# Dial Helpline 'H' for Help[*]

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**Abstract**

Post disaster helpline phones are the first coping strategy, yet the evidence of its efficacy on economic outcomes still remain elusive. Endogeneity concerns among others complicates the identification of a causal effect. Using experimental intervention in India we assess the effect of helpline phone on yield recovery following covariate shock in redgram crop. We find access to helpline phones recover yields by 36 percentage points under covariate shock but had no impact on placebo crops, which we attribute to higher collective efficacy. Evidence suggests that helpline phones are vital risk coping strategy aftermath of disaster, but seem inappropriate as routine agricultural extension services.

**Keywords:** Randomized Experiment, Natural Disaster, Agriculture, Productivity, Extension Service, Public Sector, Helpline Phone

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[*] The authors thankfully acknowledge the support of ESRC-DFID funded research project with ESRC Grant Reference: ES/J009334/1. The views expressed in this paper are entirely those of the authors and in no way represent either the official policy of funders or the policy of any other part of the UK government. We thank participants at the seminar in Glasgow University and University of Edinburgh Development Economics Workshop.

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## 1. Introduction

Recent catastrophic events have drawn increased attention on the plight of those impacted by natural disasters. When disaster strikes helpline phones are the first coping strategy adopted by governments around the world – not just natural disasters like Hurricane Katrina and Asian tsunami, but also terrorist attacks such as 9/11 and 7/7 in New York and London respectively, and more recently in Brussels and Paris.[3] Yet, there has been almost no research on the efficacy of helpline services on economic outcomes.[4] This may be due to the fact that credibly establishing causal relationship is often difficult because some may have access and knowledge about helpline phones while others not resulting in selectivity bias. In addition, to unobserved heterogeneity, omitted variables – for example, government institutional quality – may drive both economic outcomes and helpline phone services, producing misleading estimates.

In this paper, we exploit the quasi-random timing and location of the pest attack on redgram to identify the causal relationship between the effectiveness of phone helpline services and recovery of crop yields. Immediately after the pest outbreak, we implemented a field experiment providing helpline phone numbers to randomly selected farmers who suffered from the massive pest outbreak. Most of these farmers cultivate more than one crop apart from the pest infected redgram crop that allows for distinction between idiosyncratic and covariate shocks – redgram suffered from covariate shock while placebo crops ragi, horsegram and paddy had exposure to the usual idiosyncratic bouts. This distinct feature of the exogenous

[3] Besides helpline phone provides insurance against natural disasters, mitigates risk, provides support, and enhances resilience and facilities recovery.

[4] The dramatic consequences of natural disasters typically have greater incidence for the well-being of population already living on the margins in low and middle income countries, where three quarters of the world's extreme poor reside. Climate change poses additional threat to the control of agricultural catastrophic events worldwide, and it is predicted that pest and disease invasions is likely to increase further in the future. The rapid spread of mobile phone services offers a unique opportunity to reduce transaction costs and obtain access to new information relating to a range of agricultural services. Understanding the significance of these services is of paramount importance as its negligence may lead to further disproportionate suffering of the seventy-five percent of the world’s poor living in rural areas and most of them dependent on agriculture. A better appreciation of how the helpline phones are utilized to address agricultural problems can guide allocation decisions of the dwindling public resources for agriculture in developing countries.

shock provides a unique opportunity to isolate the impact of phone helplines on the differential nature of shocks in the recovery of crop yields.

Timely intervention with accurate diagnoses of pest, and information on the application of relevant sprays through helpline phones has the potential to recover crop yields under both types of shocks. We use crop wise individual farm-level panel data gathered from farm surveys on two crop cycles in the Indian state of Karnataka, before and after the 2014 devastating pest outbreak on redgram crop.[5] Our results show that randomly selected farmers who received the helpline phone numbers post disaster were able to recover their crop yields compared to another randomly selected group to whom the helpline numbers were not distributed. Though helplines accelerated the recovery process only for the crop affected from covariate shock, it had no significant impact on placebo crops. We provide several robustness checks with alternative measures of crop output and estimation methods to test the validity of our results.

This paper makes contributions to three distinct literatures. First, the results contribute to the emerging literature on the economics of disasters (Kahn 2005; Anbarci et al. 2005; Eisensee and Stromberg 2007; Yang 2008; De Mel et al. 2012; Blumenstock et al. 2014) and also to a closely related literature on risk-coping mechanisms by rural households in developing countries (Townsend 1995; Udry 1994; Ligon et al. 2002). The first coping strategy after any disaster strikes is to setup phone helplines to mitigate risk, provide support, enhance resilience and facilitate recovery. But there has been almost no research on the role and significance of helpline phones as emergency response in the recovery process, let alone when natural disaster strikes in the form of diseases and pests outbreak on crops. Conventionally, public agricultural extension programs provided an important mechanism for sharing risk and coping with adverse

[5] Note here that we do not just simply compare yields across crops and over time, which is likely incompatible, but standardise the actual yields by their crop-variety specific potential yields for comparison of the phone helpline recovery impact.

productivity shocks in agriculture (Dercon et al. 2009; Duflo et al. 2011; Krishnan and Patnam 2014). Results presented here shows that agricultural helpline extension phones are very useful when all the members of a group that provides informal risk-coping strategies to smooth idiosyncratic shocks breaks down, however, surprisingly, these helpline phones do not seem to provide adequate support against idiosyncratic shocks.

Second, an evolving body of literature documents the significance of social capital on economic outcomes that began with the work of Banfield (1958), Coleman (1990), and Putnam (1993). Several recent studies view social capital or community governance as capacity of members of a community to cooperate with others to produce socially efficient outcomes.[6] Putnam (1993) found a strong relationship between civic engagement and government quality across regions in Italy while La Porta et al. (1997) using cross country data find that increase in trust raises judicial efficiency, bureaucratic quality and tax compliance. Similar results have also been reported for outcomes such as provision of public goods (Putnam 1993); economic growth (Knack and Keefer 1997); financial development (Guiso et al. 2004) and cross-country trade (Guiso et al. 2009). In line with this literature, the cross-farmer externalities triggered by the collective problem of pest outbreak in the redgram crop mustered social action oriented to promote awareness of the problem, reinforced by the media, improved the delivery and efficacy of helpline phone services. We believe that community engagement resulted in helpline phones recovering crop yields only under covariate shock while not observing any impact for placebo crops suffering from idiosyncratic shocks.

Third, emergence of mobile phones as risk sharing mechanisms for the poor is gaining considerable interest in developing countries. In recent years, the proliferation of mobile

[6] Social norms, trust, collective efficacy, network of civic engagement and community governance are used interchangeably in the literature for social capital. Bowles and Gintis (2002) instead prefers to use the concept of community governance, which focuses on what groups do rather than what people own. However, more recent studies continue with the term social capital (Algan et al. 2013).

phones facilitates easier access to information at lower transaction costs offering a unique and robust mechanism for the poor in coping with risk. An emerging literature shows that adoption of mobile phones has tangible economic gains, reduces price dispersion and improves market efficiency, helps coping with risks, and enhances producer and consumer welfare (Jensen 2007; Aker 2010; Goyal 2010; Blumenstock et al. 2014).

Conventionally, agricultural extension services were designed to address asymmetric information of poor farmers with limited access to new information on best agricultural practices and prevailing market opportunities. Evidence on the efficacy of these programs is mixed: on the one hand, some studies find a significant and positive effect (Feder et al. 1987; for a survey see Birkhaeuser et al. 1991; Evenson 2001; Dercon et al. 2009). On the other hand, agricultural extension services are barely functional in developing countries (Rivera et al. 2001; Feder et al. 2010). In order to strengthen conventional extension services and effectively address the information asymmetries of the poor farming communities, phone based agricultural advisory services have evolved in recent years with the emergence and wider coverage of mobile phone networks (Aker 2011). To the contrary, a recent study finds no statistically significant effect of SMS-based agricultural information on several farming outcomes (Fafchamps and Minten 2012). However, Cole and Fernando (2012) find a positive and significant effect of mobile phone-based agricultural extension services on farming practices. One key concern for the mixed evidence is selection bias, arising from the failure to determine a robust counterfactual and controlling for spillover effects, that has the potential to contaminate the control group. With access to SMS-based information on mobile phones, farmers are able to contact members of their social networks more easily, thereby intensifying the probability of inter-village spillovers.

Our experimental intervention addresses these issues in two ways: first, to minimise information spillovers, our sample households are drawn from a wider spread of 327 villages in the Indian state of Karnataka, accessing agricultural extension information using a previously unknown toll-free national helpline number randomly allocated to the treatment farmers. Second, we not only examine the impact of variation in the access to helpline numbers between control and treatment groups, but also study the effect of exogenous shock to different crop types within farming households and the recovery impact of the helpline phones on their yields. This additional identification strategy disentangles the spillover effect from treatment effect (access to agricultural extension services) and also distinguishes the effectiveness of extension services from access to mobile phones.

Rest of the paper is organized as follows. Section 2 provides the background to the study. In section 3, we present the data and empirical strategy. Section 4 is devoted to empirical results. Section 5 provides potential explanation followed by concluding remarks in section 6.

## 2. Background

### 2.1 Covariate shock, crop yield and redgram crop

The experimental region in the Indian state of Karnataka (Figure 1 and 2) suffered from natural disaster in the form of devastating pest outbreak and disease in the main food crop redgram (or pigeon pea crop, scientific name *Cajanus cajan*) at the end of agricultural season in *Kharif* and beginning of *Rabi* 2013.[7] The redgram crop in the study area was infected with sterility mosaic disease (SMD), which is one of the most devastating diseases of redgram in India (Kumar et al. 2003; Ganapathy et al. 2012). Reportedly, more than 0.2 million tons of grain were lost per year in the period between 1975 and 1980, which equates

[7] The *Kharif* season is from June to September and *Rabi* is from October to January. Redgram is usually sown in June or July but under delayed monsoon rain conditions, it could be sown up to the end of August. The cropping duration of redgram could range from six to nine months and sometimes, even longer depending on the seed variety whether it is early or long duration maturing.

to more than $250 million worth of loss at current prices (Kulkarni et al. 2002). Moreover, the pest is contagious and spreads rapidly across the cultivated areas (Jones et al. 2004). In other words, the SMD that attacked the redgram crop in the experimental area is not only devastating but also tends to affect farming population collectively (covariate shock).[8]

The advice from agricultural experts however could curtail the consequences of the pest. This is important for two reasons: first, although farmers have on average 30 years of farming experience in the study region, development of resistance by pests and identification of appropriate chemical sprays poses considerable challenge requiring support from agriculture experts with scientific knowledge of the pest and chemical composition of the currently available sprays in the market. Farmers mostly rely on the local fertilizer and pesticide shop for information on sprays despite knowing that these shops have perverse incentives, most often recommending ineffective and expensive sprays (Cole and Fernando 2012).

Second, requires better coordination across farmers on application of sprays and other control measures to collectively contain the spread of the pest. The yield loss however depends on the growth stage at which the infection occurs. In the early stage infection when the plant is less than 45 days old, the loss could be between 95 to 100 percent, and late infection after 45 days but early diagnosis, though dependent on the level of the infection, loss in yield can range from 26 to 97 percent. In the study region, the infection of SMD in most cases became apparent after 90 days of sowing but was diagnosed within one and two weeks after the infestation. So there seemed considerable scope for recovering the crop

[8] SMD is sometimes described as the 'Green Plague' given that "at flowering time, affected plants are green with excessive vegetative growth and have no flowers or seed pods, under congenial conditions; it spreads rapidly like a plague" (Jones et al. 2004).

yields. Timely intervention with accurate diagnoses of pest, and information on the application and dosage of relevant sprays can recover crop yield. Though adequacy of the treatment strongly depends on the stage of plant growth, an early identification and solution is crucial for farmers to fight against the pest outbreak in order to save their redgram crop. For this, communication with extension experts is pivotal in identification of adequate strategy to fight against the common agricultural problem, where collective action is paramount. Here, the helpline phones such as Kisan Call Centre (KCC) can be very valuable in providing instantaneous access on a range of information from agricultural extension experts over the phone about pest management to sourcing of quality insecticides and pesticides.

The timing of the pest outbreak on redgram crop also adds to the gravity of the study. Since the pest infestation occurred in the *Rabi* farming season, it means that these farmers will have struggled to grow anything during the hot summer season that follows. Thus, most farmers in this region grow a portfolio of crops alongside to cope with the risk of crop failure. Apart from redgram, farmers in Gubbi also cultivate ragi, horsegram and paddy. While redgram suffered from covariate shock, other crops like ragi, horsegram and paddy also suffered but from isolated incidence of pest infestations that were not as widespread. Given that KCC helpline phones can potentially recover crops under both covariate and idiosyncratic shocks, we are able to compare recovery of yields across crops to examine the helpfulness of the helpline phones.

To understand the recovery of the redgram crop affected by the covariate shock, we need to compare the trajectory of the affected crop to a counterfactual trajectory measuring outcomes in the absence of both pest and helpline phones. We exploit the variation in pest infestations on different crop types and random allocation of KCC helpline phones between treatment and control group to isolate and identify the impact of the agricultural helpline phone services in recovering crop yields immediately after the covariate shock.

### 2.2 Agriculture extension and advisory services in India

The agricultural extension system in India is one of the largest public sector knowledge and information dissemination institutions in the world. The success of this system during the Green Revolution is fairly well documented (Ameur 1994). However, over time it has evolved as a nodal organization for distribution of subsidized agricultural inputs under various agricultural development programs. Consequently, traditional agricultural development programs such as government extension visits are ineffective. Specifically, in the state of Karnataka, only 11.5 percent of the farming households had at least one contact with a government extension worker in the 2003 survey year (National Sample Survey Organisation 2005). Similar low access to agricultural extension services are also reported in Figure 3 that is based on our baseline survey from randomly selected farming households in Karnataka. Our results show that only 8 percent and 4 percent of the farming households in the agricultural year 2012-13 had one or more visits from extension workers and scientists, respectively.

Despite reforms to strengthen its extension and research systems, several performance issues still hinder the effectiveness and efficiency of the public agricultural extension system in India (Babu et al. 2013). The new agricultural development programs in India include farmer helpline services. The Department of Agriculture & Cooperation of the Ministry of Agriculture in India introduced in early 2004 the Kisan Call Centre (KCC) helpline service as part of a wider policy framework to rapidly deliver agricultural extension services to the farming community across the country. The purpose is to respond promptly on farm-related problems and improve the quality and accelerate the transfer and exchange of information to farmers through the use of information and communication technology (ICT). Under KCC helpline, farmers call a common toll-free advisory phone service number and access expert advice from Level 1 operators (agricultural graduates) in 13 regional centers across the country in 21 local languages. Further, queries from Level 1 operators are supported by Level 2 experts located in different parts of the country at State Agriculture Universities, Indian Council for Agricultural Research institutes, and State Department of Agriculture (Government of India, 2015).

