The Strive to Revive Pulses in India with Input Subsidies, Extension Activities, and Output Price Supports

Travis J. Lybbert[1R], Ashish Shenoy[1R*], Tomoé Bourdier[2], and Caitlin Kieran[3]

[1]University of California, Davis
[2]CIRAD
[3]Landesa
[R]Senior author names presented in random order.
[*]Corresponding author. Email: shenoy@ucdavis.edu.

December 2022

Abstract

Pulse production in India has stagnated relative to staple grains and cash crops, raising concerns about rural protein consumption. We experimentally evaluate an effort to increase local pulse production in Bihar. This intervention consisted of two years of input subsidies and extension to facilitate learning, followed by a year of output price support to raise profitability. Farmers respond to price signals by expanding inputs when subsidized and increasing pulse sales under price supports. However, we see no evidence that the program shifted equilibrium production portfolios as pulses return to pre-intervention levels after the support ends. Results indicate that lack of farmer knowledge is not the main bottleneck to local pulse production.

1 Introduction

The Green Revolution unleashed dramatic increases in food supply around the world through improved germplasm and agronomy combined with investments in infrastructure, market development, and agricultural extension. In India, agricultural output expanded by nearly fourfold between 1950 and 2000 (Tiwari and Shivhare, 2017), which contributed to dramatic declines in food insecurity and malnutrition and improvements in population health and wellbeing (Deaton, 2008). Given the severe food shortages of the 1950s and 1960s, increasing the availability of calories was understandably the primary objective of these efforts, which consequently focused on cereals—primarily rice and wheat in India. While the urgency of producing cheap calories has long since faded, the legacy of Green Revolution cereal successes continues to shape on-farm production, agri-food systems, and nutritional outcomes.

One dimension of this legacy in India has been a relative decline in the prevalence of crops such as pulses that received relatively little public investment. Despite being the most prominent source of protein throughout the country, Indian pulse production grew by only 30% from 1950 to 2010, compared to over 400% increases in rice and wheat production. Pulse cultivation in India has retreated to more marginal and rainfed lands and moved further south as farmers in the Indo-Gangetic plain shifted to more productive and remunerative varieties of Green Revolution cereals (Pingali, 2012; Tiwari and Shivhare, 2017). Meanwhile, protein consumption in India continues to fall far short of international standards across socioeconomic strata (Sharma et al., 2020). Indeed, Deaton and Drèze (2009) show that per capita protein consumption in India actually declined in the 1990s and 2000s despite rapid economic growth. Seeing a link between cereal successes at the expense of domestic pulse production and stagnating protein consumption, the Government of India has sought to make pulses more readily available in domestic markets.

In this paper, we evaluate a pilot program to expand the domestic supply of protein by encouraging pulse production among smallholder farmers using improved seeds and techniques. The technological support policy couples subsidized inputs with intensive extension services—including local demonstration plots and individualized feedback—over a two-year period to establish pulses as a viable commercial crop. At the end of the input intervention period, we experimentally introduce a supplementary output price subsidy to further encourage local pulse production with market support. These efforts, initiated by NITI-Aayog, the strategic planning arm of the Government of India, were implemented as a randomized controlled trial in five districts in the northeastern state of Bihar, where farmers have followed the national trend away from pulses toward cereal crops, with the intent to scale up if successful.

The intervention design was motivated by the possibility of path dependence in agricultural technology adoption and productivity. Following decades of extension focus on cereals, the average yield for pulses in Bihar in 2010 was only 10–25% of the estimated potential yield, compared to 40–55% for rice and wheat.[1] Low productivity stems in part from limited usage of modern seed varieties and input-intensive farming practices that were the hallmark of Green Revolution gains. In our areas of study, pulses are largely peripheral crops as they are grown from traditional seeds interspersed between other crop rows, on plot borders, or on other marginal land.

The input side of the pilot program delivered intensive, short-term extension and support to raise pulse productivity to the level of other crops. Farmers may be hesitant to adopt new techniques on their own if they are uncertain about the returns or if there is a costly period of learning-by-doing before gains are realized. The policy package in this study was designed to alleviate these barriers by removing adoption costs and providing detailed training on best practices. In effect, it sought to provide farmers with the same level of extension support for pulse cropping as they had previously received for cereals. Output price supports after the input intervention period test how sensitive a new equilibrium may be to market returns. Price support took the form of either a flat per unit subsidy or a price floor matching India's Minimum Support Price (MSP) policy, both announced ahead of the planting season so farmers could adjust accordingly. These two arms separately vary expected returns and price risk (see Goyal, 2010; Donovan, 2020) in cultivation decisions. While the extent of public investment entailed in this input and output support program would be unsustainable as a permanent solution, we investigate whether the experience gained during a short period of intensive investment can shift smallholder farmers to a new equilibrium that produces more pulses.

Data for this evaluation come from a combination of household surveys, an incentive-compatible demand elicitation via an experimental seed auction, and administrative records. We conducted two household surveys per year over the two years of input support and third year of output support to generate a panel

[1] As reported in the FAO's GAEZ database.

spanning six rounds. Each survey round includes questions on agricultural production for the household's primary farmer as well as questions on food consumption and storage asked of the main food preparer. In addition, we convened an experimental auction for certified pulse seeds between the second and third year, after the end of input subsidies. Finally, we analyze administrative records from farmer groups on pulse inputs and sales among participants in the output support experiment.

Input support policies initially encouraged uptake of pulse farming, with evidence that farmers experimented with modern cultivation practices. The fraction of farmers growing pulses was 50–200% greater across three growing seasons in treatment villages relative to control in the first year when pulse seeds were fully subsidized. However, the gains in pulse cultivation dissipate over the life of the program. The difference in adoption between treatment and control fell by more than half in the second year with partial subsidies, and by the third year after subsidies expired there was no detectable treatment effect. Even those offered output price subsidies do not expand their seed demand or area cultivated. Whatever learning occurred during the subsidy period did not raise the perceived returns to pulse cultivation enough for pulses to supplant other crops. If anything, experience reinforced farmers' pessimism about the return to investment in pulses, as farmers who received two years of input support exhibit lower demand for certified pulse seeds at market prices relative to control.

Across a range of indicators on production, agricultural revenue, sales, and pulse stocks we find no evidence that households induced to grow pulses fared differently than those in the control group despite the availability of heavily subsidized inputs and extension support. Given the absence of persistent effects on pulse production, we unsurprisingly find no evidence of increased pulse or protein consumption. While each individual measure is noisy, the estimated treatment effects are quantitatively small relative to the mean across multiple outcomes and paint a consistent picture: pulse cultivation in Bihar, even under ideal conditions with intensive support, is not more lucrative than the alternative uses of agricultural land.

In our context, lack of knowledge does not appear to be the main constraint on adoption or pulses, suggesting that other binding constraints shape farmers' resistance. This conclusion contrasts with an evaluation in the neighboring state of Odisha that finds a similar combination of field visits and extension using demonstration plots lead to sustained uptake of a new drought-tolerant rice variety (Emerick and Dar, 2021).

While we do not observe an equilibrium shift in technology adoption, this study provides some evidence for the role of price supports in market development as farmer behavior responds to price signals. On the input side, adoption is greatest in the first year when inputs are fully subsidized and dwindles as subsidies are withdrawn. Those participating in the experimental auction similarly display downward-sloping demand that responds to the seed price. On the output side, while the promise of price support does not promote cultivation, subsidies increase the quantity sold on the market.[2] These results suggest that price supports can supplement other policies by adding thickness to agricultural markets—albeit not in a manner that creates a self-sustaining equilibrium that persists beyond the price supports.

This research broadly contributes to the literature on agricultural productivity. Raising agricultural productivity is a crucial component of economic development because 75% of the world's poor live in rural areas (World Bank, 2007; Castañeda et al., 2016). Across countries, the difference in productivity between rich and poor tends to be greater in agriculture than in other sectors (Caselli, 2005), and the productivity gap between agriculture and non-agriculture is greatest at the bottom of the income distribution (Gollin et al., 2014). Adamopoulos and Restuccia (2021) decompose agricultural productivity to show that crop selection and input use, rather than land endowments, account for the overwhelming majority of differences between rich and poor countries. McArthur and McCord (2017) argue improved use of inputs was a fundamental driver of growth in cereals during the Green Revolution. We investigate the potential to extend these gains to pulse crops in India.

Technology adoption is an important component of agricultural productivity (see de Janvry et al., 2017). To this end, extension work is frequently motivated by the assumption that lack of knowledge or training prevents the uptake of new technologies (Waddington and White, 2014). However, experimental evidence indicates that farmer training alone is insufficient to change farm practices (Fabregas et al., 2017; Kondylis et al., 2017; Maertens et al., 2021). In contrast, programs that augment training with hands-on demonstration and experience have shown greater success (Maertens et al., 2021; Aker and Jack, 2021; Emerick and Dar, 2021), highlighting the importance of either learning-by-doing or learning about the returns to technology

[2] The margin of adjustment is likely sale versus home storage.

(see Magruder, 2018).

Uncertainty about input quality (Bold et al., 2017; Hasanain et al., 2022) and credit constraints (Magruder, 2018) can be additional barriers to agricultural technology adoption. This project resolves both potential constraints: The intervention sourced high-quality inputs from reputable vendors and distributed locally through trusted organizations with strong community ties,[3] and our study population consists of established farmers with pre-existing access to agricultural credit.

Promotion of new technologies and modern cropping practices represent supply-side initiatives to increase agricultural productivity. A complementary approach focuses on demand-side interventions that raise the returns to investment and quality (see Bold et al., 2022; Rao and Shenoy, 2022 for experimental evaluations and Bellemare and Bloem, 2018 for a comprehensive review). Related demand-side factors include contract design (Goodhue et al., 2010; Saenger et al., 2013), market competition (Bernard et al., 2017; Macchiavello and Morjaria, 2021), and quality verification (Saenger et al., 2014; Bai, 2021). A few experimental evaluations bundle supply- and demand-side interventions simultaneously. Macchiavello and Miquel-Florensa (2019); Park et al. (2022) find that training induces greater technology upgrading when farmers are connected with output markets to sell their crop. Our research attempts to simulate the returns to market expansion with experimental price supports, with little success. It remains an open question whether a more sustained commitment to higher output prices could promote greater pulse cultivation and productivity in the long run.

2 Background

2.1 Pulses in India

India is simultaneously the largest producer, consumer, and importer of pulses in the world. The country produces around 25% and consumes around 27% of the world's pulse crop. Accordingly, pulses make up an integral part of Indian diets, and are a key ingredient in traditional cuisines around the country. Nevertheless, domestic production has lagged behind demand in recent years. From 1995 to 2016, consumption of pulses

[3]This distribution network for accessing high quality pulse seeds, which was not experimentally evaluated, remained in place after the intervention period.

in India increased at an average annual rate of 2.3%, outpacing the growth in domestic production of around 1%.While imports from Canada, Myanmar, and other nations increased to fill the gap, the pulse sector has still seen steady price increases.

Local access to pulses is particularly important because they represent a key source of protein for Indian households. Pulses account for nearly a quarter of non-cereal protein consumption on average, and are the largest protein source outside of cereals for poor households in both rural and urban areas (Rampal, 2018). Protecting this protein source is especially vital in a country where the protein content of diets lags well behind international standards across geographic and socioeconomic strata (Sharma et al., 2020). Pulse prices also play a role in macroeconomic and political stability, as unexpected price spikes have forced administrative resignations and induced turnover among elected officials[4].

To stabilize the national market, the Government of India has explored policy solutions to bolster supply through domestic production and imports. In the pulse sector, however, trade policy may be unappealing because India is a large enough consumer in the world market that demand shocks can raise world prices, leading to increasingly worse terms of trade (Joshi et al., 2016). Furthermore, the gains from trade rely on domestic market integration, and therefore may exclude more remote rural markets (Atkin and Donaldson, 2015).

In this paper, we evaluate an initiative to boost domestic pulse production through agricultural extension piloted in districts in the state of Bihar that had been pulse producing areas prior to the Green Revolution. This pilot intervention was motivated by the fact that pulse cultivation in the region typically uses low inputs and traditional cropping methods. As a result, yields lag farther behind the technological frontier than more commercial crops: pulse plots achieve only 10–25% of their theoretical maximum on average compared to 40–55% for plots devoted to rice or wheat[5], and research has identified the state as an area with the potential for productivity gains (Reddy and Reddy, 2010). The interventions we study follow from the hypothesis that technological sluggishness is path-dependent, such that a one-time investment by the government could raise yields by inducing local producers to permanently shift their cropping techniques and use of inputs.

[4]See e.g. *The Hindu*, 2015, October 21, "Finally, pulse price is a poll issue in Bihar". NITI-Aayog's interest in reviving pulse production domestically and therefore its interest in the present study were partly due to macroeconomic considerations as rapidly increasing pulse prices were a component of inflationary pressures in the early 2010s, driven in part by expensive imports.

[5]As reported in the FAO's GAEZ database.

2.2 Policy Design and Implementation

The pulses program in this study was developed as a joint initiative between the Government of India and local non-governmental organizations (NGOs). With support from the Bill and Melinda Gates Foundation, NITI-Aayog coordinated with the Aga Khan Foundation (AKF) and four local rural development NGOs in Bihar to develop a policy package to provide the most favorable conditions possible for pulse cultivation. The package was then implemented by the local partners with oversight provided by AKF over a three-year period, with the intent of scaling up successful components into a state- or nation-wide policy.

The first two years of program implementation focused on input support. Project partners first established a local market for reliable insecticide-treated, modern-variety pulse seeds, which had previously been difficult to purchase in the area of study. They offered these seeds at a subsidized cost for two years, and provided substantial extension support to program farmers over this period. After the second year, project partners continued to make seeds available at the market price. This portion of the study tests whether an intensive, short-term investment in technological upgrading can induce enough adoption to create sustained demand for seed purchases and output sales over the longer term.

In the third year, program activities shifted to marketing of output. Implementers assisted farmers that had previously received input support in forming Farmer Producer Companies (FPCs) to negotiate bulk sales with traders and processors. The program also experimented with offering price supports and backstopping the sale price with a floor set to match India's national Minimum Support Price (MSP). The MSP, which had previously been enforced for cereal crops but not for pulses in Bihar, represents an effort by the government to insure agricultural households against income loss driven by unexpected price fluctuations at the time of harvest. This portion of the study tests the elasticity of local pulse supply to increases in the sale price.

Program evaluation takes place in five districts in the Indian state of Bihar, depicted in Figure 1. Pulses, especially pigeon peas, are a staple of food consumption in this region, but local production has dwindled in the face of rapid productivity gains in other crops. Current farmers in these districts at most grow small quantities of pulses for household consumption, typically as a border crop to delineate between plots or on other marginal land. Nearly all farm households supplement home production with market purchases despite being net sellers of the other crops in their portfolio.

[Figure 1 about here.]

The region of study follows a two-season cropping cycle. In the main Kharif crop season, which runs from May through October, farmers typically grow rice for commercial sale. The pulses program promoted replacing a portion of the rice crop with either pigeon peas or black gram during this period. In the secondary Rabi season, which runs from November through February, farmers typically grow wheat, maize, and vegetables for commercial sale. The pulses program focused on green lentils during this season, but implementers provided support for a number of other pulse crops. It should be noted that pigeon peas are a longer duration crop, so that fields devoted to pigeon peas in the Kharif season would remain occupied through Rabi as well.

In a subset of project areas, soil conditions accommodate a third Zaid season in March/April. Fields are typically left fallow in these months as this is the hottest and driest part of the year. However, in low-lying fields, the soil holds enough residual moisture to enable irrigated cultivation of green gram. This season remained a minor focus of the pulse program as it was only applied to a small fraction of land in the project area and would not scale up to other parts of the state or country more generally.

3 Research Design

We evaluate two interrelated experiments to measure the effect of input and output market support on farmers' adoption and production of pulses. The input support experiment takes place over the first two project two years, spanning four cropping seasons in total. The output support experiment takes place in treated villages from the primary experiment in the year after input support expired. In this section we describe the interventions in each experiment, the randomization design, and the data used for evaluation.[6]

3.1 Theory of Change

We first present a simplified model to describe the motivation behind this evaluation. Consider a farmer that can produce using either a traditional (L) or modern (H) production technology. In a given cropping season, the farmer chooses a technology $T \in \{L, H\}$ and a level of inputs x, and then produces output $f_T(x)$. Under

[6]These two components were pre-registered with the AEA RCT registry as AEARCTR-0003872 and AEARCTR-0004393.

the traditional technology, let $f_L(0) = 0$, and let $f_L(x)$ be increasing and concave when $x > 0$. The modern technology requires up-front investment (e.g. for hybrid seeds), so that $f_H(x) = 0$ when inputs fall below some threshold $x \leq \underline{X}$. Let $f_H(x)$ also be increasing and concave above the minimum threshold when $x > \underline{X}$. Further, let there be a crossover point $\overline{X}$ below which $f_L(x) \geq f_H(x)$ and above which $f_L(x) \leq f_H(x)$. That is, at low levels of investment, the traditional technology produces more, but once inputs are sufficiently high, output from the modern technology dominates.

Figure 2a represents the pre-intervention equilibrium with low technology adoption. Farm profits can be written as revenue minus cost, that is $\pi(x) = pf(x) - x$. For each production technology, farmers will maximize profits by choosing inputs so that the slope of the production function equals the (inverse of) market price. Farmers will choose whichever technology delivers higher profits at this price, which in this case is the traditional technology.

The primary intervention lowers the required level of investment $\underline{X}$ for the modern technology by subsidizing the cost of modern inputs. This treatment, which effectively shifts the farmer's modern production function to $f_H(x + s)$ for a subsidy value s, is depicted in Figure 2b. The policy package is designed to provide a high enough level of support that adoption becomes profitable.

In this experiment, we test the hypothesis that past experience raises the return to inputs in the modern technology. This can be most directly attributed to learning-by-doing. If there are returns to experience in production techniques, then a one-time policy that provides the impetus for initial adoption can raise profitability to sustain modern practices in the long run. This effect can be described conceptually as a post-intervention production function of $f'_H(x) > f_H(x)$ in the range $x > \underline{X}$, as depicted in Figure 2c. We test this hypothesis against the alternative that post-subsidy production returns to the equilibrium in 2a.

A related possibility is that experience resolves uncertainty about returns. If farmers are risk-averse and heterogeneous in their ability, then uncertainty about their private returns to a new technology can lower the expected utility of adoption. Even if experience does not alter the distribution of productivity in the population, it can induce greater adoption on average if it gives individuals more precise information about where they fall in that distribution. Unfortunately, without an independent measure of farmer ability, our research design does not allow us to differentiate between these mechanisms. Nevertheless, both theories generate the same prediction that a short-term intervention to promote adoption of a new technology can induce a persistent increase in that technology's utilization.

The secondary experiment complements the primary intervention by evaluating the additional impact of price supports. Raising the output price leads to flatter isoprofit curves, and if the price is sufficiently high then the modern technology becomes optimal as depicted in Figure 2d. In this case, we explicitly design the experiment to test the role of risk relative to expected return by varying whether the price support is applied uniformly across the distribution of possible outcomes or selectively insures only against very low price realizations in the form of a price floor.

[Figure 2 about here.]

3.2 Description of Interventions

We evaluate two sets of policies intended to increase pulse production in our areas of study. The input intervention aims to trigger permanent change in cropping practices with an intensive package of short-term input support. The output intervention tests whether changes in cropping practices can be sustained through subsidies to the sale of outputs.

3.2.1 Input Intervention: Pulse Promotion and Support

The input support package consisted of input subsidies combined with extension support for a two-year period spanning four cropping seasons. Project implementers sourced insecticide-treated seeds for high-yielding varieties of pulses from a seed bank and made them available at harvest time. In the Kharif season, the intervention included seeds for pigeon peas and black gram, and in the Rabi season offered seeds for green lentils. Local agronomists provided specialized extension support for the promoted crops as well as additional guidance on other pulse crops, most commonly fava beans and green peas.

In treated villages, all input support activities were channeled through a village farmer group. Farmers planning to cultivate pulses joined the farmer group, and the group was responsible for delivering subsidized seeds, announcing extension visits by agronomists, and all other pulse-related activities. No such group was formed specifically for pulses in control villages, but farmer groups for other crops and investments existed in the region throughout the duration of the experiment.

In the first year, pulse project farmer group members had the option to receive pulse seeds for free under the soft conditionality that they plant what they receive and not resell. In the second year, subsidies were scaled back to 50%, and from the third year onward seeds were sold at market price. The subsidies temporarily lowered the cost of adopting modern pulse varieties. Through the life of the experiment, farmers in control villages had the option to purchase project seeds at market price as well. Therefore, the intervention tests the marginal effect of temporary subsidies and extension while holding market access to input quality constant across treatment and control arms.

Input subsidies were combined with agricultural extension. In the first year of study, the intensity of extension in treated villages varied experimentally as well. A farmers in a third of treated villages received a high-intensity extension package, where implementers set up a demonstration plot to showcase best-practices and made two visits per month to provide individualized feedback and support. The remaining two thirds of the treatment group retained access to free seeds but received minimal extension, with between zero and two visits in total by extension agents to conduct group training without hands-on demonstration or individualized feedback. In the second year, all villages assigned to treatment received high-intensity extension, so that all treated farmers had seen demonstration plots and received individualized feedback by the end of the two years of intervention.[7]

Extension services focused on best practices for pulse cultivation. Agronomists provided detailed guidance on row planting, spacing, appropriate use and timing of irrigation and fertilizer, and other techniques to maximize yield. In our areas of study, such practices are already commonly used in the cultivation of rice, wheat, and other commercial crops. However, pulses tend to be grown along plot borders or on other marginal land using low-quality seeds and low-intensity agricultural techniques. Therefore, the highest intensity intervention package was designed to maximize the potential for learning-by-doing among adopters.

[7] After the second year, implementers remained involved with project villages and may have provided further informal guidance, but no funding was allocated to these activities.

3.2.2 Output Intervention: Price Support

The output support experiment measures the elasticity of pulse supply to output prices by offering price supports to producers. Price supports took the form of either a per-unit subsidy or a guaranteed price floor, matching India's MSP program, to separately identify farmers' sensitivity to expected returns and to risk (see Donovan, 2020).

This intervention was implemented exclusively within treated villages from the input experiment, and took place in year three during the two cropping seasons after input intervention activities had concluded. At the end of the two input support years, implementers established FPCs in treated areas to enable the bulk sale of outputs. Membership for these FPCs drew heavily from farmer group members who wished to continue with commercial pulse cultivation. In this second experiment, villages were assigned to either control where farmers could sell their output at the market rate secured by the FPC, or to one of two treatment arms where this rate was augmented by a price support for black gram in the Kharif season and green lentils in the Rabi season. Treatment status was announced to each farmer group ahead of the planting season to allow participants to adjust inputs according to their anticipated returns.

Farmers in half of treated villages in this experiment were offered support in the form of a price floor. The floor was set to match the MSP offered by the Government of India, which was Rs. 56 ($0.80) per kilogram for black gram and Rs. 44.75 ($0.64) per kilogram for green lentils in the experiment year.[8] This policy effectively eliminates the possibility of very low sale price realizations. As a result, it both raises the expected returns to pulse sales at the time of harvest as well as lowers the ex ante variance of possible returns.

In the other half of treated villages, farmers were offered a per-unit subsidy to isolate the effect of raising the expected return without altering variance. We calibrated the subsidy level using historical data on local harvest prices and MSP rates in the eleven years prior to the experiment. On average, the MSP would have delivered a premium of Rs. 6/kg for black gram ad Rs. 2/kg for lentils were it enforced locally. The per-unit subsidy was set to match the average MSP premium over the market price without altering variance. See Appendix C for details on this calculation.

[8]While the MSP is technically a national policy, it was never implemented in Bihar. Therefore, it was not binding at the time of the experiment, and local wholesale prices had fallen below the official MSP multiple times in years prior.

3.3 Randomization and Sample Selection

Randomization for both experiments took place at the village level. The primary input experiment comprised 158 villages, out of which 99 were assigned to receive input support over two years. Among treated villages, extension intensity was experimentally varied over the first year with 33 villages receiving the full extension package and 66 receiving only subsidized seeds with minimal extension in the first Kharif and Rabi planting seasons. In the second year, all treated villages received the full support package with demonstration plots and individualized feedback for both seasons. Input subsidies and extension concluded after the second year. The randomization design for the input experiment is outlined in the top part of Figure 3. Village-level randomization for this experiment was stratified by block, with two participating blocks in each district.

[Figure 3 about here.]

Primary outcome data comes from surveys of a random sample of farmers in each study village. To ensure experimental comparability across treatment and control arms, we selected the survey sample before assigning treatment status. At the start of the study, ahead of the initial Kharif planting period, we held a kickoff meeting in each study village to identify farmers potentially interested in growing pulses. We then randomly selected around seven households per village from the kickoff meeting that make up the survey sample for the life of the experiment. This strategy ensures that sampling is not influenced by project participation in treatment villages.

