

## Is the mobile phone the panacea for rural poverty?

A case study on phone use among poor farmers in the Lucknow area, India



Author: Merijn van Baardewijk  
Student nr: 3402061  
University: Utrecht University  
Supervisor: Gery Nijenhuis

<b>ABSTRACT</b> .....	<b>3</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>3</b>
<b>1. INTRODUCTION</b> .....	<b>4</b>
<b>2. HISTORY OF PHONES AND M-SERVICES</b> .....	<b>6</b>
2.1. PHONE USE IN INDIA AND THE WORLD.....	6
2.2. RESEARCH ON THE IMPACT OF MOBILE PHONE USE .....	7
2.2.1. <i>Price dispersion</i> .....	7
2.2.2. <i>Increased market participation</i> .....	7
2.2.3. <i>Higher crop prices due to increased bargaining power</i> .....	7
2.2.4. <i>Qualitative research</i> .....	7
2.3. RESEARCH ON THE IMPACT OF M-SERVICES .....	8
2.3.1. <i>Market and Information services</i> .....	8
2.3.2. <i>Extension services</i> .....	9
2.4. FACTORS THAT INFLUENCE PHONE USE .....	10
2.5. CONCLUSION .....	10
<b>3. THEORETICAL FRAMEWORK</b> .....	<b>11</b>
3.1. DUNCOMBE’S FRAMEWORK .....	11
3.2. THREE ASSET CLASSES .....	11
3.3. CONTEXT OF VULNERABILITY .....	12
3.4. LIVELIHOOD STRATEGY .....	12
3.5. OUTPUT, OUTCOME AND IMPACT.....	13
3.6. CONCEPTUAL MODEL.....	14
<b>4. THEMATIC BACKGROUND</b> .....	<b>15</b>
4.1.1. <i>Geographical background</i> .....	15
4.1.2. <i>Background of the m-service by IKSL</i> .....	16
<b>5. METHODS</b> .....	<b>17</b>
5.1. RESEARCH QUESTION AND SUB QUESTIONS .....	17
5.2. DATA COLLECTION .....	17
5.3. SAMPLING.....	18
5.4. INDICATORS OF CONCEPTS .....	19
5.5. RISKS AND LIMITATIONS.....	20
<b>6. FARMERS’ ASSETS</b> .....	<b>22</b>
6.1. INTRODUCTION OF FARMERS.....	22
6.2. RESOURCE-BASED ASSETS .....	23
6.2.1. <i>Land use and cropping patterns</i> .....	23
6.2.2. <i>Infrastructure- Irrigation and Electricity</i> .....	24
6.2.3. <i>Financial assets</i> .....	24
6.3. COGNITIVE-BASED ASSETS .....	26
6.3.1. <i>Human capital</i> .....	26
6.3.2. <i>Sources of agricultural information</i> .....	27
6.3.3. <i>IKSL’s perspective on farmers’ human capital</i> .....	28
6.4. NETWORK-BASED ASSETS .....	28
6.4.1. <i>Social capital</i> .....	28
6.4.2. <i>Cultural capital</i> .....	30
6.4.3. <i>Sales of produce and bargaining traditions</i> .....	31
6.4.4. <i>Power inequality</i> .....	33
6.5. CONTEXT OF VULNERABILITY .....	33

6.5.1.	<i>Climate variability</i> .....	34
6.5.2.	<i>The threat of wildlife</i> .....	34
6.5.3.	<i>Health risk</i> .....	35
6.6.	LIVELIHOOD STRATEGIES .....	35
6.6.1.	<i>Subsistence farmers</i> .....	36
6.6.2.	<i>Commercial farmers</i> .....	36
6.6.3.	<i>Commercial farmers – diversified</i> .....	36
<b>7.</b>	<b>PHONE USE</b> .....	<b>37</b>
7.1.	REASONS FOR ADOPTING .....	37
7.2.	REASONS FOR NOT ADOPTING .....	38
7.3.	GENERAL PHONE USE .....	38
7.4.	NON-AGRICULTURAL PHONE USE .....	39
7.5.	AGRICULTURAL PHONE USE .....	40
7.6.	USE OF THE GREEN SIM .....	42
<b>8.</b>	<b>INFLUENCE OF ASSETS ON PHONE USE</b> .....	<b>44</b>
8.1.	RESOURCE-BASED ASSETS .....	44
8.1.1.	<i>Financial assets</i> .....	44
8.1.2.	<i>Electricity- and network problems</i> .....	45
8.1.3.	<i>Crop-type</i> .....	45
8.2.	COGNITIVE-BASED ASSETS .....	45
8.2.1.	<i>Age</i> .....	45
8.2.2.	<i>Human capital</i> .....	46
8.2.3.	<i>Green SIM</i> .....	46
8.3.	NETWORK-BASED ASSETS .....	47
8.3.1.	<i>Social capital</i> .....	47
8.3.2.	<i>Gender gap</i> .....	48
8.4.	LIVELIHOOD STRATEGIES .....	49
<b>9.</b>	<b>IMPACT OF MOBILE PHONE USE</b> .....	<b>50</b>
9.1.	RESOURCE-BASED ASSETS .....	50
9.1.1.	<i>Substitution of travelling</i> .....	50
9.1.2.	<i>Enhancing resource-based assets</i> .....	52
9.1.3.	<i>How the green SIM enhances resource-based assets</i> .....	53
9.2.	COGNITIVE-BASED ASSETS .....	54
9.2.1.	<i>Human capital</i> .....	54
9.3.	NETWORK-BASED ASSETS .....	55
9.3.1.	<i>Strong ties</i> .....	55
9.3.2.	<i>Weak ties</i> .....	56
<b>10.</b>	<b>CONCLUSION &amp; DISCUSSION</b> .....	<b>57</b>
	<b>REFERENCES</b> .....	<b>64</b>
	<b>APPENDIX – FARMERS INTERVIEWS</b> .....	<b>68</b>
A.	GENERAL INFO .....	68
B.	RESOURCE-BASED ASSETS .....	68
C.	COGNITIVE-BASED ASSETS .....	69
D.	NETWORK-BASED ASSETS .....	69
E.	MOBILE PHONE USE .....	70
F.	USE OF GREEN SIM .....	71
G.	FOR RESPONDENTS THAT DON'T USE A PHONE .....	73

## ABSTRACT

Many scholars have hailed the mobile phone as a tool to give farming in developing countries a new impetus. However, studies on the impact of mobile phones in general, and specific mobile phone initiatives (m-services), have shown mixed results. Research has not been able to consistently show how farmers—in particular the poor—are influenced by the adoption and use of a mobile phone.

This report uses a novel approach to assess the impact of mobile phones on poor farmers. The analysis was based on Duncombe's (2014) suggestions to make the livelihoods approach more suitable for the impact of ICT. The framework shifts the emphasis to less tangible assets, making a distinction between resource-, cognitive-, and network-based assets. A case study was done on poor farmers that make use of IKSL's green SIM, an m-service that sends farmers daily voice messages with agricultural information. 45 in-depth interviews were held around Lucknow, India. A counterfactual consisted of richer farmers, as well as farmers without the green SIM.

The respondents differ in their asset endowment, context of vulnerability and livelihood strategies. Many of the respondents' households appear to be "hanging on"; they use their assets to maintain their current living conditions, rather than improving it. Some households are "stepping up"; they have invested in education, or saved money to diversify their livelihoods. Such farmers have higher income, better social networks and more access to agricultural knowledge. Despite the heterogeneity within the sample, most respondents use the mobile phone in similar ways. Most farmers use their phone for agricultural purposes, to help buying inputs, to ask for advice and to help with marketing. Green SIM owners use the phone even more for agricultural purposes and they generally listen to all the messages. The phone strengthens social and cognitive capital, which in turn improves the production and marketing of products. However, the precise effects on physical assets, such as higher yields and more income require further investigation. Because farmers' resource endowment does not influence phone usage, mobile phones form useful tools for development.

This research has given a more detailed picture of the impact of mobile phones on poor farmers. It has proven to be useful to shift the emphasis to less tangible assets because it is here that these effects are most keenly felt. However, this research also shows the difficulties in accurately measuring these particular assets.