Despite several years of operation by KCC, there is surprisingly no rigorous impact evaluation of its services. This paper provides the first rigorous evaluation of KCC in the state of Karnataka where traditional public sector extension services are known to be ineffective and KCC initiatives have not yet widely spread. Our baseline survey reveals that most farmers in this region were not only unaware of the KCC helplines but were also very skeptical of the efficacy of any extension support from government, including the helpline phones. This gave us a unique opportunity to design a field experiment to evaluate the efficacy of KCC helpline. We exploit several dimensions of the farming conditions in this region: first, we exploit the poor coverage of the KCC helpline in this region to compare the efficacy of this initiative by providing the helpline phone numbers to randomly selected group of farming household and not to others. Second, since farmers used mobile phones to make calls to the helpline number, we are able to distinguish the effectiveness of extension services from access to mobile phones. Third, we exploit the crop types under dissimilar shock to disentangle the spillover from treatment effect in examining the impact of helpline phones.

## 3. Data and empirical strategy

As a precursor to the empirical analysis, we describe here the experiment, data sources and our identification strategy.

### 3.1. Experimental design

Our study was conducted among redgram farmers in Gubbi taluk (sub-district), located in Tumkur district, about 70 kilometres from Bangalore in the Indian state of Karnataka. Between November and January 2014, immediately after the outbreak of SMD on redgram, we identified 100 affected farmers from the list of currently enrolled farm households on the Dynamic Agricultural Tablet-based Extension Services (DATES) program that began in March 2013 in the two districts of Karnataka.[9] A timeline of the implementation and data collection activities is provided in Figure 4. Following the completion of the baseline survey, we noticed the outbreak of SMD in Tumkur district; hence, the evaluation of KCC helpline was piloted among sub-sample of farmers enrolled for the main DATES program from this district.[10] From the affected redgram farmers in the study region, we randomly distributed KCC helpline phone numbers to 70 farmers keeping 30 farmers as controls. Only two farm households from the treatment group dropped out after randomization and could not be contacted. A pre-experiment survey (different from the baseline survey) among the selected redgram farmers were carried out using a questionnaire in July 2013 confirmed that the farmers in the experimental area were not aware of the KCC helpline services. Each of these farmers cultivated more than one crop giving us a study sample of 428 crops with a plot area of 495 acres from two crop cycles between June 2012 and July 2014. Note that each farming household in the experimental area produced more than one type of crop, which could be up to four different crops or same crop but of different seed variety.

[9] DATES is a large scale experimental intervention project funded under the DFID/ESRC Growth Programme with the objective of providing agricultural extension services using unique IT-enabled tablet delivering scientific information in real time on pest-related problems to farmers in the Indian state of Karnataka.
[10] Almost the entire area is endowed with red loamy soil with eastern dry agro-climatic condition that supports cropping of redgram along with few other crops such as ragi, horsegram, paddy and chilli. Redgram, though popular but not the dominant crop, is our natural focus crop given the devastating pest outbreak it suffered, and despite good vegetative growth was facing tremendous threat to its yields at the time of the DATES program.

Given the timing of the pest outbreak and the distribution of KCC helplines, there was plenty of scope to recover crop yields for redgram and also seek extension information against idiosyncratic shocks for other crops. About 34 percent of the group that received KCC helpline numbers took complete advantage of the opportunity provided in this phone advisory service by calling the helpline several times, not only for redgram, but also for other crops. Rest 66 percent of the treatment households that were given the helpline number did not attempt to reach out for the extension information using the KCC helplines, however, we could not rule out the possibility that they received information from other fellow (treatment) farmers who were enrolled to receive the helpline. Similarly, information spillovers to control farmers could also be a potential concern. Given the geographical distance between the sample villages and poor availability of extension information in general suggests this is unlikely. This is also confirmed from specific follow-up survey question on the different sources of extension information that households received. Besides, our identification strategy discussed below is also able to isolate the impact of spillover effect from the treatment effect.

### 3.2. Data and pre-intervention survey

We examine the recovery of crop yield from the devastating disease and pest outbreak using data from a panel survey we conducted in Gubbi taluk (sub-district), located in the Tumkur district in the Indian state of Karnataka. The baseline survey was conducted in June 2013 under the DATES program in two districts, representing different agro-climatic zones in Karnataka. The program enrolled 1320 farmers from 411 villages, spread over Tumkur and Bellary districts, aimed at providing rigorous empirical evidence on what motivates farmers to adopt modern agricultural practices to enhance productivity, and how the information provided can influence their behavioural biases (limiting profitable investments), seen as one of the main causes of sub-optimal agricultural practices. Just after the completion of the baseline survey in November 2013, there were initial signs of SMD outbreak in redgram among some farmers in

Tumkur district, though none of our samples in the project had yet suffered. However, over the months of December 2013 and January 2014, the pest quickly spread covering almost the entire Tumkur district, including our sample farmers. In January 2014, we randomly distributed the KCC helpline phone number to about two-third of the 100 samples randomly selected in Tumkur district that were enrolled in the DATES program. Immediately after the harvest of all the crops, we conducted the endline survey between June and July 2014.

Our baseline survey collected retrospectively detailed crop cultivation information such as outputs and inputs used for all the crops grown during the 2012-2013 crop cycle along with household particulars and details of any crop specific extension information received and their sources. The major crops in Tumkur are ragi and redgram, widely grown for both market and home consumption. Our primary recovery indicator is standardized yield ratio measured as ratio of actual to potential yield (same method in Sen, 1981). Potential yield refers to the maximum yield of a crop when grown using a specific seed variety in environments to which it is adapted, with nutrients and water non-limiting, and pests and diseases effectively controlled (Evans and Fischer, 1999). Specifically, our main variable is associated with crop and seed-variety-specific potential yield, and this information comes from the recent agricultural reports of the International Crops Research Institute for the Semi-Arid Tropics (Indian Council of Agricultural Research 2011). The standardized yield, estimated from the crop wise production information in the baseline survey for the 2012-13 crop cycle 1, is compared to the 2013-14 crop cycle 2 with similar information collected in the post intervention survey (Figure 2). Note that, to evaluate the effect of KCC helpline phones, we not only compare the same crops for the same farmers over the two crop cycles but also compare crops affected by SMD with crops not affected (redgram vs. placebo crops), of course, controlling for farm characteristics.

Information was collected to spot peculiarity, if any, to changes in farming practice between years in the study area. Farmers in the experimental sample either use hybrid or local variety seeds. Though most prefer hybrid variety seeds due to the features like high yielding, pests resilient, short duration and low resource compatible seed properties. Farmers were asked for the source of the seeds from where they purchased to ascertain if problem lies with seed distributors who might be providing old, damaged or seeds that were not approved by the public authorities to be sold in the market. We found that regardless of the source of seeds acquired or type of seed variety farmers used, the entire standing redgram crop suffered from SMD, though to different degree dependent on the sowing times at the time of experiment in the study area.

Given that the usage of helpline phones were confined to one third of the total farmers (actual treated group) who were randomly allocated to receive the KCC helpline phone number (intent-to-treat group), it is important to address the concern that the actual treated group is subject to self-selection bias. To deal with this issue, we use the intent-to-treat group as proxy for the treatment to estimate regressions using random effects panel approach. For robustness, we estimate the model using instrumental variable approach where we instrument actual treated group with the intent-to-treat group (Banerjee et al. 2007, among others).

### 3.3. Identification strategy

The identification strategy compares crop outcomes of treatment farmers with access to helpline phone number to control farmers with no access to helpline number. Randomization of helpline number implies that differences in average crop outcomes across farm households with differential nature of access to extension information post shock has a causal interpretation.[11] Let $Y_{ijt}$ be the actual-potential yield ratio of the crop *i* of farmer *j* in period *t*; let $A_j$ be a dichotomous variable equal to 1 if farmer *j* belongs to the treatment group (they would receive the KCC helpline phone number). $D_i$ be a dichotomous variable that takes value 1 if crop *i* is redgram, and let $T_t$ be a dichotomous variable that takes value 1 for crop cycle 2. The base econometric model is:

$$Y_{ijt} = \beta_0 + \beta_1 A_j + \beta_2 D_i + \beta_3 T_t + \beta_4 A_j T_t + \beta_5 D_i T_t + X'B + \varepsilon_{ijt}, \quad (1)$$

where $X$ is a vector of control variables, and $\varepsilon_{ijt}$ is an error term. Coefficients $\beta_1, \beta_2$ and $\beta_3$ are the group fixed effect, and time fixed effects. Coefficient $\beta_4$ is the difference-in-difference effect of access to helpline services. Coefficient $\beta_5$ is the difference-in-difference effect of covariate shock. We first estimate the aggregate plot level regression separately for different shock types to disentangle the effect of helpline extension services in the presence of idiosyncratic and covariate shocks (SMD outbreak): (*i*) the subgroup of redgram and ragi crops (called Redgram-Ragi), (*ii*) for the group that consists of all four crops (called All crops-Ragi), and (*iii*) for the subgroups of the three crops that suffered idiosyncratic shocks, but not the covariate shock (called Placebo-Ragi). Note that ragi appears as counter-factual across all groups.

While the above model shows the recovery impact of helpline services at the aggregate, it is unable to isolate the impact of yield recovery for redgram crop post disaster.[12] This

[11] A simple model of farmer decision and the recovery impact of helpline phones under differential crop and shock types are provided in Appendix.
[12] An alternative identification strategy involves estimation of three interaction effect, by including the term $\gamma A_j D_i T_t$ in equation (1). However, this strategy would not help to isolate the impact of helpline on redgram because this term might be affected by confounding factors. That is, while the pest would exercise a negative impact on yield, the pest might muster social action, with a plausible positive impact on the effect of helpline phones on crop recovery (see further discussion in section 5). Estimates using these extended regressions are provided under request.

requires estimation of the above model separately for each of the crops. That is, the individual crop yield model is represented by the econometric model.

$$Y_{jt}^{i} = \delta_0^i + \delta_1^i A_j^i + \delta_2^i T_t^i + \delta_3^i A_j^i T_t^i + X'\hat{B} + \hat{\varepsilon}_{jt} , \qquad (2)$$

where $i \in \{\text{redgram, ragi, paddy, horsegram}\}$. In equation (2), coefficients $\delta_1^i$ is the treatment group fixed effects. Coefficient $\delta_2^i$ is the time fixed effects. Coefficient $\delta_3^i$ is the effect of helpline phone services. Given that most farmers grow at least two of the four crops, comparison of the recovery impact of helpline phones across different shock type disentangles the spillover effect from treatment effects and purges the effect of access to mobile phones. If spillover is a concern in equation (2) then $\delta_3^i$ should not show statistically significant impact for redgram crop while showing a robust impact for the placebo crops.

## 4. Empirical results

We start by reporting descriptive statistics and randomization balance check and then examine the impact of helpline phone on the recovery of crop yields.

### 4.1. Descriptive statistics and randomization check

Table 1 presents the variable definition, and Table 2 displays information on the implementation of experiment. In the experiment, we only provide the helpline phone number but the farmers decide whether to call or not. In other words, only the intention to treat is randomly assigned. We note a significant proportion of non-compliers: only 34 percent of those farmers who were given the helpline phone numbers used it. Non-usage has various causes. In the ex post survey, respondents were asked the reason for not contacting experts over the helpline. Among the non-caller farmers 54 percent indicated that they did not find time and will call in a week's time or next season, whilst the rest informed thought that it was not profitable any more to call and follow advice from agricultural experts. Testing the robustness of our key results we also report estimates from IV method where actual treated is instrumented with the intent-to-treat. In control group, no farmer was offered helpline number. There was minimal attrition between the baseline and follow-up: of 100 farmers interviewed in the baseline, only 98 were revisited in the follow-up survey.

**[Table 1 should be here]**

**[Table 2 should be here]**

Table 3 reports randomization balance check using baseline 2013 survey data. In this table we present the mean values of each variable for the treatment and control groups along with standard deviation in parentheses. In panel A, which considers farmer characteristics, treatment and control groups are balanced in all 5 baseline characteristics, and a joint test of significance of mean differences demonstrates overall balance. Panel B reports farm characteristics that shows imbalance in only one out of 12 baseline characteristics. The exclusion of this variable – land under paddy – from the set of controls does not alter the magnitude or significance of our results (results available from authors). The baseline survey collected detailed data on all the different sources of agricultural extension information received by the farm households and the road distance in kilometers (km) leading to information hubs. Balance checks in Panel C shows that source of farm information data remain balanced on all covariates. The panel D on household wealth across different consumer durables also shows balance.

**[Table 3 should be here]**

### 4.2. Effect of KCC helpline phones

We next estimate equation (1) using a random effects model to a two-year panel data on crops that accounts for correlations within village clusters to compute the difference-in-difference (DD) estimate of the impact of helpline phone services on the recovery of crop yield in the survey region. Table 4 displays aggregate results for each of the three crop categories: first three columns are for redgram followed by the next three columns for all four crops (redgram, ragi, paddy and horsegram) and the last three columns are exclusively for the placebo crops that suffered from idiosyncratic shocks, but not the covariate shock.

The first two columns in each of the aggregate categories are with and without control variables and no GP fixed effects. Column 3 replicates column 2, but accounting for the GP fixed effect as randomization was stratified along this dimension. Finally, columns 4-6 replicate columns 1-3, but using all crops and column 7-9 replicate columns 4-6 for the placebo crops. Reasons to include the control variables as additional determinants of standardized crop yield ratio, although the balance check in Table 3 confirms that the control and treatment group are relatively good homogeneous group of farmers, are based on the idea that household and farmer characteristics might have some potential to influence crop productivity over time, independent of whether their difference in means is statistically insignificant in the baseline randomization (Bruhn and McKenzie 2009; Dercon et al. 2009; Goodwin and Mishra 2004). The controls included are farmer's education, experience in farming, and socio-economic status, measured by the total asset value of household durables and land owned, and whether the farmer belongs to schedule caste or schedule tribe. We also control for agricultural information coming from sources other than helpline (e.g. public source such as local government offices-RSK/KVK, marketing board service or private sources such as NGOs and media), and visits from public extension advisors (further robustness of different specifications are provided in Section 4.6 below). Note that the key estimates do not seem to be sensitive to the inclusion of these additional controls.