Table 1 provides summary statistics for households participating in the input support experiment. In each household we conducted simultaneous surveys with both the main farmer as well as the primary food preparer. The first panel presents details about survey respondents. Farm respondents, predominantly male, are typically near fifty years old, and over half have completed primary education. They are slightly more educated on average in the treatment arm than in control. The primary food preparers, almost exclusively female, are typically in their mid thirties, and equally as well-educated as the farm respondents. The two respondents were frequently spouses, but farther-in-law/daughter-in-law pairs were also common.

The second panel of the Table 1 presents household characteristics for the study sample. Control households tend to be slightly larger on average, and nearly two thirds of study households have planted pulses in some form in the past. We control for respondent age, education, caste, and household size in all household-level regressions below.

[Table 1 about here.]

The final rows of Table 1 present measures of household consumption and wealth. Consistent with the small gap in education of the farm respondent, treatment households report owning slightly more assets on average, though the scale of farming is consistent between treatment arms. Treatment households also report consuming slightly more pules and more protein on average than control households. However, it should be noted that questions on wealth and consumption were asked shortly after the first experimental Kharif planting season. Therefore, balance along these measures may be influenced by program activities or anticipation of future pulse harvests.

The output support experiment takes place in the third project year, after input activities concluded. Farmers from 82 of the 99 treated villages in the primary experiment were incorporated into FPCs[9] along with producers from 70 non-study villages that had also previously received the input support package. FPCs serve as vehicles to agglomerate members' production and sell in bulk to the local market. Farmers in the 152 FPC villages that had previously received input support were randomly assigned to either receive the standard FPC price, the FPC price plus a fixed subsidy, or the FPC price with a price floor reflecting the Government of India's MSP, with assignment lasting through the Kharif and Rabi seasons. Figure 3 outlines the full randomization design with the transition across years.

Village-level randomization in the output support experiment is stratified by prior treatment assignment and by FPC board representative. FPCs are managed by a board of directors with each director representing a group of member villages. These groups serve as a dimension of stratification to minimize possible noise introduced by heterogeneity in directors' level of engagement. Evaluation data for this experiment comes from the internal operational records of the FPCs.

Table 2 provides summary statistics for input experiment participants in villages that participated in the output support experiment. The top two panels again present respondent and household characteristics, and the third panel presents outcomes from the second year of the input experiment immediately before

[9] One block out of the ten involved in the input experiment was dropped for logistical reasons.

randomization in the output experiment. Households from control villages in the output experiment are slightly more likely to be lower caste and less likely to have grown pulses prior to our intervention. However, we cannot control for any household-level or village-level characteristics in evaluation because evaluation data for this experiment come from administrative records without detailed household information.

[Table 2 about here.]

3.4 Data Collection and Analysis

Data for the input support evaluation comes from a series of household surveys asking about agricultural input, production, and consumption. In the third study year, we also conduct an incentive-compatible elicitation of demand for pulse seeds. Data for the output price evaluation comes from FPC administrative records. Because all interventions are implemented experimentally, analysis follows a straightforward regression design with dummies for treatment status.

3.4.1 Household Survey Data

Data for the primary evaluation comes from six rounds of household surveys that took place over the three intervention years. Surveys are typically conducted in either May/June shortly after the Kharif planting or in November/December shortly after the Rabi planting. This timing allows us to ask about both the output from the previous harvest as well as planting and input decisions for the coming season. We preserve the same survey households over time to generate a panel spanning the life of the experiment.

In each survey round, we separately interview both the female and male heads of household, typically a husband and wife pair. Male respondents are asked questions about agricultural inputs, production, and profits. Female respondents are asked about food consumption, other uses of household production, and health. This breakdown corresponds to typical domains of responsibility in our area of study and affords some insight into the intrahousehold impacts of our interventions.

The final survey round was scheduled for June 2020 after the conclusion of all experimental activities. Due to the COVID-19 pandemic, this survey was eventually pushed back to August and conducted by phone rather than in person. As a result, only a limited subset of outcomes are available from this round and magnitudes are not directly comparable with prior data. Regression analysis on this round of data is generally presented separately from outcomes in other rounds.

3.4.2 Experimental Seed Auction

Additional evaluation data comes from two incentive-compatible seed demand elicitations. These elicitations were conducted as experimental auctions (see Lusk and Shogren, 2007) prior to the third-year Kharif and Rabi planting periods.[10] The timing of these auctions was an essential part of the research design. They were conducted after the primary input intervention had concluded, so comparing seed demand in treated villages relative to control provides additional evidence on the sustained effects of temporary input support. They were also conducted after the output price supports had been announced to farmers to enable comparisons across treatment arms in this secondary price support experiment.

Seed demand was elicited using an incentive-compatible Becker-DeGroot-Marschak mechanism. Participants were given a list of possible prices for insecticide-treated seeds for high-yielding varieties of pigeon pea and black gram in Kharif, and of green lentil in Rabi. They report their quantity demanded at each possible price, and then one price was selected at random for participants to purchase the quantity reported at that price.[11] This mechanism provides an incentive-compatible elicitation of each participant's demand curve over a range of prices. We are limited to eliciting demand at or below market price. Participants can always buy seeds in the market outside our elicitation, so there is no incentive-compatible way to measure quantity demanded above this price.

In practice, the elicitation was implemented as a coupon for certified seed sourced by the FPC and associated implementing NGO. This ensured consistency in the product being sold across treatment and control, allowing us to attribute differences in demand to participants' opinions about pulse cultivation itself rather than about the reliability of seeds or sourcing. Coupons were required to be redeemed for the full quantity demanded so that participants could not overstate demand and subsequently readjust downward. Over 90% of coupons were redeemed for seeds, indicating that participating farmers adhered to their elicited

[10] These auctions were part of how FPCs and supporting partners elicited seed orders from farmers for the upcoming production season.

[11] To ensure incentive-compatibility, participants could not adjust their quantity demanded after the price was announced. However, they always had the option to purchase nothing at the experimental price or purchase extra at the market price. In practice, this was rare and nearly all participants purchased the quantity they committed to during the elicitation.

input demand.

3.4.3 FPC Administrative Records

Data for the second evaluation comes from FPC administrative records on seed purchases, area planted, and sales. At the time of planting, FPCs took over the implementers' role of sourcing and delivering certified pulse seeds, which they sold to member farmers at market price. They monitored members' area planted and anticipated output through the growing season to forecast their volume of sales, and then recorded the actual quantity delivered by each member farmer at harvest time. These outcomes were recorded identically cross output payment arms and are therefore experimentally comparable.

3.5 Methodology

We estimate the intention-to-treat (ITT) effect of the input intervention on the panel of in-person survey outcomes using the regression specification

$$Y_{it} = \sum_t \beta_t T_i + \alpha_t + \gamma_{b(i)} + X_i'\delta + \epsilon_{it} \tag{1}$$

where Y_{it} is an outcome of interest for household i in block $b(i)$ in year t, and T_i is a dummy indicating the treatment status of household i. The coefficients of interest β_t represent the year-specific effects of treatment, and δ_t are year fixed effects that reflect the mean among the control group. The vector X_i controls for time-invariant household characteristics[12], and $\{\gamma\}$ control for block-specific fixed effects. All results are presented with heteroskedasticity-robust standard errors clustered at the village level.

We report the intention-to-treat effect, rather than the treatment-on-treated among farmer group members, because the intervention may have delivered indirect benefits to non-members. Those in treatment villages who did not join the pulse farmer group may have still participated in extension activities, received instructions or seeds from friends or neighbors, or otherwise altered their pulse cultivation activities. Therefore, we refrain from ascribing program effects to only those that officially joined a farmer group.

[12]For analysis of pulse production, control variables include the farmers' gender, age, and education level, caste, asset ownership at the start of the program, and a binary variable indicating whether the household had cultivated any type of pulses at least once in the two years preceding program implementation. For analysis of consumption in the food and nutrition survey, we control for the respondent's age and education level as well as other household characteristics.

Endline results include seed demand elicitations that do not have a panel structure, so we evaluate treatment effects for these outcomes using a simple cross-sectional comparison across treatment arms. Formally, this regression takes the form

$$Q_{icp} = \beta T_i + \sigma_c + \phi_p + \gamma_{b(i)} + \epsilon_{icp} \tag{2}$$

where Q_icp denotes the quantity demanded by individual i for seeds of crop c at price p. The coefficient of interest, β indicates how this demand differs on average for individuals originally in treatment villages, and γ again represent block fixed effects.

We further break down treatment status in the primary intervention by first-year treatment intensity. This specification replaces the treatment dummy T_i in (1) with one of two dummy variables, S_i or E_i, corresponding to subsidy only or subsidy plus extension, respectively. This heterogeneity identifies the additional impact of agricultural extension in the presence of an input subsidy.[13] In the second year, all treated farmers received the full extension package so heterogeneity in first-year intensity measures the importance of sustained extension services over time.

We evaluate the ITT effect of the secondary output price intervention using administrative data from FPCs. These data allow for within-household comparisons across crops for agricultural inputs. Formally, we estimate

$$Y_{ic} = \beta^S Subsidy_{ic} + \beta^F Floor_{ic} + \phi_c + \gamma_i + \epsilon_{ic} \tag{3}$$

where $Subsidy_{ic}$ and $Floor_{ic}$ are indicators for whether household i was offered an output price subsidy or price floor, respectively. This was offered for only one crop per season, so we are able to make within-household comparisons to measure whether households with price supports devoted relatively more resources to the supported crop compared to other pulse types.

Unfortunately, we only observe output data on the subsidized crop sold to the FPC, so for production

[13] Heterogeneity in treatment intensity was initially introduced into the study for a short-term cost–benefit analysis, and its effect on first-year pulse takeup is explored more thoroughly by Anderson et al. (2022).

outcomes we run the regression

$$Y_v = \beta^S Subsidy_v + \beta^F Floor_v + \gamma_{b(v)} + \epsilon_v \tag{4}$$

For this regression we aggregate to village-level production, indexed by v, to account for selection into the decision to sell to the FPC. Heteroskedasticity-robust standard errors are again clustered at the village level.

Given the large number of survey outcomes, we apply two different adjustments for multiple hypothesis testing. First, we group outcomes into families and control the false discovery rate within family following Anderson (2008). Regression tables report sharpened q-values that represent the probability of false positives (i.e. the rate of Type I error) among statistically significant results computed using the two-stage procedure of Benjamini et al. (2006). Survey outcomes are grouped into adoption, consisting of fraction adopting and pulse area sown in each season; production, consisting of reported output in each season and total annual months of household pulses; yield, consisting of production per acre in each season; profitability, consisting of net profit, production revenue, sales revenue, production cost, and total area farmed; and pulse consumption, consisting of current household stock, per capita pulse consumption, and per capita protein consumption. Each table of results represents a separate outcome family.

Second, we combine outcomes for production, profitability, and consumption into single indices following Anderson (2008). For each family, an index is constructed as the first principal component among survey outcomes. Principal components analysis for production excludes months with pulses in stock because this outcome is not measured in Year 3; the index for profitability excludes net profits because it is already a linear combination of production revenue and costs; and principal components analysis for consumption excludes female protein consumption because it is not measured in the first year. We do not compute an index for yield because there are only 43 farmer-year observations in which a farmer grows pulses, and therefore has measured yield, in all three seasons. Details of principal components analysis are presented in Appendix B.

Throughout the paper, we preserve a balanced sample by excluding household that dropped out between survey rounds. We discuss attrition and verify robustness to including all survey households in Appendix A and D.

3.6 Timeline

Program activities took place from 2017 to 2020. The input intervention began with the May 2017 Kharif planting season and ran for two years through the May 2019 Zaid harvest. Output subsidies were offered in the third year for sales from November 2019 Kharif and April 2020 Rabi harvests, with seed demand elicitations during the corresponding planting periods. Endline data collection concluded in August 2020. We provide a full timeline of study activities in Figure 4.

[Figure 4 about here.]

Note that the initial survey round took place during the first Kharif season of the input intervention. In this survey we ask about the prior year's production as well as household demographic characteristics. Although the survey was conducted after the input intervention had begun, it is well before the harvest when households would realize any profits or other agricultural outcomes from decisions made in response to treatment assignment. Therefore, we treat recall and demographic data from this survey round as baseline data in regression analysis.

4 Results

In this section we present results on the impact of input subsidies, agricultural extension, and output price supports over three years. Appendix D shows the results presented here are stable across related regression specifications, and Appendix E explores heterogeneity in treatment response by preexisting household characteristics.

4.1 Impact of Input Support on Pulse Cultivation

Farmers expanded pulse production activities over the period when input subsidies and extension were ongoing, but subsequently scaled back to normal after program activities ended. This fact is most clearly demonstrated in Figure 5. The top panels show the fraction of farmers planting pulses in each season in each year of study. The input support program initially increased the fraction of farmers growing pulses by nearly double in the Kharif season, 50% in the Rabi season, and more than triple in the Zaid season.

However, these differences dwindled in the second year, when subsidies were lowered. Second-year pulse adoption by treated farmers was statistically indistingishable from control in every season except Rabi, where implementers focused the most effort. By the third year, when subsidies and extension had ended, pulse adoption among treated households was nearly identical to and statistically indistinguishable from control. Estimates are provided in the odd-numbered columns of Table 3.

[Figure 5 about here.]

Greater rates of adoption were, for the most part, not accompanied by substantial increases in area planted. Other than the initial Kharif season, point estimates of the change in area planted among treated farmers are far smaller in magnitude than the rates of adoption relative to the control mean. Results are displayed in the bottom panels of Figure 5 with point estimates in the even-numbered columns of Table 3. The patterns of adoption and area planted are consistent with treated farmers experimenting pulses on a small portion of land while subsidies and extension are available, but ultimately rejecting their viability as a major crop.

[Table 3 about here.]

Elicitation of seed demand verifies lower desire for pulse inputs among treated farmers following two years of intervention. Table 4 reports results from our incentive-compatible elicitation. All survey farmers were invited to the elicitation exercise, but only half elected to participate. As shown in Column 1, the difference in participation between treatment groups is negligible. In each village, survey teams recruited additional volunteers on the day of the elicitation to fill available spots in each session.

[Table 4 about here.]

Participants who chose to attend the elicitation were asked their seed demand over a range of prices, and one price was selected randomly for actual sale to ensure incentive compatibility. Columns 2 and 3 of Table 4 report differences in seed demand by treatment arm. Column 2 measures stated demand at the elicitation. Demand is lower for all seed types among treated farmers. To verify that demand is not depressed due to saved seeds from prior experiment years, in Column 3 we report the sum of stated demand and self-reported seed storage. This measure of total planed input use again reveals that post-intervention, there is lower desire to continue growing pulses among treated farmers.

We plot the full inverse demand curve for seeds by crop type in Figure 6. Demand curves are downward sloping, indicating that continued input subsidies could help sustain greater pulse cropping. However, seed demand is consistently lower among the previously treated group than in control at every price. This result would suggest that, to the extent that farmers updated their beliefs about pulses during the intervention period, they inferred that the returns to pulse cropping were toward the unprofitable end of their prior expectations without input support.

[Figure 6 about here.]

4.2 Project Participation and Cropping Practices

The lack of a sustained change in pulse practices was not a result of low interest or program engagement among survey respondents. Survey households were sampled from those in attendance at the initial kickoff meeting held before treatment assignment. Kickoff meetings were advertised as forums for farm households interested in learning more about pulse cultivation, so attendance already selected for those most amenable to modern cultivation technologies. Participant interest is confirmed by actual program enrollment, as on average, 54% of survey respondents joined the pulse farmer group in treated villages.

Average farmer group enrollment masks some heterogeneity by district. In particular, only 31% of kickoff meeting attendees joined a farmer group in treated villages in Samastipur, well below other districts. Low engagement among the survey sample could attenuate measured program effects because all program activities were conducted through the farmer group. In Appendix D, we verify that input experiment results using survey outcomes are robust to excluding Samastipur from analysis, indicating that this attenuation is minimal.

Among households that joined a farmer group, cropping patterns are consistent with experimentation using modern cultivation technology. As a proxy for technological upgrading, we measure whether a plot is dedicated to pulses as a mono-crop, or whether pulses are intermixed with other crops or grown on marginal border land. Monocropping allows for modern practices such as row planting, thinning, and targeted application of fertilizer and pesticides as advocated by extension agents. By contrast, with mixed or border cropping, the capacity to implement these practices is limited.

Table 5 reports treatment effects on cropping patterns broken down by farmer group membership. Overall, pulse adoption is greater among farmer group members than non-members in treated villages. The distinction is most stark in the second and third project years, when adoption among non-members is statistically indistinguishable from control. Differences in adoption between farmer group members and non-members are almost exclusively in pulse mono-cropping, presented in the first and third columns of Table 5. There is also evidence of increased pulse adoption to a lesser degree by households who do not join the farmer group in the first year, as a monocrop in the Kharif season and with both mono- and mixed cropping in the Rabi season. Note that heterogeneity by farmer group membership is non-experimental, as membership is an endogenous choice whose realization is unobserved in control villages where no group is formed. Nevertheless, the results are consistent with program effects being most concentrated among farmer group members with some spillover onto non-members as well.

[Table 5 about here.]

Cropping patterns among treated farmers also suggest that agricultural extension assisted in experimentation with modern cropping practices. To isolate the role of extension, we leverage the fact that in the first year, some treated villages were offered only seed subsidies with minimal extension and others were offered intensive extension, with extension intensity being randomly assigned. In the second year, intensive extension activities were conducted in all treated villages.

In Figure 7 we relate cropping patterns to extension activities. The figure reveals that pulse adoption in the first year is highest among farmers receiving extension, although it is nearly as high among farmers receiving subsidies only. In the second year, when subsidized farmers receive extension for the first time, this relationship flips. In both the Kharif and Rabi seasons, there is a greater rate of pulse takeup among farmers receiving extension for the first time than among those who had already received agricultural extension for a year. This evolution is especially stark in the Kharif season, where nearly all new takeup is in monocropping with little excess mixed or border cropping in treatment villages relative to control. While these patterns are statistically noisy, they are consistent with extension services facilitating experimentation with modern pulse practices.

[Figure 7 about here.]

Despite the use of modern cropping practices, we observe little evidence of increased pulse yields among treatment villages. Table 6 reports yields by year and by treatment status, with outcomes disaggeagted by the intensity of extension in the first year. The first three columns report pulse yield in each season, and the fourth column reports an index defined as the first principal component across seasons. Regression reveals no statistically significant difference in yield between treatment and control farmers, regardless of the presence of extension.

[Table 6 about here.]

Measured yield should be interpret with two caveats. First, yield is only observed conditional on adoption. Therefore, there may be selection effects in comparisons of yields between treatment and control. If input supports drew less skilled farmers or more marginal lands into pulse production, then this may lower realized average yields. Second, self-reported yield measurement is inherently noisy. We construct yield by dividing production by area. Both outcomes are self-reported with noise, and therefore their quotient is likely to include a substantial amount of measurement error. This fact is reflected in the large standard errors on Table 6.

4.3 Production, Profitability, and Household Consumption

The results above indicate by revealed preference that farmers experimented with modern pulse cultivation but did not find it to be more profitable than the alternative. Survey evidence on household production, profits, and consumption is consistent with this interpretation. In Table 7 we show that treatment does not produce any lasting statistically detectable difference in pulse production. The first three columns report differences in production by season summed across crop type, the fourth column presents results using the first principal component of production across three seasons, detailed in Appendix B, and the final column uses the self-reported number of months that harvested pulses lasted in the household.[14] Results suggest

[14]Self-reported months post-harvest was cut from the final survey round to save time during the shift to phone surveying.

that production rose in treated villages in the first year, consistent with the measured increases in adoption, although statistical significance does not survive q-value adjustment. Production subsequently fell back to its control level in the following two years.

[Table 7 about here.]

Treatment effects on pulse production are estimated with substantial noise. In the first panel of Figure 8 we plot point estimates from Table 7 relative to the first-year mean among the control group, effectively scaling treatment effects into percent changes. Standard errors are large enough that we cannot reject large positive effects that persist over time. However, estimated effects on other related outcomes reinforce the notion that low returns to pulse production led cultivation to return to pre-treatment levels over time.

[Figure 8 about here.]

Pulse output can either be sold on the market or consumed at home. Table 8 explores the former outlet by reporting treatment effects on net household agricultural profitability, and estimates are plotted relative to the first-year control mean in the second panel of Figure 8. Column 1 reports treatment effects on net agricultural profit, which consists of imputed production value (Column 2) less input costs (Column 4). Column 3 restricts to sales revenue alone, omitting the portion of agricultural production stored for home consumption. As an alternate measure of anticipated returns to agricultural activity, Column 5 reports treatment effects on the total area farmed by households. Finally, Column 6 combines these profitability variables into a single index of the first principal component as detailed in Appendix B.

Across all years and all outcomes, the estimated treatment effect on agricultural profitability is quantitatively small relative to the control mean and statistically indistinguishable from zero. Notably, increases in household pulse production in the first year did not translate into measurable increases in household agricultural profits. This fact suggests that even with modern cropping practices and subsidized inputs, growing pulses is not more lucrative than whatever activity it displaces.

[Table 8 about here.]

Even if pulses do not increase agricultural profitability, households may stand to benefit from greater protein consumption and dietary diversity. We investigate this possibility in Table 9, with estimates again plotted relative to the first-year control mean in the third panel of Figure 8. Columns 1 and 2 report households' self-reported remaining stock of pulses, in kgs. and in months respectively. Column 3 reports per capita pulse consumption in the prior week, and the next two columns report daily protein consumption over the prior week. Column 4 presents overall household consumption while Column 5 focuses only on the consumption of the main food preparer, asked only in years two and three. Like in the two prior tables, Column 6 combines these measures into a single index using principal components analysis as described in Appendix B.

Estimated treatment effects on pulse consumption are broadly consistent with the results on profitability. Across all years and outcome variables, the estimated treatment effect is quantitatively small and statistically indistinguishable from zero. Together, Tables 8 and 9 indicate that increased pulse production in the first project year neither increased farm profits overall nor did it substantially alter household diets. These null results suggest that households did not see benefits when switching to pulse cultivation and explain farmers' reluctance to continue when inputs were no longer subsidized.

[Table 9 about here.]

4.4 Impact of Output Price Supports

Increased pulse cultivation encouraged by input supports does not persist after supports are removed. In an extension to this paper's input-side evaluation, we investigate whether output price subsidies can complement agricultural extension to sustain greater local adoption. Table 10 reports the impact of a per-unit output subsidy and a guaranteed price floor on pulse cultivation and sales. Columns 1 and 2 estimate changes in area sown and seed quantity, respectively, for the Kharif season. Columns 4 and 5 show the same estimates for the Rabi season. In both seasons, we make within-household comparisons of the subsidized crop (black gram in Kharif and lentil in Rabi) against unsubsidized crops. In both cases, we find little evidence that an additional output subsidy shifts cultivation toward the subsidized crop.

[Table 10 about here.]

Even though the scale of production does not vary with the anticipated output price, it appears farmers respond to price signals at the time of sale. Farmers facing a per-unit price subsidy increased their sale of lentils in the Rabi season, as reported in Column 6 of Table 10. The price floor arm did not see a comparable increase in sales, likely because the output price was sufficiently high that the floor did not bind in the year of study. This result suggests that, while a one-time experimental subsidy was not enough to affect farmers' input choices, pulse sales respond to price signals. Therefore, long-term price policy may have more success in shifting the market equilibrium as markets develop to accommodate a larger transaction volume.

5 Conclusion

The interventions we evaluate in this paper emerged as a part of the Government of India's response to the growing gap between domestic pulse production and consumption. As a complement to centralized policy options such as expanding imports (Negi and Roy, 2015) and extending public distribution programs to include pulses (Chakrabarti et al., 2018), the pilot we study is a decentralized alternative to make pulses more available in rural areas by stimulating local pulse production (Sibhatu et al., 2015). Prior observational studies identify lack of extension and knowledge as barriers to pulse production (Joshi et al., 2016), especially in Northeastern Indian states (Pandey et al., 2019), and posit that alleviating these barriers could unlock greater pulse yields and production (Reddy and Reddy, 2010). Our findings indicate that extension alone is insufficient to convince smallholder farmers to devote land to pulses given existing technological options and market incentives. While we see short-term effects of both input and output incentives to cultivate pulses, these effects fade as soon as incentives are phased out. Indeed, the only glimmer of learning we detect works against pulses as treated farmers appear to realize anew why they prefer other crops.

These results stand out in contrast to the evaluation by Emerick and Dar (2021) in the neighboring state of Odisha, which finds sustained farm-level adoption of a drought-tolerant rice variety in response to a comparable input and learning intervention. While our context and study population are similar to theirs, there is one major difference: Whereas Emerick and Dar (2021) consider adoption of a novel rice variety among farmers already growing rice, we consider similar farmers' decision to allocate productive resources to pulse cultivation and evaluate adjustment on the margin of crop choice. Since farmers in both study locations have scaled back pulse production over the last several decades in favor of more profitable rice and wheat production, convincing them to return to pulses is a fundamentally different proposition than getting them to adopt a new and better-performing rice variety.

