	[18.34]	[7.99]	[1.63]	[0.28]	[0.63]	[154.78]	[476.26]	[64.14]	[0.64]	[2.23]	[0.73]		[16.07]	[0.01]
Incentives Treatment	43.7	8.413	17.57	12.91	7.687**	0.5	0.417	-93.48	-277.6	-17.31	0.776	2.921	-0.832		20.57	0.00963
	[50.30]	[33.11]	[24.96]	[8.08]	[3.35]	[0.34]	[0.72]	[260.66]	[520.06]	[63.58]	[0.83]	[2.48]	[1.02]		[16.62]	[0.01]
Control Mean	272.1	136.8	98.1	23.31	2.082	0.179	0.54	0	2949.7	120.6	0.0566	3.259	0.802	0	9.426	0
Control Number of Observations	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186
Control Standard Deviation	161.5	95.79	67.29	42.69	6.125	1.012	7.367	0	5701	700.8	0.772	7.364	1.041	0	44.02	0
Total Number of Observations	982	982	982	981	982	982	981	982	982	982	982	982	982	982	982	982

	Vitamins per Hectare	Potassium per Hectare	Paid Labor Days per Hectare	Unpaid Labor Days per Hectare	Irrigation Spending per Hectare	Used Irrigation	% Plots with IAPP Variety	% Plots with FreshSeed	Interaction FreshSeed and IAPP Variety	Used Green Manure	Used Line Planting	Used IPM	Used Vermi-Compost	Used Double Transplant	Used Dapog	Used Alternative Wet/Dry Method
Regular Treatment	-0.555	1.261	7.182	7.5	821.2	-0.0024	0.208**	0.230***	0.229***	0.0318	0.307***	0.0459	0.106**	0.0371	0.00408*	0.00129
	[0.57]	[5.34]	[7.66]	[10.61]	[676.23]	[0.00]	[0.10]	[0.06]	[0.06]	[0.03]	[0.06]	[0.06]	[0.05]	[0.10]	[0.00]	[0.00]
Shared Demo Treatment	-0.577	-17.92**	-2.1	8.382	345.7	-0.00617	0.118	-0.00103	0.084	0.0653**	0.180*	0.172**	0.124**	0.0342	-0.000142	-0.000665
	[0.49]	[8.27]	[9.88]	[10.84]	[1035.00]	[0.02]	[0.19]	[0.11]	[0.09]	[0.03]	[0.11]	[0.08]	[0.05]	[0.08]	[0.00]	[0.00]
Incentives Treatment	-0.0702	-12.32	-4.939	5.705	570	0.00453	0.155	-0.0808	0.0593	0.0101	0.198	0.275**	0.0301	0.126	-0.0198	-0.00142
	[0.62]	[10.52]	[10.41]	[12.14]	[877.47]	[0.01]	[0.14]	[0.10]	[0.09]	[0.04]	[0.15]	[0.12]	[0.06]	[0.09]	[0.01]	[0.01]
Control Mean	2.002	8.777	30.12	47.1	4358.9	1	0.398	0.41	0.187	0.0269	0.387	0.333	0	0.306	0	0
Control Number of Observations	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186
Control Standard Deviation	5.172	46.24	38.77	48.91	4136.9	0	0.415	0.469	0.342	0.162	0.488	0.473	0	0.462	0	0
Total Number of Observations	982	982	982	982	982	982	982	982	982	982	982	982	982	982	982	982