## ACKNOWLEDGEMENTS

I would like to express my gratitude to all who have supported me during my research. Firstly, I thank IKSL's staff for welcoming me, giving me advice, and connecting me to their subscribers. Special thanks goes to the content creator of the Lucknow office, Punit Misra, who not only helped me in my research, but has become a valuable friend. I am also grateful to all who supported me during my stay in Lucknow in various ways. Lastly, I would like to thank my supervisor, Gery Nijenhuijs, for her positive yet critical remarks throughout the process.

# 1. INTRODUCTION

While India's economy as a whole grows at a remarkable pace, rural areas stay behind (Das, 2012). Agriculture is the main means of living for 49 % of the population, but its contribution to GDP is only 18 % and steadily declining (CIA, 2015). Productivity growth in agriculture has been substantially lower than other BRIC countries (World Bank, 2014). Indian farmers traditionally suffer from unfavourable weather conditions and poor asset endowment. Particularly troublesome is that farmers lack access to information to deal with those problems.

In view of the gap in farmers' access to knowledge, increasing amounts of scholars perceive ICT as an essential tool to fight rural poverty (World Bank, 2011). ICT can increase access to, or even substitute for resources. Mobile phone technology is particularly promising, as it is widely accessible, relatively cheap, and provides ever more applications. As Jeffrey Sachs (2008) claims: *"Extreme poverty is almost synonymous with extreme isolation, especially rural isolation. But mobile phones and wireless internet end isolation, and will therefore prove to be the most transformative technology of economic development of our time."* According to Sachs, sheer market forces will lead to a continuing convergence of digital access. In contrast, some scholars argue that the mobile phone might strengthen existing inequalities and create a digital divide (e.g. Aker, 2008; Wijetunga, 2014). Whether mobile phones reduce inequality or not, there is no doubt that mobile phones are increasingly changing the lives of people all over the world, farmers included (Nakasone, Torero & Minten, 2014).

Governments, scientists and NGO's alike are developing mobile phone based services that aim to empower the poor farmers. Such m-services have grown rapidly throughout the world, specifically in India (Qiang, Kuek, Dymond & Esselaar, 2011). Indian m-services, such as *Reuters Market Light* (1.4 mln subscriptions), *IKSL* (1.1 mln), and *mKisan* (0.8 mln) reach many farmers. However, scientific studies assessing m-services' impact show mixed results and have been primarily focused on economic benefits (Duncombe, 2012). Furthermore, none of the existing research has focussed on the poor farmer (Burrell and Oreglia, 2015). Baümüller (2015) has carried out a literature review on m-services and concludes that the existing research is incomplete; there are too few studies focused on m-services and the results are inconclusive. Taking those critiques into account, this research takes an inductive and holistic approach to study the impact of mobile phones on poor farmers.

The fieldwork has taken place in India because of two reasons: (1) A major problem in India's agricultural sector is the dissemination of knowledge, (2) India has a highly developed ICT sector and the most m-service initiatives in the world (Qiang et al., 2011). A case study is based on IKSL, a commercial company that operates an m-service throughout India. IKSL's service started in 2007 and therefore has considerable experience and a substantial number of subscribers. IKSL is chosen because it is particularly accessible to poor farmers because the messages are voice-based and thus can be used by illiterate. Moreover, IKSL's service is free of costs to everyone in the possession of a special SIM card, called *green SIM*.

To get a complete picture of the use and impact of the mobile phone, the analysis will take into account three different types of assets that farmers possess. First, resource-based assets, which are all tangible assets, such as a house, farmland and annual income. Second, cognitive-based assets such as education and farming skills. Third, network-based assets are social networks, as well as culture and power relations. The distinction of network-, resource- and cognitive-based assets stems from Duncombe's (2014) suggestions for research in ICT for development (ICT4D). This is a novel approach to understanding rural livelihoods that emphasises the importance of intangible assets, because they are the most

relevant for ICT (Duncombe, 2014). The research question, based on these distinctions, is the following:

**How does the use of a mobile phone, and of IKSL's green SIM specifically, influence the resource-, network- and cognitive-based assets of poor farmers in Lucknow?**

In conducting the investigation, I received support from the m-service provider IKSL regarding the selection of the sample and contacting respondents. The primary source of data consists of in-depth interviews with poor farmers in the Lucknow area in Northern India. In order to compare the results, a counterfactual consists of farmers in the same area who are less poor, as well as farmers who do not own a mobile phone. The interviews entail mainly open ended questions that help to better understand how phones are used and how they influence different aspects of farmers' lives. Moreover, I will explore how differences in asset endowments influences farmers' phone use.

This research will gain useful insight in "the black box" of phone use. That insight is beneficial for organisations that provide agricultural services. Such organisations have until now only done extensive research before the implementation of the service (Glendenning & Ficarelli, 2011), while this research assesses how the service fits the actual needs of farmers in practise. Other organisations that try to improve agriculture through mobile technology could benefit likewise. This research is predominantly actor-oriented and gives a new perspective of the possibilities for m-services, in contrast with previous research that takes an economic or technological perspective (Duncombe, 2012). This research is a first exploration of the use of Duncombe's (2014) framework of livelihood assets and can help to develop it further.

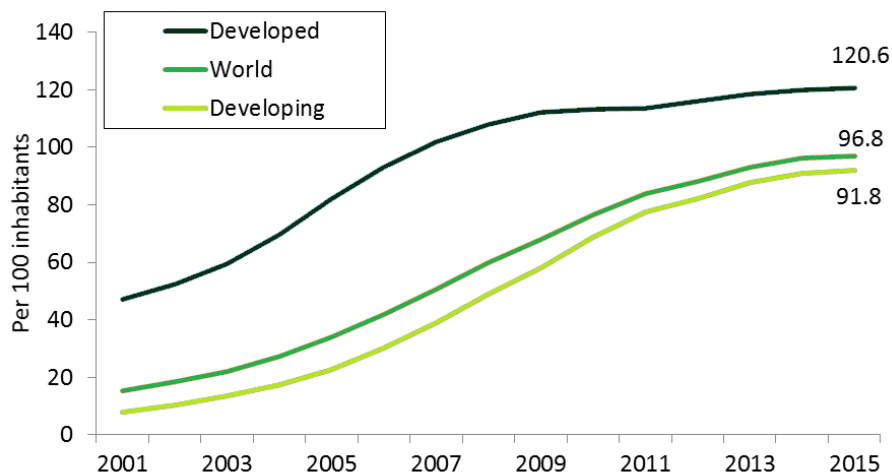
The outline of this report is as follows: Chapter 2 entails an overview of mobile phone use in the world, followed by the relevant research of mobile phone use for rural development. Chapter 3 comprises a detailed explanation of the theoretical framework of this research. Chapter 4 provides background information on the geographical area and IKSL. Chapter 5 explicates the methodology. Chapters 6 to 10 present the empirical findings of this research. Chapters 7-10 deal with the four sub questions regarding farmers' assets (6), their phone use (7), the influence of different asset endowment on phone use (8), and the impact of mobile phones (9). The last chapter contains a conclusion and discussion of the results.

## 2. HISTORY OF PHONES AND M-SERVICES

This chapter gives relevant background information regarding the research of mobile phone use for development. The first section contains a short overview of the spread of phone use in the present times. The second section discusses the literature on the impact of mobile phone use on farmers. The third section discusses studies that focus specifically on the impact of m-services on farmer's livelihood.

### 2.1. Phone use in India and the world

The mobile phone has seen a remarkable growth in the past 15 years all over the world (figure 1). The number of phones per habitants almost seems to converge around 100 % in both the developed and the developing world. This doesn't mean that nearly all people in developing countries own a phone, because many people own multiple SIMs (Donner, 2015). Nonetheless, phone use can be considered ubiquitous in both urban and rural areas.



**Figure 1** Mobile phone subscriptions per 100 inhabitants (ITU, 2015)

Differences among developing countries are notable, it is estimated that Latin America has 52.3 unique subscribers per 100 inhabitants, while Asia Pacific has 44.6 and sub-Saharan Africa only 39 unique subscribers per 100 inhabitants (GSMA, 2015a). Even more pronounced are differences between rural and urban places. Within India the differences are huge between the urban state of Delhi (156 subscriptions per 100 inhabitants) and rural areas such as Uttar Pradesh (30 subscriptions per 100 inhabitants) (Pick & Sarkar, 2015). But already in 2008, even in the most remote places most people at least sometimes used a mobile phone (de Silva, 2008). In terms of smartphone use, developing countries are still lagging behind. According to a survey done in 2015, 43% of all adults in the world own a smartphone, while in India the same number is 17% (Pew research center, 2016).