This difference sheds light on a lasting legacy of the Green Revolution: prioritizing the production of cheap staples to meet the caloric needs of the 1940s and 1950s laid the groundwork for the nutritional challenges of today. In recent decades, priorities have shifted to include dietary diversity and micronutrient consumption (Welch and Graham, 2000; Pingali, 2012). In India, protein consumption, for which the country lags well behind comparison countries (Sharma et al., 2020), is a leading concern. Since pulses are the main source of protein (Kumar et al., 2017) and have historically been an integral component of traditional cuisines throughout South Asia, increased pulse consumption is seen as an important policy target toward diverse, balanced diets (Tiwari and Shivhare, 2017; Minocha et al., 2019). Even though agri-food markets are much better integrated in India than they once were, household access to pulses remains the most significant barrier to consumption (John et al., 2021), which makes stimulating local production of pulses a compelling way to increase local pulse consumption. Yet, Green Revolution institutions, investments and policies create strong headwinds for any such effort to encourage farmers to consider taking up the pulse crops that their grandfathers abandoned.

At heart, the potential for on-farm interventions to influence farmers' crop choice is limited by the available germplasm and cropping technology. The varieties of pulses on offer today are not actually that much more productive than those of the past. By comparison, rice and wheat varieties have improved dramatically through decades of public and private investment. While these technological successes have catalyzed a host of institutions, investments, and policies that continue to favor cereals, leveling the playing field through agricultural extension and market support cannot substantively alter production portfolios as long as the pulse production frontier lags behind that of alternative crops. Serious investment in breeding and agronomy upstream likely has greater potential to change this calculus and bring pulses off the periphery than the kind of on-farm support we evaluate.

Since a public sector commitment to pulse productivity on this scale seems unlikely at this point, we end with a more realistic version of this reflection: As long as the accumulated productivity gains and institutional momentum of cereals persist, it is hard to imagine any on-farm intervention will sustainably convince farmers to give up these favored crops to free up land for pulse cultivation. This study provides rigorous evidence to back up this hard reality.

References

Adamopoulos, Tasso and Diego Restuccia, "Geography and Agricultural Productivity: Cross-Country Evidence from Micro Plot-Level Data," *The Review of Economic Studies*, 2021, *89* (4), 1629–1653.

Aker, Jenny C and Kelsey Jack, "Harvesting the Rain: The Adoption of Environmental Technologies in the Sahel," Working Paper 29518, National Bureau of Economic Research November 2021.

Anderson, Ellen, Rupika Singh, Daniel Stein, and Kate Sturla, "What are the barriers to pulse cultivation in India? Evidence from a randomized controlled trial," Unpublished manuscript 2022.

Anderson, Michael L., "Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects," *Journal of the American Statistical Association*, 2008, *103* (484), 1481–1495.

Atkin, David and Dave Donaldson, "Who's Getting Globalized? The Size and Implications of Intra-national Trade Costs," Working Paper 21439, National Bureau of Economic Research 2015.

Bai, Jie, "Melons as Lemons: Asymmetric Information, Consumer Learning and Quality Provision," 2021. mimeo.

Bellemare, Marc and Jeffrey Bloem, "Does contract farming improve welfare? A review," *World Development*, 2018, *112* (C), 259–271.

Benjamini, Yoav, Abba M. Krieger, and Daniel Yekutieli, "Adaptive Linear Step-up Procedures That Control the False Discovery Rate," *Biometrika*, 2006, *93* (3), 491–507.

Bernard, Tanguy, Alain de Janvry, Samba Mbaye, and Elisabeth Sadoulet, "Expected Product Market Reforms and Technology Adoption by Senegalese Onion Producers," *American Journal of Agricultural Economics*, 2017, *99* (4), 1096–1115.

Bold, Tessa, Kayuki C. Kaizzi, Jakob Svensson, and David Yanagizawa-Drott, "Lemon Technologies and Adoption: Measurement, Theory and Evidence from Agricultural Markets in Uganda," *The Quarterly Journal of Economics*, 2017, *132* (3), 1055–1100.

_ , Selene Ghisolfi, Frances Nsonzi, and Jakob Svensson, "Market Access and Quality Upgrading: Evidence from Four Field Experiments," *American Economic Review*, 2022, *112* (8), 2518–52.

Caselli, Francesco, "Chapter 9: Accounting for Cross-Country Income Differences," in Philippe Aghion and Steven N. Durlauf, eds., *Handbook of Economic Growth*, Vol. 1, Elsevier, 2005, pp. 679–741.

Castañeda, Andrés, Dung Doan, David Newhouse, Minh Cong Nguyen, Hiroki Uematsu, and João Pedro Azevedo, *Who are the Poor in the Developing World?*, The World Bank, 2016.

Chakrabarti, Suman, Avinash Kishore, and Devesh Roy, "Effectiveness of Food Subsidies in Raising Healthy Food Consumption: Public Distribution of Pulses in India," *American Journal of Agricultural Economics*, 2018, *100* (5), 1427–1449.

de Janvry, A., E. Sadoulet, and T. Suri, "Chapter 5: Field Experiments in Developing Country Agriculture," in Abhijit Vinayak Banerjee and Esther Duflo, eds., *Handbook of Economic Field Experiments*, Vol. 2 of *Handbook of Economic Field Experiments*, North-Holland, 2017, pp. 427–466.

Deaton, Angus, "Height, Health, and Inequality: The Distribution of Adult Heights in India," *American Economic Review*, 2008, *98* (2), 468–74.

_ **and Jean Drèze**, "Food and Nutrition in India: Facts and Interpretations," *Economic and Political Weekly*, 2009, *44* (7), 42–65.

Donovan, Kevin, "The Equilibrium Impact of Agricultural Risk on Intermediate Inputs and Aggregate Productivity," *The Review of Economic Studies*, 2020, *88* (5), 2275–2307.

Emerick, Kyle and Manzoor H. Dar, "Farmer Field Days and Demonstrator Selection for Increasing Technology Adoption," *The Review of Economics and Statistics*, 2021, *103* (4), 680–693.

Fabregas, Raissa, Michael Kremer, Jon Robinson, and Frank Schilbach, "Evaluating agricultural information dissemination in western Kenya," 3ie Grantee Final Report, International Initiative for Impact Evaluation 2017.

Gollin, Douglas, David Lagakos, and Michael E. Waugh, "Agricultural Productivity Differences across Countries," *American Economic Review*, 2014, *104* (5), 165–70.

Goodhue, Rachael E., Sandeep Mohapatra, and Gordon C. Rausser, "Interactions Between Incentive Instruments: Contracts and Quality in Processing Tomatoes," *American Journal of Agricultural Economics*, 2010, *92* (5), 1283–1293.

Goyal, Aparajita, "Information, Direct Access to Farmers, and Rural Market Performance in Central India," *American Economic Journal: Applied Economics*, July 2010, *2* (3), 22–45.

Hasanain, Ali, Muhammad Yasir Khan, and Arman Rezaee, "No bulls: Experimental evidence on the impact of veterinarian ratings in Pakistan," 2022. mimeo.

John, Anjaly Teresa, Sanchit Makkar, Swaminathan Sumathi, Minocha Sumedha, Patrick Webb, Kurpad Anura V, and Tinku Thomas, "Factors influencing household pulse consumption in India: A multilevel model analysis," *Global Food Security*, 2021, *29.*

Joshi, Pramod Kumar, Avinash Kishore, and Devesh Roy, "Making pulses affordable again: Policy options from the farm to retail in India," IFPRI Discussion Paper 1555, International Food Policy Research Institute 2016.

Kondylis, Florence, Valerie Mueller, and Jessica Zhu, "Seeing is believing? Evidence from an extension network experiment," *Journal of Development Economics*, 2017, *125*, 1–20.

Kumar, Praduman, Pramod Kumar Joshi, and Shinoj Parappurathu, "Ch. 2: Changing consumption patterns and roles of pulses in nutrition, and future demand projections," in Devesh Roy, Pramod Kumar Joshi, and Raj Chandra, eds., *Pulses for nutrition in India: Changing patterns from farm to fork*, International Food Policy Research Institute, 2017, pp. 21–61.

Lusk, Jayson L. and Jason F. Shogren, *Experimental Auctions: Methods and Applications in Economic and Marketing Research* Quantitative Methods for Applied Economics and Business Research, Cambridge University Press, 2007.

Macchiavello, Rocco and Ameet Morjaria, "Competition and Relational Contracts in the Rwanda Coffee Chain," *The Quarterly Journal of Economics*, 2021, *136* (2), 1089–1143.

_ **and Josepa Miquel-Florensa**, "Buyer-Driven Upgrading in GVCS: The Sustainable Quality Program in Colombia," SSRN Scholarly Paper ID 3464455, Social Science Research Network 2019.

Maertens, Annemie, Hope Michelson, and Vesall Nourani, "How Do Farmers Learn from Extension Services? Evidence from Malawi," *American Journal of Agricultural Economics*, 2021, *103* (2), 569–595.

Magruder, Jeremy R., "An Assessment of Experimental Evidence on Agricultural Technology Adoption in Developing Countries," *Annual Review of Resource Economics*, 2018, *10* (1), 299–316.

McArthur, John W. and Gordon C. McCord, "Fertilizing growth: Agricultural inputs and their effects in economic development," *Journal of Development Economics*, 2017, *127*, 133–152.

Minocha, Sumedha, Sanchit Makkar, Sumathi Swaminathan, Tinku Thomas, Patrick Webb, and Anura V. Kurpad, "Supply and demand of high quality protein foods in India: Trends and opportunities," *Global Food Security*, 2019, *23*, 139–148.

Negi, Akanksha and Devesh Roy, "The cooling effect of pulse imports on price: The case of the pigeon pea in India," IFPRI Discussion Paper 1439, International Food Policy Research Institute 2015.

Pandey, Vijay Laxmi, S. Mahendra Dev, and Ranjeeta Mishra, "Pulses in eastern India: production barriers and consumption coping strategies," *Food Security*, 2019, *11*, 609–622.

Park, Sangyoon, Zhaoneng Yuan, and Hongsong Zhang, "Technology Training, Buyer-Supplier Linkage, and Quality Upgrading in an Agricultural Supply Chain," 2022. mimeo.

Pingali, Prabhu L., "Green Revolution: Impacts, limits, and the path ahead," *Proceedings of the National Academy of Sciences*, 2012, *109* (31), 12302–08.

Rampal, Priya, "An Analysis of Protein Consumption in India Through Plant and Animal Sources," *Food and Nutrition Bulletin*, 2018, *39* (4), 564–580.

Rao, Manaswini and Ashish Shenoy, "Got (Clean) Milk? Organization, Incentives, and Management in Indian Dairy Cooperatives," 2022. mimeo.

Reddy, A and G.P. Reddy, "Supply Side Constrains in Production of Pulses in India: A Case Study of Lentil," *Agricultural Economics Research Review*, 2010, *23* (1), 129–136.

Saenger, Christoph, Matin Qaim, Maximo Torero, and Angelino Viceisza, "Contract farming and smallholder incentives to produce high quality: experimental evidence from the Vietnamese dairy sector," *Agricultural Economics*, 2013, *44* (3), 297–308.

_ , Maximo Torero, and Matin Qaim, "Impact of Third-party Contract Enforcement in Agricultural Markets—A Field Experiment in Vietnam," *American Journal of Agricultural Economics*, 2014, *96* (4), 1220–1238.

Sharma, Manika, Avinash Kishore, Devesh Roy, and Kuhu Joshi, "A comparison of the Indian diet with the EAT-Lancet reference diet," *BMC Public Health*, 2020, *20* (812).

Sibhatu, Kibrom T., Vijesh V. Krishna, and Matin Qaim, "Production diversity and dietary diversity in smallholder farm households," *Proceedings of the National Academy of Sciences*, 2015, *112* (34), 10657–62.

Tiwari, AK and AK Shivhare, "Pulses in India: Retrospect and Prospects," Technical Report, Government of India 2017.

Waddington, Hugh and Howard White, "Farmer field schools: from agricultural extension to adult education," 3ie Systematic Review, International Initiative for Impact Evaluation 2014.

Welch, Ross M. and Robin D. Graham, "A new Paradigm for World Agriculture: Productive, Sustainable, Nutritious, Healthful Food Systems," *Food and Nutrition Bulletin*, 2000, *21* (4), 361–366.

World Bank, *World Development Report 2008: Agriculture for Development* World Development Report, The World Bank, 2007.

Figure 1: Map of Project Area

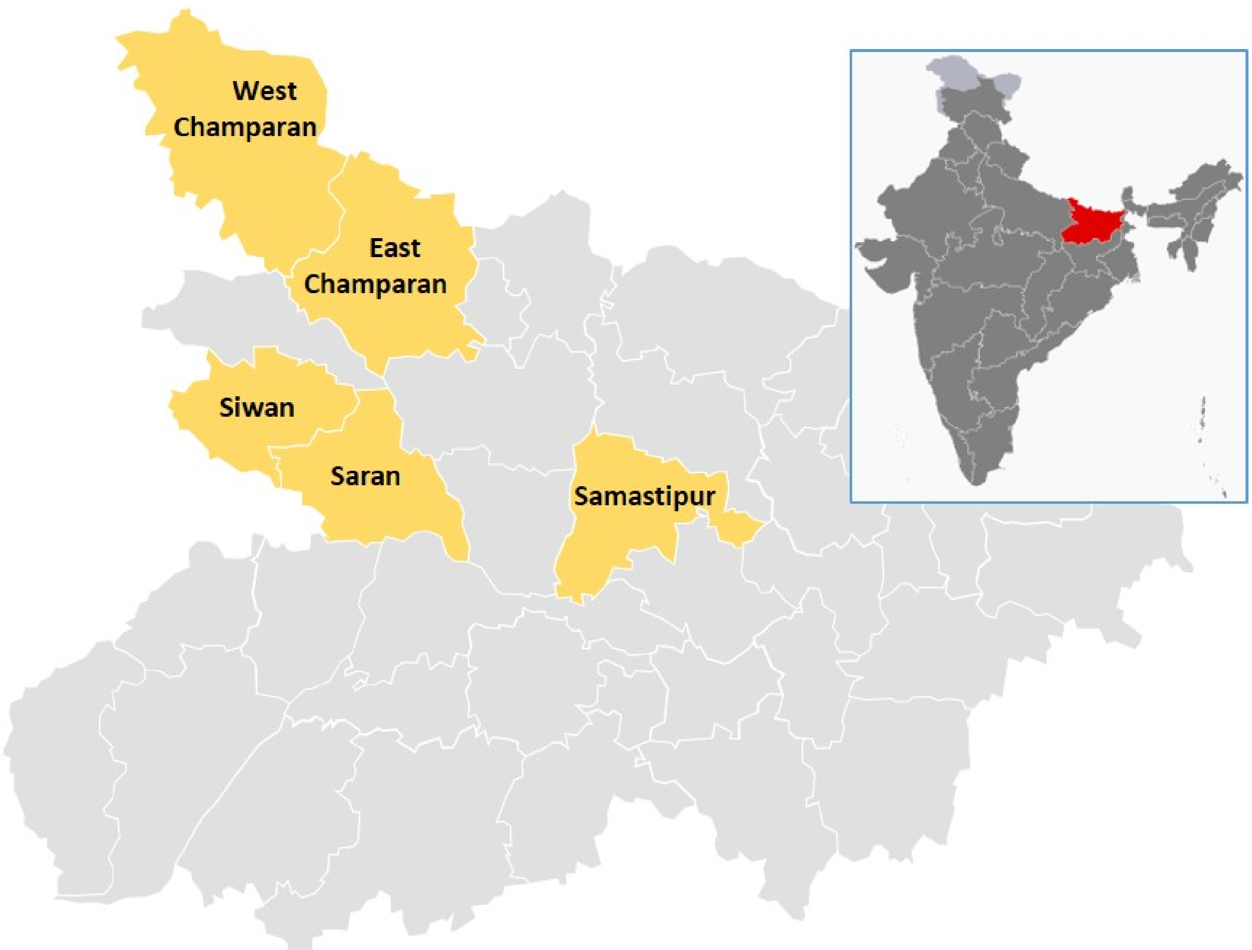
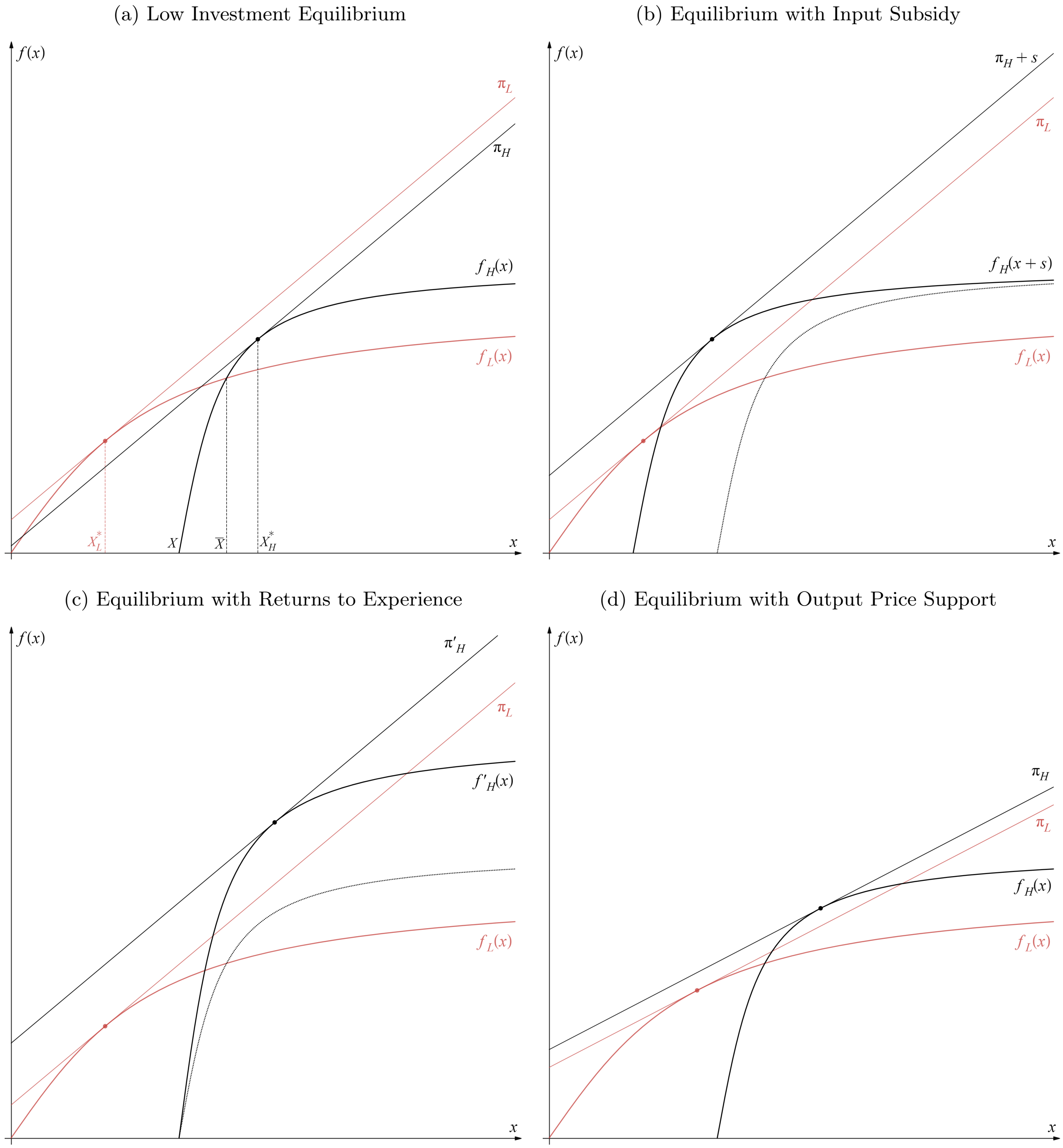


Figure 2: Theory of Change



Notes: Production functions and isoprofit curves at the optimal level of production. $f_L(x)$ represents traditional production technology, and $f_H(x)$ represents modern technology. (a) Pre-study equilibrium with low investment and output. Profit from low investment (X_L^*) with traditional technology exceeds profit from high investment (X_H^*) with modern technology. (b) Equilibrium during input intervention with subsidy s for modern variety seeds and inputs. Subsidized profit from modern technology now exceeds profit from traditional technology. (c) Post-intervention equilibrium when there are returns to experience. Production function with modern technology grows from $f_H(x)$ to $f'_H(x)$, and is now more profitable than traditional technology. (d) Equilibrium with output price support. An increase in the output price flattens isoprofit curves, creating the possibility that modern technology dominates traditional technology even under the existing production functions without returns to experience.

