# Chapter 1: Introduction

Agricultural information delivery comprises of communicating relevant agricultural technology, information and knowledge to farmers and is carried out with the intent that the information will be adopted by farmers and will lead to enhanced agricultural productivity. India has a huge institutional setup for delivery of agricultural information by public institutions to farmers and a large part of success of green revolution is attributed to effective delivery of input use recommendation to farmers using this setup. The most common method of information delivery is in-person delivery, in which extension agent visits farmers and suggests them on recommended practices.

In context of current agricultural situation in India, two relevant issues stand out. First issue is low access to information and the second issue is delivery of effective information. Currently, there is low access to agricultural information among farmers. A nationally representative survey shows that less than fifty percent farmers had access to any source of information on agriculture. Low access to agricultural information has contributed to sub-optimal agricultural practices such as mismatch between nutrient application and nutrient requirements and has resulted high yield gaps and low returns from agriculture.

There are several reasons for low provisioning of information by public agencies. Across developing countries, there has been a shift in commitment of various institutions away from agricultural extension, which is reflected in erosion of funding for agricultural research and information delivery by both international institutions and local governments (IFAD, 2001). Also, there is a general sense of food security, due to which agricultural research and extension receive less attention from both governments and by public at large (Balasubramanian, 2014). We focus on a specific issue, namely difficulty in establishing impact of agricultural information delivery on various outcomes linked to agriculture. Unless impact is established in a way that it is nearly irrefutable, it would be difficult to get larger resource commitment for agricultural extension as public resources come with an opportunity cost.

Alongwith low access to information, there are issues related to effectiveness of available information. Access to agricultural information may not always translate into its adoption (NSSO , 2013). Method used for delivery of agricultural information can have impact on adoption of the

information by farmers. Traditional method of providing information through extension agents is on a decline, mostly because comes with a huge financial cost, but also because the method was used in a way that the approach was top-down and limited skills and knowledge of agents often limited the nature of advice that they could provide. The agent-based method has somewhat been replaced by several Information and Communication Technology (ICT) based methods. It is advocated that ICT for agricultural information delivery can potentially solve several problems related to traditional methods namely 'scale, sustainability, relevance and responsiveness' (Aker J. C., 2011, pp 645). While there have been multiple studies on effectiveness of ICT for delivery of agricultural information, the results have mostly been mixed. Most applications are not able to provide farmer specific advice, are not interactive, are mostly query based and may not be suitable for farmers with limited literacy and limited understanding of use internet/ICT applications (Umadikar, Sangeetha, Kalpana, Soundarapandian, & Prashant, 2014).

In this study, we explore impact of a hybrid method of agricultural information delivery on crop related outcomes such as yields, costs, returns and efficiency of input conversion and fertilizer use. We evaluate results from a two-year agricultural information delivery project conducted for paddy and cotton crop in India. Information was provided to farmers through a combination of agent-based information delivery and ICT to three hundred farmers. Access to information was experimentally varied to help draw causal inferences regarding impact of intervention on agricultural outcomes.

Though there is substantial literature on impact of information delivery on agricultural outcomes, no recent study on impact of agricultural information delivery has a research design that is free from faults where establishing causality between information delivery and agricultural outcomes is concerned. Non-experimental interventions could suffer from endogenous placement of intervention and self-selection of beneficiaries into the intervention (Romani, 2003). Experimental evidences which do not account for sharing of information between treatment and control farmers could end up reporting erroneous effects of intervention (Janvry, Dustan, & Sadoulet, 2010). While issues regarding accurate measurement of impact of agricultural information delivery are widely recognised, there is no study, atleast in our knowledge, which satisfactorily addresses all concerns that have been raised about issues of endogeneity, selection bias, simultaneity bias and spillover of information from treatment group to control group.

Second gap in literature relates to method of delivering information to farmers. It is now recognised that there is no one best method for delivering information. A good extension service should be context specific (Swanson (2008); World Bank (2008); demand driven (Rivera & Qamar, 2003), pluralistic (Rivera & Qamar, 2003); should be communicated using local and traditional media (Acunzo, Pafumi, Torres, & Tirol, 2014) and visual forms of communication (FAO, 2000); should supplement indigenous knowledge rather than replace it (Coldevin, 2001), and finally should be easy to understand, easily available, available when needed and should be reliable (Mittal & Mehar, 2014). Methods for agricultural information delivery should be able to take into consideration different needs of farmers based on where the farmer falls in a whole spectrum of subsistence and commercial agriculture, difference in information absorption ability of farmers (Babu, Glendenning, Asenso-Okyere, & Govindarajan, 2012) and different levels of resources and skills or individuals of different genders, age and occupation absorb and use information (Richardson, 2004).

Due to their various limitations, exclusive uses of traditional extension workers or ICT for information delivery are not able to fulfil all the criteria stated above. Despite this, the studies have been restricted to evaluation of impact of single methods. An exception to this is study by Gandhi et al. (2009) where researchers study impact of digital video alongwith mediation by humans. However, the study limits evaluation to impact of intervention on change in agricultural practices and does not present quantifiable results on impact of information delivery on agricultural outcomes, such as yields.

Our study provides reliable quantitative estimates of impact of a hybrid method of personalised information delivery on agricultural outcomes. The intervention led to significant increase in returns for the three crops that we analyze, albeit only at the end of two years of intervention. The results achieved by us are significant especially in the Indian context where the low rate of growth in agriculture has been a cause of concern. We show that agricultural information delivery measures can exploit existing yield gaps and achieve significant increases in yields and returns in a short time span. We also show that increase in yields need not imply adverse environmental consequences. The project also led to farmers reducing expenses incurred on plant protection chemicals and rationalizing fertilizer quantities. Finally, a cost-benefit analysis shows that benefits

to be achieved from agricultural information delivery far outweigh costs of providing these services.

The rest of the thesis is organized as follows: we present a detailed literature review on history of agricultural information delivery in India and current state of Indian agriculture, followed by research gap that the study addresses. We then present theoretical frameworks within which the study is situated, details of the intervention from which study draws its data, results of the study and conclude with policy implications of the study.