Increasingly, scholars view the widespread use of mobile phones as a tool for the development of rural lives. The next section will discuss the research on this topic.

## 2.2. Research on the impact of mobile phone use

One of the most cited articles on the research of mobile phone use for development is written by Jensen (2007). The author studied the impact of mobile phones on fishermen in the Indian state Kerala. The findings were overwhelmingly positive; phones were used to coordinate between fishermen and markets, which led to increased market efficiency, less price dispersion, less waste, and benefits for all. Later, Jensen's findings were largely confirmed by Abraham (2008) in the same area, as well as Salia et al. (2011) in Ghana. Subsequently, a number of scholars studied whether the mobile phone could similarly affect farmers. Scholars focused on different aspects, which will be discussed accordingly.

### 2.2.1. Price dispersion

The first to examine the effects of mobile phone use on farmers was Aker (2008), who studied the impact of mobile phones on price dispersion in grain markets in Niger. She found that traders could search more easily for market information. The lower transaction costs led to arbitrage by traders, which led to reduced price dispersion. Aker studied the impact of phone use in various collaborations, but she never focused on the phone use by farmers themselves (e.g. Aker 2010; Tack & Aker, 2014). Therefore, Aker's research gives little insight into the benefits that accrue to farmers.

### 2.2.2. Increased market participation

The first study that explored the impact of mobile phones on farmers specifically, was done by Muto & Yamano (2009), who showed that extended phone coverage in a certain area led to increased market participation by banana-farmers. The authors measure market participation with the amount of produce that are sold by each individual. The authors suggest that due to farmers' knowledge about market prices, farmers were able to reduce the risk associated with the marketing of bananas and therefore to increase their production. The authors did not find a positive impact for farmers who grew corn; presumably because it is less risky, so farmers can grow it without detailed market information. This is partially confirmed by Egyir et al. (2011), who studied the impact of mobile phone use in Ghana. The respondents in the sample cultivated corn, a non-perishable crop. The authors did find that farmers sold more, but the effects were virtually offset by the costs of the mobile phone. The theory on the influence of perishability is contradicted by Tadesse and Bahiigwa (2015), who studied the impact of mobile phones on market participation in Ethiopia. The authors found statistically significant effect for three non-perishable crops teff (an African cereal), wheat and corn and for perishable vegetables as well, but not for the non-perishable crops barley and pulse. The authors do not speculate about the reasons for the differences.

### 2.2.3. Higher crop prices due to increased bargaining power

In Ghana, Zanello, Srinivasan and Shankar (2014) found weak evidence that the adoption of mobile phones helped farmers to facilitate sales at the gate, resulting in increased sales. Furthermore, they suggest that mobile phones give farmers more bargaining power, leading to higher crop prices. Similarly, Lee and Bellemare (2013) found that farmers in the Philippines gained higher crop prices, presumably due to increased bargaining power resulting from the use of mobile phones.

### 2.2.4. Qualitative research

All these scholars have tested various mechanisms in which the mobile phone influences farmers' livelihood, but the findings seem inconclusive. Only two notable studies have taken a qualitative approach, thereby examining the influence of mobile phones on farmers in detail. The first study on the broader impact of mobile phones was done by Martin and Abbot (2011) in Uganda. The authors found that phones are used a multitude of ways, which all



improve a farmer's livelihood. Besides for market information, the phone was used mostly to coordinate access to agricultural inputs. Furthermore, farmers used their phone to communicate with agricultural experts and even to monitor financial transactions. A similar research was done by Furuholt and Matotay (2011) in Tanzania. The authors point out that increased communication and information have benefits during the different stages of farming: preparation, cultivation, harvesting and marketing. The two qualitative studies show how the mobile phone is used in various ways, but they are not focussed specifically on poor farmers.

### 2.3. Research on the impact of m-services

This section consist of an overview of all relevant literature of m-services. Many governments, companies and NGOs have created various m-services in areas varying from health, education, finance, and rural livelihoods. Only the relevant m-services will be discussed, which are: market and information services (MIS) and extension services. These services send SMS or audio messages with farming related information.

#### 2.3.1. Market and Information services

Market and information services (MIS) provide farmers with the market prices on a daily basis, usually through SMS texts. The main part of MIS is to provide timely and accurate information on the crop prices. This is supposed to address the knowledge-asymmetry that farmers suffer from: traditionally traders are better informed about the crop prices and can use this to exploit farmers, by charging higher than reasonable prices. By providing farmers with market rate information, MIS gives farmers the same knowledge as the traders. In this way, MIS is expected to increase farmers' bargaining power and stimulate farmers to sell their crops at the market offering the highest prices (arbitrage).

Remarkably, the first two studies on the impact of MIS found no significant results in terms of crop prices or arbitrage (Camacho & Conover, 2011; Fafchamps & Minten, 2012). Both articles did not investigate why the MIS was not successful. According to Fafchamps and Minten the results suggest that the markets are not as unfair to farmers as the theory purports; traders are already conducting arbitrage and giving farmers fair prices. Contrarily, a study on farmers in Ghana, did find increased crop prices due to the MIS (Courtois & Subervie, 2015). It is unclear why MIS sometimes leads to significant results, but not always.

A number of studies after that have tried to explain why MIS is not always successful. Nakasone (2013) claims that the impact of MIS depends on the perishability of the crop. The theory is as follows. Under asymmetric information traders try to buy products for much lower prices than the market price. In order to avoid exploitation, farmers try to learn the market prices by restricting output and keep products for own consumption. The more perishable the crops, however, the less farmers are able to use this mechanism. Thus, with perishable crops farmers are more easily exploited by middlemen and thus MIS can potentially have more impact (Nakasone, 2013).

Similarly, Nyarko, Hildebrandt, Romagnoli and Soldani (2015) think that the impact of MIS depends on the crop, but for different reasons. In Peru, the authors found that for Yam, MIS had much more impact than for corn and cassava. They argue that Yam is more heterogeneous, the quality of the product differ with every batch, meaning that farmers and traders always have to negotiate about the crop price. For the more homogenous crops corn and cassava, there is a reference market price, which leaves little room for negotiation. An increase in knowledge about the market rates does not influence the bargaining power of a

corn- or cassava-farmer because there is no bargaining at all. In other words, the impact of MIS on market prices depends on the heterogeneity of the crop.

Another possibility might be in the design of the services, as Wyche and Steinfield (2015) argue. The authors examined why, despite the potential benefits of MIS, so little Kenyan smallholder farmers adopted such a service. They conclude that there is a mismatch between the design of MIS and smallholder farmers' perception of the *affordances* of mobile phones. Affordances are the possibilities that belong to objects. For example, the affordance of a staircase is the possibility to climb the stairs. Wyche and Steinfield found the following differences between the perceived affordances of a mobile phone and the technical possibilities of MIS: (1) Smallholder farmers perceive mobile phones as social items, not as agricultural tools; (2) Phones are seen as primarily voice-based, not as text-based; and (3) Since the batteries are often empty for long periods, the phone is not a channel for timely information.

### 2.3.2. Extension services

Besides market information, m-services can be used to provide all sorts of information that is relevant to farming. In remote villages, even basic and easy to apply cost-saving practices are unknown. Practises such as simple spacing and lining techniques could easily be sent through SMS, voice message or app, thereby improving farm productivity (Matous, Todo & Pratiwi 2015). Providing information on farming practises, but also weather forecasts is done by current extension services, as well as companies.

In 2011, Raj et al. (2011) published an article on an experiment with SMS-based m-serviced, with a focus on crop and nutrient management. The participants reported to have increased their income up to 15 % due to the service. The experiment was unique because it was based on tailor made advice for all individual farmers.

Many authors have pointed out that SMS-based m-services are not suitable to address the needs of poor farmers (e.g. Burell and Oglia, 2013; Wyche and Steinfield, 2015). More promising in reaching the poor and illiterate might be the audio based initiatives. An interesting article is written by Mittal, Gandhi & Tripathi (2010) who compared two different m-services in India. The first, which is also the object of this research is IKSL, based on daily voice-based messages. The second is Reuters Market light, which uses SMS. Both m-services send similar information to their customers; market information, weather forecasts, and other agricultural information. The authors found that farmers benefited from the information and were able to increase their income as a consequence. As mentioned in section 2.3.1 Fafchamps and Minten (2012) found that the RML service had not led to increased crop rates, but Mittal et al. (2010) found that the service does lead to increased income in other ways. Remarkably, Mittal et al. did not find that the voice-based IKSL serviced was more suitable for farmers than the SMS-based RML.