**[Table 4 should be here]**

The estimates reported in Table 4 third row that includes all the controls suggest a positive but not significant impact of helpline phone services on crop yield, although the effect eventually turned significant when we omitted GP fixed effects ($p<0.1$). The size of the estimates decreases, although still insignificant, when we focus on placebo crops that suffered from idiosyncratic shocks (columns 7-9). This result is in line with some recent studies on agricultural extension program (Fafchamps and Minten 2012; Feder et al. 2004). Regarding effect of time T, the positive and significant estimates reflect the fact that treatment year 2013-2014 (crop cycle 2) was a good agricultural year with normal rainfall that encouraged intense pest activities. On the other hand, the baseline year 2012-2013 (crop cycle 1) was a dry agricultural year with slightly below normal rainfall and general water shortage with much less pest infestation. The significant negative estimates in the fifth row confirms the devastating pest shock of SMD on redgram yield.

Recalling that equation (1) does not help us to identify the plausible impact of helpline services on crop recovery under covariate shocks (a detailed discussion is provided in Appendix A, using a simple model for farmer decisions), we now proceed to estimate crop specific regressions based on equation (2).

### 4.3. Recovery of crops

Here we distinguish the recovery from different shock types by examining the helpline response to each of the crops separately. Given that 88% of the farmers across baseline and treatment years cultivated both redgram and ragi in the same season and the treatment farmers who accessed helpline phone for information received information across all crops, a comparison of the helpline impact across crops will potentially isolate the treatment effect from spillover effect. The contamination of control is much more serious under covariate shock in redgram because of the collective solution required to address SMD and information spillover from treatment to control farmers. The information spillover is much less of a concern in other crops where pest infestations are isolated and varied across treatment and control farmers. Hence, had the helpline phone been effective, then in the presence of spillover effects, we would expect no impact for redgram but a significant impact for the placebo crops. However, this is not what we find in Table 5 that reports results of the impact of helpline service on yield for different crops separately. The first three columns present the results for redgram, whilst the rest, every three consecutive columns from (4) to (12) are for ragi, horsegram and paddy, respectively. Note that the estimates for horsegram and paddy are noisy due to small sample size. The third row that reports the impact of helpline phone shows significant impact for redgram, though for rest of the crops the evidence is mixed with none being significant. This indeed suggests that spillover is not really a cause for concern in the estimates. Since farmers used mobile phones to access the helpline phone for receiving information under both covariate and idiosyncratic risk, estimates reported here are able to distinguish the effectiveness of the extension services from access to mobile phones.

**[Table 5 should be here]**

Due to non-compliance, the estimates presented are underestimates given that only 34 percent of farming households with access to the helpline line number had actually called the number. The instrumental variables (IV) estimator is a useful tool to evaluate treatment here. In Table 6, we estimate the instrumental variables model with the initial assignment of the helpline number to the treatment group and its interaction with time dummy serving as instruments. Although the aggregate plot level IV regression in Columns (1) and (2) shows no impact of helpline phones, the crop wise plot level estimate in Column (3) show similar effects as previously reported in Table 5, except here the impact of helpline presented in Panel B Column 3 is twice the size of the intention to treat estimates (0.36 vs. 0.12 recovery per acre in the crop yield ($p<0.1$)).[13] Similar results are also reported by Kling et al., (2007) in a different context where about half the households with housing vouchers to move out of high poverty neighborhood actually moved.

Overall, our results suggests that access to helpline phones recover crop yield by 36 percentage points for crops under covariate shocks but shows no impact for placebo crops suffering from isolated incidence of pests.

**[Table 6 should be here]**

### 4.4. Effects of education, wealth and caste

We next examine the role of education, wealth and caste on crop yield recovery before and after the natural disaster. Results in Table 7 shows education to impact the recovery of crop yields negatively, albeit insignificant, while greater than 10 years of education is significant at the aggregate plot level regressions. One potential explanation, informed from our field work, is better educated farmers post disasters migrate to cities in search of transitory employments to mitigate the short fall in income rather than trying to recover yields.

Following recent studies on caste shaping economic outcomes (Anderson 2011; Kumar 2013), we expected some evidence of heterogeneous effects of caste division where treatment farmers are split into schedule caste and schedule tribe. The lower caste categories are generally neglected of information on technological improvements in agriculture and are unable to recover their crop yields when disaster strikes. Surprisingly

[13] To see whether the instrument suffers from the presence of weak instrument, we check the F-statistics for the first stage regressions and find that the F-statistics for the first stage regressions exceed 10 (as proposed by Staiger and Stock 1997).

results reported in Table 7 and 8 find caste to play no significant role in the recovery of crop yields. It is however not implausible that rapidly changing market-based economic growth in India can dilute the impact of caste division over the time and hence, the effect of caste is not particularly robust in our results.

At the aggregate plot level wealth shows mixed results with negative effect for total land owned although insignificant, while positive and significant for ownership of total durable assets. However, this impact though positive is insignificant for all the crops except ragi in Table 8 from crop wise plot level regressions. This differential impact across crops could be some source of concern, hence, we estimated the helpline impact with and without this control to see if the estimates are sensitive to its inclusion. Results, not presented here but can be requested, shows that the estimates for the helpline impact across crops do not change when wealth is excluded from the regressions.

### 4.5. Impact of extension advise and farming experience

For other channels that may independently compliment or substitute helpline service in affecting crop yield in the treatment group, our model specification includes more than one visit of the public extension advisor to farm, and also a measure on local public and private source of crop information.  Not surprisingly, we find no significant evidence of an effect of farm visits by the extension advisor (Table 9). This result is consistent with the existing literature that finds no significant role of extension services in agricultural outcomes (Gautam and Anderson 1999; Rivera et al. 2001; Anderson and Feder 2007).

Estimates for the impact of extension information from public or private sources reported in Table 9 are negative and insignificant. In this regard, qualitative survey in the experiment area suggests that farmers tend to visit the local agricultural centers primarily to collect subsidized or free farm inputs such as seeds, fertilizer etc. The current role of the government agricultural department has been reduced to merely a provider of subsidised inputs under different agricultural development programs. This is completely in contrast to the Green Revolution era where it was credited to have made significant contributions to productivity enhancement (Ameur 1994).

How useful is farmer's crop cultivation experience in the recovery of crop yields under different types of shocks? Results presented in Table 9 shows no impact of experience at the aggregate plot level regressions despite farmers having on average 30 years of experience (Table 3). Similar results are also seen in Table 10 with crop wise plot level regressions. This is understandable given that current farming practices are below optimal for reasons such as occurrences of new pests and diseases, development of resistance by old pests and changes in chemical composition of soil. Markets through changes in prices, that farmers often in developing countries are not fully aware of, also influence the availability of new seed varieties with better traits and better chemical sprays to address new and old pest and diseases.

**4.6. Robustness to model specification, variable definition, and estimation method**

Here we examine the robustness of our results to changes in model specification, variable definition and estimation methods. We first examine whether our results are sensitive to the inclusion of road distance to main local governmental division (Gram Panchayat in Table 11 and 12) and road distance to main town in the sub-district (Taluk or sub-district in Table 13 and 14). It is postulated here that access to information depends on how far the farmer's house is located from the nearest government departments or local information hubs. Our main results for both aggregate and crop wise specifications are robust to its inclusion of both the distance variables.

The effect of distance to main district town (taluk) is negative, and statistically significant, but distance to Gram Panchayat is negative, but not statistically significant, which is consistent with the idea of impact of access to good road discussed in Dercon et al. (2009). However, inclusion of road distance to taluk (Table 13) improves the significance of the impact of the helpline compared to the estimates presented in Table 4, but with size remaining almost similar. However, the impact of helpline reported in Table 14 post disaster remains significant, though slightly higher, for the redgram crop compared to previous estimates presented in Table 5 without controlling for distance to information hubs. The estimates for the placebo crops however remain insignificant.

We next examine the robustness of our results to change in the measurement of our dependent variable from standardized crop yield to standardized crop production (results displayed in Table 15 and 16). This definition takes into account the variation in crop production based on its seed variety. Our main results for both aggregate and crop wise are robust to measurement change in the dependent variable. Next we examine in Tables 17 and 18 the robustness of our outcomes to changes in estimation method. Although, Breusch-Pagan Lagrange multiplier (LM) test for random effects confirms that a random effects regression is applicable and a simple OLS regression is less efficient[14], we pool the data and re-estimate a pooled OLS regression. Estimates for helpline impact shows that our results are robust to changes in estimation method.

## 5. Potential Mechanism

[14] See footnote 9 in Table 17 for the Breusch and Pagan Lagrangian Multiplier Test Results.

Any distance extension services based on helpline phones contributing to the recovery of crop yield is conditional on good mutual understanding between farmers and agricultural experts. And the mutual understanding is strengthened by trust. But the trust transcends the individual, as this is created and recreated in the community and by the community, and contributes to the community governance (Bowles and Gintis, 2002). In our context, farmers would have to report the agricultural problem to the agricultural expert, and for the success of this end, farmers would have to create a discourse that can be adequately understood by the expert so that the expert can figure out the problem in the crop. On the other hand, the expert advice should be formulated in such a way that the diagnosis and solution makes sense for the farmer. Otherwise, the farmer would find it difficult to follow the advice. The trust becomes a fundamental ingredient in this communication.

The capacity of farmers to create a discourse that can help the agricultural expert to adequately identify an agricultural problem, and the capacity of the expert to adequately transmit the solution would increase in exceptional scenarios. Covariate shocks in agriculture (namely, devastating pest outbreak like SMD) would enforce community governance by mustering social action oriented to promote awareness of the problem, which would result in trust on problem identification and solution. Moreover, the trust would be reinforced by the action of media and the effort of governments. In other words, in the contexts of devastating pest outbreak, farmers would easily endorse the community discourse around the pest and the expert can easily figure out the agricultural problem and provide an advice that makes sense and the farmer can rely on. In the appendix, we develop a model of individual choice for farmer decisions, which takes into account how covariate shocks muster trust and strengthen community governance, creating the conditions for a good understanding between agricultural experts and farmers.

Our theoretical discussion unveils community and state governance as mechanisms that facilitate a good understanding between farmers and agricultural experts, which, according to our estimates, seems to be a necessary condition for the success of helpline services. Certainly, when we focus on crop samples that suffered idiosyncratic shocks, but not covariate shocks, the impact of helplines is positive, but not statistically significant. However, the impact of helpline on recovery of redgram (the crop that suffered the covariate shock) is positive and statistically significant ($p<0.1$), providing support for the relevance of social action and trust embodied by the community.

## 6. Concluding Remarks

The central empirical finding here is that randomly selected farmers who received the phone helpline numbers post disaster were able to recover their crop yields. The helpline accelerated the recovery process only for the pest damaged redgram crops, but had no significant impact on placebo crops that did not suffer from covariate shock. Unlike idiosyncratic shock, the widespread pest outbreak musters social capital facilitating effective communications between agricultural extension experts and farmers in promoting the recovery process from covariate shock.

We believe that helpline phone services helped to improve farmers' decisions and recover crop yields due to the presence of common understanding of devastating and collective problem. This feature that collective problem triggered social action and trust, through discourse and mutual exchange of ideas in the community promoting better communication between agricultural experts and farmers, heightened the impact of helpline services. Thus, adequate public policies in helping farmers to improve crop yield, even under natural disasters, should be focused on providing the knowledge basis to have a clear and direct communication between farmers and experts, so that both are able to understand, identify and transmit the problem and solution without speculation.

Broadly, the results offer evidence to improve emergency helpline services through improving public awareness and knowledge. Specifically, the results of the paper reiterates the continued challenges prevalent in agricultural extension, particularly in the public sector system. The private sector is now increasingly involved in the delivery of the agricultural extension provision in India, mostly through experimenting with the use of information and communication technology. Essentially, the opportunity to reach a greater number of farmers quickly with no additional costs is becoming better and increasingly adopted. Nonetheless, as results reaffirm, the compelling inherent challenge is improving the common understanding to drive communication between the farmer and the experts (communication skills) and address agricultural problems over the phone. This would mean that partnership and coordination between public and private initiative could best serve the interest of the farmers. The suggestion should steer policy intervention towards balancing the application of extension approaches, ensuring the practical relevance of the advice and avoid wasting scarce resources on over-doing (over-relying) distance extension not based on good understanding of the agricultural problem. Programme of sharing photographs electronically (e.g. posters) using tablets that help farmers and experts to identify and confirm specific agricultural problems would increase the efficacy of these emergency helpline services.

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**Appendix A.**

A simple model for farmer decision and crop yield recovery

Consider $A, K \subseteq \Re$ be the set of actions, and the set of agricultural knowledge. Let there be a natural ranking, $\geq$, on $A$ and $K$. The ranking on $A$ is read as the quality of the action (quality understood as capacity to increase crop yield), and the ranking on $K$ is read as the quality of the agricultural knowledge. Moreover, consider a choice correspondence $C(A, \succcurlyeq_k)$, generated by a preference relation $\succcurlyeq_k$ over A that depends on $k \in K$. Then, we assume that the next property is satisfied: $\frac{dProb[a \succcurlyeq_k a' | \, a \geq a']}{dk} > 0$. That is, greater agricultural knowledge would increase the probability that the farmer chooses an action of greater quality.

Consider the possibility that farmer's agricultural knowledge increased by (helpline phone) contact with an agricultural expert, and also by having access to a cognizant community. Formally, consider a function $f: [0,1]^2 \rightarrow K$, which captures the feedback from the community and agricultural experts' knowledge to farmer's knowledge. Let us focus on the simple case in which $f(\varphi, \tau) = k_0 + \varphi \Theta_S + \tau(\Theta_T + \varphi \Theta_I)$, where $k_0 \in \Re$ is farmer base knowledge; $\varphi \in \{0,1\}$ is the access to a community that has fostered social action on problem awareness (zero means no access to a cognizant community); $\tau \in \{0,1\}$ is the helpline phone access to agricultural experts' advice (zero means no access); $\Theta_S, \Theta_T, \Theta_I \geq 0$ are the direct effect of having access to a cognizant community, the direct effect of having helpline phone advice from agricultural experts, and the combined effect of receiving advice from agricultural experts and also having access to a cognizant community. In our model the capacity of experts' knowledge to enhance farmer's agricultural knowledge would be given by the difference $\frac{\Delta f(\cdot)}{\Delta \tau}. = \Theta_T + \varphi \Theta_I$.

Let's now account for the possibility that covariate shock cause cross-farmer externalities, mustering social action. For simplicity, we assume that the nature of shock on crop productivity (covariate *vs* idiosyncratic shocks) defines the community type (cognizant, non-cognizant community) regarding a particular problem. Formally, let $\rho \in \{0,1\}$ denote the existence of a covariate shock, that is: a devastating/collective agricultural problem such as pest outbreak (zero means no problem). In a scenario characterized by the absence of covariate shock [$\rho = 0$] and therefore, by a community that has not fostered awareness on crop problems [$\varphi = 0$] and no access to agricultural experts [$\tau = 0$], the reduced crop yield equation would be given by:

$$y = \alpha + U_Y, \qquad \text{(A.1)}$$

where α captures the expected base crop yield. The term $U_Y$ is for the unobserved factors that affect crop production, where $E(U_Y) = 0$.