Figure 3: Randomization Design for Primary and Secondary Experiments

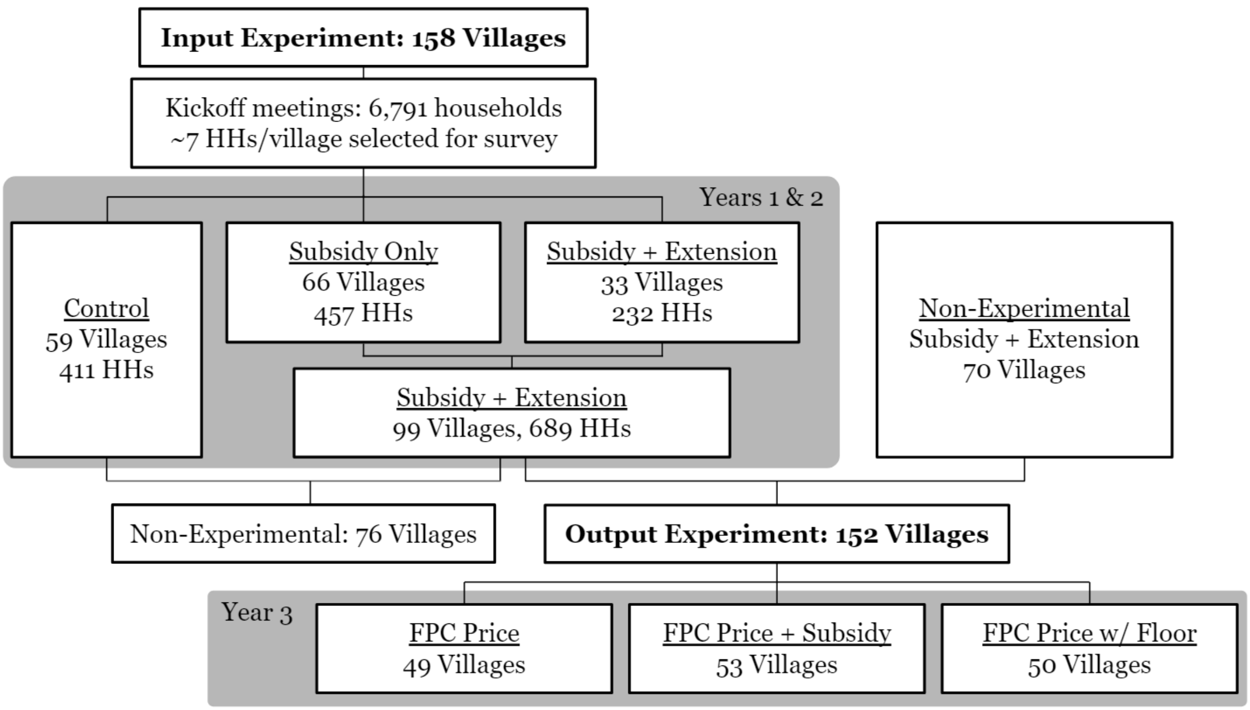


Figure 4: Timeline of Activities

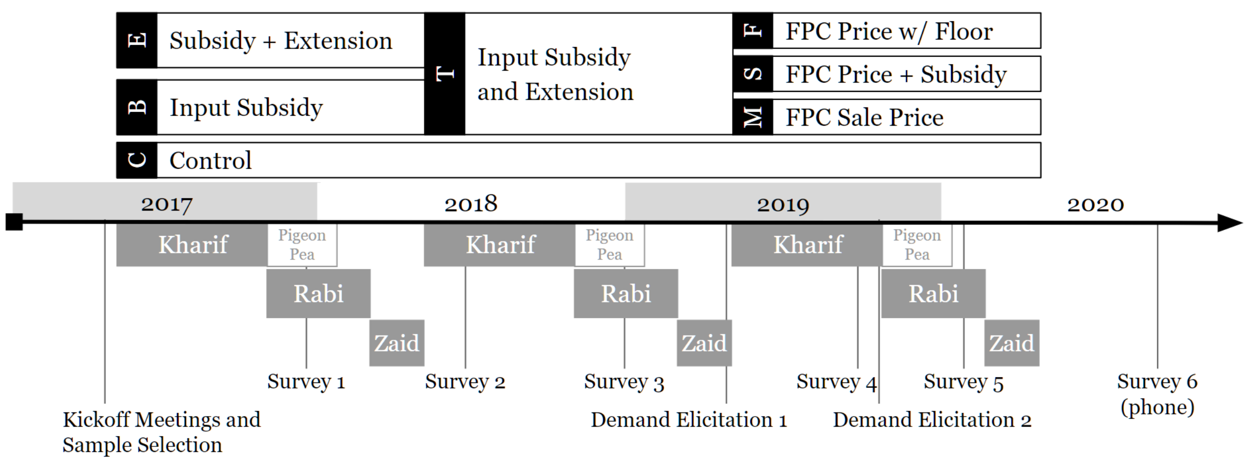
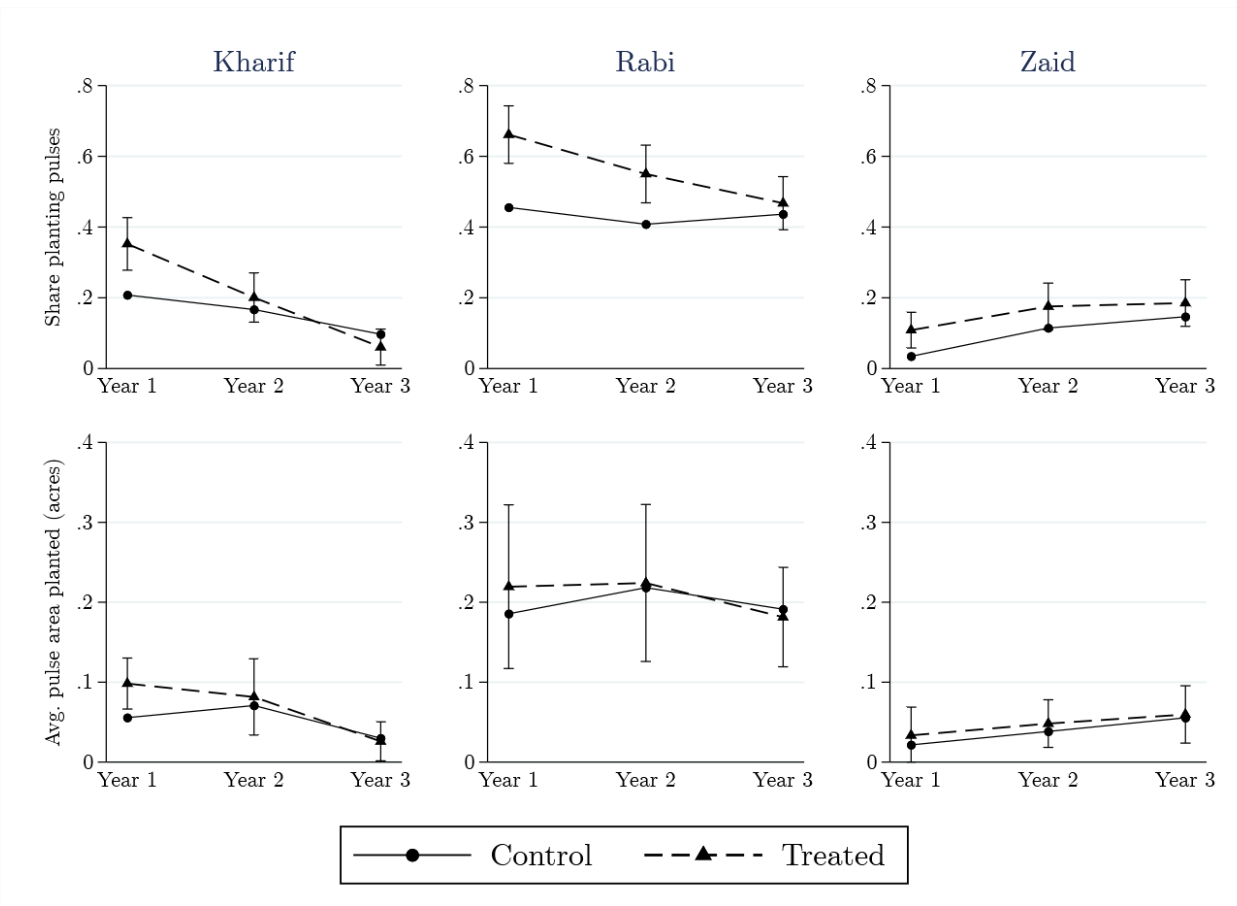
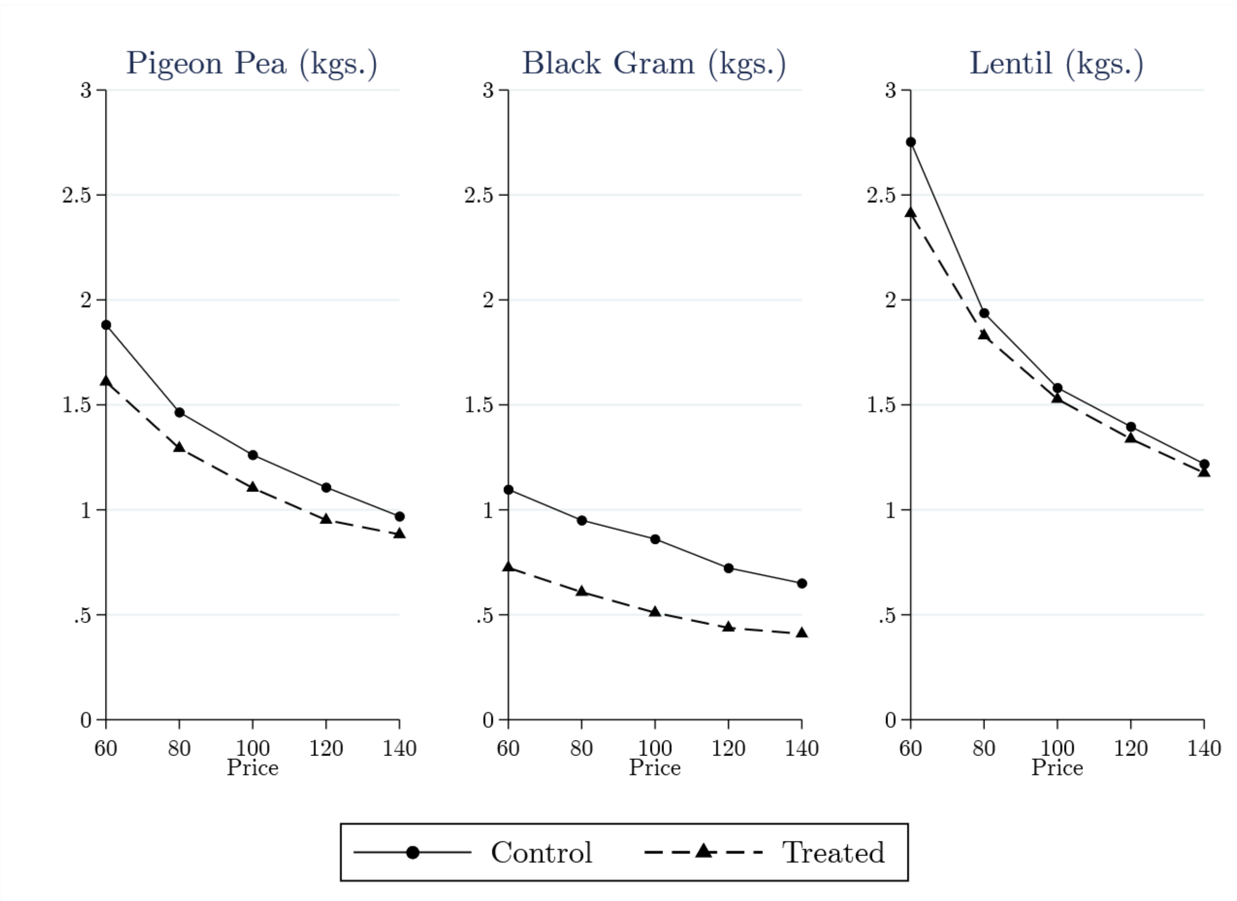


Figure 5: Pulse Adoption and Area Sown



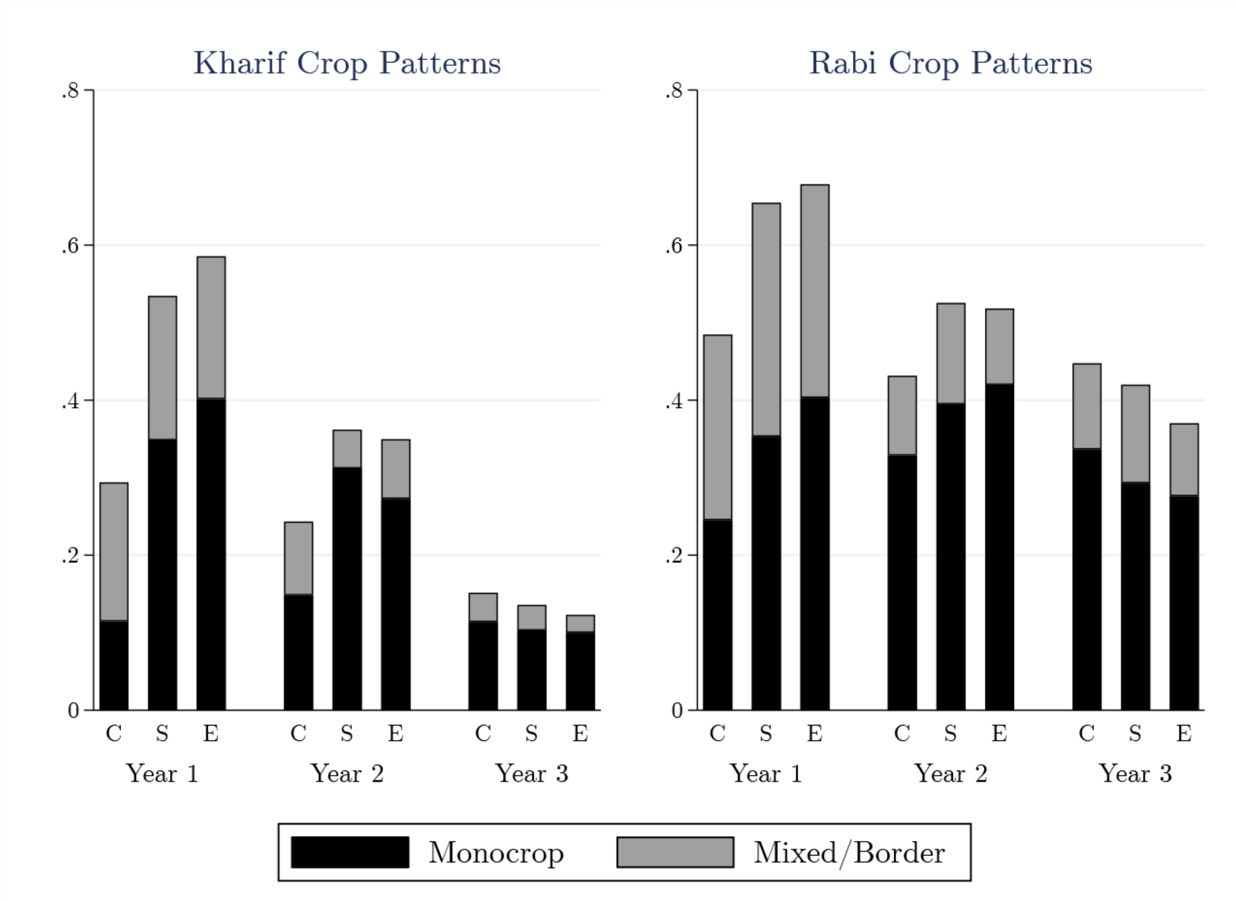
Notes: Graphical representation of regression estimates reported in Table 3.

Figure 6: Seed Demand Curves



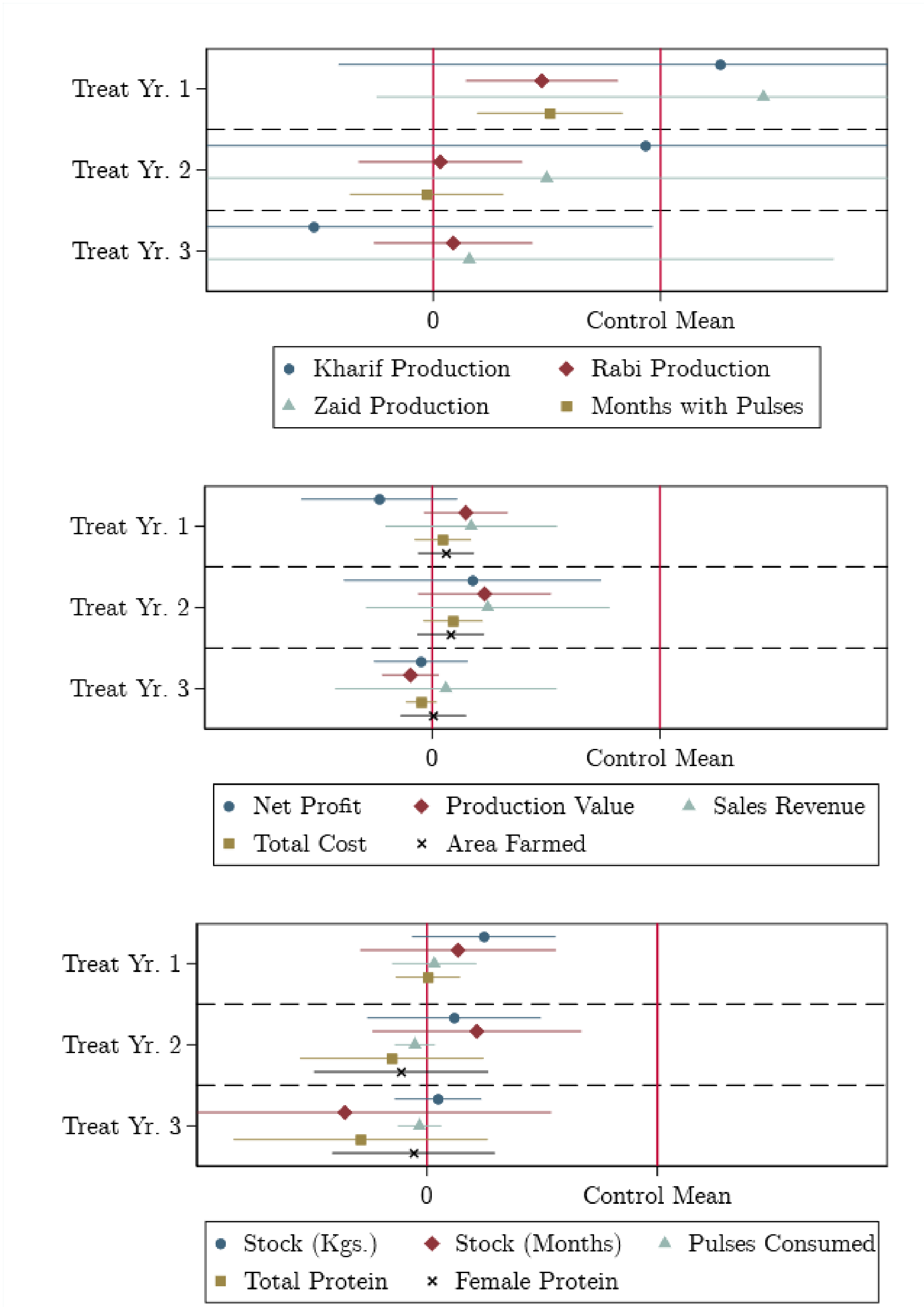
Notes: Average quantity demanded at each price in incentive-compatible elicitation of demand for coupon for certified seeds delivered by FPC.

Figure 7: Adoption Patterns by Year and Treatment Status



Notes: Fraction of farmers growing pulses by cropping practice. E denotes extension in first year; S denotes subsidy only in first year; C denotes control. In second year, both E and S received high-intensity extension.

Figure 8: Treatment Effects on Production, Profits, and Consumption Relative to Control Mean



Notes: Graphical representation of results presented in Tables 7, 8, and 9 with 95% confidence intervals. Each row represents the difference between treatment and control divided by the control mean and can be interpreted as the percent change in the outcome relative to control. We present the same results in standard deviations in Appendix D.

Table 1: Baseline Characteristics by Input Experiment Treatment Status

Variable	(1) 0 Mean/SE	(2) 1 Mean/SE	(3) Total Mean/SE	T-test Difference (1)-(2)
Farm respondent:				
Male	0.868	0.840	0.850	0.028
	(0.018)	(0.016)	(0.012)	
Age	48.264	49.371	48.952	-1.107
	(0.884)	(0.664)	(0.531)	
Primary School	0.548	0.658	0.616	-0.109***
	(0.027)	(0.020)	(0.016)	
Secondary School	0.390	0.485	0.449	-0.095***
	(0.026)	(0.021)	(0.017)	
Food respondent:				
Male	0.008	0.004	0.006	0.003
	(0.004)	(0.003)	(0.002)	
Age	35.627	36.142	35.947	-0.515
	(0.646)	(0.505)	(0.397)	
Primary School	0.506	0.588	0.557	-0.082
	(0.050)	(0.036)	(0.029)	
Secondary School	0.391	0.461	0.434	-0.069
	(0.049)	(0.037)	(0.029)	
Household:				
HH Size	7.524	6.656	6.984	0.868***
	(0.217)	(0.143)	(0.122)	
SC/ST	0.179	0.150	0.161	0.029
	(0.021)	(0.015)	(0.012)	
Past Pulses	0.642	0.665	0.656	-0.023
	(0.026)	(0.020)	(0.016)	
Wealth Index	-0.253	-0.018	-0.107	-0.235**
	(0.078)	(0.067)	(0.051)	
Land Owned	1.383	1.684	1.570	-0.301**
	(0.090)	(0.080)	(0.060)	
N	341	561	902	

Notes: Mean values of baseline covariates. Wealth and land area are censored at the 95th percentile. The value displayed for t-tests are the differences in the means across the groups. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 2: Baseline Characteristics by Output Experiment Treatment Status

Variable	(1) Control Mean/SE	(2) Subsidy Mean/SE	(3) Floor Mean/SE	T-test Difference (1)-(2)	T-test Difference (1)-(3)
Farm respondent:					
Male	0.831	0.849	0.868	-0.019	-0.038
	(0.027)	(0.024)	(0.024)		
Age	48.969	50.324	48.493	-1.355	0.477
	(1.164)	(1.105)	(1.042)		
Primary School	0.634	0.628	0.709	0.006	-0.075
	(0.034)	(0.032)	(0.031)		
Secondary School	0.461	0.459	0.576	0.003	-0.114**
	(0.035)	(0.033)	(0.034)		
Food respondent:					
Male	0.006	0.005	0.000	0.000	0.005
	(0.005)	(0.005)	(0.000)		
Age	34.979	38.306	35.510	-3.326***	-0.531
	(0.841)	(0.879)	(0.760)		
Primary School	0.559	0.578	0.708	-0.019	-0.149*
	(0.052)	(0.068)	(0.071)		
Secondary School	0.415	0.463	0.600	-0.048	-0.185**
	(0.052)	(0.068)	(0.072)		
Household:					
HH Size	6.621	6.528	6.591	0.093	0.030
	(0.253)	(0.227)	(0.220)		
SC/ST	0.200	0.110	0.122	0.090**	0.078**
	(0.029)	(0.021)	(0.023)		
Past Pulses	0.564	0.689	0.678	-0.125***	-0.114**
	(0.036)	(0.031)	(0.033)		
Asset Index	-0.116	0.008	-0.001	-0.124	-0.115
	(0.108)	(0.116)	(0.108)		
Land Owned	1.482	1.709	1.693	-0.228	-0.212
	(0.130)	(0.128)	(0.124)		
Land Farmed	1.376	1.647	1.514	-0.271**	-0.139
	(0.095)	(0.095)	(0.088)		
Weekly Pulses (g/capita)	255.921	268.198	257.128	-12.277	-1.207
	(16.894)	(15.792)	(17.800)		
Daily Protein (g/capita)	19.839	20.954	26.490	-1.116	-6.651
	(2.811)	(2.836)	(3.763)		
Pulse Stock Left (months)	1.344	1.496	1.676	-0.152	-0.332
	(0.168)	(0.163)	(0.185)		
N	195	219	205		

Notes: Mean values of baseline covariates and second-year food consumption. Wealth, land area, and consumption are censored at the 95th percentile. The value displayed for t-tests are the differences in the means across the groups. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 3: Adoption and Area Cultivated by Input Treatment Status

	Kharif		Rabi		Zaid	
	Adoption (1)	Area (2)	Adoption (3)	Area (4)	Adoption (5)	Area (6)
Treat Yr. 1	0.144***	0.043	0.206***	0.034	0.074*	0.012
	(0.04)	(0.02)	(0.04)	(0.05)	(0.03)	(0.02)
	[0.006]	[0.122]	[0.000]	[1.000]	[0.073]	[1.000]
Treat Yr. 2	0.034	0.011	0.142**	0.006	0.061	0.010
	(0.04)	(0.02)	(0.04)	(0.05)	(0.03)	(0.02)
	[1.000]	[1.000]	[0.017]	[1.000]	[0.758]	[1.000]
Treat Yr. 3	-0.037	-0.004	0.031	-0.010	0.038	0.004
	(0.03)	(0.01)	(0.04)	(0.03)	(0.03)	(0.02)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]
Year 2	-0.041	0.015	-0.047	0.033	0.080	0.017
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Year 3	-0.111	-0.026	-0.019	0.006	0.112	0.034
	(0.04)	(0.01)	(0.04)	(0.05)	(0.03)	(0.02)
Control Mean	0.21	0.06	0.46	0.19	0.03	0.02
R-Squared	0.21	0.10	0.18	0.12	0.09	0.08
Observations	2511	2511	2511	2511	2004	2004

Notes: Regressions according to (1). Standard errors clustered at the village level reported in parentheses and sharpened q-values in square brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level after q-value adjustment.

Table 4: Seed Demand by Input Treatment Status

	Survey	Seed Quantity (Kg.)	
	Participate	Purchased	Total
	(1)	(2)	(3)
Treat	0.0216	-0.174*	-0.712**
	(0.0336)	(0.105)	(0.323)
Price=60		0.824***	0.824***
		(0.0519)	(0.0519)
Price=80		0.445***	0.445***
		(0.0350)	(0.0350)
Price=100		0.245***	0.245***
		(0.0227)	(0.0227)
Price=120		0.0998***	0.0998***
		(0.0151)	(0.0151)
Price=140		0	0
		(.)	(.)
Control Mean	0.46	0.94	3.04
R-Squared	0.03	0.14	0.13
Observations	3244	17865	17865

Notes: Regressions according to (2). Control mean evaluated at price of Rs. 140. Standard errors clustered by village reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 5: Pulse Cropping Patterns by Farmer Group Membership

	Kharif		Rabi	
	Mono (1)	Mixed (2)	Mono (3)	Mixed (4)
Treat Yr. 1	0.162***	-0.0267	0.0921*	0.107**
	(0.0474)	(0.0456)	(0.0481)	(0.0484)
Treat Y1*Farmer Group	0.0883*	0.0702	0.125***	0.0505
	(0.0468)	(0.0453)	(0.0462)	(0.0438)
Treat Yr. 2	0.0369	-0.0218	0.0369	0.0720*
	(0.0414)	(0.0293)	(0.0430)	(0.0400)
Treat Y2*Farmer Group	0.156***	-0.0543*	0.124***	-0.0119
	(0.0459)	(0.0279)	(0.0443)	(0.0366)
Treat Yr. 3	-0.0776**	-0.0151	-0.0390	-0.00749
	(0.0328)	(0.0178)	(0.0403)	(0.0349)
Treat Y3*Farmer Group	0.104***	-0.00869	0.0699*	0.0436
	(0.0345)	(0.0236)	(0.0380)	(0.0308)
Year 2	0.0153	-0.122***	0.0706*	-0.188***
	(0.0446)	(0.0279)	(0.0389)	(0.0345)
Year 3	-0.0262	-0.177***	0.0655*	-0.149***
	(0.0413)	(0.0338)	(0.0380)	(0.0342)
Control Mean	0.115	0.202	0.245	0.312
R-Squared	0.211	0.155	0.127	0.129
Observations	1625	1625	2255	2255

Notes: Regressions following (1) with treatment effects broken down by farmer group membership. Standard errors clustered by village reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 6: Productivity by Input Treatment Status

	Yield (Kg./Acre)		
	Kharif	Rabi	Zaid
	(1)	(2)	(3)
Treat Yr. 1	14.766	-41.347	-27.228
	(23.11)	(122.26)	(54.87)
	[1.000]	[1.000]	[1.000]
Treat Yr. 2	-19.712	65.481	2.866
	(42.18)	(113.67)	(35.83)
	[1.000]	[1.000]	[1.000]
Treat Yr. 3	3.433	-132.453	23.500
	(42.93)	(78.48)	(42.02)
	[1.000]	[1.000]	[1.000]
Year 2	113.998	-123.052	-31.076
	(39.00)	(78.73)	(57.41)
Year 3	70.297	-216.638	-59.724
	(32.17)	(92.90)	(51.85)
Control Mean	64.37	466.74	140.84
R-Squared	0.11	0.04	0.20
Observations	555	1179	252

Notes: Regressions according to (1). Standard errors clustered at the village level reported in parentheses and sharpened q-values in square brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level after q-value adjustment.