Another Indian service was investigated by Cole and Fernando (2012). The authors studied the impact of the Indian Avaaj Otalo service, which is based on audio messages that are sent on a daily basis to the farmers. The authors found that many farmers (50%) used the service and actually changed their behaviour. However, they found that farmers did not actually learn anything, but merely followed the advice of the NGO because they had already been familiar with and trusted them for years.

## 2.4. Factors that influence phone use

A considerable body of literature has described the factors that influence mobile phone adoption and usage. Based on that literature, Islam and Grönlund (2011) have developed a model that summarizes all relevant factors. According to the model, the adoption of phones is influenced by farmers' perceived usefulness and perceived ease of use of phones, which are in turn influenced by external factors (e.g. network density, market structure), socio-demographics (age, gender and education) and social influence.

Notable is a study by Nyamba and Mlozi (2012) that specifically focused on the factors that influence phone use for agricultural purposes by Tanzanian farmers. The authors focused on specific socio-demographic aspects. They found that phone use for agricultural purposes is correlated with gender, marital status and income. Interestingly, the authors found no statistical relationship with education levels, suggesting the phones can overcome the digital divide. The study also describes the common problems with phone use for agricultural purposes: high costs, unreliable electricity, poverty, illiteracy and no access to experts.

## 2.5. Conclusion

The first section of this chapter describes how rapidly phone use has become ubiquitous, both in the developed as well in the developing world. Section two discusses the literature regarding the impact of phone use on farmers in developing countries. The first research was done on fishermen, where the phone led to increased market efficiency, decreased dispersion and welfare gains for the fishermen. Research on the impact of phones on agriculture seems to be less convincing. Most research focuses on quantitative effects, i.e. price dispersion, market participation and crop prices, but much of the results are weak or inconclusive. Qualitative research shows that farmers use the phone in many ways, during every part of the agricultural cycle. The third section describes articles that focus specifically on the impact of m-services. Research initially focussed on the effects of MIS, which sends market information to farmers, but the evidence mixed. The mixed results might be explained by differences in perishability or heterogeneity of crops, or by design of the service. More promising seem extension services, specifically the ones based on audio such as IKSL, because they are more suitable for poor and illiterate farmers. It is important to notice, that none of the articles focused explicitly on poor farmers, so it remains unclear to what extent they benefit. Section 2.4 describes shortly the influences on phone use, which can be divided in several categories. The most important factors for agricultural phone use seem to be gender, income and marital status.

### 3. THEORETICAL FRAMEWORK

This chapter explains the theoretical framework of this research. The sections 1-3 deal with aspects of Duncombe's (2014) framework and section 4 contains a conceptual model.

#### 3.1. Duncombe's framework

A popular approach to study rural poverty in-depth is the sustainable livelihoods approach. The sustainable livelihoods approach is influenced by Sen's capability approach (1997), whereby the poor are not described by what they don't have, but by the assets that they use to gain a living. Such an approach is useful to study the impact of external factors on farmers because it is people-centred, holistic and systematic (Kaag et al., 2004). Although it is popular among scholars, it is not complete, but part of an ongoing debate on how to best understand poverty in all its complexity.

In traditional livelihoods approach, the emphasis often lies on material forms of capital. Often the various forms of social assets, such as network, cultural and political capital are not distinguished, thereby disregarding their importance. In particular with regards to mobile phones these intangible assets are of major importance and therefore deserving of a more central place on an equal footing with tangible assets. Duncombe's framework, then, consists of three asset classes, which will be discussed in the next section. This research is a first exploration of the usefulness of Duncombe's framework; there have neither been any empirical studies based on the framework, nor any scientific discussions of its applicability.

#### 3.2. Three asset classes

Assets are at the core of the livelihoods analysis, as they comprise the broad variety of capital people have. Assets are not only the means to gain a living, but are valuable in and of itself. Duncombe (2014) has proposed the following three groups of assets:

1. Resource-based assets: This category encompasses physical (e.g. infrastructure), natural (e.g. forests) and financial capital (e.g. income) that are commonly used in livelihoods research. This category contains all tangible assets that are relatively easy to measure.
2. Cognitive-based assets: Duncombe (2014) includes human capital such as knowledge and skills, as well as psychological capital. The present research does not take into account the psychological capital of farmers due to time- and resource constraints. Although Duncombe stresses the importance of psychological capital, he gives neither a clear description nor useful indicators to research this. Duncombe only refers to Kleine (2010), who describe psychological capital as the capacity to envision alternatives. To measure psychological capital such as mood, hope and optimism, a series of fine-tuned questions would have to have been included in the interviews. This would have been quite difficult considering the language barrier and would have led to very long interviews. This research did include a number of questions regarding psychological capital and although the results are inconclusive, in this particular study this type of capital seemed less important than Duncombe implies.
3. Network-based assets: These soft assets include social, cultural and political capital. These intangible assets are based on relationships, trust, and reciprocity, and lie at the basis of economic activity. For extremely poor people, social networks are imperative for survival, since they can replace material assets. Mobile phones can strengthen such networks (Carmody, 2012).

### 3.3.Context of vulnerability

Traditionally, the Livelihoods approach includes the context of vulnerability and institutions. Institutions—or “the rules of the game”—are largely included in the network-based assets as social capital, cultural capital and bargaining traditions. These are not seen as contextual factors, but as assets of farmers. Although informal institutions are categorized as assets, it is important to note that farmers have limited agency in this regard.

This report does separately discuss the context of vulnerability. Vulnerability could also be seen as the lack of certain assets, but it is nonetheless useful to discuss separately. The vulnerability to a household’s environment contains *stresses* and *shocks*. Stresses are long-term, or predictable pressure such as seasonality or declining water levels and shocks are unpredictable and sudden, such as diseases and hailstorms (Krantz, 2001).

Duncombe (2014), points to the importance of the government, which influences access to ICT, in particular for marginalized people. The government sets the institutional playing field in terms of rules and regulation, as well as the taxes which subsequently influence the price of for example mobile networks. The contextual structure should not be seen as an external source that influences the passive individual. People have the capability to observe, change or neglect certain structures. The structure is a dynamic, ongoing interplay between all agents (e.g. governments, companies, farmers) (Long & Van der Ploeg, 1994).

### 3.4.Livelihood strategy

Based on differences in asset endowments and the influence of contextual factors, farmers follow a certain livelihoods strategy. The livelihoods strategy is the combination of choices that lead a certain trajectory. Critiques have pointed out that decisions are not necessarily made in a uniform way by households and that much of the decisions are not made consciously. They suggest pathways or trajectories as more accurate descriptions, to emphasise the historic value. For practical purpose, without neglecting the criticism, this report uses the term “strategy”. Traditionally a distinction is made between the strategies specialization, diversification and migration (Scoones, 1998). An addition to this distinction can be made according to the extent that farmers are able to change their strategy. This distinction was proposed by Dorward et al. (2009):

1. Hanging in: Choices and activities are used to merely maintain livelihood levels, often in the face of adversity. Due to a lack of assets, farmers are not able to specialize or diversify.
2. Stepping up: Choices and activities regard investments in assets to expand the level of welfare. Farmers can use agricultural inputs in different ways to increase productivity (intensification) or change strategies toward more fruitful activities such as livestock (diversification).
3. Stepping out: The shift towards new (non-agricultural) activities that require initial investments that lead to higher or more stable returns. Saving, investing in livestock, investing in vehicles or migration can be a “launch pad” for making such a shift.

It can be a part of each of the three livelihood strategies to buy and use a mobile phone. It should be noted that these strategies are not mutually exclusive and the stark division is merely theoretical.