Under similar context as in equation (A.1) but now with farmers having access to phone based agricultural advice [$\tau = 1$], the reduced form equation for crop yield would be given by:

$$y = \alpha + \Theta_T + U_Y. \qquad \text{(A.2)}$$

Under similar context as in equation (A.1) but in the event of covariate shock [$\rho = 1$], which would enforce community governance by mustering social action oriented to promote awareness of the problem [$\varphi = 1$] and build trust on problem identification and solution, the reduced form equation for crop yield would be given by:

$$y = \alpha + \mu + \Theta_S + U_Y, \qquad \text{(A.3)}$$

where $\mu < 0$ is the direct effect of the covariate shock on crop productivity. In the context of equation (A.3), but with access to phone based advice from experts [$\tau = 1$], the reduced form equation for crop yield would be given by:

$$y = \alpha + \mu + \Theta_T + \Theta_S + \Theta_I + U_Y. \quad \text{(A.4)}$$

For the general case, our model has the following reduced form equation for crop yield:

$$y_{\tau,\rho,\varphi} = \alpha + \mu\rho + \tau\Theta_T + \varphi\Theta_S + \tau\varphi\Theta_I + U_Y. \quad \text{(A.5)}$$

A strategy that combines random allocation of agricultural extension advice (the intervention) and crop samples with and without the impact of covariate shocks would help to identify both direct and combined impact of the intervention, $\Theta_T + \Theta_I$(the true impact of the intervention in Bulte et al. 2014). Equation (A.5) shows that when we use regression equation (1) in the paper to examine the treatment effect of the intervention it is likely to be underestimated. Here $\beta_4$ would capture the difference-in-difference of helpline albeit other factors held constant and is represented by the difference between $y_{1,\rho,\varphi}$ and $y_{0,\rho,\varphi}$. Thus, $\beta_4 = \Theta_T + \varphi\Theta_I$. This regression equation however cannot isolate the true effects of the intervention misleading the inference that the combined effects are not statistically significantly different from zero, while individually any one of them may be significantly different from zero. Hence, our strategy here is to examine the helpline impact separately for each crop distinguishing crops by type of shock.

In regression equation (2), $\delta_3^i$ captures the difference-in-difference of helpline. Thus, for crops that did not suffer from covariate shock (idiosyncratic shocks only), parameter $\delta_3^i$ is the difference between $y_{0,0,0}$ (given in equation A.1) and $y_{1,0,0}$ (given in equation A.2.). Thus, $\delta_3^i = \Theta_T$, for $i$= ragi, paddy and horsegram. However, parameter $\delta_3^i$ for the crop that suffered the covariate shock is the difference between $y_{0,1,1}$(given by equation A.3) and $y_{1,1,1}$ (given by equation A.4). That is, $\delta_3^{\mathrm{i}} = \Theta_T + \Theta_I$, where $i$= redgram. Thus, by comparing estimates for crops that suffered from covariate shock to crops that suffered from idiosyncratic shocks only, we could identify the sign and significance of both the effects, $\Theta_T$ and $\Theta_I$.

Figure 1: District map of Karnataka, India


Figure 2: Village map of Gubbi Taluk in Tumkur District, Karnataka

Figure 3. Number of Extension visits to farmer's fields

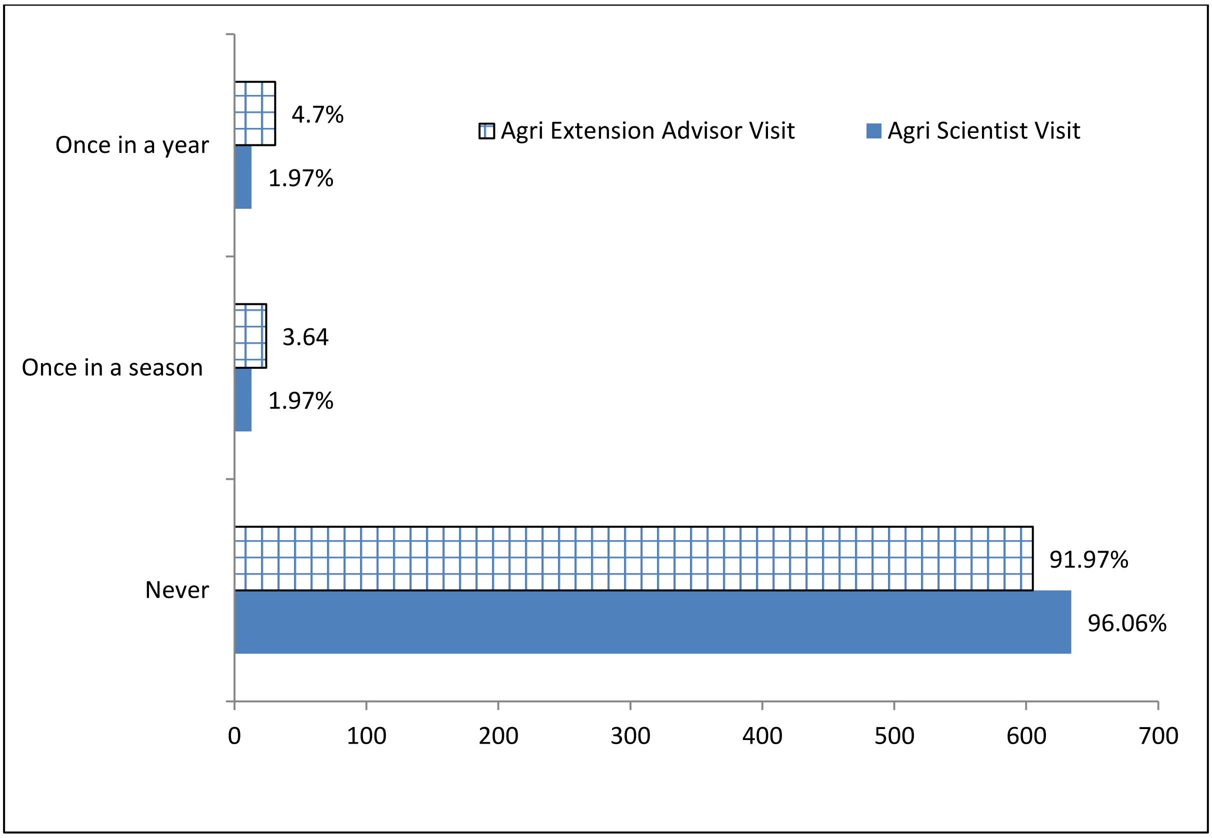

Figure 4. Experimental design

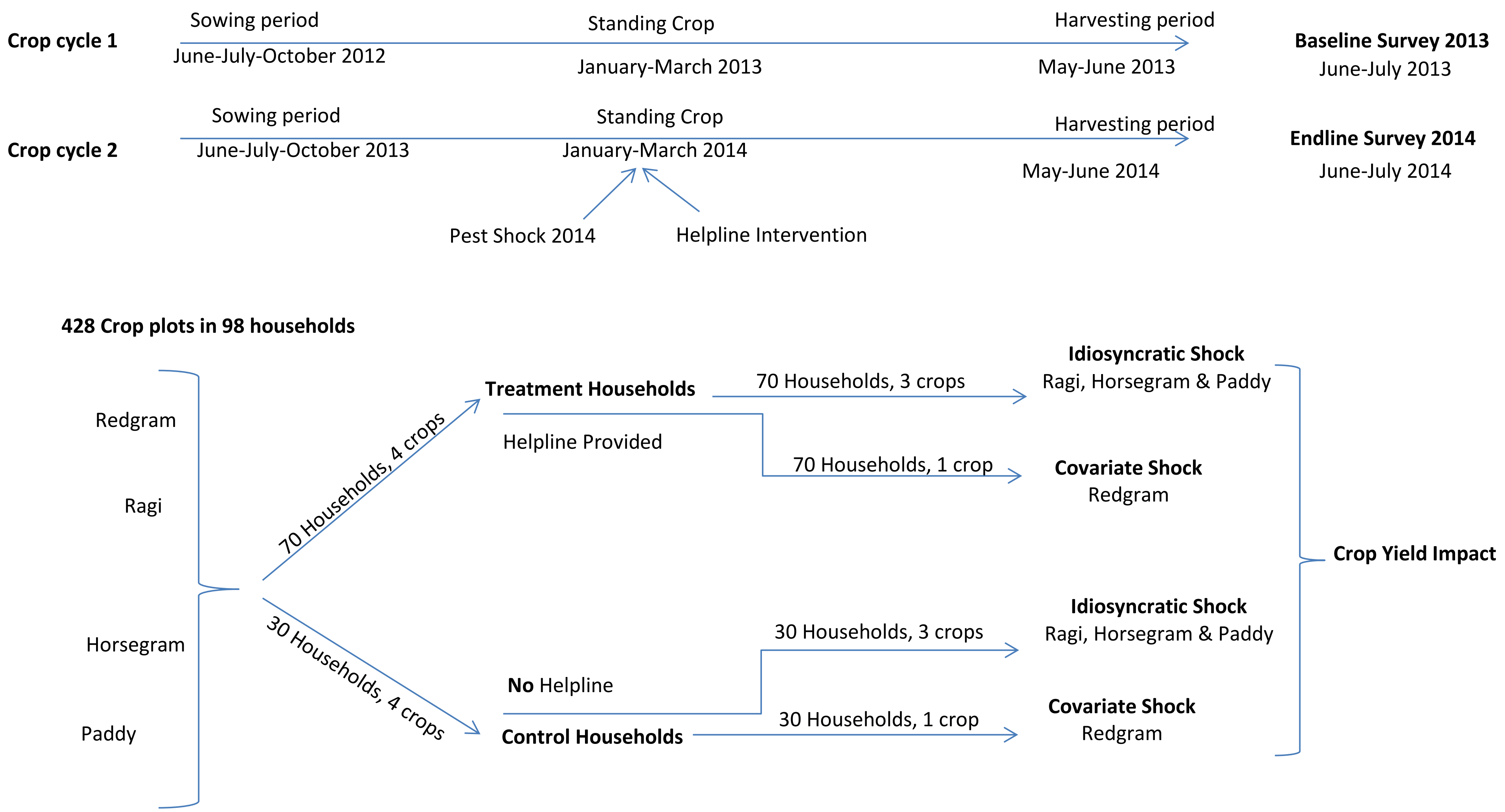

**Table 1: Variable Definition in regression analysis**

| Variable name | Definition |
|---|---|
| Treatment (A) | Dummy =1 for household that was randomly assigned to the group intended to be treated in the field experiment, and 0 otherwise. |
| Time (T) | Dummy =1 for year 2014, and value 0 for year 2013. |
| Education | Category based on number of years of education. |
| Crop experience | Category based on number of years of crop experience. |
| Caste | Dummy = 1 for household that belongs to a scheduled caste and tribe, otherwise 0. |
| Redgram yield ratio | Redgram actual yield divided by redgram potential yield† |
| Ragi yield ratio | Ragi actual yield divided by ragi potential yield† |
| Horsegram yield ratio | Horsegram actual yield divided by horsegram potential yield† |
| Paddy yield ratio | Paddy actual yield divided by paddy potential yield† |
| Land owned | Log of farm land owned in acres. |
| Redgram (D) | Dummy = 1 for redgram crop grown, otherwise 0. |
| Ragi | Dummy = 1 for ragi crop grown, otherwise 0. |
| Horsegram | Dummy = 1 for horsegram crop grown, otherwise 0. |
| Paddy | Dummy = 1 for paddy crop grown, otherwise 0. |
| External agricultural information | Dummy=1 for agricultural information from public and private sources, other than the help line sources, otherwise 0$. |
| Public Ext. Advisor visit | Category based on number of visits of the Public Extension Advisor. |
| Distance to GP | Category based on road distance from farmer's house to the local Government administrative division (Gram Panchayat). |
| Distance to Taluk | Category based on road distance from farmer's house to the Taluk (sub-district town). |
| Total asset value | Log of value of the durable assets own by the household in Indian rupees (House, Television, Radio/Transistor, mobile phone/telephone, steel trunk/Almirah, car/van/Jeep, motorbike/scooter, bicycle, VCD). |

Source: Own data generated from farm surveys.The data on crop-wise potential yield for calculation of yield ration comes from Agricultural Reports of International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) of recent years, Indian Council of Agricultural Research Annual Reports, District Agricultural Reports: Tumkur District at a Glance, 2010-2011, sourced from UAS, Bangalore. $ Public Source= Rayata Samparka Kendra (RSK- Agricultural information Centre) and Krishi Vignana Kendra (KVK – Agricultural Science Centre): Local Government centres to provide agricultural information and facilities, Marketing board SMS service and Private Source: NGO+ Veterinary hospital+ Agricultural college+ Co-operative society+ Other + Media (i.e. Radio/ T.V./ Newspaper) + Farm magazines like Annadata, Krishimunnade, Krishimitra or Sirisamrudhhi.†Potential productivity is specific to crop and seed variety.

**Table 2: Treatment Compliance (from follow-up survey)**

| | Number of households | | | |
|---|---|---|---|---|
| | Treatment group | | Control group | |
| **KCC helpline number** | **Yes** | **No** | **Yes** | **No** |
| **Allocated** | 70 | 0 | 0 | 30 |
| **Accessed** | 68 | 0 | 0 | 30 |
| **Usage** | 23 | 45 | 0 | 30 |

**Note:** KCC helpline number was allocated to random sample of farm households in Gubbi district in the southern Indian state of Karnataka, India. In this experiment we only offer the helpline number to farmers but do not enforce that the farmers actually call the number. Note here that only the intention to treat is randomly assigned. The difference 2 between the allocated and accessed are the farmers who could not be tracked after the baseline survey. Usage refers to the actual usage who called the helpline phone number for support (34 percent).