Table 7: Pulse Production by Input Treatment Status

	Harvest Production (Kgs.)			Prod.	HH Stock
	Kharif	Rabi	Zaid	Index	(Months)
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	1.962	16.277*	2.946	0.236	1.322*
	(1.32)	(5.77)	(1.75)	(0.08)	(0.42)
	[1.000]	[0.090]	[1.000]		[0.063]
Treat Yr. 2	1.451	1.049	1.012	0.073	-0.076
	(1.93)	(6.21)	(2.01)	(0.09)	(0.44)
	[1.000]	[1.000]	[1.000]		[1.000]
Treat Yr. 3	-0.819	2.975	0.321	0.021	0.000
	(1.17)	(6.01)	(1.65)	(0.07)	(.)
	[1.000]	[1.000]	[1.000]		[.]
Year 2	3.946	6.614	3.376	0.210	0.573
	(1.36)	(4.46)	(1.80)	(0.06)	(0.44)
Year 3	1.127	2.858	2.976	0.003	0.000
	(1.14)	(4.94)	(1.59)	(0.06)	(.)
Control Mean	1.55	34.08	2.03	-0.08	2.58
R-Squared	0.09	0.17	0.07	0.16	0.16
Observations	2511	2004	2004	2511	1674

Notes: Regressions according to (1). Standard errors clustered at the village level reported in parentheses and sharpened q-values in square brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level after q-value adjustment.

Table 8: Profits and Costs by Input Treatment Status

	Profit (1)	Revenue (2)	Sales (3)	Cost (4)	Farm Area (5)	Profit Index (6)
Treat Yr. 1	4442.594	4456.582	2230.851	2418.971	0.084	0.135
	(3317.98)	(2808.46)	(2489.41)	(3267.39)	(0.09)	(0.10)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	
Treat Yr. 2	-3379.568	6940.508	3179.382	4762.896	0.112	0.215
	(5469.39)	(4463.87)	(3530.01)	(3439.99)	(0.10)	(0.15)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	
Treat Yr. 3	948.790	-2873.859	782.103	-2511.382	0.006	-0.052
	(1993.22)	(1912.21)	(3211.86)	(1789.70)	(0.10)	(0.08)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	
Year 2	9565.310	14368.450	11726.240	-455.713	0.243	0.371
	(3858.68)	(3137.17)	(2994.30)	(2483.21)	(0.08)	(0.09)
Year 3	18586.565	-25817.847	6776.690	-33990.658	0.030	-0.674
	(3241.46)	(2538.30)	(2489.74)	(2754.74)	(0.08)	(0.07)
Control Mean	-19107.33	30179.16	13025.87	52129.79	1.38	-0.04
R-Squared	0.03	0.37	0.31	0.41	0.32	0.41
Observations	2511	2511	2004	2511	2511	2511

Notes: Regressions according to (1). Standard errors clustered at the village level reported in parentheses and sharpened q-values in square brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level after q-value adjustment.

Table 9: Consumption and Stocks by Input Treatment Status

	Stock Remaining		Consumption	Daily Protein (g)		Cons.
	Kgs.	Months	(Kg./Week)	HH/capita	Female	Index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat Yr. 1	1.083	0.247	12.688	0.060	0.000	0.124
	(0.69)	(0.39)	(37.08)	(1.05)	(.)	(0.09)
	[1.000]	[1.000]	[1.000]	[1.000]	[.]	
Treat Yr. 2	0.516	0.395	-20.832	-2.259	-11.190	0.051
	(0.84)	(0.42)	(17.73)	(2.99)	(19.08)	(0.10)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	
Treat Yr. 3	0.209	-0.648	-12.837	-4.269	-5.740	-0.081
	(0.42)	(0.83)	(19.15)	(4.14)	(17.81)	(0.07)
	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	
Year 2	0.792	0.013	-130.192	5.174	-0.420	-0.035
	(0.60)	(0.30)	(27.87)	(2.58)	(23.09)	(0.07)
Year 3	-2.141	-5.921	-86.696	8.800	0.000	-0.797
	(0.56)	(0.87)	(29.90)	(3.71)	(.)	(0.11)
Control Mean	4.38	1.82	399.79	14.80	99.62	0.25
R-Squared	0.15	0.23	0.15	0.09	0.03	0.22
Observations	2511	2511	2469	2469	1629	2469

Notes: Regressions according to (1). Standard errors clustered at the village level reported in parentheses and sharpened q-values in square brackets. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level after q-value adjustment.

Table 10: Cultivation and Sales by Output Treatment Status

	Kharif Season			Rabi Season		
	Area	Sown	Sold	Area	Sown	Sold
	(1)	(2)	(3)	(4)	(5)	(6)
Subsidy	-0.000196	0.0941	5.053	0.0440	0.663	112.4**
	(0.205)	(1.305)	(18.67)	(0.152)	(1.757)	(54.83)
Price Floor	0.00812	0.0388	-2.632	0.0349	0.515	29.29
	(0.179)	(1.077)	(12.81)	(0.139)	(1.683)	(36.14)
Control Mean	0.09	0.98	51.48	0.15	1.86	75.36
HH FEs	X	X		X	X	
R-Squared	0.91	0.91	0.47	0.95	0.94	0.18
Observations	3356	3356	112	10725	10725	152

Notes: Columns 1, 2, 4, and 5 report regression results according to (3). Columns 3 and 6 report regression results according to(4). Standard errors clustered by village in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Acknowledgements and Disclosure Statement

We are indebted to the study participants for generously giving their time. We are grateful to Tinni Sawhney, RP Singh, Vineet Kumar, Adarsh Anand, Ruchi Chaurasia, Tushar Krishna, and members of the Aga Khan Rural Support Programme, Kaushalya Foundation, Nav Jagrati, and SSEVS for local support. We thank Ellen Anderson, Komal Jain, Nandish Kenia, Rupika Singh, and Kate Sturla for assistance with data collection, and Tony Cavalieri, Mariana Kim, and Marcella McClatchey for financial and logistical support.

Project implementation and evaluation were funded by independent grants from the Bill and Melinda Gates Foundation, Evaluation funding included two and a half months of summer salary each for authors Lybbert and Shenoy, three years of graduate student funding for author Bourdier, and one year of graduate student funding for author Kieran. Authors declare we have no further conflicts of interest. No institution had the right to review results before publication.

All data collection was approved by the University of California, Davis IRB. Primary analysis was pre-registered at the AEA RCT registry under AEARCTR-0003872 and AEARCTR-0004393.

Supplementary Appendix for "Reviving Pulses"

For Online Publication Only

A Survey Attrition

Table S1 reports the number of households surveyed in each round by treatment status. The first and third columns report the number of households, while the second and fourth columns report the number of households remaining in a balanced panel up to that point. Attrition is nearly identical between treatment and control, with small numbers exiting the sample in each round. The rate of attrition is substantially higher in the final Rabi survey owing to the fact that it was a phone survey conducted after the onset of COVID-19, while all other round were conducted in person.

[Table S1 about here.]

Table S2 reports household baseline characteristics by survey attrition status. The first column reports data for households that participated in all survey rounds, column 2 includes those that responded to all survey rounds but did not participate in the third-year Rabi phone survey, and column 3 presents data on those that missed at least one in-person survey. Households that did not participate in the COVID-19 phone survey tend to be wealthier and more educated, but these characteristics do not predict prior attrition.

[Table S2 about here.]

For regression analysis, we restrict to a balanced panel of households. This yields a sample of 924 households for data collected in the Kharif season and 669 households for data collected in the Rabi season. Variables that include data from the third-year Rabi phone survey include Rabi pulse production and yield, Zaid adoption and area, Zaid production and yield, and sales revenue. Other outcomes on profitability and household consumption were dropped from phone surveys for time. The year fixed effect controls for differences in response induced by survey mode in the final phone round. In Appendix D we demonstrate robustness to attrition by running regressions using all households in an unbalanced panel.

Table S1: Households per Survey Round

	Control		Treatment	
	Households	Balanced Panel	Households	Balanced Panel
Year 1 Kharif	404	404 (100%)	678	678 (100%)
Year 1 Rabi	393	393 (97%)	665	665 (98%)
Year 2 Kharif	391	381 (94%)	639	628 (93%)
Year 2 Rabi	356	348 (86%)	588	579 (85%)
Year 3 Kharif	347	317 (78%)	577	523 (77%)
Year 3 Rabi	268	250 (62%)	454	419 (62%)

Number of households responding in each survey round. Balanced panel reflects number of households available in all survey rounds up to that point. Year 3 Rabi survey was conducted by phone during COVID-19 pandemic, and therefore has higher rates of attrition.

Table S2: Baseline Characteristics by Survey Attrition

Variable	(1) All Surveys Mean/SE	(2) Drop Phone Mean/SE	(3) Drop Early Mean/SE	T-test Difference (1)-(2)	(1)-(3)
Farm respondent:					
Male	0.870	0.778	0.839	0.092***	0.031
	(0.013)	(0.032)	(0.024)		
Age	49.315	48.649	46.773	0.666	2.543**
	(0.612)	(1.277)	(1.000)		
Primary School	0.661	0.468	0.600	0.193***	0.061*
	(0.018)	(0.038)	(0.028)		
Secondary School	0.493	0.292	0.458	0.201***	0.035
	(0.019)	(0.035)	(0.028)		
Food respondent:					
Male	0.004	0.015	0.005	-0.011*	-0.002
	(0.002)	(0.008)	(0.004)		
Age	35.812	36.187	36.777	-0.374	-0.965
	(0.462)	(0.910)	(0.727)		
Primary School	0.570	0.568	0.618	0.002	-0.048
	(0.031)	(0.096)	(0.069)		
Secondary School	0.437	0.462	0.510	-0.024	-0.073
	(0.031)	(0.096)	(0.070)		
Household:					
HH Size	7.030	6.917	6.386	0.113	0.644**
	(0.145)	(0.266)	(0.192)		
SC/ST	0.169	0.129	0.149	0.040	0.020
	(0.014)	(0.026)	(0.023)		
Past Pulses	0.656	0.643	0.632	0.013	0.024
	(0.018)	(0.037)	(0.031)		
Asset Index	-0.028	-0.412	0.004	0.383***	-0.032
	(0.060)	(0.117)	(0.104)		
Land Owned	1.629	1.294	1.734	0.335**	-0.105
	(0.072)	(0.119)	(0.119)		
N	669	171	242		

Notes: Mean values of baseline covariates by attrition status. Column 1 includes households that responded to all surveys, Column 2 contains those that answered all in-person surveys but dropped out of final Rabi season phone survey, and Column 3 includes those that absent from at least one in-person survey. Wealth and land area are censored at the 95th percentile. The value displayed for t-tests are the differences in the means across the groups. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

B Principal Components Analysis

Table S3 reports results from principal components analysis used for construction of production, profitability, and consumption indices, respectively. The first panel reports loading factors on each season of production as presented in Table 7. Months of household pulse stock is excluded because it is not measured in the third year. Only the first principal component has an associated eigenvector greater than one, although the high unexplained variation in production outcomes indicates that pulse production is relatively uncorrelated across seasons within a farmer-year.

[Table S3 about here.]

The second panel of Table S3 reports loading factors on variables related to profitability as presented in Table 8. Net profit is excluded because it is already a linear combination of production revenue and production cost. Only the first principal component is associated with an eigenvector greater than one. The large difference between the first and second eigenvalue as well as the relatively low unexplained variation in variables indicates that profitability measures are fairly well correlated.

The final panel of Table S3 reports loading factors on variables related to consumption as presented in Table 9. Daily protein consumption of the (predominantly female) household food preparer is excluded because data was not collected in the first year. Both the first and second components are associated with eigenvalues greater than one, while the third and fourth are associated with eigenvalues less than one. The first component places positive weight on all variables, but the unexplained variation indicates that it is most strongly associated with household pulse stocks.

The second principal component of consumption picks up most of the remaining variation in pulse and protein consumption. It places a slight negative weight on household stock variables, and larger positive weight on consumption outcomes. The first two components together explain 58.7% and 61.4% of per capita pulse and protein consumption, respectively.

Regression estimation using the second principal component of consumption is consistent with the null results presented in Table 9. The estimated treatment effects in years 1, 2, and 3 are negative and quantitatively small at -0.01, -0.10, and -0.08, respectively, and all three coefficients are statistically indistinguishable from zero at the 10% level.

Table S3: Principal Components Analysis Details

	Production	
	Loading	Unexplained
Kharif Production	0.484	0.734
Rabi Production	0.614	0.533
Zaid Production	0.595	0.598
First Eigenvalue	1.135	
Second Eigenvalue	0.962	
	Profitability	
	Loading	Unexplained
Production Revenue	0.529	0.210
Sales Revenue	0.486	0.334
Production Cost	0.528	0.213
Area Farmed	0.452	0.424
First Eigenvalue	2.819	
Second Eigenvalue	0.579	
	Consumption	
	Loading	Unexplained
Household Stock (Kgs.)	0.668	0.418
Household Stock (Months)	0.639	0.467
Pulse Consumption	0.348	0.814
Protein Consumption	0.157	0.968
First Eigenvalue	1.306	
Second Eigenvalue	1.154	

C Output Subsidy Calibration

Price floors offered by FPCs in the third experiment year matched the national MSP, which was set at Rs.56/kg. for black gram and Rs. 44.75/kg. for lentils in the year of study. We calibrate the per-unit subsidy to match the average MSP premium over the market wholesale price at harvest in the prior ten years, with zero premium when the market price exceeded the MSP. Historical price data from Bihar was unavailable for this exercise, so we use inflation-adjusted market prices in the neighboring state of Uttar Pradesh reported by the Indian Ministry of Agriculture. For this calculation, we use the October market price for black gram and the March price for lentils. The black gram MSP exceeded the inflation-adjusted market price in 2009, 2011, 2017, and 2018, with an average premium of Rs. 5.88, so the black gram subsidy was set at Rs. 6. The lentil MSP exceeded the inflation-adjusted market price in 2011, 2012, 2013, and 2018, with an average premium of Rs. 1.72, so the lentil subsidy was set at Rs. 2. Full price details are provided in Table S4.

[Table S4 about here.]

Table S4: Market Prices and Implicit MSP Subsidies by Year

	Black Gram (MSP = Rs. 56/kg.)		Lentil (MSP = Rs. 44.75/kg.)	
	Market Price	Subsidy	Market Price	Subsidy
2009	40.72	15.28	52.29	0
2010	68.08	0	54.58	0
2011	49.95	6.05	42.55	2.20
2012	56.48	0	38.98	5.77
2013	61.44	0	44.33	0.42
2014	62.41	0	48.10	0
2015	97.39	0	54.70	0
2016	65.75	0	58.48	0
2017	33.52	20.48	52.46	0
2018	39.01	16.99	35.96	8.79
Average		5.88		1.72

Notes: Inflation-adjusted market prices from Uttar Pradesh as reported by the Ministry of Agriculture, and the level of implicit subsidy that would have been issued under the current MSP. Black gram uses the October price; lentil uses the March price.

D Robustness

Figure S1 reports standardized treatment effects on pulse production by season, profitability outcomes, and consumption outcomes. Each row reports the difference in mean between treatment and control divided by the variable standard deviation, as a counterpart to Figure 8 that divides by the control mean.

[Figure S1 about here.]

In the rest of this section we verify that results presented in Tables 3, 6, 7, 8, and 9 are robust to ignoring attrition and conducting analysis with an unbalanced panel of households, to omitting household controls, and to dropping data from the Samastipur district where farmer group membership was the lowest. We also present results broken down by first-year treatment status, differentiating between farmers that received subsidies alone and those that received subsidies with high-intensity extension in the first year.

D.1 Ignoring Attrition

The main analysis drops households that do not participate in every survey round to restrict to a balanced panel. The following tables present results using all respondents regardless of their participation in other survey rounds.

[Table S5 about here.]

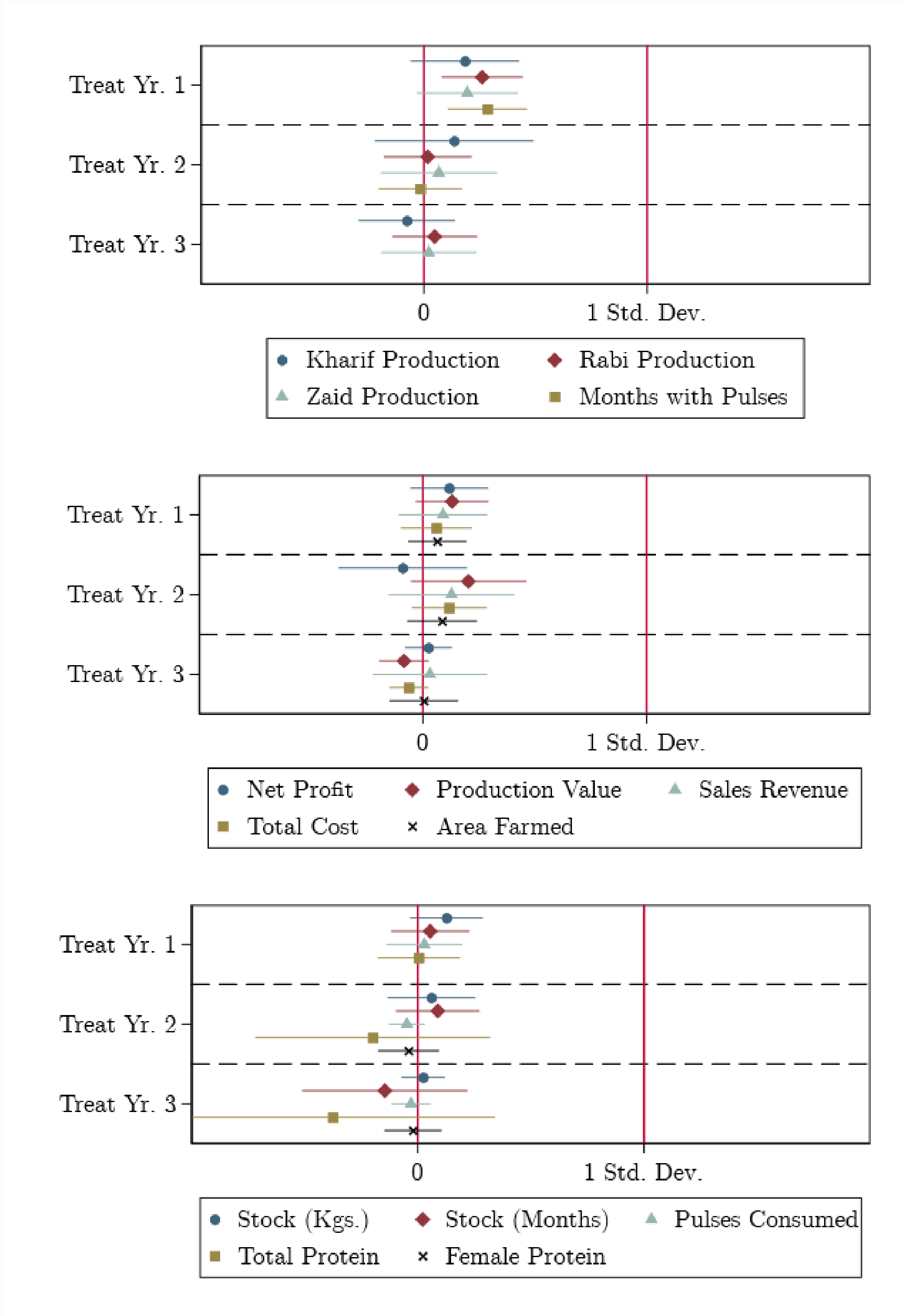
[Table S6 about here.]

[Table S7 about here.]

[Table S8 about here.]

[Table S9 about here.]

Figure S1: Standardized Treatment Effects on Production, Profits, and Consumption



Notes: Graphical representation of results presented in Tables 7, 8, and 9 with 95% confidence intervals. Each row represents the difference between treatment and control divided by the standard deviation. We present the same results relative to the control mean in Figure 8.

Table S5: Results on Adoption and Area: Unbalanced Panel

	Kharif		Rabi		Zaid	
	Adoption (1)	Area (2)	Adoption (3)	Area (4)	Adoption (5)	Area (6)
Treat Yr. 1	0.158***	0.0488***	0.215***	0.0367	0.0798***	0.0165
	(0.0400)	(0.0180)	(0.0432)	(0.0560)	(0.0257)	(0.0191)
Treat Yr. 2	0.0495	0.0173	0.157***	0.00935	0.0690**	0.0148
	(0.0367)	(0.0247)	(0.0431)	(0.0529)	(0.0336)	(0.0163)
Treat Yr. 3	-0.0226	0.00220	0.0445	-0.00669	0.0442	0.00873
	(0.0261)	(0.0128)	(0.0395)	(0.0317)	(0.0353)	(0.0191)
Year 2	-0.0410	0.0149	-0.0505	0.0324	0.0800***	0.0168
	(0.0330)	(0.0169)	(0.0340)	(0.0282)	(0.0263)	(0.0191)
Year 3	-0.110***	-0.0254**	-0.0221	0.00548	0.112***	0.0339
	(0.0361)	(0.0123)	(0.0363)	(0.0492)	(0.0318)	(0.0208)
Control Mean	0.21	0.06	0.46	0.19	0.03	0.02
R-Squared	0.17	0.06	0.12	0.07	0.07	0.05
Observations	2520	2520	2520	2520	2007	2007

Notes: This table reproduces results form Table 3 using an unbalanced panel of all survey responses from every round.

Table S6: Results on Yield: Unbalanced Panel

	Yield (Kg./Acre)		
	Kharif	Rabi	Zaid
	(1)	(2)	(3)
Treat Yr. 1	42.43	20.32	-60.45
	(26.04)	(107.8)	(69.63)
Treat Yr. 2	7.292	30.44	12.60
	(38.61)	(98.55)	(44.72)
Treat Yr. 3	6.151	-165.8**	156.8
	(39.70)	(82.65)	(116.5)
Year 2	90.66***	-94.85	-56.73
	(32.85)	(68.09)	(54.95)
Year 3	71.77**	-142.6	-230.0
	(29.23)	(91.27)	(162.7)
Control Mean	64.37	466.7	140.8
R-Squared	0.0803	0.0458	0.157
Observations	653	1379	315

Notes: This table reproduces results form Table 6 using an unbalanced panel of all survey responses from every round.

Table S7: Results on Production: Unbalanced Panel

	Harvest Production (Kgs.)			Prod.	HH Stock
	Kharif	Rabi	Zaid	Index	(Months)
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	2.937**	11.75**	2.099	0.241***	1.196***
	(1.161)	(5.255)	(1.305)	(0.0726)	(0.387)
Treat Yr. 2	2.100	1.071	0.289	0.0681	-0.00964
	(1.788)	(5.283)	(1.541)	(0.0823)	(0.445)
Treat Yr. 3	-0.533	0.891	2.441	0.0538	0
	(0.989)	(4.290)	(2.545)	(0.0793)	(.)
Year 2	3.510***	2.108	2.733**	0.170***	0.702*
	(1.335)	(3.545)	(1.281)	(0.0529)	(0.398)
Year 3	0.905	-8.112*	-1.031	-0.0866	0
	(0.906)	(4.597)	(2.802)	(0.0864)	(.)
Control Mean	1.554	34.08	2.027		2.578
R-Squared	0.0788	0.140	0.0300	0.124	0.150
Observations	3078	3078	3078	3078	1924

Notes: This table reproduces results form Table 7 using an unbalanced panel of all survey responses from every round.

Table S8: Results on Profits: Unbalanced Panel

	Profit (1)	Revenue (2)	Sales (3)	Cost (4)	Farm Area (5)	Profit Index (6)
Treat Yr. 1	2905.2	5614.9**	1962.9	4191.7	0.107	0.178*
	(3249.7)	(2483.9)	(1945.6)	(3193.8)	(0.0788)	(0.0934)
Treat Yr. 2	-1551.0	7642.1*	2933.5	3936.6	0.0809	0.203
	(4666.3)	(3904.3)	(2674.8)	(3046.9)	(0.0954)	(0.128)
Treat Yr. 3	275.2	-2923.8	775.8	-2084.3	0.0477	-0.0357
	(1719.0)	(1791.6)	(2333.3)	(1741.7)	(0.0997)	(0.0773)
Year 2	8390.5**	11204.1***	8124.5***	-1689.2	0.262***	0.298***
	(3451.2)	(2740.5)	(2091.7)	(2384.9)	(0.0753)	(0.0803)
Year 3	18170.5***	-24945.5***	3792.1**	-32294.9***	0.0505	-0.636***
	(3105.7)	(2243.0)	(1876.7)	(2738.7)	(0.0745)	(0.0641)
Control Mean	-19107.33	30179.16	13025.87	52129.79	1.38	
R-Squared	0.03	0.35	0.29	0.38	0.32	0.39
Observations	2950	2950	2950	2950	2950	2950

Notes: This table reproduces results form Table 8 using an unbalanced panel of all survey responses from every round.