### 3.5. Output, outcome and impact

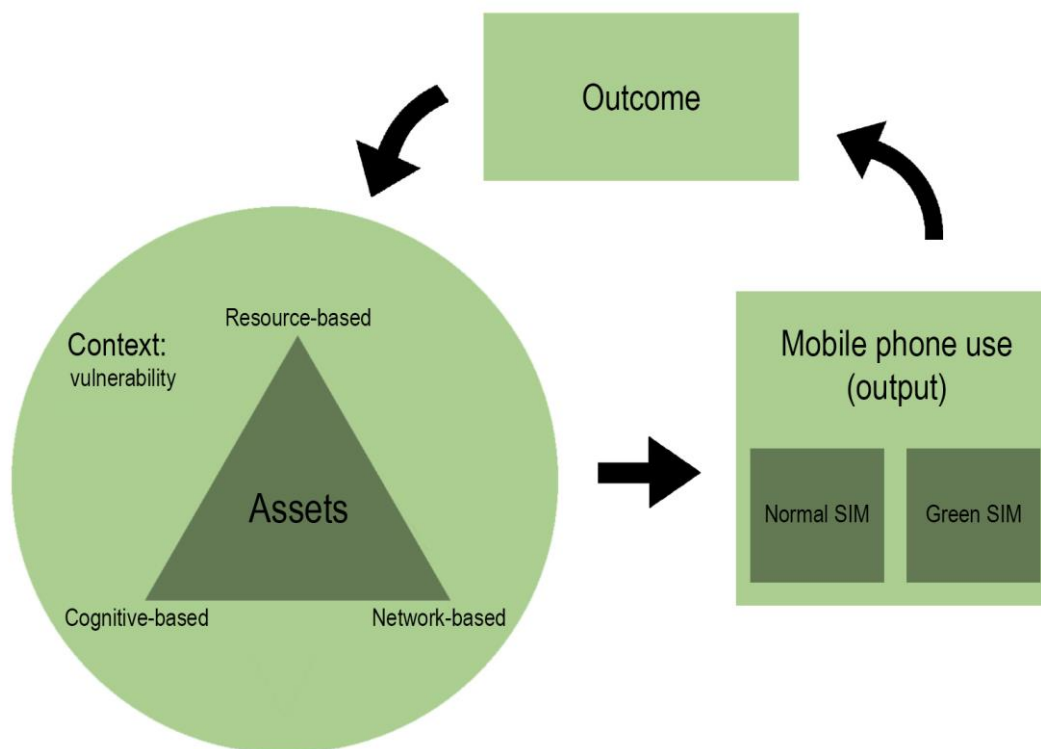
In line with Duncombe (2014), the results of choosing to adopt a mobile phone and m-service will be divided in output, outcome and impact. Outputs are the immediate, easy to measure, effects in human behaviour. This could be voice, text or app-related information in case of smartphones. Outcomes are changes in assets, which enhance people's freedom, or range of choices that an individual has. Outcomes of mobile phone use will be distinguished in (Duncombe, 2014):

1. Substituting assets: As mentioned in chapter 2, mobile phones can be used to search for market prices, rather than travelling to markets to obtain price information. The mobile phone can thus be used to substitute infrastructure and travel expenses. Phones can have negative effects as well, since the money could have been spent on other things (i.e. opportunity costs).
2. Enhancing assets: Mobile phones can for instance enhance social assets by increasing the frequency of contact or enhance human capital, for example when farmers acquire texting skills. In other words, mobile phones can make assets more efficient and productive.
3. Disembodiment of assets: Disembodiment entails changing content from material to virtual form. For example previously informally held information of one's social network can be codified and stored. This widens and strengthens farmers' network.
4. Exchanging and combining assets: An example is mobile money (m-money) that combines social assets with financial assets.

In other words, outcomes can be defined as the extent to which mobile phones can be used to increase the range of choices that support an individual livelihood strategy (Kleine, 2010). Whereas outcome entails the immediate increased freedom, impact entails the long-term effects of mobile phones on livelihoods (e.g. increased food security). Since this research is not a longitudinal study, impact of mobile phone use cannot be measured in any reliable way. The relationship is bidirectional, as the assets limit or support the adoption and/or use of mobile phones.

### 3.6. Conceptual model

The previous sections described the relevant concepts for this research. They are graphically shown in figure 2 as a conceptual model. The three types of assets are presented in a triangle, with equal importance for the resource-, network- and cognitive-based assets. The assets are surrounded by the context of vulnerability. Chapter 6 will discuss the availability of assets and the contextual factors of the respondents. On the right of the circle is mobile phone use, which will be dealt with in chapter 7. The arrow indicates a relationship between assets and mobile phone use, which will be dealt with in chapter 8. Mobile phone use leads to a certain outcome, which in turn influences a farmer's asset base through substitution, enhancement, disembodiment or exchange and combining. The outcome of phone use will be discussed in chapter 9.



**Figure 2** conceptual model based on Duncombe's (2014) suggestions

## 4. THEMATIC BACKGROUND

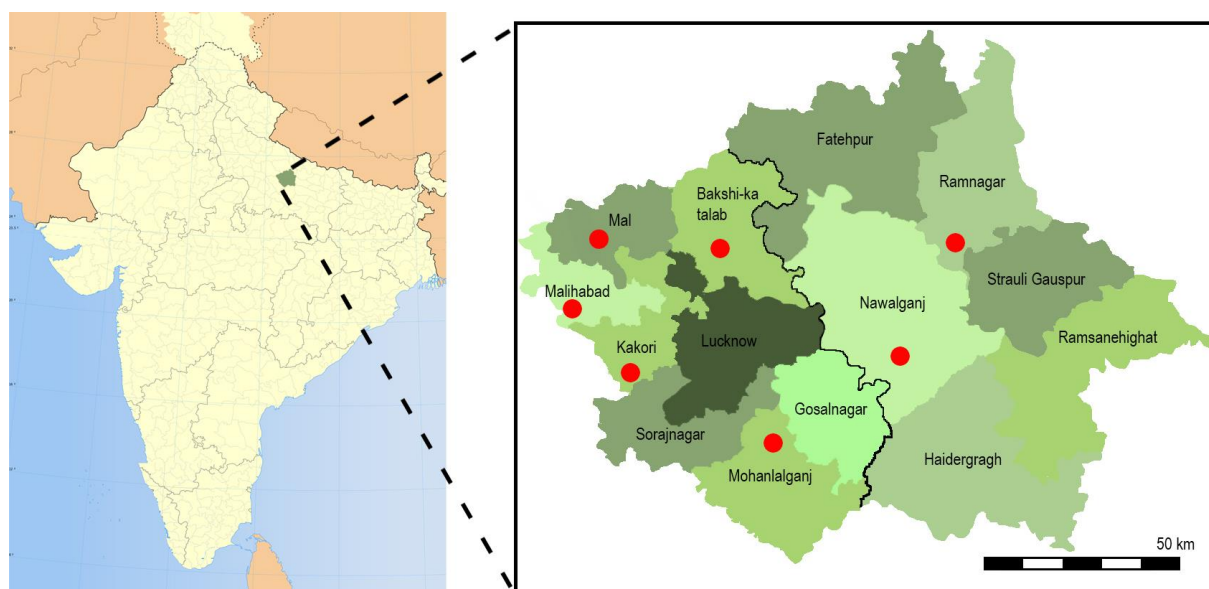
This chapter provides a description of the geographical area of this research and a background summary of the m-service by IKSL.

### 4.1.1. Geographical background

Much of the research described in the previous chapter is conducted in India, which is also the country with the most m-services in the world (Qiang et al., 2011). Many Indian m-services are aimed at providing text-, voice- or app-based content focused on improving farmers' livelihoods, such as RML, IKSL and mKisan. The reason for this seems to be a combination of a well-developed ICT sector and a huge agriculture-dependent population that suffers from stagnating productivity growth. For these reasons, India is an appropriate place for conducting research on m-services.

This research focusses on Uttar Pradesh, the most populous state in India, primarily dependent on agriculture and among the lowest of Indian states in terms of Human Development Index (IHDI, 2011). More specifically, this study was conducted in the area surrounding the state capital Lucknow. Lucknow is a city with ~4,5 million inhabitants is mostly a urban area. However, surrounding the city is a considerable area where ~1.5 million people live. Of the rural households in Lucknow, ~83 % is Hindu, ~16 % Muslim and less than ~1 % are Sikh. Like the rest of India, the population is very young, with ~38 % being below 15 years of age. The education levels are also very low, ~38 % of the population is illiterate (Kumar, 2008).