**Table 3. Control and Treatment Households – Baseline Balance Check -2013**

| Variable | Control Observation | Treatment Observation | Total Observation | Control Mean | Treatment Mean | P-value | Result |
|---|---|---|---|---|---|---|---|
| **Panel A: Farmer Characteristics** | | | | | | | |
| Family size (number of members) | 30 | 68 | 98 | 5.1 (2.44) | 4.76 (1.96) | 0.51 | T=C |
| Age in number of years | 30 | 68 | 98 | 49.1 (11.10) | 50.60 (12.36) | 0.55 | T=C |
| Education (number of years of education) | 30 | 68 | 98 | 5.70 (4.74) | 6.28 (4.55) | 0.57 | T=C |
| Caste | 30 | 68 | 98 | 0.13 (0.35 ) | 0.21 (0.41) | 0.37 | T=C |
| Crop experience (number of years in crop farming) | 30 | 68 | 98 | 30.1 (10.49) | 31.60 (12.32) | 0.54 | T=C |
| **Panel B: Farm Characteristics†** | | | | | | | |
| Land owned in acres | 30 | 68 | 98 | 5.13 (3.16) | 5.45 (3.88) | 0.67 | T=C |
| Total land cultivated in acres‡ | 30 | 68 | 98 | 5.30 (3.04) | 5.52 (3.88) | 0.75 | T=C |
| Total land Irrigated in acres | 30 | 68 | 98 | 1.95 (2.15) | 1.86 (2.60) | 0.86 | T=C |
| Crop land cultivated in acres‡ | 59 | 134 | 193 | 1.17 (0.79) | 1.14 (.99) | 0.83 | T=C |
| Overall crop yield per acre | 59 | 134 | 193 | 2.58 (4.31) | 1.82 (4.59) | 0.27 | T=C |
| Redgram yield/acre (overlap households) | 16 | 42 | 58 | 0.72 (1.54) | 0.25 (0.56) | 0.25 | T=C |
| Ragi yield/ acre (overlap households) | 31 | 69 | 100 | 2.36 (3.15) | 1.60 (2.48) | 0.24 | T=C |
| Horsegram yield/ acre (overlap households) | 6 | 15 | 21 | 0.40 (0.18) | 0.77 (.82) | 0.18 | T=C |
| Paddy yield/ acre (overlap households) | 6 | 8 | 14 | 10.90 (6.97) | 13.89 (12.42) | 0.58 | T=C |
| Land under paddy in acre (overlap households) | 6 | 8 | 14 | 1.22 (0.63) | 0.65 (0.26) | 0.08* | T≠C |
| Land under redgram in acre (overlap households) | 16 | 42 | 58 | 0.72 (0.59) | 0.59 (0.44) | 0.43 | T=C |
| Land under ragi in acre (overlap household) | 31 | 69 | 100 | 1.43 (0.83) | 1.56 (1.11) | 0.53 | T=C |
| Land under horsegram in acre | 6 | 15 | 21 | 0.93 (0.84) | 0.99 (0.78) | 0.88 | T=C |
| **Panel C: Source of Farm Information** | | | | | | | |
| Number of visits of the Public Extension Advisor | 30 | 68 | 98 | 1.16 (0.53) | 1.20 (0.56) | 0.74 | T=C |
| Source of crop information: public/private | 30 | 68 | 98 | 0.26 (0.45) | 0.25 (0.44) | 0.86 | T=C |
| Household road distance to GP in km | 30 | 68 | 98 | 4.74 (2.61) | 4.07 (2.32) | 0.23 | T=C |
| Household road distance to State / | 30 | 68 | 98 | 6.76 (3.29) | 5.69 (3.19) | 0.14 | T=C |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| National Highway in km | | | | | | | |
| Household road distance to sub-district town in km | 30 | 68 | 98 | 21.4 (8.21) | 21.95 (7.85) | 0.76 | T=C |
| **Panel D: Household Wealth** | | | | | | | |
| Log(Total asset value)(i.e. household durables value) | 30 | 68 | 98 | 10.79 (1.63) | 11.03 (2.28) | 0.56 | T=C |
| House owned | 30 | 68 | 98 | 0.53 (0.51) | 0.60 (0.49) | 0.53 | T=C |
| Car owned | 30 | 68 | 98 | 0.03 (0.18) | 0.03 (0.17) | 0.92 | T=C |
| Bike owned | 30 | 68 | 98 | 0.56 (0.56) | 0.60 (0.55) | 0.76 | T=C |
| Television owned | 30 | 68 | 98 | 0.76 (0.43) | 0.76 (0.42) | 0.98 | T=C |
| Radio owned | 30 | 68 | 98 | 0.06 (0.25) | 0.014 (0.12) | 0.29 | T=C |
| Bi-cycle owned | 30 | 68 | 98 | 0.96 (0.66) | 0.83 (0.66) | 0.38 | T=C |
| Telephone/ mobile owned | 30 | 68 | 98 | 1.26 (0.98) | 1.17 (0.62) | 0.64 | T=C |

**Note:** H0: mean (Treatment) – mean (Control) = 0 When P-value is not significant (*p < 0.1, ** p < 0.05, *** p < 0.01), we do not reject H0. It means the treatment and control group are the same in all basic characteristics. †Overlap households mean that each household in the experiment area produces more than one type of crop, which could be up to three different crops or same crop but of different seed variety in a season. We exploit this cropping pattern within a farm household. As the information requirement for crops vary, it is expected that the helpline would have differential impact on different crops. The approach also helps to improve the sample size with total observations around 428 in the modeling; ‡ Land cultivated is greater than land owned due to prevalence of share cropping practice. Also, the area is under plantation and field crops are mixed with plantation (Coconut, Arecanut). Therefore, area under crop cultivation could be less than owned / overall cultivated land.

**Table 4. The Effect of Telephone Helpline Service on Crop Yield recovery, Random Effects Model**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Redgram-Ragi | | | All crops-Ragi | | | Placebo-Ragi | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Treatment (A) | -0.066 | -0.064 | -0.073 | -0.047 | -0.042 | -0.050 | -0.026 | -0.023 | -0.024 |
| | (0.041) | (0.043) | (0.048) | (0.037) | (0.039) | (0.041) | (0.038) | (0.039) | (0.034) |
| Time (T) | 0.296*** | 0.291*** | 0.287*** | 0.315*** | 0.312*** | 0.306*** | 0.340*** | 0.340*** | 0.333*** |
| | (0.058) | (0.058) | (0.057) | (0.057) | (0.057) | (0.056) | (0.071) | (0.072) | (0.072) |
| Helpline impact (A*T) | 0.082 | 0.086* | 0.084 | 0.054 | 0.054 | 0.056 | 0.018 | 0.017 | 0.021 |
| | (0.052) | (0.052) | (0.052) | (0.051) | (0.051) | (0.050) | (0.070) | (0.071) | (0.071) |
| Redgram (D) | -0.014 | -0.015 | -0.012 | -0.012 | -0.013 | -0.011 | | | |
| | (0.034) | (0.036) | (0.037) | (0.034) | (0.035) | (0.036) | | | |
| Pest outbreak effect (D*T) | -0.173*** | -0.167*** | -0.168*** | -0.175*** | -0.168*** | -0.169*** | | | |
| | (0.038) | (0.039) | (0.039) | (0.038) | (0.039) | (0.039) | | | |
| Horsegram | | | | 0.079 | 0.089 | 0.109* | 0.082 | 0.094 | 0.111* |
| | | | | (0.059) | (0.061) | (0.059) | (0.059) | (0.061) | (0.060) |
| Paddy | | | | 0.383*** | 0.371*** | 0.392*** | 0.386*** | 0.370*** | 0.370*** |
| | | | | (0.113) | (0.118) | (0.119) | (0.114) | (0.120) | (0.121) |
| Horsegram * T | | | | -0.034 | -0.053 | -0.077 | -0.036 | -0.053 | -0.063 |
| | | | | (0.076) | (0.081) | (0.078) | (0.076) | (0.082) | (0.081) |
| Paddy * T | | | | -0.141 | -0.131 | -0.127 | -0.146 | -0.135 | -0.133 |
| | | | | (0.111) | (0.112) | (0.115) | (0.115) | (0.114) | (0.116) |
| Constant | 0.159*** | 0.120* | 0.034 | 0.148*** | 0.032 | -0.077 | 0.133*** | 0.019 | -0.118 |
| | (0.037) | (0.071) | (0.067) | (0.033) | (0.084) | (0.071) | (0.033) | (0.110) | (0.117) |
| $R^2$ | 0.3396 | 0.3660 | 0.4152 | 0.3697 | 0.3961 | 0.4412 | 0.4127 | 0.4453 | 0.4731 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| N | 355 | 355 | 355 | 428 | 428 | 428 | 280 | 280 | 280 |

**Notes:**

1. Table considers the effect of the helpline treatment (access to helpline phone number) on yield (recovery) ratio of crops before and after the natural disaster. The dependent variable is standardized yield ratio measured as ratio of actual to potential yield. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo or non-redgram crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

3. The outcome variable in columns 1 through 9, standardized crop yield ratio is defined as actual yield/ potential yield. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account variation in the crop yield based on the seed variety within types of crop. Each household in the experimental area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

4. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value); Horsegram dummy; Paddy dummy; Horsegram * Time; and Paddy * Time.

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model in column 3, 6 & 9 accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) $^{*}$ $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Table 5. Effect of Telephone Helpline Extension Service on Crop-wise Yield recovery by shock type, Random Effects Model**

| Dep. variable: Crop-wise standardized yield ratio | Crop wise plot level | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Placebo | | | | | | | | |
| | Redgram | | | Ragi | | | Horsegram | | | Paddy | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Treatment (A) | -0.100 | -0.087 | -0.091 | -0.051 | -0.054 | -0.055 | 0.041 | 0.049 | -0.044 | -0.012 | 0.015 | -0.011 |
| | (0.084) | (0.078) | (0.088) | (0.042) | (0.040) | (0.039) | (0.082) | (0.142) | (0.158) | (0.192) | (0.326) | (0.360) |
| Time (T) | 0.088 | 0.084 | 0.082 | 0.317*** | 0.314*** | 0.311*** | 0.245 | 0.278* | 0.255* | 0.210*** | 0.266** | 0.256** |
| | (0.063) | (0.067) | (0.068) | (0.074) | (0.077) | (0.078) | (0.183) | (0.148) | (0.134) | (0.062) | (0.118) | (0.122) |
| Helpline impact (A * T) | 0.125* | 0.125* | 0.122* | 0.055 | 0.061 | 0.060 | 0.049 | -0.019 | 0.051 | -0.137 | -0.216 | -0.214 |
| | (0.064) | (0.066) | (0.069) | (0.073) | (0.077) | (0.078) | (0.202) | (0.190) | (0.179) | (0.098) | (0.157) | (0.168) |
| Constant | 0.177** | 0.057 | 0.011 | 0.147*** | 0.172** | 0.067 | 0.183*** | -0.297 | -0.202 | 0.535*** | -0.365 | -0.531 |
| | (0.087) | (0.114) | (0.095) | (0.038) | (0.084) | (0.094) | (0.067) | (0.479) | (0.607) | (0.098) | (1.104) | (0.956) |
| $R^2$ | 0.1485 | 0.1958 | 0.3549 | 0.4282 | 0.4750 | 0.4963 | 0.2548 | 0.3377 | 0.4189 | 0.1691 | 0.4592 | 0.4913 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| N | 148 | 148 | 148 | 207 | 207 | 207 | 46 | 46 | 46 | 27 | 27 | 27 |

**Notes:** 1. Table considers the effect of the helpline treatment (access to helpline phone number) on crop-specific standardized yield before and after the natural disaster. Redgram crop in the study area was infected with the dangerous disease that is specific to redgram - sterility mosaic disease. Placebo crops (ragi, horsegram and paddy) suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of pest attacks.

2. Regressions in the column 1, 4, 7, 10 are without the inclusion of control variables.

3. The outcome variable in columns 1 through 12, crop-wise standardized yield ratio is defined as actual crop-specific yield/ potential crop-specific yield. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The yield ratio definition takes into account variation in the crop yield based on the seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

4. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value).

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 6. Effect of Telephone Helpline Extension Service on Crop Yield recovery, using 2SLS**

| **Panel A: IV First Stage** | Aggregate plot level | | Crop wise plot level | |
|---|---|---|---|---|
| Dep. variable: Actual Treated | Redgram Ragi | All crop-Ragi | Regram | Placebo |
| | (1) | (2) | (3) | (4) |
| Helpline impact (A*T) (intent-to-treat group) | 0.331*** | 0.344*** | 0.344*** | 0.320*** |
| | (0.068) | (0.062) | (0.115) | (0.086) |
| Constant | 5.55e-16 | 1.11e-16 | 1.14e-15 | 1.11e-16 |
| | (0.046) | (0.043) | (0.077) | (0.051) |
| $R^2$ | 0.234 | 0.244 | 0.236 | 0.231 |
| F | 21.335 | 15.018 | 14.814 | 20.306 |
| Baseline survey controls | NO | NO | NO | NO |
| GP fixed effects | NO | NO | NO | NO |
| $N$ | 355 | 428 | 148 | 207 |
| **Panel B: IV Second Stage** | | | | |
| Dep. variable: Standardized crop yield ratio | | | | |
| Treatment (A) | -0.066 | -0.047 | -0.100 | -0.051 |
| | (0.041) | (0.037) | (0.084) | (0.042) |
| Time (T) | 0.298*** | 0.318*** | 0.088 | 0.317*** |
| | (0.057) | (0.055) | (0.063) | (0.074) |
| Helpline impact (A*T) (*predicted*) | 0.247 | 0.157 | 0.362* | 0.171 |
| | (0.155) | (0.149) | (0.187) | (0.230) |
| Redgram (D) | -0.014 | -0.012 | | |
| | (0.034) | (0.034) | | |
| Pest outbreak effect (D*T) | -0.177*** | -0.177*** | | |
| | (0.037) | (0.038) | | |
| Horsegram | | 0.079 | | |
| | | (0.059) | | |
| Paddy | | 0.383*** | | |
| | | (0.113) | | |
| Horsegram * T | | -0.017 | | |
| | | (0.080) | | |
| Paddy * T | | -0.167* | | |
| | | (0.100) | | |
| Constant | 0.159*** | 0.148*** | 0.177** | 0.147*** |
| | (0.037) | (0.033) | (0.087) | (0.038) |
| $R^2$ | 0.3396 | 0.3697 | 0.1485 | 0.4282 |
| Baseline survey controls | NO | NO | NO | NO |

| | | | | |
|---|---|---|---|---|
| GP fixed effects | NO | NO | NO | NO |
| chi2 | 235.39*** | 244.88*** | 24.15 | 242.64 |
| N | 355 | 428 | 148 | 207 |

Notes:

1. Table 17 considers the effect of the helpline treatment (access to helpline phone number) on aggregate yield ratio of crops before and after the natural disaster. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.
2. The method of instrumental variables (IV) is used to re-estimate the main Table 4 to check the robustness of results. The computational method used to calculate IV estimates is two-stage least-squares (2SLS). Following Banerjee et al. (2007) the actual treated group (household who called helpline number) is instrumented with the intent-to-treat group (A * Time: Random distribution of helpline number). The First stage OLS regression results are present in Panel A with F statistics. The second stage RE regression results are present in Panel B in which predicted values of the first stage regression results are plugged to instrument the impact of helpline usage on yield.
3. In Panel B, the outcome variable is the crop-wise yield ratio defined as actual crop-specific yield/ potential crop-specific yield. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The yield ratio definition takes into account variation in the crop yield based on the seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.
4. Aggregate plot level regression in column (1) and (2) use ragi crop as counterfactual.
5. We follow Bruhn and Mckenzie (2009). The regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.
6. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 7: The Effect of Education, Wealth and Caste on Crop Yield Recovery, Random Effects Model**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | |
|---|---|---|---|---|---|---|
| | Redgram-Ragi | | All crops-Ragi | | Placebo-Ragi | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Education (Reference group <6 years)** | | | | | | |
| Between 6 to 10 years of education | -0.015 | -0.016 | -0.028 | -0.023 | -0.030 | -0.029 |
| | (0.040) | (0.029) | (0.040) | (0.024) | (0.043) | (0.043) |
| > 10 years of education | -0.044 | -0.048* | -0.054* | -0.059** | -0.065** | -0.074** |
| | (0.030) | (0.025) | (0.031) | (0.027) | (0.030) | (0.032) |
| **Caste** | | | | | | |
| Schedule caste / tribe | -0.024 | -0.017 | -0.023 | -0.017 | -0.017 | -0.021 |
| | (0.041) | (0.028) | (0.038) | (0.023) | (0.035) | (0.032) |
| **Wealth** | | | | | | |
| Ln(Total Land owned, in acres) | -0.066** | -0.032 | -0.061* | -0.025 | -0.066** | -0.038 |
| | (0.031) | (0.025) | (0.031) | (0.024) | (0.032) | (0.032) |
| Ln(Total durable asset value) | 0.019*** | 0.018*** | 0.021*** | 0.020*** | 0.023*** | 0.022*** |
| | (0.006) | (0.004) | (0.006) | (0.005) | (0.006) | (0.008) |
| Constant | 0.120* | 0.034 | 0.032 | -0.077 | 0.019 | -0.118 |
| | (0.071) | (0.067) | (0.084) | (0.071) | (0.110) | (0.117) |
| $R^2$ | 0.3660 | 0.4152 | 0.3961 | 0.4412 | 0.4453 | 0.4731 |
| T | YES | YES | YES | YES | YES | YES |
| GP fixed effects | NO | YES | NO | YES | NO | YES |
| *N* | 355 | 355 | 428 | 428 | 280 | 280 |

**Notes:**

1. This table reports the effect of education, wealth and caste on crop yield recovery before and after the natural disaster. The dependent variable is standardized yield ratio measured as ratio of actual to potential yield. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

3. The outcome variable in columns 1 through 9, standardized crop yield ratio is defined as actual yield/ potential yield. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account variation in the crop yield based on the seed variety within types of crop. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

4. Other baseline control variables in all columns include public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16, 30 years), (30, 45 years) and > 45 years); Treatment (A) and Helpline impact (A*T). Columns 1-4 includes Redgram (D) and Pest outbreak effect (D*T). Columns 3-6 includes Horsegram dummy; Paddy dummy; Horsegram dummy * time and Paddy dummy * time.

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model in column 4 and 8 accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 8. The Effect of Education, Wealth and Caste on Crop-wise Yield Recovery by Shock Type, Random Effects Extended Model**

| Dep. variable: Crop-wise standardized yield ratio | Crop wise plot level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Placebo | | | | | |
| | Redgram | | Ragi | | Horsegram | | Paddy | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Education (Reference group <6 years)** | | | | | | | | |
| Between 6 to 10 years of education | -0.018 | -0.020 | -0.005 | -0.011 | -0.039 | -0.025 | -0.202 | 0.048 |
| | (0.091) | (0.075) | (0.041) | (0.042) | (0.091) | (0.093) | (0.223) | (0.444) |
| > 10 years of education | -0.035 | -0.036 | -0.049 | -0.056* | 0.024 | -0.021 | -0.280 | -0.031 |
| | (0.067) | (0.058) | (0.032) | (0.030) | (0.117) | (0.122) | (0.637) | (0.803) |
| **Caste** | | | | | | | | |
| Schedule caste / tribe | -0.036 | -0.031 | -0.022 | -0.023 | 0.051 | 0.010 | 0.129 | 0.281 |
| | (0.087) | (0.067) | (0.045) | (0.046) | (0.100) | (0.119) | (0.615) | (0.926) |
| **Wealth** | | | | | | | | |
| Ln(Total Land owned, in acres) | -0.056 | -0.022 | -0.074*** | -0.053* | -0.035 | -0.033 | 0.038 | 0.141 |
| | (0.056) | (0.047) | (0.028) | (0.029) | (0.076) | (0.102) | (0.299) | (0.316) |
| Ln(Total durable asset value | 0.019 | 0.018* | 0.018*** | 0.019*** | 0.027 | 0.020 | 0.065 | 0.028 |
| | (0.015) | (0.011) | (0.006) | (0.007) | (0.028) | (0.036) | (0.103) | (0.103) |
| Constant | 0.057 | 0.011 | 0.172** | 0.067 | -0.297 | -0.202 | -0.365 | -0.531 |
| | (0.114) | (0.095) | (0.084) | (0.094) | (0.479) | (0.607) | (1.104) | (0.956) |
| $R^2$ | 0.1958 | 0.3549 | 0.4750 | 0.4963 | 0.3377 | 0.4189 | 0.4592 | 0.4913 |
| T | YES | YES | YES | YES | YES | YES | YES | YES |
| GP fixed effects | NO | YES | NO | YES | NO | YES | NO | YES |
| *N* | 148 | 148 | 207 | 207 | 46 | 46 | 27 | 27 |

**Notes:**

1. This table reports the effect of education, wealth and caste on crop yield recovery before and after the natural disaster. The fours crops are given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Ragi, horsegram and paddy suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. The outcome variable in columns 1 through 8, crop-wise yield ratio is defined as actual crop-specific yield/ potential crop-specific yield. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The yield ratio definition takes into account variation in the crop yield based on the seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

3. Definition of variables used in all regressions is shown in Table 1.

4. Other baseline control variables in all columns include public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16, 30 years), (30, 45 years) and > 45 years); Treatment (A) and Helpline impact (A*T).

5. We follow Bruhn and Mckenzie, 2009:218. The regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

6. Standard errors in brackets clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 9: The Effect of Other Extension Advice and Crop Cultivation Experience on Crop Yield recovery, Random Effects Extended Model**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | |
|---|---|---|---|---|---|---|
| | Redgram-Ragi | | All crops-Ragi | | Placebo-Ragi | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Extension Advisors Visit (Reference Group 0 Visits)** | | | | | | |
| Ext. adv. Visits: One visit | -0.019 | -0.018 | -0.019 | -0.016 | -0.029 | -0.020 |
| | (0.034) | (0.027) | (0.037) | (0.030) | (0.047) | (0.045) |
| **Other Sources of Extension Information** | | | | | | |
| Public/Private Info. | -0.003 | -0.018 | 0.001 | -0.013 | 0.033 | 0.015 |
| | (0.024) | (0.018) | (0.031) | (0.027) | (0.037) | (0.036) |
| **Crop Cultivation Experience (Reference Group < 16 years)** | | | | | | |
| Experience: (16,30) years | -0.021 | 0.006 | 0.026 | 0.050 | 0.029 | 0.052 |
| | (0.043) | (0.041) | (0.055) | (0.046) | (0.072) | (0.066) |
| Experience: (30, 45) years | -0.029 | -0.017 | 0.026 | 0.037 | -0.003 | 0.016 |
| | (0.046) | (0.044) | (0.052) | (0.042) | (0.067) | (0.061) |
| Experience: > 45 years | -0.073* | -0.062 | -0.029 | -0.016 | -0.027 | -0.016 |
| | (0.044) | (0.041) | (0.051) | (0.040) | (0.072) | (0.066) |
| | (0.006) | (0.004) | (0.006) | (0.005) | (0.006) | (0.008) |
| Constant | 0.120* | 0.034 | 0.032 | -0.077 | 0.019 | -0.118 |
| | (0.071) | (0.067) | (0.084) | (0.071) | (0.110) | (0.117) |
| $R^2$ | 0.3660 | 0.4152 | 0.3961 | 0.4412 | 0.4453 | 0.4731 |
| T | YES | YES | YES | YES | YES | YES |
| GP fixed effects | NO | YES | NO | YES | NO | YES |
| *N* | 355 | 355 | 428 | 428 | 280 | 280 |

**Notes:**

1. This table reports the effect of extension advisors visit, other extension advice and crop cultivation experience on crop yield recovery before and after the natural disaster. The dependent variable is standardized yield ratio measured as ratio of actual to potential yield. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo or non-redgram crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

3. The outcome variable in columns 1 through 9, standardized crop yield ratio is defined as actual yield/ potential yield. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account variation in the crop yield based on the seed variety within types of crop. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

4. Other baseline control variables in all columns include Number of years of education (Ref: <6 years vs (6, 10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value) ; Treatment (A) and Helpline impact (A*T). Columns 1-4 includes Redgram (D) and Pest outbreak effect (D*T). Columns 3-6 includes Horsegram dummy; Paddy dummy; Horsegram dummy * time and Paddy dummy * time.

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model in column 4 and 8 accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 10. The Effect of Other Extension Advice and Crop Cultivation Experience on Crop-wise Yield recovery by shock type, Random Effects Model**

| Dep. variable: Crop-wise standardized yield ratio | Crop wise plot level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Placebo | | | | | |
| | Redgram | | Ragi | | Horsegram | | Paddy | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Extension Advisors Visit (Reference Group 0 Visits)** | | | | | | | | |
| Ext. adv. Visits: One visit | -0.004 | -0.016 | -0.031 | -0.029 | 0.132 | 0.162 | 0.000 | 0.000 |
| | (0.080) | (0.066) | (0.050) | (0.048) | (0.149) | (0.164) | (.) | (.) |
| **Other Extension Information** | | | | | | | | |
| Public/Private Info. | -0.055 | -0.065* | 0.040 | 0.023 | -0.090 | -0.095 | -0.020 | 0.050 |
| | (0.042) | (0.039) | (0.031) | (0.028) | (0.166) | (0.181) | (0.133) | (0.142) |
| **Crop Cultivation Experience (Reference Group < 16 years)** | | | | | | | | |
| Experience: (16,30) years | 0.016 | 0.032 | -0.058 | -0.031 | 0.198 | 0.092 | 0.293 | 0.352 |
| | (0.063) | (0.062) | (0.062) | (0.056) | (0.290) | (0.390) | (0.369) | (0.306) |
| Experience: (30, 45) years | 0.072 | 0.044 | -0.111* | -0.085 | 0.278 | 0.186 | 0.265 | 0.368 |
| | (0.057) | (0.052) | (0.060) | (0.054) | (0.295) | (0.399) | (0.574) | (0.556) |
| Experience: > 45 years | -0.034 | -0.039 | -0.114 | -0.103 | 0.181 | 0.121 | 0.200 | 0.476 |
| | (0.072) | (0.074) | (0.077) | (0.075) | (0.291) | (0.384) | (0.640) | (0.839) |
| Constant | 0.057 | 0.011 | 0.172** | 0.067 | -0.297 | -0.202 | -0.365 | -0.531 |
| | (0.114) | (0.095) | (0.084) | (0.094) | (0.479) | (0.607) | (1.104) | (0.956) |
| $R^2$ | 0.1958 | 0.3549 | 0.4750 | 0.4963 | 0.3377 | 0.4189 | 0.4592 | 0.4913 |
| T | YES | YES | YES | YES | YES | YES | YES | YES |
| GP fixed effects | NO | YES | NO | YES | NO | YES | NO | YES |
| *N* | 148 | 148 | 207 | 207 | 46 | 46 | 27 | 27 |

**Notes:**

1. This table reports the effect of extension advisors visit, other extension advice and crop cultivation experience on crop yield recovery before and after the natural disaster. The fours crops are given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Ragi, horsegram and paddy suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. The outcome variable in columns 1 through 8, crop-wise yield ratio is defined as actual crop-specific yield/ potential crop-specific yield. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The yield ratio definition takes into account variation in the crop yield based on the seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

3. Definition of variables used in all regressions is shown in Table 1.

4. Other baseline control variables in all columns include Number of years of education (Ref: <6 years vs (6, 10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value) ; Treatment (A) and Helpline impact (A*T).

5. We follow Bruhn and Mckenzie, 2009:218. The regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

6. Standard errors in brackets clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table 11. Robustness of Econometric Model Specification I: Effect of Telephone Helpline Service on Crop Yield recovery, Random Effects Model**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Redgram-Ragi | | | All crops-Ragi | | | Placebo-Ragi | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Treatment (A) | -0.071 | -0.067 | -0.077 | -0.049 | -0.041 | -0.046 | -0.022 | -0.015 | -0.012 |
| | (0.046) | (0.046) | (0.051) | (0.039) | (0.040) | (0.042) | (0.037) | (0.038) | (0.035) |
| Time (T) | 0.296*** | 0.291*** | 0.287*** | 0.315*** | 0.312*** | 0.306*** | 0.341*** | 0.341*** | 0.334*** |
| | (0.058) | (0.058) | (0.057) | (0.057) | (0.057) | (0.056) | (0.071) | (0.072) | (0.072) |
| Helpline impact (A*T) | 0.082 | 0.086* | 0.084 | 0.054 | 0.054 | 0.056 | 0.017 | 0.016 | 0.021 |
| | (0.051) | (0.052) | (0.052) | (0.051) | (0.051) | (0.050) | (0.071) | (0.071) | (0.071) |
| Redgram (D) | -0.012 | -0.014 | -0.011 | -0.011 | -0.013 | -0.012 | | | |
| | (0.035) | (0.037) | (0.038) | (0.035) | (0.036) | (0.037) | | | |
| Pest outbreak effect (D*T) | -0.174*** | -0.168*** | -0.169*** | -0.175*** | -0.168*** | -0.169*** | | | |
| | (0.037) | (0.039) | (0.039) | (0.038) | (0.039) | (0.039) | | | |
| Horsegram | | | | 0.080 | 0.089 | 0.107* | 0.079 | 0.091 | 0.106* |
| | | | | (0.060) | (0.061) | (0.059) | (0.057) | (0.060) | (0.060) |
| Paddy | | | | 0.378*** | 0.372*** | 0.395*** | 0.394*** | 0.380*** | 0.380*** |
| | | | | (0.114) | (0.119) | (0.120) | (0.115) | (0.120) | (0.120) |
| Horsegram * Time | | | | -0.035 | -0.052 | -0.076 | -0.034 | -0.051 | -0.059 |
| | | | | (0.076) | (0.081) | (0.078) | (0.076) | (0.081) | (0.081) |
| Paddy * Time | | | | -0.140 | -0.132 | -0.126 | -0.147 | -0.136 | -0.132 |
| | | | | (0.112) | (0.112) | (0.115) | (0.115) | (0.114) | (0.116) |
| Dist. to GP *(Ref: <= 5 Km)* | | | | | | | | | |
| > 5 km | -0.034 | -0.016 | -0.015 | -0.014 | 0.004 | 0.012 | 0.024 | 0.040 | 0.043 |
| | (0.040) | (0.034) | (0.022) | (0.038) | (0.035) | (0.022) | (0.034) | (0.037) | (0.030) |
| Constant | 0.176*** | 0.130* | 0.045 | 0.155*** | 0.029 | -0.086 | 0.121*** | -0.006 | -0.147 |
| | (0.049) | (0.071) | (0.067) | (0.042) | (0.081) | (0.069) | (0.036) | (0.101) | (0.112) |
| $R^2$ | 0.3423 | 0.3665 | 0.4156 | 0.3700 | 0.3962 | 0.4416 | 0.4139 | 0.4487 | 0.4765 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 355 | 355 | 355 | 428 | 428 | 428 | 280 | 280 | 280 |

**Notes:**

1. The regression equation specification is altered to check robustness of the main results. The model in Table 9 additionally controls for the road access to village GP, defined as road distance from household to village gram panchayat office in kilometers (Km), categorized as 'less than or equal to 5 km' and 'more than 5 km'. The sample shows maximum average distance from household to GP town is 13 km.