Table S9: Results on Consumption: Unbalanced Panel

	Stock Remaining		Consumption	Daily Protein (g)		Cons.
	Kgs.	Months	(Kg./Week)	HH/capita	Female	Index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat Yr. 1	1.056*	0.402	-4.066	-0.183	0	0.121
	(0.632)	(0.348)	(39.64)	(0.844)	(.)	(0.0844)
Treat Yr. 2	0.556	0.408	-25.24	0.226	2.572	0.0541
	(0.734)	(0.352)	(16.31)	(2.713)	(16.72)	(0.0901)
Treat Yr. 3	0.348	-0.705	-23.17	-5.469	-11.50	-0.0759
	(0.383)	(0.743)	(18.94)	(3.862)	(16.34)	(0.0725)
Year 2	0.407	-0.0308	-147.5***	4.566**	-3.971	-0.0812
	(0.484)	(0.238)	(29.77)	(2.217)	(20.42)	(0.0620)
Year 3	-2.452***	-5.297***	-101.2***	9.285**	0	-0.805***
	(0.491)	(0.751)	(30.25)	(3.568)	(.)	(0.102)
Control Mean	4.38	1.82	399.79	14.80	99.62	
R-Squared	0.15	0.21	0.15	0.09	0.03	0.21
Observations	3078	3078	2942	2942	1913	2942

Notes: This table reproduces results form Table 9 using an unbalanced panel of all survey responses from every round.

D.2 Dropping Household Controls

The main analysis controls for the age and education for the household head, caste, asset ownership, and prior experience with pulses. The following tables present results omitting these controls. Regressions in this section still include block fixed effects.

[Table S10 about here.]

[Table S11 about here.]

[Table S12 about here.]

[Table S13 about here.]

[Table S14 about here.]

Table S10: Results on Adoption and Area: No Household Controls

	Kharif		Rabi		Zaid	
	Adoption (1)	Area (2)	Adoption (3)	Area (4)	Adoption (5)	Area (6)
Treat Yr. 1	0.158***	0.0488***	0.215***	0.0367	0.0798***	0.0165
	(0.0400)	(0.0180)	(0.0432)	(0.0560)	(0.0257)	(0.0191)
Treat Yr. 2	0.0495	0.0173	0.157***	0.00935	0.0690**	0.0148
	(0.0367)	(0.0247)	(0.0431)	(0.0529)	(0.0336)	(0.0163)
Treat Yr. 3	-0.0226	0.00220	0.0445	-0.00669	0.0442	0.00873
	(0.0261)	(0.0128)	(0.0395)	(0.0317)	(0.0353)	(0.0191)
Year 2	-0.0410	0.0149	-0.0505	0.0324	0.0800***	0.0168
	(0.0330)	(0.0169)	(0.0340)	(0.0282)	(0.0263)	(0.0191)
Year 3	-0.110***	-0.0254**	-0.0221	0.00548	0.112***	0.0339
	(0.0361)	(0.0123)	(0.0363)	(0.0492)	(0.0318)	(0.0208)
Control Mean	0.21	0.06	0.46	0.19	0.03	0.02
R-Squared	0.17	0.06	0.12	0.07	0.07	0.05
Observations	2520	2520	2520	2520	2007	2007

Notes: This table reproduces results form Table 3 omitting household controls.

Table S11: Results on Yield: No Household Controls

	Yield (Kg./Acre)		
	Kharif	Rabi	Zaid
	(1)	(2)	(3)
Treat Yr. 1	5.224	-49.58	-7.367
	(27.70)	(151.5)	(46.75)
Treat Yr. 2	-14.77	28.05	25.97
	(47.41)	(131.2)	(39.12)
Treat Yr. 3	-4.802	-156.9*	49.13
	(52.32)	(84.85)	(49.94)
Year 2	118.4***	-112.5	-13.08
	(41.38)	(108.4)	(53.46)
Year 3	87.33**	-122.1	-41.12
	(40.46)	(112.4)	(50.75)
Control Mean	64.37	466.7	140.8
R-Squared	0.0968	0.0294	0.0700
Observations	469	920	253

Notes: This table reproduces results form Table 6 omitting household controls.

Table S12: Results on Production: No Household Controls

	Harvest Production (Kgs.)			Prod.	HH Stock
	Kharif	Rabi	Zaid	Index	(Months)
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	2.633*	18.59***	3.407*	0.336***	1.573***
	(1.480)	(5.988)	(1.823)	(0.0891)	(0.473)
Treat Yr. 2	2.106	3.801	1.541	0.126	0.177
	(2.285)	(6.451)	(2.108)	(0.108)	(0.482)
Treat Yr. 3	0.0386	5.660	0.782	0.0779	0
	(1.483)	(6.217)	(1.668)	(0.0907)	(.)
Year 2	4.944***	6.614	3.376*	0.266***	0.596
	(1.663)	(4.450)	(1.796)	(0.0694)	(0.463)
Year 3	1.640	2.858	2.976*	0.139**	0
	(1.418)	(4.922)	(1.585)	(0.0621)	(.)
Control Mean	1.554	34.08	2.027		2.578
R-Squared	0.0713	0.0787	0.0458	0.0634	0.101
Observations	2007	2007	2007	2007	1338

Notes: This table reproduces results form Table 7 omitting household controls.

Table S13: Results on Profits: No Household Controls

	Profit	Revenue	Sales	Cost	Farm Area	Profit Index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat Yr. 1	4541.9	6968.4**	5180.2*	4309.7	0.160	0.245*
	(3324.3)	(3426.0)	(2913.9)	(4072.6)	(0.108)	(0.139)
Treat Yr. 2	-3404.0	9253.6*	6185.4	6690.5*	0.188	0.322*
	(5982.5)	(5091.8)	(4145.0)	(3996.8)	(0.128)	(0.179)
Treat Yr. 3	883.5	-408.4	3825.7	-432.7	0.0848	0.0618
	(1640.2)	(1643.7)	(3641.0)	(1588.4)	(0.122)	(0.0925)
Year 2	9820.9**	14615.1***	11726.2***	-526.0	0.242***	0.375***
	(3944.0)	(3193.0)	(2986.0)	(2482.9)	(0.0806)	(0.0936)
Year 3	18772.3***	-25736.4***	6776.7***	-34086.3***	0.0292	-0.675***
	(3294.8)	(2546.0)	(2482.8)	(2747.7)	(0.0792)	(0.0719)
Control Mean	-19107.33	30179.16	13025.87	52129.79	1.38	
R-Squared	0.03	0.23	0.14	0.21	0.06	0.15
Observations	2520	2520	2007	2520	2520	2520

Notes: This table reproduces results form Table 8 omitting household controls.

Table S14: Results on Consumption: No Household Controls

	Stock Remaining		Consumption	Daily Protein (g)		Cons.
	Kgs.	Months	(Kg./Week)	HH/capita	Female	Index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat Yr. 1	1.565**	0.345	46.16	2.644**	0	0.214**
	(0.745)	(0.409)	(39.96)	(1.173)	(.)	(0.105)
Treat Yr. 2	0.917	0.477	12.04	0.309	-6.346	0.139
	(0.875)	(0.425)	(19.79)	(3.067)	(19.41)	(0.112)
Treat Yr. 3	0.700*	-0.595	20.23	-1.705	-0.726	0.00723
	(0.415)	(0.807)	(20.59)	(4.241)	(17.42)	(0.0668)
Year 2	0.872	0.0284	-129.6***	5.204**	-0.494	-0.0332
	(0.599)	(0.291)	(27.89)	(2.577)	(22.85)	(0.0728)
Year 3	-2.134***	-5.918***	-88.07***	8.703**	0	-0.799***
	(0.554)	(0.860)	(29.72)	(3.705)	(.)	(0.113)
Control Mean	4.38	1.82	399.79	14.80	99.62	
R-Squared	0.07	0.22	0.05	0.02	0.01	0.15
Observations	2520	2520	2469	2469	1634	2469

Notes: This table reproduces results form Table 9 omitting household controls.

D.3 Excluding Samastipur

The main analysis presents intention-to-treat (ITT) effects on a sample of households drawn from those attending the initial kickoff project kickoff meetings. Among study districts, Samastipur had the lowest rate of subsequent farmer group membership among this sample in treated villages at 31%, well below the project average of 54%. Since all program activities are organized through the farmer group, measured effects are likely to be the weakest in this district. The following tables reproduce main results dropping Samastipur from analysis.

[Table S15 about here.]

[Table S16 about here.]

[Table S17 about here.]

[Table S18 about here.]

[Table S19 about here.]

Table S15: Results on Adoption and Area: Exclude Samastipur

	Kharif		Rabi		Zaid	
	Adoption (1)	Area (2)	Adoption (3)	Area (4)	Adoption (5)	Area (6)
Treat Yr. 1	0.120***	0.0458**	0.168***	0.0253	0.0739***	0.0129
	(0.0428)	(0.0195)	(0.0454)	(0.0620)	(0.0282)	(0.0212)
Treat Yr. 2	0.0410	0.0223	0.155***	0.00512	0.0576	-0.000333
	(0.0409)	(0.0283)	(0.0458)	(0.0599)	(0.0370)	(0.0175)
Treat Yr. 3	-0.0456	0.00312	0.0116	-0.0183	0.0319	-0.00804
	(0.0282)	(0.0141)	(0.0414)	(0.0376)	(0.0336)	(0.0163)
Year 2	-0.0566	0.0105	-0.0755**	0.0401	0.0788***	0.0191
	(0.0381)	(0.0197)	(0.0376)	(0.0335)	(0.0301)	(0.0233)
Year 3	-0.147***	-0.0367***	-0.0302	0.0108	0.0985***	0.0227
	(0.0401)	(0.0138)	(0.0427)	(0.0589)	(0.0335)	(0.0239)
Control Mean	0.24	0.07	0.50	0.21	0.03	0.02
R-Squared	0.22	0.10	0.18	0.11	0.09	0.08
Observations	2082	2082	2082	2082	1617	1617

Notes: This table reproduces results form Table 3 omitting households from the district of Samastipur.

Table S16: Results on Yield: Exclude Samastipur

	Yield (Kg./Acre)		
	Kharif	Rabi	Zaid
	(1)	(2)	(3)
Treat Yr. 1	5.998	-78.11	-17.39
	(28.22)	(158.4)	(58.73)
Treat Yr. 2	-14.24	-7.539	-13.76
	(49.14)	(154.3)	(39.49)
Treat Yr. 3	-17.89	-116.8	-35.50
	(59.78)	(94.46)	(37.63)
Year 2	124.2***	-113.4	7.411
	(44.48)	(115.3)	(67.32)
Year 3	90.42**	-156.3	-17.82
	(44.80)	(122.8)	(56.46)
Control Mean	69.49	491.2	137.1
R-Squared	0.126	0.0382	0.383
Observations	418	776	169

Notes: This table reproduces results form Table 6 omitting households from the district of Samastipur.

Table S17: Results on Production: Exclude Samastipur

	Harvest Production (Kgs.)			Prod.	HH Stock
	Kharif	Rabi	Zaid	Index	(Months)
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	2.382	12.08*	3.173	0.197**	1.222**
	(1.591)	(6.127)	(2.017)	(0.0848)	(0.468)
Treat Yr. 2	2.112	-1.497	0.148	0.0468	0.0339
	(2.299)	(7.122)	(2.353)	(0.102)	(0.499)
Treat Yr. 3	-1.013	3.851	-0.511	0.0108	0
	(1.345)	(7.065)	(1.807)	(0.0803)	(.)
Year 2	4.630***	8.633	4.507**	0.255***	0.626
	(1.600)	(5.229)	(2.115)	(0.0629)	(0.500)
Year 3	1.155	4.830	3.773**	0.0170	0
	(1.353)	(5.854)	(1.805)	(0.0705)	(.)
Control Mean	1.84	36.80	1.95		2.89
R-Squared	0.09	0.17	0.09	0.15	0.14
Observations	2082	1617	1617	2082	1388

Notes: This table reproduces results form Table 7 omitting households from the district of Samastipur.

Table S18: Results on Profits: Exclude Samastipur

	Profit (1)	Revenue (2)	Sales (3)	Cost (4)	Farm Area (5)	Profit Index (6)
Treat Yr. 1	4811.2	4657.5*	1003.0	1059.2	0.0529	0.107
	(3705.4)	(2703.6)	(2545.1)	(3487.6)	(0.0941)	(0.105)
Treat Yr. 2	-7111.1	3763.5	852.2	4160.0	0.0397	0.128
	(6620.6)	(4747.7)	(3894.0)	(3560.5)	(0.117)	(0.161)
Treat Yr. 3	394.9	-1421.4	-683.4	-1381.8	-0.00468	-0.0363
	(2026.4)	(1939.4)	(3400.6)	(1917.8)	(0.116)	(0.0889)
Year 2	12498.7***	15811.1***	12859.5***	-2106.2	0.263***	0.386***
	(4291.9)	(3394.6)	(3460.2)	(2820.2)	(0.0925)	(0.110)
Year 3	22017.7***	-23363.1***	7626.2***	-34056.3***	0.0285	-0.632***
	(3572.5)	(2136.4)	(2878.4)	(2897.8)	(0.0932)	(0.0668)
Control Mean	-21681.92	26964.31	10242.45	51485.15	1.45	
R-Squared	0.03	0.36	0.28	0.40	0.32	0.39
Observations	2082	2082	1617	2082	2082	2082

Notes: This table reproduces results form Table 8 omitting households from the district of Samastipur.

Table S19: Results on Consumption: Exclude Samastipur

	Stock Remaining		Consumption	Daily Protein (g)		Cons.
	Kgs.	Months	(Kg./Week)	HH/capita	Female	Index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat Yr. 1	1.381*	0.0784	7.651	1.319	0	0.131
	(0.770)	(0.404)	(40.53)	(0.980)	(.)	(0.102)
Treat Yr. 2	0.196	-0.0944	-24.49	2.909	14.34	-0.00453
	(0.967)	(0.457)	(19.60)	(1.931)	(16.96)	(0.118)
Treat Yr. 3	0.220	-0.505	-14.17	-3.487	-8.558	-0.0637
	(0.489)	(0.949)	(20.10)	(3.606)	(18.05)	(0.0799)
Year 2	1.109	0.226	-138.9***	1.404	-18.43	-0.0134
	(0.694)	(0.321)	(31.32)	(1.404)	(21.40)	(0.0848)
Year 3	-1.928***	-6.121***	-94.17***	8.028**	0	-0.811***
	(0.608)	(0.959)	(33.41)	(3.514)	(.)	(0.121)
Control Mean	4.55	1.73	390.83	14.08	81.51	
R-Squared	0.15	0.23	0.15	0.11	0.04	0.22
Observations	2082	2082	2045	2045	1348	2045

Notes: This table reproduces results form Table 9 omitting households from the district of Samastipur.

D.4 First-Year Treatment Status

Among the treated group in the input experiment, a third received intensive extension in both years while the other two thirds received intensive extension in only the second year. The main analysis combines these groups into a single treatment arm. The following tables break apart the main results by first-year treatment status.

[Table S20 about here.]

[Table S21 about here.]

[Table S22 about here.]

[Table S23 about here.]

[Table S24 about here.]

Table S20: Results on Adoption and Area by First-Year Treatment Status

	Kharif		Rabi		Zaid	
	Adoption (1)	Area (2)	Adoption (3)	Area (4)	Adoption (5)	Area (6)
Ext. Yr. 1	0.146***	0.0491*	0.219***	0.0114	0.0631*	0.00295
	(0.0531)	(0.0292)	(0.0560)	(0.0588)	(0.0368)	(0.0197)
Ext. Yr. 2	0.0377	-0.0149	0.157***	0.0617	0.0727*	0.0136
	(0.0460)	(0.0215)	(0.0558)	(0.0706)	(0.0412)	(0.0172)
Ext. Yr. 3	-0.0191	-0.00713	-0.00910	-0.00193	0.0132	0.00276
	(0.0366)	(0.0166)	(0.0480)	(0.0468)	(0.0447)	(0.0270)
Subs. Yr. 1	0.144***	0.0393**	0.199***	0.0452	0.0794***	0.0166
	(0.0415)	(0.0171)	(0.0447)	(0.0537)	(0.0281)	(0.0208)
Subs. Yr. 2	0.0322	0.0235	0.134***	-0.0221	0.0543	0.00772
	(0.0385)	(0.0308)	(0.0459)	(0.0491)	(0.0388)	(0.0175)
Subs. Yr. 3	-0.0452	-0.00243	0.0510	-0.0137	0.0516	0.00482
	(0.0287)	(0.0143)	(0.0417)	(0.0310)	(0.0365)	(0.0191)
Year 2	-0.0411	0.0152	-0.0475	0.0327	0.0800***	0.0168
	(0.0332)	(0.0171)	(0.0345)	(0.0283)	(0.0264)	(0.0192)
Year 3	-0.111***	-0.0257**	-0.0190	0.00568	0.112***	0.0339
	(0.0363)	(0.0124)	(0.0370)	(0.0495)	(0.0319)	(0.0209)
Control Mean	0.21	0.06	0.46	0.19	0.03	0.02
R-Squared	0.21	0.10	0.18	0.12	0.09	0.08
Observations	2511	2511	2511	2511	2004	2004

Notes: This table reproduces results form Table 3 broken apart by first-year treatment status.

Table S21: Results on Yield by First-Year Treatment Status

	Yield (Kg./Acre)		
	Kharif	Rabi	Zaid
	(1)	(2)	(3)
Ext. Yr. 1	14.77	-29.65	-57.38
	(29.91)	(242.5)	(59.34)
Ext. Yr. 2	-77.52*	-138.3	20.31
	(44.87)	(134.3)	(50.13)
Ext. Yr. 3	-58.09	-229.1**	105.7
	(48.99)	(108.1)	(101.8)
Subs. Yr. 1	4.571	-104.2	-12.79
	(29.83)	(175.2)	(64.37)
Subs. Yr. 2	22.86	73.10	-3.779
	(56.16)	(194.4)	(39.19)
Subs. Yr. 3	34.76	-180.6*	-12.13
	(65.96)	(97.38)	(34.69)
Year 2	118.3***	-112.9	-32.68
	(41.94)	(112.7)	(58.47)
Year 3	86.37**	-122.8	-56.95
	(39.67)	(117.5)	(52.09)
Control Mean	64.37	466.7	140.8
R-Squared	0.136	0.0423	0.209
Observations	469	917	252

Notes: This table reproduces results form Table 6 broken apart by first-year treatment status.

Table S22: Results on Production by First-Year Treatment Status

	Harvest Production (Kgs.)			Prod.	HH Stock
	Kharif	Rabi	Zaid	Index	(Months)
	(1)	(2)	(3)	(4)	(5)
Ext. Yr. 1	2.573	21.02***	2.646	0.283***	1.383**
	(2.170)	(7.763)	(2.659)	(0.0975)	(0.580)
Ext. Yr. 2	-1.407	0.286	0.953	-0.00849	-0.0579
	(2.142)	(8.381)	(2.272)	(0.105)	(0.534)
Ext. Yr. 3	-0.548	1.707	-0.454	0.00448	0
	(1.994)	(8.239)	(2.148)	(0.0936)	(.)
Subs. Yr. 1	1.650	13.79**	3.091	0.213**	1.292***
	(1.506)	(6.268)	(1.917)	(0.0892)	(0.458)
Subs. Yr. 2	2.878	1.489	1.030	0.113	-0.0851
	(2.412)	(6.313)	(2.244)	(0.0996)	(0.495)
Subs. Yr. 3	-0.961	3.682	0.719	0.0297	0
	(1.244)	(6.301)	(1.736)	(0.0758)	(.)
Year 2	3.946***	6.614	3.376*	0.210***	0.573
	(1.357)	(4.466)	(1.802)	(0.0564)	(0.436)
Year 3	1.127	2.858	2.976*	0.00274	0
	(1.141)	(4.940)	(1.591)	(0.0610)	(.)
Control Mean	1.55	34.08	2.03		2.58
R-Squared	0.09	0.17	0.07	0.16	0.16
Observations	2511	2004	2004	2511	1674

Notes: This table reproduces results form Table 7 broken apart by first-year treatment status.

Table S23: Results on Profits by First-Year Treatment Status

	Profit (1)	Revenue (2)	Sales (3)	Cost (4)	Farm Area (5)	Profit Index (6)
Ext. Yr. 1	8087.0**	4557.9	3898.6	1037.9	0.103	0.129
	(3374.0)	(3425.6)	(3311.0)	(4133.6)	(0.103)	(0.133)
Ext. Yr. 2	-3856.6	11979.2**	6282.8	9166.1**	0.285**	0.403**
	(6653.9)	(5947.1)	(4750.4)	(4351.9)	(0.129)	(0.185)
Ext. Yr. 3	823.4	-3871.5	5121.0	-2205.4	0.106	0.0254
	(2177.3)	(2780.7)	(4094.1)	(2234.7)	(0.130)	(0.0929)
Subs. Yr. 1	2624.5	4418.5	1457.6	3121.7	0.0755	0.139
	(3719.2)	(3096.1)	(2676.3)	(3620.8)	(0.0972)	(0.115)
Subs. Yr. 2	-3131.0	4426.6	1643.6	2565.2	0.0258	0.121
	(7446.9)	(4839.7)	(3944.8)	(3691.3)	(0.110)	(0.161)
Subs. Yr. 3	1021.0	-2360.9	-1409.9	-2654.6	-0.0430	-0.0905
	(2179.9)	(2135.9)	(3419.2)	(2020.6)	(0.106)	(0.0933)
Year 2	9565.3**	14368.5***	11726.2***	-455.7	0.243***	0.371***
	(3861.0)	(3139.1)	(2996.6)	(2484.7)	(0.0811)	(0.0938)
Year 3	18586.6***	-25817.8***	6776.7***	-33990.7***	0.0303	-0.674***
	(3243.4)	(2539.8)	(2491.6)	(2756.4)	(0.0801)	(0.0724)
Control Mean	-19107.33	30179.16	13025.87	52129.79	1.38	
R-Squared	0.03	0.38	0.31	0.41	0.32	0.41
Observations	2511	2511	2004	2511	2511	2511

Notes: This table reproduces results form Table 8 broken apart by first-year treatment status.

Table S24: Results on Consumption by First-Year Treatment Status

	Stock Remaining		Consumption	Daily Protein (g)		Cons.
	Kgs.	Months	(Kg./Week)	HH/capita	Female	Index
	(1)	(2)	(3)	(4)	(5)	(6)
Ext. Yr. 1	1.129	0.214	112.2*	0.946	0	0.221*
	(0.872)	(0.461)	(66.69)	(1.300)	(.)	(0.121)
Ext. Yr. 2	1.398	0.534	-21.65	1.471	15.72	0.152
	(1.207)	(0.537)	(25.96)	(4.161)	(34.35)	(0.151)
Ext. Yr. 3	0.0250	-0.429	5.151	0.0627	16.69	-0.0410
	(0.609)	(0.983)	(23.40)	(5.266)	(25.51)	(0.0857)
Subs. Yr. 1	1.062	0.264	-36.82	-0.361	0	0.0752
	(0.756)	(0.454)	(35.22)	(1.149)	(.)	(0.102)
Subs. Yr. 2	0.0764	0.327	-20.07	-4.102	-24.44	0.000412
	(0.846)	(0.461)	(18.56)	(3.019)	(16.85)	(0.108)
Subs. Yr. 3	0.303	-0.757	-21.21	-6.336	-16.40	-0.0998
	(0.443)	(0.932)	(22.12)	(4.081)	(17.95)	(0.0837)
Year 2	0.792	0.0127	-130.2***	5.174**	-0.412	-0.0350
	(0.601)	(0.297)	(27.89)	(2.585)	(23.10)	(0.0729)
Year 3	-2.141***	-5.921***	-86.67***	8.803**	0	-0.797***
	(0.556)	(0.866)	(29.92)	(3.709)	(.)	(0.113)
Control Mean	4.38	1.82	399.79	14.80	99.62	
R-Squared	0.15	0.23	0.16	0.09	0.03	0.22
Observations	2511	2511	2469	2469	1629	2469

Notes: This table reproduces results form Table 9 broken apart by first-year treatment status.