The farmers that live in the Lucknow area are indirectly influenced by the city and therefore cannot be considered representative of all farmers in Uttar Pradesh. Although farms in Lucknow are not bigger (Sharma, 2015), the infrastructure seems to be better developed; all villages in the district have electricity, the roads are well maintained and there is more irrigation than in most of Uttar Pradesh (Kumar, 2008). Moreover, Lucknow has been developing rapidly in recent years, resulting in a constant demand for day labour, which is an important source of income for many farmers. The distance of the farmers to the city ranges from 20km to 50km on the map.



**Figure 3** Left: India, with Lucknow area in green. Right: Lucknow area (red dots are village locations)



Lucknow is surrounded by a variety of agrarian areas. Figure 3 shows a map of Lucknow's surroundings, with the Lucknow district on the left and Barabanki district on the right. The districts are divided in areas called *Tahsils*, which each have different cropping patterns. Most of the farmers from the Lucknow district are mostly dependent on wheat, combined with rice and cash crops. However, some districts are specialized in Dasherri mangoes; Malhibad, Kakori and Sarojanigar to the West of Lucknow. To the East lies the district Barabanki, where farmers are more focussed on rice, rather than wheat. The most important cash crop in Barabanki is mint. As described in chapter 2, previous studies have shown that different crops correlate with different phone usage (Nyarko et al., 2015; Nakasone, 2013), which is why this area forms an ideal research area.

#### 4.1.2. Background of the m-service by IKSL

As mentioned, India is home to various m-services that are aimed at providing agricultural related information, such as RML, mKisan and IKSL's green SIM. For this research the focus has been on the green SIM because it is the only voice-based, rather than text-based service and therefore potentially more useful for poor and illiterate farmers.

IFFCO Kisan Sanchar Limited (IKSL) was initiated in 2007 as a joint venture between a telecom company (Airtel) and a fertilizer company (Indian Farmers Fertiliser Cooperative Limited, IFFCO). IKSL's mission is to offer various services that provide the latest ICT for the development of farmers in India. Their main product for the feature phone is the green SIM card, which can be used as a normal SIM for any mobile phone, but offers additional m-services. The main service provides up to 4 free daily voice messages to its subscribers. IKSL puts a lot of effort in making the content interesting for farmers. They often record dialogues, background music and stylistic effects to improve listening rates.

Those 1-minute messages include:

1. Market-information on the most common crops.
2. Weather forecasts.
3. Advice on crop decisions, rotation and the newest varieties.
4. Soil management. How much fertilizer to use.
5. Information about the latest pests in specific areas and how to treat and prevent them.
6. Animal husbandry. How to care for animals, what to do if they are sick.
7. Government schemes.

On a weekly basis subscribers receive an SMS with market and weather information. Subscribers can also call a helpline for any inquiries, free of charge. In 2014, IKSL had sold 3.1 million green SIM cards half of which used the m-service (GSMA, 2015b).

IKSL's has offices in every state of India, where teams of content creators work on the daily voice messages. These offices also include sales teams who are responsible for the marketing of the SIM cards. IKSL also operates call centres which all green SIM owners can call for free with any questions, or to participate in a quiz. IKSL is a commercial company and its business model is based on the sales of the green SIMs, which cost 100 ₹ (~€ 1,30).

## 5. METHODS

This chapter describes the methods that are used for this research. The first section will briefly deal with the research question and the sub questions. The second section presents the data collection, followed by the sampling in the third section. Section four describes the indicators that are used for measurement. Section five entails the limitations of this research.

### 5.1. Research question and sub questions

As mentioned in the introduction, the research is as follows:

**How does the use of a mobile phone, and of IKSL's green SIM specifically, influence the resource-, cognitive- and network-based assets of poor farmers in Lucknow?**

In order to organize the analysis in a systematic way, the following sub questions are used:

***Sub question 1.*** *What are the resource-, cognitive- and network-based assets of the farmers?*

This question is descriptive and entails the understanding of the available assets of farmers. Equal attention will be paid to physical, network and cognitive assets. The respondents will be compared according to differences in asset endowments. Many of the assets can be quantified.

***Sub question 2.*** *How is the mobile phone used for agricultural and non-agricultural purposes?*

This question is descriptive and entails the understanding of how farmers use a mobile phone, both for agricultural and other purposes. The answer encompasses phone output, such as the frequency and form of specific use. Special attention is paid to the use of m-services, distinguishing market- and other agricultural information.

***Sub question 3.*** *To what extent does the asset endowment enable or constrain mobile phone use?*

This question is partly descriptive, but also explanatory; it gives insight in why farmers use the mobile phone as the way they do. The answer will illustrate how the access and use of resource-, cognitive- and network-based assets influences phone use. This was done by asking the respondents why they behave in certain ways. By comparing a variety of farmers with different access to assets, the causal links can be triangulated.

***Sub question 4.*** *To what extent does mobile phone use substitute, enhance, disembody, exchange and combine farmers' assets?*

This question is also descriptive and regards mobile phone use from a theoretical perspective. The answer to this question gives insight in the impact of mobile phone use on farmers. This helps to understand if and how mobile phone use leads to increasing ability to deal with vulnerability, to increase their capabilities and to improve their living conditions.

### 5.2. Data collection

This research is primarily qualitative, with the goal of understanding and explaining the use of mobile phones among poor farmers. I take an interpretivist perspective by showing the perspective of the farmer. The ambition is to rigorously research the farmers in the context of

their surroundings. To truly understand the farmers' situation it is imperative to ask them what their situation is and let them speak freely in their own words. Therefore, a research method was selected that contains in-depth interviews in which the respondents can elaborate their answers. The main data source is 45 in-depth interviews with farmers (head of the household) in the Lucknow area. The qualitative data is used to explore and understand how farmers behave regarding mobile phones, and how this influences their lives. In order to discern the viewpoint of the farmer, semi-structured open questions have been used that enable farmers to speak their mind. Open ended questions are used because they are less suggestive and stimulate longer, more detailed answers, as compared to close ended questions. Initially, some questions included scales and ranking and ordering, but these questions proved to be difficult for respondents and did not lead to useful answers. The interviews have been done in the local language by an interpreter, who immediately translated the answers in English. During the interviews, the answers were noted on paper as well as recorded on tape. The written notes were especially useful for observations on the respondents' behaviour as well as the environment. Most interviews had a duration of around 1 hour, with extreme cases of 30 minutes or 2 hours.

### 5.3.Sampling

Table 1 shows the location of the respondents.

District	Tahsil	Village	Green SIM	Normal SIM	No phone
Lucknow	Bakshi-ka talab	Godhna	1		
	Kakori	Dasheri	2	3	
		Unknown		1	
		Simrau		2	1
	Mal	Unknown	2	1	
	Malihabad	Wasi Udain	1	1	
		Wali Nagar	1	1	
		Kanaar		1	
		Bhudeya	1	2	1
	Mohanalganj	Gopal Kera	1	2	1
		Raja Kera	1	2	
		Sameysi	1	2	1
		Vilas Kera		2	2
		Gaura	1	2	1
	Barabanki	Nawalganj	Tera	1	
Ramnagar		Chakpura	1	1	
	<b>Total</b>		14	23	8

**Table 1:** location of the respondents

45 farmers were selected as follows: First, I was provided with a list of green SIM owners by the IKSL office in Lucknow. From that list of approximately 10.000 subscribers, random numbers were chosen by selecting every 100<sup>th</sup> number on the list. These phone numbers were called to check if they were farmers and were willing to make an appointment for an interview the next day. For each day, approximately three appointments were made, of which two were cancelled on average (due to unexpected events, or errors in communication). This means that on each field day a visit was made to one green SIM owner in one village. During the research, attention was paid to the dispersion of villages in the sample as well as the variation in land size.

After the interview with the green SIM owner, one or two interviews were held with other farmers from the same village. These farmers were found through snowballing (by asking the green SIM owner to arrange meetings), or by driving around the village and asking everyone whether they were farmers, or where we could find farmers. Approximately half of the farmers that were around agreed to participate in the interviews. The selection of farmers was made based on a qualitative assessment of the assets of the farmers, by looking at the quality of their houses and the size of their land. The number of respondents was not set from the beginning, but based on data saturation; new interviews were conducted until new additional interviews did not lead to new information. The following table shows the location of the respondents from the sample.