Note: Variables are kg per hectare for regressions with 'per hectare' the regression title. Variables are dummy variables (take the value of 1 for yes and value of 0 for no) for regression with “used” in the title. All other regression has percent as their unit. All regressions contain fixed effect for districts and standard errors are clustered at village level. These regression only include Barisal and Rangpur districts during Boro season 2014-15, adoption year. All continuous variables are winsorized on the 99 percent level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively. Fresh Seed varities are those that are acquired from an NGO, IAPP or government project, and not acquired from "bazar retailer", "a seed multiplication village", "recycled seed from another farmer", and recycled seed from own farm." Inputs and Technology Definitions: TSP - Triple SuperPhosphate (a great phosphorous fertilizer); MOP - Muriate of Potash or Potassium Chloride ; FYM - Farmyard manure ; NPKS - Mixed fertilizer of Nitrogen, Potassium and Phosphorous; DAP - Diammonium Phosphate, widely used phosphorous fertilizer ; Green Manure - a fertilizer consisting of growing plants that are plowed back into the soil ; Line Planting - a technique in which weeds around a crop are taken out to allow crop's healthy growth ; IPM - an ecosystem-based strategy that focuses on long-term prevention of pests ; VermiCompost - the process of composting using various worms ; Double Transplant - a small field area is transplanted to let seedlings grow which are then transplanted all over the field ; Dapog - a bed is prepared for seedling to grow which are then transplanted all over fields - no soil is used in the dapog bed hence the seedlings become established early ; Alternative Wet/Dry Method - a water-saving technology that farmers can apply to reduce their irrigation water use in rice fields without decreasing yield.

Agricultural Outcomes

Appendix B - Table 5: Farm Total Agriculture Outcomes, Adoption Year

	Total Value All Harvest (BG Taka)	Net Yield (BG Taka/Ha)	Gross Yield (BG Taka/Ha)	Total Earnings All Crop Sales (BG Taka)	Total Input Spending (BG Taka)	Total Plotsize (Ha)	Harvest Value IAPP Crops (BG Taka)	Commercialization (Earnings/Production)
Regular Treatment	1093.1	4160.6	5904.3	-3155.8	498.9	0.00313	3190	-0.00633
	[6317.99]	[6585.49]	[9279.60]	[3326.90]	[2233.29]	[0.04]	[4230.98]	[0.03]
Shared Demo Treatment	1080.4	6822.6	7596.6	-1744.3	-648.5	0.00848	1063	0.0109
	[7370.12]	[8376.15]	[10312.16]	[4026.23]	[2896.66]	[0.05]	[4775.38]	[0.06]
Incentives Treatment	-6162.2	1472.9	1614.9	-5020.3	-2644.8	-0.0258	-1617.1	-0.0112
	[7606.12]	[8886.57]	[10648.96]	[3900.66]	[2565.43]	[0.06]	[4411.74]	[0.07]
Lag of Dependent Variable	0.539***	0.151***	0.250***	0.483***	1.512***	0.605***	0.647***	0.0804
	[0.05]	[0.04]	[0.04]	[0.05]	[0.17]	[0.03]	[0.05]	[0.06]
Baseline Mean	45424.4	64301	76273.4	18992	7021.7	0.588	32197.6	0.388
Baseline Number of Observations	1636	1636	1636	1636	1636	1636	1482	1636
Control Mean	56855	55120.1	95002.4	28949.8	23760.1	0.584	36375.3	0.437
Control Number of Observations	220	220	220	220	220	220	208	220
Control Standard Deviation	55602.5	42734.1	55189.6	35603	23022.8	0.406	36813.2	0.307
Total Number of Observations	1732	1732	1732	1732	1732	1732	1557	1732

Notes: All variables are aggregates of all crops on all plots of the household in Boro Season 2014-2015. Districts are Rangpur and Barisal. All regressions are ANCOVAs, contain fixed effect for districts and standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. All variables are winsorized on the 99% level on the upper tail. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90%, 95%, or 99% respectively.

Crop's Share of Total Cultivated Area

Appendix B - Table 6: Individual Crop's Cultivated Areas as a Share of Total Area, Adoption Year

	Boro	Wheat	Lentil	Mung	Mustard	Sesame
Regular Treatment	0.00456	0.0151	0.00276	0.0134	0.013	0.00339**
	[0.03]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]
Shared Demo Treatment	-0.00818	0.00764	0.000459	0.0374	0.012	0.00732
	[0.05]	[0.01]	[0.02]	[0.03]	[0.01]	[0.00]
Incentives Treatment	-0.00853	0.0207	0.0156	0.0314	0.0133	0.00497*
	[0.04]	[0.01]	[0.02]	[0.03]	[0.01]	[0.00]
Lag of Dependent Variable	0.552***	0.372***	0.250***	0.553***	0.0955**	0.151
	[0.04]	[0.07]	[0.05]	[0.04]	[0.04]	[0.12]
Control Mean	0.515	0.017	0.0209	0.044	0.0142	0.00104
Control Number of Observations	220	220	220	220	220	220
Control Standard Deviation	0.326	0.0687	0.0832	0.165	0.0533	0.00862
Total Number of Observations	1732	1732	1732	1732	1732	1732

Notes: Plot share is calculated as the mono plot area dedicated to a certain crop, divided by total cultivated area in Boro season 2014-2015. The value is set to zero if a household did not grow the crop. All regressions are ANCOVAs, contain fixed effect for districts, standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90 percent, 95 percent, or 99 percent respectively.