E Heterogeneity

In this section, we explore heterogeneity in treatment effects for every survey outcome in our analysis. Formally we run the regression

$$Y_{it} = \sum_t \beta_t T_i + \sigma_t T_i \times \mathbf{1}\{I_i = 1\} + \alpha_t + \phi_t \times \mathbf{1}\{I_i = 1\} + \gamma_{b(i)} + X_i' \delta + \epsilon_{it} \quad (5)$$

for some characteristic represented by the dummy variable I. We examine heterogeneity by membership in the pulse farmer group for treated households, by prior experience growing pulses, by above/below median asset ownership, and by above/below median land ownership.

[Table S25 about here.]

[Table S26 about here.]

[Table S27 about here.]

[Table S28 about here.]

[Table S29 about here.]

[Table S30 about here.]

[Table S31 about here.]

[Table S32 about here.]

[Table S33 about here.]

[Table S34 about here.]

[Table S35 about here.]

[Table S36 about here.]

[Table S37 about here.]

[Table S38 about here.]

[Table S39 about here.]

[Table S40 about here.]

[Table S41 about here.]

[Table S42 about here.]

[Table S43 about here.]

[Table S44 about here.]

[Table S45 about here.]

[Table S46 about here.]

[Table S47 about here.]

[Table S48 about here.]

[Table S49 about here.]

[Table S50 about here.]

Table S25: Heterogeneity Analysis: Kharif Pulse Adoption

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.144***	0.0954**	0.115***	0.117***	0.169***
	(0.0379)	(0.0444)	(0.0369)	(0.0402)	(0.0458)
Treat Y1*($I = 1$)		0.0914**	0.0390	0.0559	-0.0572
		(0.0433)	(0.0573)	(0.0598)	(0.0679)
Treat Yr. 2	0.0340	-0.0105	-0.0115	0.0208	0.0229
	(0.0355)	(0.0378)	(0.0393)	(0.0373)	(0.0374)
Treat Y2*($I = 1$)		0.0830**	0.0713	0.0302	0.0229
		(0.0391)	(0.0505)	(0.0592)	(0.0525)
Treat Yr. 3	-0.0365	-0.0627**	0.00665	-0.0458	-0.0359
	(0.0260)	(0.0274)	(0.0273)	(0.0311)	(0.0328)
Treat Y3*($I = 1$)		0.0494	-0.0617	0.0231	0.00453
		(0.0304)	(0.0448)	(0.0453)	(0.0449)
$I = 1$		0	0.206***	0.0485	0.0647
		(.)	(0.0451)	(0.0465)	(0.0518)
Year 2	-0.0411	-0.0411	0.0339	-0.0123	-0.00571
	(0.0332)	(0.0332)	(0.0300)	(0.0338)	(0.0404)
Y2*($I = 1$)		0	-0.120**	-0.0596	-0.0794
		(.)	(0.0465)	(0.0476)	(0.0558)
Year 3	-0.111***	-0.111***	-0.0424*	-0.0736**	-0.0629
	(0.0363)	(0.0363)	(0.0249)	(0.0333)	(0.0425)
Y3*($I = 1$)		0	-0.109**	-0.0767*	-0.107*
		(.)	(0.0519)	(0.0439)	(0.0629)
Control Mean	0.21	0.21	0.06	0.16	0.15
R-Squared	0.21	0.22	0.22	0.22	0.22
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 3 Column 1 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S26: Heterogeneity Analysis: Kharif Pulse Area

		Interaction ($I=1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	0.0427***	0.0204	0.00588	0.00437	0.0165
	(0.0163)	(0.0193)	(0.0136)	(0.0168)	(0.0170)
Treat Y1*($I=1$)		0.0416*	0.0557*	0.0783***	0.0500*
		(0.0211)	(0.0284)	(0.0288)	(0.0292)
Treat Yr. 2	0.0107	-0.0301	-0.00912	-0.00160	0.0254
	(0.0244)	(0.0184)	(0.0137)	(0.0152)	(0.0394)
Treat Y2*($I=1$)		0.0757**	0.0298	0.0250	-0.0287
		(0.0323)	(0.0382)	(0.0537)	(0.0498)
Treat Yr. 3	-0.00395	-0.00492	-0.00189	-0.00674	-0.00974
	(0.0125)	(0.0142)	(0.0112)	(0.0143)	(0.0135)
Treat Y3*($I=1$)		0.00240	-0.000615	0.00801	0.0154
		(0.0138)	(0.0197)	(0.0237)	(0.0218)
$I=1$		0	0.0316*	-0.0292	0.00394
		(.)	(0.0184)	(0.0238)	(0.0179)
Year 2	0.0152	0.0152	0.00999	-0.00508	0.0145
	(0.0171)	(0.0171)	(0.0115)	(0.0140)	(0.0240)
Y2*($I=1$)		0	0.00829	0.0419	0.00156
		(.)	(0.0283)	(0.0348)	(0.0348)
Year 3	-0.0257**	-0.0257**	-0.00929	-0.0248**	-0.0114
	(0.0123)	(0.0124)	(0.00661)	(0.0125)	(0.0155)
Y3*($I=1$)		0	-0.0262	-0.00185	-0.0320
		(.)	(0.0199)	(0.0204)	(0.0227)
Control Mean	0.06	0.06	0.01	0.04	0.03
R-Squared	0.10	0.10	0.10	0.10	0.10
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 3 Column 2 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S27: Heterogeneity Analysis: Rabi Pulse Adoption

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	0.206***	0.141***	0.236***	0.194***	0.197***
	(0.0415)	(0.0489)	(0.0563)	(0.0526)	(0.0495)
Treat Y1*($I = 1$)		0.121***	-0.0510	0.0250	0.00341
		(0.0412)	(0.0640)	(0.0696)	(0.0679)
Treat Yr. 2	0.142***	0.0707	0.170***	0.139***	0.0993**
	(0.0416)	(0.0456)	(0.0579)	(0.0524)	(0.0479)
Treat Y2*($I = 1$)		0.133***	-0.0391	0.00811	0.0854
		(0.0428)	(0.0679)	(0.0604)	(0.0621)
Treat Yr. 3	0.0310	-0.0250	0.0162	0.00380	0.0473
	(0.0383)	(0.0413)	(0.0577)	(0.0507)	(0.0456)
Treat Y3*($I = 1$)		0.105***	0.0228	0.0607	-0.0371
		(0.0366)	(0.0720)	(0.0654)	(0.0703)
$I = 1$		0	0.264***	0.0678	0.146***
		(.)	(0.0472)	(0.0625)	(0.0545)
Year 2	-0.0475	-0.0475	0.0424	-0.0307	0.00571
	(0.0345)	(0.0345)	(0.0396)	(0.0439)	(0.0465)
Y2*($I = 1$)		0	-0.143***	-0.0347	-0.119*
		(.)	(0.0531)	(0.0647)	(0.0640)
Year 3	-0.0190	-0.0190	0.0508	0.0429	0.00571
	(0.0370)	(0.0370)	(0.0561)	(0.0526)	(0.0428)
Y3*($I = 1$)		0	-0.111*	-0.128*	-0.0554
		(.)	(0.0667)	(0.0693)	(0.0679)
Control Mean	0.46	0.46	0.24	0.38	0.36
R-Squared	0.18	0.19	0.18	0.18	0.19
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 3 Column 3 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S28: Heterogeneity Analysis: Rabi Pulse Area

		Interaction ($I=1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.0338	0.00879	-0.0194	0.0362	0.0560*
	(0.0522)	(0.0511)	(0.0996)	(0.0470)	(0.0318)
Treat Y1*($I=1$)		0.0465	0.0842	-0.0116	-0.0585
		(0.0292)	(0.0909)	(0.0541)	(0.0830)
Treat Yr. 2	0.00584	0.000603	-0.0421	0.0324	-0.0149
	(0.0501)	(0.0535)	(0.0969)	(0.0502)	(0.0394)
Treat Y2*($I=1$)		0.0101	0.0761	-0.0591	0.0338
		(0.0450)	(0.0977)	(0.0645)	(0.0949)
Treat Yr. 3	-0.00988	-0.0257	0.0429	0.0186	0.00628
	(0.0317)	(0.0314)	(0.0317)	(0.0366)	(0.0278)
Treat Y3*($I=1$)		0.0296	-0.0849	-0.0614	-0.0380
		(0.0306)	(0.0544)	(0.0660)	(0.0646)
$I=1$		0	-0.00932	-0.00905	0.165*
		(.)	(0.0809)	(0.0546)	(0.0968)
Year 2	0.0327	0.0327	0.0312	0.0375	0.0637*
	(0.0283)	(0.0283)	(0.0238)	(0.0355)	(0.0380)
Y2*($I=1$)		0	0.00234	-0.0100	-0.0695
		(.)	(0.0466)	(0.0503)	(0.0552)
Year 3	0.00568	0.00568	-0.0980	0.0266	0.0339
	(0.0495)	(0.0495)	(0.0958)	(0.0419)	(0.0242)
Y3*($I=1$)		0	0.166*	-0.0433	-0.0633
		(.)	(0.0975)	(0.0630)	(0.0971)
Control Mean	0.19	0.19	0.15	0.12	0.09
R-Squared	0.12	0.12	0.12	0.12	0.13
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 3 Column 4 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S29: Heterogeneity Analysis: Zaid Pulse Adoption

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.0739***	0.0462*	0.0649*	0.0943***	0.0706**
	(0.0257)	(0.0270)	(0.0329)	(0.0249)	(0.0306)
Treat Y1*($I = 1$)		0.0503*	0.0146	-0.0364	0.0117
		(0.0281)	(0.0376)	(0.0426)	(0.0431)
Treat Yr. 2	0.0609*	0.00405	0.0473	0.0769*	0.0617
	(0.0337)	(0.0366)	(0.0533)	(0.0426)	(0.0381)
Treat Y2*($I = 1$)		0.103***	0.0218	-0.0288	-0.00666
		(0.0324)	(0.0544)	(0.0556)	(0.0515)
Treat Yr. 3	0.0385	0.0423	0.0189	0.00725	0.0292
	(0.0336)	(0.0399)	(0.0544)	(0.0378)	(0.0335)
Treat Y3*($I = 1$)		-0.00635	0.0292	0.0612	0.00783
		(0.0383)	(0.0616)	(0.0511)	(0.0581)
$I = 1$		0	0.00886	0.0283	-0.0151
		(.)	(0.0222)	(0.0387)	(0.0291)
Year 2	0.0800***	0.0800***	0.0842***	0.0738***	0.0511
	(0.0264)	(0.0264)	(0.0306)	(0.0277)	(0.0339)
Y2*($I = 1$)		0	-0.00679	0.0122	0.0639
		(.)	(0.0386)	(0.0413)	(0.0449)
Year 3	0.112***	0.112***	0.105**	0.123***	0.0730**
	(0.0318)	(0.0319)	(0.0450)	(0.0336)	(0.0315)
Y3*($I = 1$)		0	0.0109	-0.0214	0.0863*
		(.)	(0.0515)	(0.0517)	(0.0502)
Control Mean	0.03	0.03	0.02	0.00	0.03
R-Squared	0.09	0.10	0.09	0.09	0.10
Observations	2004	2004	2004	2004	2004

Notes: This table reproduces results form Table 3 Column 5 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S30: Heterogeneity Analysis: Zaid Pulse Area

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.0119	0.00740	0.0267*	0.0254***	-0.000163
	(0.0180)	(0.0165)	(0.0150)	(0.00972)	(0.0224)
Treat Y1*($I = 1$)		0.00803	-0.0222	-0.0270	0.0289
		(0.0184)	(0.0311)	(0.0329)	(0.0383)
Treat Yr. 2	0.00982	0.00427	0.00210	0.00979	0.0164
	(0.0152)	(0.0161)	(0.0142)	(0.0153)	(0.0144)
Treat Y2*($I = 1$)		0.00993	0.0112	-0.000720	-0.0144
		(0.0181)	(0.0266)	(0.0295)	(0.0316)
Treat Yr. 3	0.00416	0.0180	0.00209	0.0196	0.0148
	(0.0183)	(0.0234)	(0.0218)	(0.0164)	(0.0117)
Treat Y3*($I = 1$)		-0.0249	0.00317	-0.0311	-0.0268
		(0.0256)	(0.0317)	(0.0283)	(0.0356)
$I = 1$		0	0.0278	0.00350	-0.0376
		(.)	(0.0236)	(0.0366)	(0.0347)
Year 2	0.0168	0.0168	0.0173*	0.0271**	-0.00732
	(0.0192)	(0.0192)	(0.00884)	(0.0118)	(0.0254)
Y2*($I = 1$)		0	-0.000765	-0.0201	0.0534
		(.)	(0.0303)	(0.0363)	(0.0364)
Year 3	0.0339	0.0339	0.0369**	0.0268***	-0.00320
	(0.0208)	(0.0209)	(0.0159)	(0.00879)	(0.0237)
Y3*($I = 1$)		0	-0.00484	0.0140	0.0821**
		(.)	(0.0349)	(0.0390)	(0.0405)
Control Mean	0.02	0.02	0.00	0.00	0.02
R-Squared	0.08	0.08	0.08	0.08	0.08
Observations	2004	2004	2004	2004	2004

Notes: This table reproduces results form Table 3 Column 6 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S31: Heterogeneity Analysis: Kharif Pulse Yield

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	14.77	29.34	42.38	-2.799	7.903
	(23.11)	(26.46)	(42.82)	(28.66)	(31.98)
Treat Y1*($I = 1$)		-23.09	-33.15	35.81	13.05
		(21.96)	(44.36)	(39.47)	(49.35)
Treat Yr. 2	-19.71	7.942	-38.90	-4.448	-51.29
	(42.18)	(56.58)	(57.71)	(59.04)	(64.50)
Treat Y2*($I = 1$)		-42.88	23.58	-16.97	63.94
		(45.91)	(84.83)	(85.45)	(87.56)
Treat Yr. 3	3.433	-34.92	32.16	-27.59	-125.8*
	(42.93)	(48.87)	(32.26)	(65.96)	(68.03)
Treat Y3*($I = 1$)		56.34	-22.95	56.27	250.1**
		(53.74)	(60.72)	(102.1)	(98.35)
$I = 1$		0	50.17	35.31	19.96
		(.)	(40.88)	(35.08)	(44.79)
Year 2	114.0***	114.3***	121.1**	109.7***	142.6**
	(39.00)	(39.26)	(60.42)	(38.88)	(57.24)
Y2*($I = 1$)		0	-9.008	5.866	-58.13
		(.)	(80.91)	(58.92)	(76.59)
Year 3	70.30**	70.46**	-8.993	91.09	146.2**
	(32.17)	(32.13)	(46.27)	(65.68)	(60.62)
Y3*($I = 1$)		0	84.55	-35.31	-161.4**
		(.)	(56.26)	(85.98)	(81.25)
Control Mean	64.37	64.37	57.75	66.99	44.36
R-Squared	0.11	0.11	0.11	0.11	0.12
Observations	555	555	555	555	555

Notes: This table reproduces results form Table 6 Column 1 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S32: Heterogeneity Analysis: Rabi Pulse Yield

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	-41.35	145.5	-321.8	-15.95	83.95
	(122.3)	(241.8)	(254.2)	(255.8)	(263.5)
Treat Y1*($I = 1$)		-311.1	362.9	-50.87	-219.0
		(276.8)	(299.6)	(306.6)	(339.0)
Treat Yr. 2	65.48	92.41	480.3	9.144	196.2
	(113.7)	(131.6)	(354.5)	(218.0)	(246.1)
Treat Y2*($I = 1$)		-55.66	-570.2	95.53	-207.1
		(214.8)	(371.8)	(239.5)	(271.2)
Treat Yr. 3	-132.5*	-144.3*	-265.3	-47.52	-216.1*
	(78.48)	(76.89)	(169.5)	(73.49)	(118.4)
Treat Y3*($I = 1$)		13.34	176.2	-187.9	136.1
		(66.56)	(178.2)	(140.0)	(138.6)
$I = 1$		0	-110.9	-74.23	4.818
		(.)	(255.6)	(176.2)	(161.8)
Year 2	-123.1	-119.4	-355.2	-47.76	-51.48
	(78.73)	(79.66)	(250.1)	(165.9)	(116.6)
Y2*($I = 1$)		0	311.7	-137.1	-138.6
		(.)	(278.5)	(195.9)	(158.1)
Year 3	-216.6**	-215.9**	-177.7	-372.4**	-125.9
	(92.90)	(93.33)	(297.6)	(149.9)	(155.6)
Y3*($I = 1$)		0	-58.94	310.4	-159.0
		(.)	(303.6)	(189.0)	(222.9)
Control Mean	466.74	466.74	530.91	512.99	458.17
R-Squared	0.04	0.05	0.05	0.05	0.05
Observations	1179	1179	1179	1179	1179

Notes: This table reproduces results form Table 6 Column 2 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S33: Heterogeneity Analysis: Zaid Pulse Yield

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	-27.23	-77.47	-77.80	-33.35	17.29
	(54.87)	(72.61)	(96.78)	(96.06)	(85.34)
Treat Y1*($I = 1$)		76.52	58.75	-15.78	-55.30
		(72.19)	(101.5)	(83.83)	(84.67)
Treat Yr. 2	2.866	-29.94	1.338	-72.76	-52.06
	(35.83)	(38.02)	(61.14)	(47.79)	(59.33)
Treat Y2*($I = 1$)		41.48	-1.129	113.0*	83.93
		(44.91)	(76.40)	(60.93)	(73.00)
Treat Yr. 3	23.50	81.61	187.0	-35.72	5.711
	(42.02)	(63.95)	(171.1)	(58.67)	(55.18)
Treat Y3*($I = 1$)		-112.4	-229.9	89.12	23.75
		(71.04)	(202.4)	(96.60)	(80.78)
$I = 1$		0	-78.80	-46.35	-58.78
		(.)	(88.01)	(80.41)	(68.82)
Year 2	-31.08	-29.56	-69.30	-32.55	-39.42
	(57.41)	(58.46)	(95.04)	(90.40)	(75.12)
Y2*($I = 1$)		0	48.77	-19.14	15.36
		(.)	(86.41)	(64.71)	(67.12)
Year 3	-59.72	-56.97	-114.5	-78.07	-99.89
	(51.85)	(52.94)	(85.07)	(62.99)	(71.34)
Y3*($I = 1$)		0	76.83	0	65.80
		(.)	(98.20)	(.)	(81.48)
Control Mean	140.84	140.84	190.00	360.00	149.17
R-Squared	0.20	0.21	0.22	0.21	0.21
Observations	252	252	252	252	252

Notes: This table reproduces results form Table 6 Column 3 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S34: Heterogeneity Analysis: Kharif Pulse Production

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	1.962	1.978	-0.450	-0.183	0.139
	(1.321)	(1.458)	(1.104)	(1.223)	(1.050)
Treat Y1*($I = 1$)		-0.0121	3.846*	4.547**	3.709*
		(1.832)	(2.079)	(2.129)	(2.190)
Treat Yr. 2	1.451	0.505	-0.379	0.894	0.256
	(1.926)	(1.919)	(1.300)	(1.426)	(1.723)
Treat Y2*($I = 1$)		1.759	2.686	1.242	2.331
		(2.289)	(2.913)	(4.038)	(3.695)
Treat Yr. 3	-0.819	-1.661	-1.112	-1.782	-2.970**
	(1.175)	(1.226)	(0.876)	(1.245)	(1.331)
Treat Y3*($I = 1$)		1.568	0.528	2.214	4.728*
		(1.678)	(1.982)	(2.483)	(2.480)
$I = 1$		0	-0.661	-1.041	-0.580
		(.)	(1.140)	(1.443)	(1.310)
Year 2	3.946***	3.946***	1.127	2.055**	3.411**
	(1.356)	(1.357)	(0.785)	(0.969)	(1.483)
Y2*($I = 1$)		0	4.499***	3.906	1.199
		(.)	(1.671)	(2.729)	(2.927)
Year 3	1.127	1.127	-0.373*	1.227	2.349*
	(1.140)	(1.141)	(0.206)	(1.089)	(1.269)
Y3*($I = 1$)		0	2.393	-0.207	-2.739
		(.)	(1.807)	(2.055)	(2.286)
Control Mean	1.55	1.55	0.31	1.10	0.73
R-Squared	0.09	0.09	0.09	0.09	0.09
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 7 Column 1 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S35: Heterogeneity Analysis: Rabi Pulse Production

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	16.28***	10.68*	16.55***	12.55**	13.03**
	(5.769)	(6.275)	(6.069)	(5.763)	(5.081)
Treat Y1*($I = 1$)		10.16*	-0.506	6.753	3.397
		(5.634)	(8.768)	(9.392)	(9.891)
Treat Yr. 2	1.049	-4.994	11.23	-0.270	1.370
	(6.214)	(6.672)	(7.721)	(7.147)	(5.834)
Treat Y2*($I = 1$)		10.96*	-15.63	2.348	-1.372
		(5.720)	(10.28)	(10.11)	(10.65)
Treat Yr. 3	2.975	-4.168	7.113	0.332	5.309
	(6.014)	(6.361)	(7.491)	(7.666)	(5.335)
Treat Y3*($I = 1$)		12.94**	-6.540	5.141	-5.523
		(5.464)	(9.925)	(10.91)	(10.31)
$I = 1$		0	15.72**	-1.336	22.16***
		(.)	(6.933)	(8.641)	(7.556)
Year 2	6.614	6.614	2.947	7.992	11.27**
	(4.463)	(4.466)	(5.213)	(5.114)	(5.121)
Y2*($I = 1$)		0	5.914	-2.691	-10.31
		(.)	(7.378)	(8.131)	(8.486)
Year 3	2.858	2.858	0.453	8.180	6.303
	(4.936)	(4.940)	(5.618)	(6.392)	(4.400)
Y3*($I = 1$)		0	3.880	-10.40	-7.622
		(.)	(7.363)	(9.272)	(10.11)
Control Mean	34.08	34.08	15.81	22.86	18.78
R-Squared	0.17	0.18	0.18	0.18	0.19
Observations	2004	2004	2004	2004	2004

Notes: This table reproduces results form Table 7 Column 2 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S36: Heterogeneity Analysis: Zaid Pulse Production

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	2.946*	3.090	3.425	3.831**	1.707
	(1.748)	(1.885)	(2.160)	(1.529)	(2.122)
Treat Y1*($I = 1$)		-0.253	-0.732	-1.585	2.911
		(2.178)	(3.255)	(3.158)	(3.810)
Treat Yr. 2	1.012	-0.741	0.547	0.246	1.289
	(2.008)	(1.938)	(2.490)	(1.901)	(2.056)
Treat Y2*($I = 1$)		3.149	0.613	1.540	-0.987
		(2.150)	(3.844)	(4.105)	(4.218)
Treat Yr. 3	0.321	1.168	0.771	1.826	2.131
	(1.646)	(1.946)	(2.680)	(1.590)	(1.414)
Treat Y3*($I = 1$)		-1.513	-0.600	-2.782	-4.110
		(1.921)	(3.250)	(3.149)	(3.395)
$I = 1$		0	0.837	1.819	-3.059
		(.)	(1.915)	(2.680)	(2.593)
Year 2	3.376*	3.376*	3.011	3.730**	0.423
	(1.801)	(1.802)	(1.907)	(1.617)	(2.408)
Y2*($I = 1$)		0	0.589	-0.690	6.533*
		(.)	(3.080)	(3.390)	(3.399)
Year 3	2.976*	2.976*	3.632*	2.508**	-0.803
	(1.590)	(1.591)	(2.026)	(1.176)	(1.554)
Y3*($I = 1$)		0	-1.057	0.914	8.360***
		(.)	(2.959)	(3.093)	(2.927)
Control Mean	2.03	2.03	0.63	0.19	1.52
R-Squared	0.07	0.08	0.07	0.08	0.08
Observations	2004	2004	2004	2004	2004

Notes: This table reproduces results form Table 7 Column 3 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S37: Heterogeneity Analysis: Production Index

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	0.236***	0.191**	0.207**	0.142*	0.143**
	(0.0756)	(0.0736)	(0.0820)	(0.0727)	(0.0690)
Treat Y1*($I = 1$)		0.0864	0.0438	0.194	0.169
		(0.0770)	(0.109)	(0.123)	(0.135)
Treat Yr. 2	0.0725	-0.0300	0.113	0.0781	0.0754
	(0.0885)	(0.0907)	(0.109)	(0.0924)	(0.0829)
Treat Y2*($I = 1$)		0.191**	-0.0666	-0.00868	-0.0265
		(0.0922)	(0.154)	(0.183)	(0.169)
Treat Yr. 3	0.0214	-0.0525	0.0551	0.0203	0.0221
	(0.0711)	(0.0781)	(0.0774)	(0.0811)	(0.0704)
Treat Y3*($I = 1$)		0.138	-0.0472	0.0118	-0.00590
		(0.0836)	(0.112)	(0.137)	(0.141)
$I = 1$		0	0.227***	-0.0134	0.187**
		(.)	(0.0727)	(0.103)	(0.0926)
Year 2	0.210***	0.210***	0.148**	0.151***	0.174**
	(0.0564)	(0.0564)	(0.0610)	(0.0491)	(0.0752)
Y2*($I = 1$)		0	0.1000	0.123	0.0811
		(.)	(0.0943)	(0.126)	(0.126)
Year 3	0.00274	0.00274	0.0321	0.0299	0.0183
	(0.0610)	(0.0610)	(0.0613)	(0.0706)	(0.0582)
Y3*($I = 1$)		0	-0.0468	-0.0560	-0.0349
		(.)	(0.0926)	(0.108)	(0.121)
Control Mean					
R-Squared	0.16	0.16	0.16	0.16	0.17
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 7 Column 4 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S38: Heterogeneity Analysis: Months with Pulses