## 5.4. Indicators of concepts

This section describes, based on the theoretic framework, which indicators were used to measure each category of the conceptual model. Two important parts are not taken into account, as is discussed in the theoretic framework as well (red in table 2). Psychological capital is not included: because of its subtlety and complexity it would require too many questions. Also the impact of the mobile phone use is not possible, as the respondents are not able to accurately observe and explain long term differences in their wellbeing. Initially both topics were investigated, but the interviews did not yield sufficiently elaborate answers.

Category	Subcategory	Indicators
Resource-based assets	Physical capital	Infrastructure, irrigation, house, electricity, animals
	Financial capital	Income, savings, loans
	Natural capital	Land, water, crops
Cognitive-based assets	Human capital	Education, skills, knowledge, information sources
	Psychological capital	Perceptions, values
Network-based assets	Social capital	Farmers' group, size of network, weak/strong ties traders, links to information
	Cultural capital	Culture, marketing/bargaining-culture
	Political capital	Inequality, power-relations, caste system
Context	Vulnerability	Climate variability, diseases, farming/animal emergencies
Phone use (output)	General phone use	Monthly expenses, Contact with friends, shopkeeper, and others.
	Green SIM use	Listening messages, calling helpline
Outcome	Agricultural	Reduced travelling, Increased income, productivity, higher prices, increased animal health, increased land fertility
	Non agricultural	Better relationship with friends or family, Improved health.
Impact		Reduced vulnerability, increased food security.

**Table 2** concepts and indicators (red shaded cells are not investigated)

## 5.5. Risks and Limitations

This research is meant to explore, understand and explain the behaviour of farmers. The sample is chosen to be diverse and to have certain characteristics with regard to phone use and resource availability. This approach entails a small and non-representative sample of the subject group. Besides the known bias in the sample, there is probably a selection bias, farmers that would like to participate might have different characteristics than the entire population. The findings therefore, cannot be extrapolated to the entire subject group. The research does provide in-depth knowledge about the farmers, but further research is needed to confirm the findings and test them on a larger and representative sample.

In qualitative research, the central role for myself as a tool requires reflection on my own position. To limit my cultural and theoretical predilections, the analysis is based on a systematic framework, with clear indicators.

A danger in this research is that the respondents do not answer honestly, due to their (unconscious) desire to give certain answers. Respondents might exaggerate or give answers that they think is what I want to hear. Moreover, respondents do not usually record their income, yields or other details. To avoid such “altered truths” the interviews include primarily open-ended non suggestive questions. Besides asking the right questions, it is therefore important that the farmers feel at ease with telling the truth. This can be facilitated by behaving appropriately and being honest, friendly and open as a researcher. Nonetheless, a critical standpoint towards farmers answers was kept.

In order to let the respondents speak freely without being pushed in a certain direction, the interviews were as open structured as possible. However, to ensure comparability the questions should be the same and answers should be in the same form. These contradictory aspects have been addressed in two ways. Firstly, for the first 10 respondents, the interviews were more open structured. The answers, as well as feedback from the interpreter were used to improve the questions. Secondly, some questions were formulated in different ways within the same interview to learn how to evoke the most elaborate answers. This is also a form of triangulation. After those first 10 respondents, a more structured interview was created, which was used for the rest of the respondents. After the initial 10 interviews, the questions remained unchanged to ensure comparability.

Another consideration is the internal validity of this research, since the goal is to understand the causal relationship between phone use and a farmer’s asset base. Even though the research is conducted at a single point in time, the causal relation can be assessed through questions about how and why they behave a certain way.

Since this research is mainly qualitative, it is important to consider the following criteria (Bryman, 2008):

- *Credibility* is guaranteed by various forms of triangulation, such as comparing the results with scientific literature and conversations with IKSL. Moreover, during the entire research, a structural and clear approach was used.
- *Transferability* is addressed by a focus on thick data, by asking open questions.
- *Dependability* is guaranteed by adopting an audible approach: making notes and memos, recording the interviews and saving them.
- *Confirmability* is dealt with by understanding and reporting on my own positionality.

The most important practical limitation is the language barrier. As I do not speak the local language, I was completely dependent on translators, who form an extra layer of interpretation. To deal with the language issue, I explained everything to the translator clearly

and instructed to translate as literal as possible. Sometimes, however, literal translations were not possible; in some instances the interviews took longer than expected and the respondents were in a rush to end the interview. In such cases, the interpreter would not translate everything the respondent said, but focused on the relevant answers.

## 6. FARMERS' ASSETS

This is the first empirical chapter and will answer the first sub question:

**Sub question 1.** *What are the resource-, cognitive- and network-based assets of the farmers?*

First, a short introduction describes the respondents' basic demographics and how they gain a living. Subsequently the results are presented in three parts for the resource-, cognitive- and network-based asset classes.

### 6.1. Introduction of farmers



**Figure 4** Two respondents with houses of different quality

In total, 45 farmers have been interviewed, of which 14 own a green SIM, 23 own a normal SIM and 8 do not own a mobile phone. The sample is a varied mix, with wide differences in household size, land sizes, annual incomes and cropping patterns. Figure 4 shows two respondents that differ widely: on the left a small family dependent on crop cultivation, the house on the right a big family specialized in livestock. The respondents in this research are all male because of two reasons. First, Indian society is highly male-dominated whereby men are usually in charge of the farm, higher educated and are better able to answer questions regarding the farm. The second—more important—reason, is that interviews with women are deemed inappropriate, especially since I am a male foreigner. However, during some of the interviews, women did participate in the interviews. The average age of the respondents is 47 years. This is much higher than the average age in India, because all the respondents are heads of the household. Most of the respondents live with an extended family, ranging from 6 to 30 members in the same house.

Approximately half of the respondents is fully dependent on agriculture and do not receive any other income. The other half is partially dependent on agriculture and earns additional income from day labour, a full time job, or entrepreneurial activities. Given the choice, most farmers would do some other work than agriculture, like owning a shop or working for the government. However, they are unable to get such jobs because they lack education and financial resources. The attractiveness of city jobs in this area might be one reason that agricultural productivity is lower as compared to the rest of Uttar Pradesh (Kumar, 2008). Although, many wish to find some other occupation, by far most household members cannot find such employment and work on the farm. Day labour is available in the region, either through private companies or the government. Many household members work in these jobs, ranging from 10 up to 100 days a year. Most farmers that have additional non-farm work, will wake up early (4-6 am) to work in the field and leave for day labour in the morning or

afternoon (9-12 am). Respondents with larger-sized land often hire such day labourers to work in their fields.

Most respondents explain that their life has improved significantly over the past 10 years. These improvements have come mainly as a result of increased electricity and irrigation facilities. This has led to significant improvements in their financial situation. Both richer, as well as poorer farmers indicate that their standards of living have increased in the previous decade. However, farmers are generally living in uncertainty, as exemplified by the unseasonal rains that caused yields to plunge for most farmers. Important in farmers' lives are schemes that the government has in place to deal with uncertainties. Farmers can for example benefit from a compensation scheme in case of crop failures, or buy subsidized pesticides.

## 6.2. Resource-based assets

### 6.2.1. Land use and cropping patterns

The most important physical asset that farmers have is agricultural land. Most of the respondents cultivate their own land, but 1/3<sup>rd</sup> of farmers lease plots that are owned by others. In India, the leasing of land is often paid with a share of the yields, a system known as share-cropping. Share-cropping often reduces the incentive for productivity improvements for farmers, as some of the gains accrue to the owner of the land in India (Banerjee, Mukherjee & Haldar, 2015). Respondents of this research mentioned having to pay up to 1/3<sup>rd</sup> of their produce. The size of land under cultivation in the sample is 1.6 hectare on average, which is bigger than the average of 1.2 in Lucknow (Kumar, 2008). The difference is the result of purposeful sampling, meant to compare smaller with bigger landholders. If a completely random and representative sample had been used, there would not have been enough bigger farmers for a good comparison. Table 3 shows a summary of land size within the sample.

Farmer category	Marginal (<1 ha)	Small (1-2 ha)	Medium (>2 ha)
No phone	4	2	3
Normal SIM	11	6	5
Green SIM	5	4	5
Total	20	12	13

**Table 3:** Distribution of phone use and farm size (N=45)



Annually, respondents grow an average of 90,000 ₹ (~ € 1,300<sup>1</sup>) worth of crops, based on the market rate. There is a wide variety of income, based on land size and productivity. Moreover, bigger farmers sell most of their products, while smaller farmers consume most of it themselves. The actual income will be even more unequal than the production. Some farmers are focused on cash crops specifically, such as mangoes, mint or wood, but most of the farmers mostly grow staple crops.