Appendix B - Table 7: Diversification of Crops, Adoption Year

		Share Of Total Cultivated Area For:			
	Number of Crops	Main Crop	2 Main Crops	3 Main Crops	4 Main Crops
Regular Treatment	0.235	0.00443	-0.00685	-0.00288	0.00219
	[0.60]	[0.03]	[0.02]	[0.02]	[0.01]
Shared Demo Treatment	-0.672	-0.00283	-0.00967	-0.00669	0.000378
	[0.76]	[0.03]	[0.02]	[0.02]	[0.02]
Incentives Treatment	0.228	-0.0159	-0.00283	0.0164	0.0257
	[0.82]	[0.02]	[0.02]	[0.02]	[0.02]
Lag of Dependent Variable	0.381***	0.295***	0.232***	0.195***	0.240***
	[0.05]	[0.03]	[0.04]	[0.06]	[0.09]
Control Mean	5.445	0.65	0.848	0.919	0.947
Control Number of Observations	220	220	220	220	220
Control Standard Deviation	3.777	0.225	0.179	0.151	0.132
Total Number of Observations	1732	1732	1732	1732	1732

Notes: Number of crops is the number of types of crops grown by the household, two instances of the same crop is counted once. The share of the main crop(s) area of total cultivated area includes monocropped crops. All regressions are ANCOVAs, contain fixed effect for districts, standard errors are clustered at village level and have dummies identifying households not surveyed at baseline. *,**,*** signify that the estimate of the treatment effect (compared to control) is greater than zero at a confidence level of 90%, 95%, or 99% respectively.

Appendix B - Table 8: Harvest Values of Different Crops, Adoption Year

Crop	Region	Median Yield (Kg/Ha)	Median Sales Price (BG Taka/Kg)	Median Gross Yield (BG Taka/Ha)	Median Net Yield (BG Taka/Ha)	Median Net Yield Including Opportunity Cost Of Unpaid Labor (BG Taka / Ha)	Median Total Labor Days (days / Ha)	Number Of Households Growing Crop
Paddy	North	6136	15	107386	60430	28883	220	643
	South	4943	17.5	74147	28296	5325	164	426
Wheat	North	2966	22.5	59318	28867	-5379	208	114
	South	1521	20	34222	7291	-18120	155	167
Lentil	North	371	53.3	19773	-1716	-100580	597	5
	South	494	53.3	26363	17260	-5210	124	359
Mung	North	198	60	11894	1524	-63333	280	8
	South	412	60	24716	13931	-9526	144	403
Mustard	North	989	40	32954	19834	-2464	115	98
	South	618	40	24716	12497	-9355	117	124

Notes: This table presents the median harvest value for the main IAPP crops in Boro season 2014-15. The harvest value is calculated by multiplying the yield in Kg/Ha by the price of the crop. Prices are calculated based on median reported sales prices when there is a large enough sample, while prices from other regions are used in instances of small sample sizes. Prices are reported in Bangladeshi Taka (1 Taka is equal to about .013 USD at the time of writing this report). The median net yields are the harvest value minus cost of inputs, divided by plot size used of that crop. The second median net yield includes the opportunity cost of paid labor. The opportunity price of labor (200 Bangladeshi taka per day) is the median price for paid labor reported by the households during adoption year. This is most likely an overestimation as it is not certain that the members of the household would actually get that price if they worked for pay instead of working on their own farms. This helps explain the negative values in median net yield that includes opportunity cost for unpaid labor. Labor days per hectare includes all labor days spent from planting to post-harvest processing and includes paid labor as well as all types of unpaid household labor (male, female, and adult equivalent child labor days).