2. Table 9 considers the effect of the helpline treatment (access to helpline phone number) on aggregate yield ratio before and after the natural disaster. The dependent variable is standardized yield ratio measured as ratio of actual to potential yield. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo or non-redgram crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

4. The outcome variable is aggregate yield ratio. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

8. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value); Horsegram dummy; Paddy dummy; Horsegram * Time; and Paddy * Time.

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 12. Robustness of Econometric Model Specification I: Effect of Telephone Helpline Service on Crop-specific Yield recovery by shock type, Random Effects Model**

| Dep. variable: Standardized crop yield ratio | Crop wise plot level | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Placebo | | | | | | | | |
| | Redgram | | | Ragi | | | Horsegram | | | Paddy | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Treatment (A) | -0.111 | -0.098 | -0.102 | -0.051 | -0.051 | -0.053 | 0.057 | 0.109 | 0.034 | 0.043 | 0.119 | -0.680$^{*}$ |
| | (0.090) | (0.085) | (0.093) | (0.044) | (0.041) | (0.042) | (0.085) | (0.183) | (0.233) | (0.193) | (0.220) | (0.398) |
| Time (T) | 0.086 | 0.082 | 0.080 | 0.317$^{***}$ | 0.314$^{***}$ | 0.311$^{***}$ | 0.270 | 0.310$^{*}$ | 0.279$^{*}$ | 0.199$^{***}$ | 0.250$^{**}$ | 0.386$^{*}$ |
| | (0.062) | (0.066) | (0.067) | (0.075) | (0.077) | (0.078) | (0.198) | (0.167) | (0.148) | (0.052) | (0.104) | (0.203) |
| Helpline impact (A * T) | 0.124$^{**}$ | 0.125$^{*}$ | 0.121$^{*}$ | 0.055 | 0.061 | 0.060 | 0.025 | -0.048 | 0.024 | -0.125 | -0.189 | -0.087 |
| | (0.063) | (0.065) | (0.069) | (0.074) | (0.077) | (0.078) | (0.223) | (0.209) | (0.196) | (0.093) | (0.128) | (0.284) |
| Dist. to GP *(Ref: <= 5 Km)* | | | | | | | | | | | | |
| > 5 km | -0.078 | -0.057 | -0.041 | -0.002 | 0.014 | 0.005 | 0.060 | 0.082 | 0.115 | 0.303$^{***}$ | 0.775$^{**}$ | 1.494$^{***}$ |
| | (0.072) | (0.062) | (0.049) | (0.036) | (0.035) | (0.031) | (0.090) | (0.145) | (0.159) | (0.084) | (0.354) | (0.450) |
| Constant | 0.218$^{*}$ | 0.097 | 0.049 | 0.148$^{***}$ | 0.163$^{**}$ | 0.064 | 0.143$^{**}$ | -0.380 | -0.305 | 0.479$^{***}$ | -0.874 | 0.000 |
| | (0.116) | (0.138) | (0.115) | (0.045) | (0.079) | (0.094) | (0.062) | (0.493) | (0.619) | (0.100) | (0.803) | (.) |
| $R^2$ | 0.4765 | 0.2040 | 0.1641 | 0.3579 | 0.4755 | 0.4963 | 0.2644 | 0.3484 | 0.4348 | 0.2063 | 0.6180 | 0.8281 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 148 | 148 | 148 | 207 | 207 | 207 | 46 | 46 | 46 | 27 | 27 | 27 |

1. The regression equation specification is altered to check robustness of the main crop-specific results. The Table 10 controls for road access to village GP, defined as road distance from household to village gram panchayat office in kilometers (Km), categorized as 'less than or equal to 5 km' and 'more than 5 km'. The sample shows maximum average distance from household to GP town is 13 km.

2. Table 10 considers the effect of the helpline treatment (access to helpline phone number) on crop-specific yield ratio before and after the natural disaster. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. Regressions in the column 1-3, 4-6, 7-9, 10-12 are crop-specific (redgram, ragi, horsegram and paddy) results, with control variables, GP effects (and without controls and GP effects).

4. The outcome variable is crop-wise yield ratio in the Table10. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

5. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value).

6. Definition of variables used in all regressions is shown in Table 1.

7. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

8. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 13. Robustness of Econometric Model Specification II: Effect of Telephone Helpline Service on Crop Yield recovery, Random Effects Model**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Redgram-Ragi | | | All crops-Ragi | | | Placebo-Ragi | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Treatment (A) | -0.057 | -0.056 | -0.068 | -0.039 | -0.034 | -0.045 | -0.023 | -0.020 | -0.026 |
| | (0.040) | (0.042) | (0.047) | (0.036) | (0.039) | (0.040) | (0.039) | (0.040) | (0.034) |
| Time (T) | 0.292*** | 0.287*** | 0.286*** | 0.310*** | 0.307*** | 0.305*** | 0.338*** | 0.338*** | 0.333*** |
| | (0.056) | (0.057) | (0.057) | (0.055) | (0.056) | (0.056) | (0.070) | (0.071) | (0.072) |
| Helpline impact (A*T) | 0.085* | 0.088* | 0.085* | 0.058 | 0.057 | 0.057 | 0.020 | 0.017 | 0.021 |
| | (0.050) | (0.051) | (0.052) | (0.050) | (0.050) | (0.050) | (0.070) | (0.070) | (0.071) |
| Redgram (D) | -0.008 | -0.010 | -0.010 | -0.006 | -0.008 | -0.009 | | | |
| | (0.036) | (0.037) | (0.038) | (0.036) | (0.037) | (0.037) | | | |
| Pest outbreak effect (D*T) | -0.175*** | -0.170*** | -0.169*** | -0.177*** | -0.171*** | -0.170*** | | | |
| | (0.038) | (0.039) | (0.039) | (0.038) | (0.039) | (0.039) | | | |
| Horsegram | | | | 0.095 | 0.098 | 0.108* | 0.090 | 0.098 | 0.111* |
| | | | | (0.060) | (0.061) | (0.059) | (0.059) | (0.061) | (0.060) |
| Paddy | | | | 0.388*** | 0.377*** | 0.392*** | 0.389*** | 0.372*** | 0.370*** |
| | | | | (0.114) | (0.117) | (0.119) | (0.115) | (0.119) | (0.121) |
| Horsegram * Time | | | | -0.045 | -0.063 | -0.076 | -0.041 | -0.057 | -0.063 |
| | | | | (0.077) | (0.080) | (0.078) | (0.078) | (0.082) | (0.081) |
| Paddy * Time | | | | -0.147 | -0.131 | -0.125 | -0.150 | -0.136 | -0.133 |
| | | | | (0.112) | (0.113) | (0.115) | (0.114) | (0.113) | (0.116) |
| Distance to Taluk *(Ref: <=15 Km)* | | | | | | | | | |
| > 15 km | -0.132** | -0.134*** | -0.069* | -0.133** | -0.141*** | -0.062* | -0.073** | -0.065* | 0.019 |
| | (0.060) | (0.052) | (0.038) | (0.052) | (0.041) | (0.033) | (0.034) | (0.034) | (0.043) |
| Constant | 0.263*** | 0.149** | 0.070 | 0.253*** | 0.075 | -0.039 | 0.192*** | 0.034 | -0.130 |
| | (0.065) | (0.074) | (0.064) | (0.056) | (0.079) | (0.069) | (0.042) | (0.104) | (0.118) |
| $R^2$ | 0.3646 | 0.5380 | 0.4190 | 0.3903 | 0.4162 | 0.4435 | 0.4190 | 0.4490 | 0.4737 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 355 | 355 | 355 | 428 | 428 | 428 | 280 | 280 | 280 |

**Notes:**

1. The regression equation specification is altered to check the robustness of results. The model in Table 11 additionally controls for road access to Gubbi Taluk (sub-district town), defined as road distance from household to Taluk (sub-district) in kilometers (km), categorized as 'less than or equal to 15 km' and 'more than 15 km'. The sample shows maximum average distance from household to Gubbi district is 37 km.

2. Table 11 considers the effect of the helpline treatment (access to helpline phone number) on aggregate and crop-specific yield ratio before and after the natural disaster. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

4. The outcome variable in is aggregate yield ratio. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

5. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value); Horsegram dummy; Paddy dummy; Horsegram * Time; and Paddy * Time.

6. Definition of variables used in all regressions is shown in Table 1.

7. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

8. Standard errors in parentheses clustered by village code (48 clusters) $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 14. Robustness of Econometric Model Specification II: Effect of Telephone Helpline Service on Crop-specific Yield recovery by shock type, Random Effects Model**

| Dep. variable: Standardized crop-wise yield ratio | Crop wise plot level | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Placebo | | | | | | | | |
| | Redgram | | | Ragi | | | Horsegram | | | Paddy | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Treatment (A) | -0.075 | -0.067 | -0.072 | -0.048 | -0.052 | -0.058 | 0.040 | 0.045 | -0.072 | 0.031 | 0.047 | -0.011 |
| | (0.067) | (0.069) | (0.082) | (0.043) | (0.040) | (0.040) | (0.084) | (0.145) | (0.143) | (0.195) | (0.313) | (0.360) |
| Time (T) | 0.071 | 0.063 | 0.068 | 0.316*** | 0.313*** | 0.311*** | 0.241 | 0.267* | 0.253** | 0.203*** | 0.256** | 0.256** |
| | (0.063) | (0.065) | (0.067) | (0.074) | (0.077) | (0.078) | (0.195) | (0.154) | (0.128) | (0.055) | (0.108) | (0.122) |
| Helpline impact (A * T) | 0.137** | 0.142** | 0.135* | 0.055 | 0.061 | 0.060 | 0.052 | -0.005 | 0.036 | -0.132 | -0.198 | -0.214 |
| | (0.067) | (0.068) | (0.069) | (0.073) | (0.077) | (0.078) | (0.211) | (0.199) | (0.181) | (0.096) | (0.145) | (0.168) |
| Dist. to Taluk *(Ref: <=15 Km)* | | | | | | | | | | | | |
| > 15 km | -0.258* | -0.295** | -0.222** | -0.056 | -0.025 | 0.046 | -0.016 | -0.045 | 0.257 | -0.233*** | -0.425 | 0.000 |
| | (0.143) | (0.123) | (0.090) | (0.038) | (0.036) | (0.043) | (0.074) | (0.088) | (0.287) | (0.083) | (0.366) | (.) |
| Constant | 0.383** | 0.196 | 0.163 | 0.192*** | 0.174** | 0.047 | 0.198** | -0.239 | -0.463 | 0.703*** | -0.087 | -0.531 |
| | (0.174) | (0.131) | (0.126) | (0.048) | (0.083) | (0.093) | (0.085) | (0.470) | (0.656) | (0.074) | (0.930) | (0.956) |
| $R^2$ | 0.2486 | 0.3189 | 0.4073 | 0.4334 | 0.4757 | 0.4990 | 0.2550 | 0.3376 | 0.4365 | 0.2027 | 0.4788 | 0.4913 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| N | 148 | 148 | 148 | 207 | 207 | 207 | 46 | 46 | 46 | 27 | 27 | 27 |

**Notes:**

1. The regression equation specification is altered to check robustness of the main results. The model in Table 12 controls for road access to Gubbi Taluk (sub-district town), defined as road distance from household to Taluk (sub-district) in kilometers (km), categorized as 'less than or equal to 15 km' and 'more than 15 km'. The sample shows average distance from household to Gubbi district is 37 km.

2. Table 12 considers the effect of the helpline treatment (access to helpline phone number) on crop-specific yield ratio before and after the natural disaster. Each of the four crops was given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. Regressions in column 1-3, 4-6, 7-9, 10-12 are crop-specific (redgram, ragi, horsegram and paddy) results, with control variables.

4. The outcome variable in is crop-wise yield ratio. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

5. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value).