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	1.322***	0.950**	1.538***	1.702***	1.807***
	(0.418)	(0.456)	(0.526)	(0.452)	(0.494)
Treat Y1*($I = 1$)		0.700*	-0.344	-0.757	-1.093
		(0.381)	(0.611)	(0.679)	(0.664)
Treat Yr. 2	-0.0762	-0.837	0.520	0.237	0.391
	(0.441)	(0.523)	(0.470)	(0.478)	(0.472)
Treat Y2*($I = 1$)		1.416***	-0.922	-0.629	-1.063
		(0.538)	(0.667)	(0.691)	(0.771)
Treat Yr. 3	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
Treat Y3*($I = 1$)		0	0	0	0
		(.)	(.)	(.)	(.)
$I = 1$		0	1.593***	0.576	1.442***
		(.)	(0.447)	(0.528)	(0.543)
Year 2	0.573	0.573	0.466	0.515	0.560
	(0.436)	(0.436)	(0.414)	(0.482)	(0.519)
Y2*($I = 1$)		0	0.170	0.119	0.0287
		(.)	(0.706)	(0.699)	(0.829)
Year 3	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
Y3*($I = 1$)		0	0	0	0
		(.)	(.)	(.)	(.)
Control Mean	2.58	2.58	0.99	1.78	1.58
R-Squared	0.16	0.16	0.16	0.16	0.16
Observations	1674	1674	1674	1674	1674

Notes: This table reproduces results form Table 7 Column 5 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S39: Heterogeneity Analysis: Agricultural Profit

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	4442.6	5346.3	5952.9	2031.5	3199.6
	(3318.0)	(3402.5)	(3860.2)	(2719.5)	(3278.8)
Treat Y1*($I = 1$)		-1592.2	-1952.5	4555.2	3006.4
		(3000.4)	(5166.0)	(4805.1)	(5701.5)
Treat Yr. 2	-3379.6	-12476.7	-9038.3	-3453.6	-9522.9
	(5469.4)	(11196.1)	(14145.7)	(3343.3)	(10102.5)
Treat Y2*($I = 1$)		16819.2	8375.7	-155.8	11715.0
		(12182.0)	(15508.2)	(12006.0)	(12974.1)
Treat Yr. 3	948.8	1738.0	841.4	552.0	1800.7
	(1993.2)	(2139.4)	(2574.3)	(2006.1)	(2247.2)
Treat Y3*($I = 1$)		-1381.4	201.6	433.8	-1708.1
		(1267.9)	(2100.1)	(2019.3)	(2172.0)
$I = 1$		0	-2446.0	-6801.9	-1985.7
		(.)	(4074.7)	(4817.6)	(5119.9)
Year 2	9565.3**	9565.3**	5938.7	8601.5***	7329.8*
	(3858.7)	(3861.0)	(3913.4)	(2439.3)	(3804.2)
Y2*($I = 1$)		0	5787.8	1990.6	5010.2
		(.)	(5804.2)	(5868.6)	(6910.5)
Year 3	18586.6***	18586.6***	16057.8***	17031.0***	16430.3***
	(3241.5)	(3243.4)	(2974.0)	(2598.5)	(3377.0)
Y3*($I = 1$)		0	4035.8	3212.7	4832.5
		(.)	(4226.4)	(4196.5)	(5222.4)
Control Mean	-19107.33	-19107.33	-17021.84	-17893.28	-17100.66
R-Squared	0.03	0.03	0.03	0.03	0.03
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 8 Column 1 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S40: Heterogeneity Analysis: Agricultural Production Revenue

		Interaction ($I=1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	4456.6	1086.1	3432.0	-1290.0	337.6
	(2808.5)	(3286.2)	(3096.4)	(2536.1)	(2799.6)
Treat Y1*($I=1$)		6272.4**	1343.8	11290.7**	6771.1
		(3030.4)	(4347.5)	(4415.4)	(4641.3)
Treat Yr. 2	6940.5	1031.7	9549.5*	3395.1	5330.4
	(4463.9)	(4994.7)	(5607.8)	(4034.2)	(4452.2)
Treat Y2*($I=1$)		10945.3**	-4518.0	6341.5	-7.595
		(5189.5)	(7113.7)	(7656.8)	(8075.6)
Treat Yr. 3	-2873.9	-562.3	-2567.8	-297.1	1758.5
	(1912.2)	(2200.7)	(3083.1)	(1872.5)	(1882.6)
Treat Y3*($I=1$)		-4188.3*	231.5	-4464.5*	-7082.5**
		(2278.8)	(3343.6)	(2500.2)	(2977.2)
$I=1$		0	10934.9***	-3818.3	13849.8***
		(.)	(3236.8)	(4273.8)	(3601.9)
Year 2	14368.5***	14368.5***	10126.7***	7389.1***	8231.5***
	(3137.2)	(3139.1)	(3669.5)	(2228.4)	(2891.0)
Y2*($I=1$)		0	6769.7	14414.8***	13753.8**
		(.)	(4802.7)	(5239.7)	(5939.6)
Year 3	-25817.8***	-25817.8***	-17341.9***	-17128.2***	-16493.1***
	(2538.3)	(2539.8)	(2464.1)	(1979.4)	(2316.5)
Y3*($I=1$)		0	-13527.3***	-17947.3***	-20897.9***
		(.)	(3473.3)	(3382.6)	(4022.9)
Control Mean	30179.16	30179.16	20348.77	19649.23	19701.62
R-Squared	0.37	0.38	0.38	0.41	0.42
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 8 Column 2 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S41: Heterogeneity Analysis: Agricultural Sales

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	2230.9	4000.6	1888.0	387.6	697.9
	(2489.4)	(2757.0)	(3479.4)	(2126.8)	(2677.9)
Treat Y1*($I = 1$)		-3170.9	848.3	3575.0	2894.3
		(2681.9)	(4324.5)	(4528.9)	(4594.0)
Treat Yr. 2	3179.4	1900.0	10663.0**	3131.6	4897.8
	(3530.0)	(4181.4)	(4089.8)	(3026.7)	(3399.7)
Treat Y2*($I = 1$)		2299.1	-11910.9*	-358.5	-5697.7
		(4428.1)	(6462.0)	(7108.5)	(7049.6)
Treat Yr. 3	782.1	-319.1	5004.3	-1376.0	2016.7
	(3211.9)	(3555.1)	(4061.6)	(3239.7)	(3383.4)
Treat Y3*($I = 1$)		1979.6	-6600.4	4114.8	-2918.5
		(3397.0)	(5279.5)	(5188.8)	(5628.7)
$I = 1$		0	2333.9	-8764.7*	3826.7
		(.)	(3469.2)	(4534.6)	(3727.3)
Year 2	11726.2***	11726.2***	2900.3	4508.0***	4785.1**
	(2994.3)	(2996.6)	(2767.3)	(1629.6)	(1970.2)
Y2*($I = 1$)		0	14235.4***	14098.1**	15356.6***
		(.)	(4721.4)	(5879.0)	(5594.5)
Year 3	6776.7***	6776.7***	1581.1	6136.9***	4827.2**
	(2489.7)	(2491.6)	(2537.5)	(2146.4)	(1911.2)
Y3*($I = 1$)		0	8380.0**	1249.7	4312.9
		(.)	(4004.3)	(4170.1)	(4569.2)
Control Mean	13025.87	13025.87	8380.42	5980.69	7147.19
R-Squared	0.31	0.31	0.31	0.31	0.32
Observations	2004	2004	2004	2004	2004

Notes: This table reproduces results form Table 8 Column 3 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S42: Heterogeneity Analysis: Agricultural Costs

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	2419.0	-1326.1	2157.0	-1817.7	-1444.3
	(3267.4)	(3939.6)	(4111.0)	(3433.1)	(3850.6)
Treat Y1*($I = 1$)		6973.2*	-150.1	8073.3*	5639.3
		(3907.1)	(5258.8)	(4601.3)	(5837.1)
Treat Yr. 2	4762.9	185.0	7202.1*	5661.9	5567.8
	(3440.0)	(3919.9)	(4303.3)	(3455.5)	(3669.9)
Treat Y2*($I = 1$)		8506.5**	-3995.1	-2332.9	-3820.9
		(3967.0)	(5851.8)	(5815.7)	(5902.5)
Treat Yr. 3	-2511.4	-2333.5	-493.9	-1275.3	708.6
	(1789.7)	(2044.1)	(2650.0)	(1762.0)	(1773.1)
Treat Y3*($I = 1$)		-248.9	-2384.2	-1937.1	-4763.4
		(2142.5)	(3009.9)	(2546.7)	(2951.6)
$I = 1$		0	18151.7***	2185.6	18156.8***
		(.)	(3537.6)	(3904.9)	(4548.7)
Year 2	-455.7	-455.7	1362.0	-3211.7	-1979.8
	(2483.2)	(2484.7)	(3125.9)	(2573.1)	(2874.3)
Y2*($I = 1$)		0	-2901.0	5692.1	3415.7
		(.)	(4252.5)	(3667.4)	(3474.3)
Year 3	-33990.7***	-33990.7***	-22657.7***	-24140.4***	-23901.2***
	(2754.7)	(2756.4)	(2928.4)	(2823.3)	(3156.1)
Y3*($I = 1$)		0	-18087.0***	-20344.4***	-22611.8***
		(.)	(3952.8)	(3283.2)	(4638.7)
Control Mean	52129.79	52129.79	38263.28	38744.81	38710.19
R-Squared	0.41	0.41	0.42	0.43	0.44
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 8 Column 4 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S43: Heterogeneity Analysis: Area Farmed

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.0839	-0.0439	0.102	-0.0240	0.119
	(0.0859)	(0.0982)	(0.111)	(0.0919)	(0.0819)
Treat Y1*($I = 1$)		0.239**	-0.0279	0.200	-0.141
		(0.113)	(0.158)	(0.164)	(0.164)
Treat Yr. 2	0.112	-0.000588	0.0948	0.000723	0.0145
	(0.103)	(0.122)	(0.128)	(0.145)	(0.129)
Treat Y2*($I = 1$)		0.210	0.0230	0.202	0.148
		(0.132)	(0.187)	(0.210)	(0.203)
Treat Yr. 3	0.00620	-0.0858	0.195	0.0761	0.116
	(0.101)	(0.116)	(0.128)	(0.113)	(0.106)
Treat Y3*($I = 1$)		0.173	-0.290	-0.157	-0.233
		(0.111)	(0.180)	(0.191)	(0.171)
$I = 1$		0	0.382***	-0.349**	0.781***
		(.)	(0.118)	(0.138)	(0.133)
Year 2	0.243***	0.243***	0.234***	0.194*	0.348***
	(0.0811)	(0.0811)	(0.0806)	(0.105)	(0.108)
Y2*($I = 1$)		0	0.0154	0.101	-0.235
		(.)	(0.135)	(0.155)	(0.177)
Year 3	0.0303	0.0303	-0.0295	-0.0166	0.187**
	(0.0800)	(0.0801)	(0.0839)	(0.0845)	(0.0872)
Y3*($I = 1$)		0	0.0955	0.0970	-0.351**
		(.)	(0.140)	(0.164)	(0.142)
Control Mean	1.38	1.38	0.89	1.01	0.81
R-Squared	0.32	0.32	0.32	0.32	0.35
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 8 Column 5 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S44: Heterogeneity Analysis: Agricultural Earnings Index

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.135	0.0216	0.121	-0.0497	0.0279
	(0.104)	(0.124)	(0.133)	(0.0997)	(0.113)
Treat Y1*($I = 1$)		0.212*	0.0134	0.357**	0.148
		(0.127)	(0.176)	(0.159)	(0.184)
Treat Yr. 2	0.215	0.0261	0.360**	0.149	0.192
	(0.147)	(0.165)	(0.168)	(0.144)	(0.148)
Treat Y2*($I = 1$)		0.350**	-0.238	0.103	-0.0619
		(0.171)	(0.244)	(0.268)	(0.275)
Treat Yr. 3	-0.0523	-0.0646	0.0752	0.00817	0.0886
	(0.0826)	(0.0952)	(0.119)	(0.0921)	(0.0878)
Treat Y3*($I = 1$)		0.0256	-0.178	-0.112	-0.241
		(0.0985)	(0.149)	(0.140)	(0.148)
$I = 1$		0	0.519***	-0.252	0.689***
		(.)	(0.125)	(0.155)	(0.142)
Year 2	0.371***	0.371***	0.227**	0.142*	0.221**
	(0.0938)	(0.0938)	(0.103)	(0.0849)	(0.0940)
Y2*($I = 1$)		0	0.230	0.475***	0.338**
		(.)	(0.152)	(0.162)	(0.159)
Year 3	-0.674***	-0.674***	-0.489***	-0.478***	-0.399***
	(0.0724)	(0.0724)	(0.0868)	(0.0712)	(0.0738)
Y3*($I = 1$)		0	-0.295**	-0.405***	-0.616***
		(.)	(0.126)	(0.111)	(0.120)
Control Mean					
R-Squared	0.41	0.41	0.41	0.42	0.44
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 8 Column 6 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S45: Heterogeneity Analysis: Pulse Stock (Kgs.)

		Interaction ($I=1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	1.083	0.0507	0.0736	0.0335	0.419
	(0.693)	(0.759)	(0.635)	(0.674)	(0.580)
Treat Y1*($I=1$)		1.928**	1.501	2.128*	0.964
		(0.743)	(1.057)	(1.211)	(1.323)
Treat Yr. 2	0.516	-0.699	0.681	0.119	0.475
	(0.836)	(0.857)	(0.866)	(0.833)	(0.752)
Treat Y2*($I=1$)		2.264***	-0.309	0.792	-0.229
		(0.838)	(1.175)	(1.609)	(1.530)
Treat Yr. 3	0.209	-0.351	0.716	0.258	0.404
	(0.417)	(0.443)	(0.479)	(0.453)	(0.468)
Treat Y3*($I=1$)		1.058**	-0.666	-0.0120	-0.162
		(0.414)	(0.669)	(0.742)	(0.803)
$I=1$		0	2.228***	-0.480	3.332***
		(.)	(0.834)	(1.033)	(1.095)
Year 2	0.792	0.792	0.222	0.283	0.805
	(0.600)	(0.601)	(0.606)	(0.642)	(0.559)
Y2*($I=1$)		0	0.911	1.051	-0.0299
		(.)	(1.016)	(1.298)	(1.396)
Year 3	-2.141***	-2.141***	-1.205**	-1.695***	-0.493
	(0.556)	(0.556)	(0.463)	(0.468)	(0.426)
Y3*($I=1$)		0	-1.493*	-0.920	-3.692***
		(.)	(0.790)	(0.877)	(1.180)
Control Mean	4.38	4.38	1.73	3.00	1.99
R-Squared	0.15	0.16	0.16	0.16	0.18
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 9 Column 1 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S46: Heterogeneity Analysis: Pulse Stock (Months)

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	0.247	-0.230	-0.307	-0.0358	-0.0800
	(0.392)	(0.467)	(0.429)	(0.434)	(0.373)
Treat Y1*($I = 1$)		0.875*	0.775	0.480	0.370
		(0.507)	(0.627)	(0.644)	(0.619)
Treat Yr. 2	0.395	-0.360	0.432	-0.0797	0.287
	(0.418)	(0.446)	(0.443)	(0.395)	(0.386)
Treat Y2*($I = 1$)		1.388***	-0.126	0.869	-0.0229
		(0.443)	(0.625)	(0.753)	(0.726)
Treat Yr. 3	-0.648	0.909	-1.935*	-1.248	-0.351
	(0.826)	(0.837)	(1.081)	(0.796)	(0.780)
Treat Y3*($I = 1$)		-2.870***	2.160	1.296	-0.185
		(0.804)	(1.372)	(1.407)	(1.225)
$I = 1$		0	1.297***	0.505	2.107***
		(.)	(0.491)	(0.494)	(0.560)
Year 2	0.0127	0.0127	-0.186	0.0982	0.0971
	(0.297)	(0.297)	(0.367)	(0.346)	(0.348)
Y2*($I = 1$)		0	0.318	-0.177	-0.189
		(.)	(0.582)	(0.616)	(0.671)
Year 3	-5.921***	-5.921***	-3.110***	-3.718***	-3.897***
	(0.865)	(0.866)	(0.855)	(0.699)	(0.776)
Y3*($I = 1$)		0	-4.486***	-4.550***	-4.535***
		(.)	(1.228)	(1.355)	(1.209)
Control Mean	1.82	1.82	0.97	1.13	0.90
R-Squared	0.23	0.24	0.24	0.25	0.25
Observations	2511	2511	2511	2511	2511

Notes: This table reproduces results form Table 9 Column 2 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S47: Heterogeneity Analysis:Weekly Pulse Consumption

		Interaction ($I = 1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	12.69	24.40	20.18	7.391	-38.75
	(37.08)	(48.03)	(54.09)	(41.63)	(50.29)
Treat Y1*($I = 1$)		-21.80	-12.81	7.433	103.5
		(48.53)	(64.94)	(61.50)	(71.43)
Treat Yr. 2	-20.83	-17.36	-22.45	-28.44	-49.84**
	(17.73)	(20.98)	(27.14)	(26.72)	(24.80)
Treat Y2*($I = 1$)		-6.592	2.992	15.43	63.11*
		(17.95)	(30.99)	(33.18)	(34.19)
Treat Yr. 3	-12.84	-5.977	-42.19	-18.50	-29.57
	(19.15)	(24.52)	(28.89)	(27.44)	(27.52)
Treat Y3*($I = 1$)		-12.78	46.31	12.20	37.33
		(23.59)	(35.26)	(34.34)	(36.76)
$I = 1$		0	40.19	38.65	-18.59
		(.)	(47.39)	(48.42)	(51.86)
Year 2	-130.2***	-130.2***	-108.6***	-88.03**	-121.3***
	(27.87)	(27.89)	(37.00)	(36.40)	(37.14)
Y2*($I = 1$)		0	-34.44	-86.96	-19.87
		(.)	(53.56)	(56.35)	(50.97)
Year 3	-86.70***	-86.69***	-45.46	-43.10	-84.90**
	(29.90)	(29.92)	(41.75)	(35.40)	(38.03)
Y3*($I = 1$)		0	-65.65	-90.15*	-4.062
		(.)	(53.86)	(53.56)	(53.38)
Control Mean	399.79	399.79	347.98	345.48	390.63
R-Squared	0.15	0.15	0.15	0.16	0.16
Observations	2469	2469	2469	2469	2469

Notes: This table reproduces results form Table 9 Column 3 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S48: Heterogeneity Analysis: Daily Protein Consumption (Household)

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0.0603	-0.129	-1.066	0.533	-1.030
	(1.049)	(1.401)	(1.345)	(1.290)	(1.424)
Treat Y1*($I = 1$)		0.358	1.956	-0.929	2.658
		(1.438)	(1.391)	(1.462)	(1.696)
Treat Yr. 2	-2.259	-3.015	-6.682*	-2.618	-3.154
	(2.991)	(3.586)	(3.410)	(3.198)	(2.620)
Treat Y2*($I = 1$)		1.401	6.830	0.617	1.338
		(3.092)	(5.458)	(5.629)	(6.569)
Treat Yr. 3	-4.269	-4.217	-4.986	-5.830	-0.223
	(4.139)	(4.617)	(3.216)	(6.349)	(5.358)
Treat Y3*($I = 1$)		-0.0828	0.974	3.199	-8.782
		(3.016)	(6.903)	(7.266)	(8.536)
$I = 1$		0	0.490	-1.110	-3.410**
		(.)	(1.168)	(2.010)	(1.618)
Year 2	5.174**	5.174**	4.861	3.848	2.180
	(2.583)	(2.585)	(3.240)	(2.864)	(2.312)
Y2*($I = 1$)		0	0.510	2.731	6.705
		(.)	(5.107)	(5.154)	(5.903)
Year 3	8.800**	8.800**	5.051	9.905*	4.096
	(3.707)	(3.709)	(3.074)	(5.668)	(4.088)
Y3*($I = 1$)		0	5.977	-2.286	10.59
		(.)	(6.603)	(6.498)	(7.848)
Control Mean	14.80	14.80	14.09	15.36	15.35
R-Squared	0.09	0.09	0.09	0.09	0.09
Observations	2469	2469	2469	2469	2469

Notes: This table reproduces results form Table 9 Column 4 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S49: Heterogeneity Analysis: Daily Protein Consumption (Female)

		Interaction ($I = 1$)			
	Main Result	Farmer Group Member	Grew Pulses Pre-Study	Above Median Asset Index	Above Median Land Owned
	(1)	(2)	(3)	(4)	(5)
Treat Yr. 1	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
Treat Y1*($I = 1$)		0	0	0	0
		(.)	(.)	(.)	(.)
Treat Yr. 2	-11.19	-16.84	-46.24	-1.777	-28.95
	(19.08)	(23.92)	(43.54)	(23.73)	(25.39)
Treat Y2*($I = 1$)		10.50	55.45	-19.68	37.09
		(19.60)	(49.02)	(37.19)	(39.94)
Treat Yr. 3	-5.740	-5.467	-10.85	-9.506	19.05
	(17.81)	(20.73)	(18.25)	(22.18)	(19.96)
Treat Y3*($I = 1$)		-0.391	7.199	7.127	-52.52
		(17.51)	(31.34)	(30.39)	(37.51)
$I = 1$		0	21.66	-11.32	32.00
		(.)	(26.88)	(27.78)	(30.16)
Year 2	-0.420	-0.412	34.95	-8.836	23.91
	(23.09)	(23.10)	(41.81)	(28.38)	(30.35)
Y2*($I = 1$)		0	-56.45	17.32	-54.48
		(.)	(49.11)	(40.90)	(45.63)
Year 3	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)
Y3*($I = 1$)		0	0	0	0
		(.)	(.)	(.)	(.)
Control Mean	99.62	99.62	113.51	83.68	98.19
R-Squared	0.03	0.03	0.03	0.03	0.03
Observations	1629	1629	1629	1629	1629

Notes: This table reproduces results form Table 9 Column 5 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.

Table S50: Heterogeneity Analysis: Pulse Consumption Index

		Interaction ($I=1$)			
	Main Result (1)	Farmer Group Member (2)	Grew Pulses Pre-Study (3)	Above Median Asset Index (4)	Above Median Land Owned (5)
Treat Yr. 1	0.124	0.00530	-0.00861	0.00915	-0.0136
	(0.0927)	(0.104)	(0.101)	(0.0956)	(0.0875)
Treat Y1*($I=1$)		0.219**	0.192	0.221	0.221
		(0.108)	(0.149)	(0.154)	(0.170)
Treat Yr. 2	0.0506	-0.119	0.0493	-0.0353	0.00745
	(0.104)	(0.106)	(0.104)	(0.111)	(0.0971)
Treat Y2*($I=1$)		0.314***	-0.00796	0.166	0.0430
		(0.106)	(0.152)	(0.209)	(0.199)
Treat Yr. 3	-0.0810	0.0327	-0.196*	-0.140*	-0.0303
	(0.0746)	(0.0837)	(0.103)	(0.0801)	(0.0754)
Treat Y3*($I=1$)		-0.205**	0.200	0.139	-0.0449
		(0.0812)	(0.124)	(0.121)	(0.0993)
$I=1$		0	0.346***	0.0439	0.443***
		(.)	(0.125)	(0.128)	(0.146)
Year 2	-0.0350	-0.0350	-0.0810	-0.0331	-0.0297
	(0.0728)	(0.0729)	(0.0855)	(0.0914)	(0.0870)
Y2*($I=1$)		0	0.0728	-0.00433	-0.0125
		(.)	(0.142)	(0.171)	(0.188)
Year 3	-0.797***	-0.797***	-0.427***	-0.504***	-0.489***
	(0.113)	(0.113)	(0.113)	(0.0992)	(0.0938)
Y3*($I=1$)		0	-0.589***	-0.606***	-0.690***
		(.)	(0.160)	(0.173)	(0.169)
Control Mean					
R-Squared	0.22	0.23	0.23	0.24	0.26
Observations	2469	2469	2469	2469	2469

Notes: This table reproduces results form Table 9 Column 6 and explores heterogeneity along various dimensions. Column 2 separates treated households by the endogenous decision to participate in the farmer group. Column 3 separates by prior experience with pulses. Column 4 separates by above/below median asset ownership. Column 5 separates by above/below median land ownership.