6. Definition of variables used in all regressions is shown in Table 1.

7. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

8. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 15. Robustness of Dependent Variable: Effect of Telephone Helpline Service on Recovery of Crop Production, Random Effects Model**

| Dep. variable: Standardized crop production ratio | Aggregate plot level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Redgram-Ragi | | | All crops-Ragi | | | Placebo-Ragi | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Treatment (A) | -0.066 | -0.064 | -0.073 | -0.047 | -0.042 | -0.050 | -0.026 | -0.023 | -0.024 |
| | (0.041) | (0.043) | (0.048) | (0.037) | (0.039) | (0.041) | (0.038) | (0.039) | (0.034) |
| Time (T) | 0.296*** | 0.291*** | 0.287*** | 0.315*** | 0.312*** | 0.306*** | 0.340*** | 0.340*** | 0.333*** |
| | (0.058) | (0.058) | (0.057) | (0.057) | (0.057) | (0.056) | (0.071) | (0.072) | (0.072) |
| Helpline impact (A*T) | 0.082 | 0.086* | 0.084 | 0.054 | 0.054 | 0.056 | 0.018 | 0.017 | 0.021 |
| | (0.052) | (0.052) | (0.052) | (0.051) | (0.051) | (0.050) | (0.070) | (0.071) | (0.071) |
| Redgram (D) | -0.014 | -0.015 | -0.012 | -0.012 | -0.013 | -0.011 | | | |
| | (0.034) | (0.036) | (0.037) | (0.034) | (0.035) | (0.036) | | | |
| Pest outbreak effect (D*T) | -0.173*** | -0.167*** | -0.168*** | -0.175*** | -0.168*** | -0.169*** | | | |
| | (0.038) | (0.039) | (0.039) | (0.038) | (0.039) | (0.039) | | | |
| Horsegram | | | | 0.079 | 0.089 | 0.109* | 0.082 | 0.094 | 0.111* |
| | | | | (0.059) | (0.061) | (0.059) | (0.059) | (0.061) | (0.060) |
| Paddy | | | | 0.383*** | 0.371*** | 0.392*** | 0.386*** | 0.370*** | 0.370*** |
| | | | | (0.113) | (0.118) | (0.119) | (0.114) | (0.120) | (0.121) |
| Horsegram * T | | | | -0.034 | -0.053 | -0.077 | -0.036 | -0.053 | -0.063 |
| | | | | (0.076) | (0.081) | (0.078) | (0.076) | (0.082) | (0.081) |
| Paddy * T | | | | -0.141 | -0.132 | -0.127 | -0.146 | -0.135 | -0.133 |
| | | | | (0.111) | (0.112) | (0.115) | (0.115) | (0.114) | (0.116) |
| Constant | 0.159*** | 0.120* | 0.034 | 0.148*** | 0.032 | -0.077 | 0.133*** | 0.019 | -0.118 |
| | (0.037) | (0.071) | (0.067) | (0.033) | (0.084) | (0.071) | (0.033) | (0.110) | (0.117) |
| $R^2$ | 0.3396 | 0.3660 | 0.4152 | 0.3697 | 0.3961 | 0.4413 | 0.4127 | 0.4453 | 0.4731 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 355 | 355 | 355 | 428 | 428 | 428 | 280 | 280 | 280 |

**Notes:**

1. Table 13 considers the effect of the helpline treatment (access to helpline phone number) on aggregate crop production ratio before and after the natural disaster. The dependent variable is standardized production ratio measured as ratio of actual to potential production. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

3. The outcome variable in columns 1 to 9 is aggregate production ratio. Production is measured as crop production in total land under cultivation. The definition takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or same crop but of different seed variety in a season.

4. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value); Horsegram dummy; Paddy dummy; Horsegram * Time; and Paddy * Time.

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 16. Effect of Telephone Helpline Extension Service on Crop-specific Production ratio by shock type, Random Effects Model**

| Dep. variable: Standardized crop-wise production ratio | Crop wise plot level | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Placebo | | | | | | | | |
| | Redgram | | | Ragi | | | Horsegram | | | Paddy | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Treatment (A) | -0.100 | -0.087 | -0.091 | -0.051 | -0.054 | -0.055 | 0.041 | 0.049 | -0.044 | -0.012 | 0.015 | -0.011 |
| | (0.084) | (0.078) | (0.088) | (0.042) | (0.040) | (0.039) | (0.082) | (0.142) | (0.158) | (0.192) | (0.326) | (0.360) |
| Time (T) | 0.088 | 0.084 | 0.082 | 0.317*** | 0.314*** | 0.311*** | 0.245 | 0.278* | 0.255* | 0.210*** | 0.266** | 0.256** |
| | (0.063) | (0.067) | (0.068) | (0.074) | (0.077) | (0.078) | (0.183) | (0.148) | (0.134) | (0.062) | (0.118) | (0.122) |
| Helpline impact (A * T) | 0.125* | 0.125* | 0.122* | 0.055 | 0.061 | 0.060 | 0.049 | -0.019 | 0.051 | -0.137 | -0.216 | -0.214 |
| | (0.064) | (0.066) | (0.069) | (0.073) | (0.077) | (0.078) | (0.202) | (0.190) | (0.179) | (0.098) | (0.157) | (0.168) |
| Constant | 0.177** | 0.057 | 0.011 | 0.147*** | 0.172** | 0.067 | 0.183*** | -0.297 | -0.202 | 0.535*** | -0.365 | 0.000 |
| | (0.087) | (0.114) | (0.095) | (0.038) | (0.084) | (0.094) | (0.067) | (0.479) | (0.607) | (0.098) | (1.104) | (.) |
| $R^2$ | 0.1485 | 0.1958 | 0.3549 | 0.4282 | 0.4750 | 0.4963 | 0.2548 | 0.3377 | 0.4189 | 0.1691 | 0.4592 | 0.4913 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| N | 148 | 148 | 148 | 207 | 207 | 207 | 46 | 46 | 46 | 27 | 27 | 27 |

**Notes:**

1. Table 14 considers the effect of the helpline treatment (access to helpline phone number) on crop-specific production ratio before and after the natural disaster. Each of the four crops was given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

2. Regressions in the column 1-3, 4-6, 7-9 and 10-12 are crop-specific (redgram, ragi, horsegram and paddy) results, with and without control variables plus GP effects.

3. The outcome variable in columns 1 – 12 is crop-wise production ratio. Production is measured as crop production in total land under cultivation. For example, redgram production ratio is defined as actual total redgram production/ potential total redgram production and similarly each crop-specific production ratio is determined. The definition takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or same crop but of different seed variety in a season.

4. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value).

5. Definition of variables used in all regressions is shown in Table 1.

6. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

7. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 17. Robustness of Estimation Method: Effect of Telephone Helpline Service on Crop Yield recovery, Pooled OLS Estimates**

| Dep. variable: Standardized crop yield ratio | Aggregate plot level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Redgram-Ragi | | | All crops-Ragi | | | Placebo-Ragi | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Treatment (A) | -0.066* | -0.066 | -0.073 | -0.041 | -0.038 | -0.046 | -0.021 | -0.018 | -0.019 |
| | (0.038) | (0.040) | (0.046) | (0.035) | (0.038) | (0.040) | (0.039) | (0.040) | (0.035) |
| Time (T) | 0.299*** | 0.291*** | 0.287*** | 0.325*** | 0.320*** | 0.310*** | 0.354*** | 0.352*** | 0.342*** |
| | (0.060) | (0.059) | (0.057) | (0.059) | (0.058) | (0.056) | (0.071) | (0.072) | (0.072) |
| Helpline impact (A*T) | 0.084 | 0.089* | 0.086 | 0.045 | 0.046 | 0.050 | 0.004 | 0.003 | 0.010 |
| | (0.052) | (0.052) | (0.052) | (0.053) | (0.053) | (0.051) | (0.072) | (0.072) | (0.072) |
| Redgram (D) | -0.025 | -0.027 | -0.020 | -0.026 | -0.028 | -0.022 | | | |
| | (0.033) | (0.034) | (0.037) | (0.033) | (0.034) | (0.036) | | | |
| Pest outbreak effect (D*T) | -0.165*** | -0.158*** | -0.162*** | -0.164*** | -0.156*** | -0.159*** | | | |
| | (0.038) | (0.039) | (0.040) | (0.038) | (0.039) | (0.039) | | | |
| Horsegram | | | | 0.103* | 0.110* | 0.128** | 0.102* | 0.113* | 0.129** |
| | | | | (0.058) | (0.060) | (0.057) | (0.058) | (0.060) | (0.059) |
| Paddy | | | | 0.392*** | 0.376*** | 0.394*** | 0.395*** | 0.373*** | 0.373*** |
| | | | | (0.123) | (0.127) | (0.126) | (0.123) | (0.128) | (0.128) |
| Horsegram * T | | | | -0.067 | -0.083 | -0.105 | -0.063 | -0.078 | -0.089 |
| | | | | (0.070) | (0.074) | (0.072) | (0.071) | (0.076) | (0.075) |
| Paddy * T | | | | -0.131 | -0.119 | -0.113 | -0.139 | -0.127 | -0.122 |
| | | | | (0.133) | (0.133) | (0.132) | (0.133) | (0.132) | (0.133) |
| Constant | 0.156*** | 0.116* | 0.031 | 0.139*** | 0.024 | -0.080 | 0.125*** | 0.027 | -0.111 |
| | (0.035) | (0.067) | (0.065) | (0.032) | (0.074) | (0.067) | (0.034) | (0.100) | (0.110) |
| $R^2$ | 0.340 | 0.367 | 0.416 | 0.370 | 0.397 | 0.442 | 0.413 | 0.446 | 0.474 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 355 | 355 | 355 | 428 | 428 | 428 | 280 | 280 | 280 |

**Notes:**

1. The estimation method of the regression equation is altered to check robustness of the main results. Although Breusch-Pagan Lagrange multiplier (LM) test for random effects confirms that a random effects regression is applicable and a simple OLS regression is less efficient, we pool the data and re-estimate a pooled OLS regression (see point 9). Estimates in regression Table 15 shows that the results are robust to changes in estimation method.

2. Table 15 considers the effect of the helpline treatment (access to helpline phone number) on aggregate yield ratio before and after the natural disaster. Each of the four crops was given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. All regressions use ragi crop as counterfactual. Regressions in column 1-3 considers only redgram crop, columns 4-6 include all crops in the sample and columns 7-9 excludes redgram (to isolate idiosyncratic shock from the covariate shock).

4. The outcome variable is aggregate yield ratio. Yield is measured as crop production per acre of land under cultivation. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

5. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value); Horsegram dummy; Paddy dummy; Horsegram * Time; and Paddy * Time.

6. Definition of variables used in all regressions is shown in Table 1.

7. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

8. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

9. LM test helps to decide between running a random effects regression and a simple OLS regression. It tests the null hypothesis that variance across entities is zero i.e. no significant difference across units leading to no panel effect. On STATA 13, we have used a user-written command xttest0 which is applied right after running the random effects model. Breusch and Pagan Lagrangian Multiplier Test Results for Random Effects:

yldgapratio(uniqid,t) = Xb + u(uniqid) + e(uniqid,t)

| Variables | Estimated results | sd = sqrt(Var) |
|---|---|---|
| Standardized redgram yield ratio | .0658569 | .256626 |
| e (variance overall) | .0355812 | .1886297 |
| u (variance within group-yield) | .0265132 | .1628286 |
| Test: Var(u) = 0 | chibar2(01) = 1.95 | |
| | Prob > chibar2 = 0.0812 | |

Note that we reject the null and conclude that random effects model is appropriate.

**Table 18. Robustness of Estimation Method: Effect of Telephone Helpline Service on Crop-specific Yield recovery by shock type, Pooled OLS Estimates**

| Dep. variable: Standardized crop-wise yield ratio | Crop wise plot level | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Placebo | | | | | | | | |
| | Redgram | | | Ragi | | | Horsegram | | | Paddy | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Treatment (A) | -0.090 | -0.087 | -0.087 | -0.052 | -0.054 | -0.055 | 0.041 | 0.083 | 0.008 | 0.093 | 0.171 | 0.210 |
| | (0.065) | (0.064) | (0.082) | (0.043) | (0.041) | (0.040) | (0.082) | (0.138) | (0.148) | (0.233) | (0.260) | (0.318) |
| Time (T) | 0.104 | 0.097 | 0.088 | 0.319*** | 0.315*** | 0.311*** | 0.245 | 0.284* | 0.275* | 0.396** | 0.512* | 0.474* |
| | (0.062) | (0.066) | (0.065) | (0.075) | (0.077) | (0.078) | (0.183) | (0.156) | (0.147) | (0.162) | (0.246) | (0.243) |
| Helpline impact (A * T) | 0.126** | 0.131** | 0.124* | 0.054 | 0.061 | 0.060 | 0.049 | -0.054 | -0.007 | -0.361 | -0.590* | -0.644* |
| | (0.058) | (0.060) | (0.064) | (0.074) | (0.077) | (0.078) | (0.202) | (0.192) | (0.185) | (0.239) | (0.304) | (0.334) |
| Constant | 0.148** | 0.003 | -0.015 | 0.147*** | 0.175** | 0.068 | 0.183** | -0.417 | -0.349 | 0.454*** | -0.851 | -0.723 |
| | (0.071) | (0.108) | (0.099) | (0.038) | (0.082) | (0.092) | (0.067) | (0.456) | (0.584) | (0.128) | (1.061) | (1.182) |
| $R^2$ | 0.149 | 0.199 | 0.356 | 0.428 | 0.475 | 0.496 | 0.255 | 0.342 | 0.424 | 0.184 | 0.530 | 0.582 |
| Baseline survey controls | NO | YES | YES | NO | YES | YES | NO | YES | YES | NO | YES | YES |
| GP fixed effects | NO | NO | YES | NO | NO | YES | NO | NO | YES | NO | NO | YES |
| *N* | 148 | 148 | 148 | 207 | 207 | 207 | 46 | 46 | 46 | 27 | 27 | 27 |

**Notes:**

1. The estimation method of the regression equation is altered to check robustness of the main crop-specific results. Although Breusch-Pagan Lagrange multiplier (LM) test for random effects confirms that a random effects regression is applicable and a simple OLS regression is less efficient, we pool the data and re-estimate a pooled OLS regression. Estimates in regression table shows that the results are robust to changes in estimation method.

2. Table 16 considers the effect of the helpline treatment (access to helpline phone number) on crop-specific yield ratio before and after the natural disaster. Each of the four crops was given the helpline number treatment. Redgram crop in the study area was infected with the dangerous disease specific to redgram - sterility mosaic disease. Placebo crops include ragi, horsegram and paddy that suffered from idiosyncratic shocks with some farmers experiencing isolated bouts of minor pest infestations.

3. Regressions in the column 1-3, 4-6, 7-9, 10-12 are crop-specific (redgram, ragi, horsegram and paddy) results, with control variables.

4. The outcome variable is crop-wise yield ratio. Yield is measured as crop production per acre of land under cultivation. For example, redgram yield ratio is defined as actual redgram yield/ potential redgram yield and similarly each crop-specific yield ratio is determined. The definition of yield ratio takes into account the variation in the crop production based on its seed variety. Each household in the experiment area produces more than one type of crop, which could be up to four different crops or a same crop but of different seed variety in a season.

5. Other baseline control variables included are public/private sources of crop information; Number of visits of the public extension advisor *(Ref: 0 visit vs* One visit, Two visits*)*; Number of years of crop farming experience (*Ref: <16 years vs* (16,30 years), (30, 45 years) and > 45 years ); Number of years of education (*Ref: <6 years vs* (6,10 years) and > 10 years); Whether belonging to schedule caste / tribe; Ln(Total land owned, in acres); Ln(Total durable asset value).
6. Definition of variables used in all regressions is shown in Table 1.

7. Following Bruhn and Mckenzie (2009:218) the regression model accounts for gram panchayat (GP- the lowest tier of Rural Local Self Government) fixed effects, as the randomization was stratified along this dimension. It is possible that shocks may differ across GPs (regions). Moreover, in practice, implementation of treatment may vary across GPs. As expected, the p-values are lower when including the GP dummies. The results, not shown here, are bigger and more significant without GP effects.

8. Standard errors in parentheses clustered by village code (48 clusters) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.