The decision to grow a specific crop depends on the soil and climate, but also on the available assets. Farmers in Lucknow traditionally rotate the crops wheat and rice, during summer and winter respectively. Many farmers grow small quantities of vegetables on the side for their own consumption. These days, fruits such as mango and guava and other crops such as mint and wood have increased in popularity due to the higher market prices (Kumar, 2008). However, many farmers cannot make that transition because they cannot afford the extra risks associated with such crops; not only are the input costs much higher for fruit trees, but it will also take many years before they start bearing fruits. Whereas wheat and rice are annual crops, mangoes can take up to 7 years before they will produce yields. Despite the extra profits in the long term, most farmers cannot take the risk of such long term investments. Another reason that farmers do not make the shift, is that they are dependent on their crops for their own consumption. One respondent explained it as follows:

*I grew mangoes before, but I cannot eat mangoes every day of the year. (59 year old farmer, Gopalhera)*

Nonetheless, many farmers experiment with a small number of mango and other fruit trees for their own consumption.

### 6.2.2. Infrastructure- Irrigation and Electricity

The production of crops is not only dependent on the land availability and crop choice, but also on the available irrigation infrastructure. Most farmers in this area have access to some form of irrigation, which enables them to grow multiple crops per year. The respondents mentioned three different sources of irrigation: a canal, a government tube well or private tube well. Access to a canal or a government run tube well is available in some areas. In other areas, farmers can sometimes rent a private tube well, or build their own, depending on financial assets. The different irrigation systems are associated with different costs. The costs of irrigation are substantial due to the costs of energy. Using a diesel pump costs around 150 ₹/hour (~ € 2) for the fuel, which can go up to 10,000 ₹/year (€ ~140) for a 2 hectare plot. Alternatively, farmers can irrigate the land with electricity, which is much cheaper but far less reliable. Most of the respondents have access to irrigation, but some of them are not able to pay for regular irrigation.

Most of the respondents have electricity, but the average availability is only 16 hours per day. This is enough for most farmers for lighting, appliances and charging the phone. But, some farmers see the lack of electricity as a major annoyance, and scold the government for not providing more. The main problem with a lack of electricity is not necessarily the low availability but the unpredictability which can cause problems for the irrigation of the land.

### 6.2.3. Financial assets

The income generated by the households often comes from various sources, sales of crops, livestock, other farm related work and non-agricultural related work. Everything combined, the households have an average income of 126,000 ₹ (€ 1,800) in a normal year. After

---

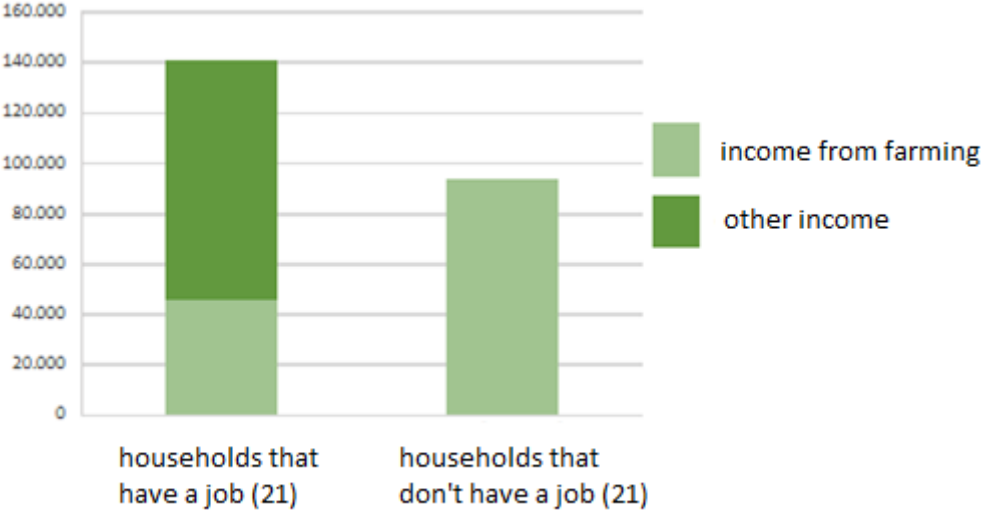
<sup>1</sup> Throughout this report Indian Rupees are used. When relevant, corresponding amounts in Euros are mentioned within brackets, based on a conversion rate of € 1 = 70 ₹.

dividing the income of each household by the amount of its members, the average is ~13.000 ₹/year/capita. The income-based poverty line in rural India is determined by the government to be ~12.000 ₹ (~ € 171) per year per capita (GIPC, 2014). This indicates that 25 of the households are living below the poverty line. Table 4 shows the income of the households members. The categories are based on x times the poverty line.

Annual Income in ₹ per member of the household	Number of households
< 12.000	25
12.000 - 24.000	12
24.000 - 36.000	7
36.000 - 48.000	1
Total	45

**Table 4** Categories of Income of the households, divided by members of the household (n=45)

To better understand how the income is generated, figure 5 shows the differences for two groups of respondents; those that have non-agricultural work, and those that do not. Note that figure 5 deals with the income per household, roughly equal to 10 times the income per capita as households contain on average ~10 members. The first group of respondents, those who do have non-agricultural income within the household, earn much less from their farming activities. They earn on average ~45,000 ₹ (~ € 640) annually from farming, while households fully dependent on agriculture earn ~95,000 ₹ (~€ 1,400) annually.



**Figure 5:** Annual income for households with and without jobs (n=45)

It is important to note that the agricultural income presented in this graph is an estimation by the farmers and that it does not include a deduction of the input costs. This means that the actual spendable income for food, clothing and other expenses will be much less. The input costs depend on the crop type, but some farmers estimate it to be 50% of the revenue. This was also found by a study on farmers' profits in Uttar Pradesh (Kumar, 2008). It is also important to note that all numbers are based on normal years, while some years can be heavily impacted by bad weather conditions. In a particular bad year, the yields from agriculture can be as low as 20% of the normal amount, resulting in net losses due to the input costs.

The above-described variability in income makes farmers highly dependent on savings and loans. In the Lucknow region, formal credit generally seems to be available. The respondents have access to the *Kisan Credit Card*, a government scheme that is meant to support farmers gain easy access to affordable credit. In theory, the credit card offers loans at favourable conditions, with low interest rates and the possibility to reschedule repayment in case of crop failure. However, according to many respondents the credit card has several problems. First of all, the interest rate starts at 4 % for the first 6 months, but will rise to 9% after that. Respondents argue that these prices are unfair. As one respondent put it: “*even if I am just one day late, the interest goes up*” (45 year old farmer, Chakpura).

A more important problem is the extra bribe which many farmers have to pay the bank official in order to receive a loan. Approximately half of the respondents explained that they paid a bribe in the range of 5-10 % of the loan required. Most of the farmers have taken some loans in the past, either to cover personal expenses, or to invest in agriculture. Currently, 8 farmers have an outstanding loan, averaging 140,000 ₹ (~ € 2,000), which is twice their average yearly salary. This means that farmers cannot be expected to pay off their loan within the maximum time of 12 months, let alone within the 6 months of low interest. These debts can become a serious burden for farmers; one farmer even had to sell his land to pay off his debt.

Half of the respondents manage to save some amount of their income for the future. They often save around 5-20.000 ₹ per year. The savings are usually meant for investment in the farm, children's education, or a wedding. Some of the respondents explain that these savings usually don't last for long and are often spent on other sudden expenses, due to failed crops or healthcare costs.

### 6.3. Cognitive-based assets

This section analyses the respondents' availability of cognitive capital. According to Duncombe's (2014) framework it includes both human and psychological capital, but for the purpose of this research the focus is on human capital only.

#### 6.3.1. Human capital

To understand the level of human capital it is useful to start with the levels of formal education. Table 6 gives a rough overview of the education levels of the respondents. As is shown in the table, 16 % of the respondents is illiterate, meaning that they never went to school and are unable to read or write. These levels correspond to the heads of the households, who are on average 47 years old.

	Marginal (N=20)	Small (N=12)	Medium (N=13)	All (N=45)	All in %
Illiterate	6	1	-	7	16 %
Primary school (<10 <sup>th</sup> standard)	5	6	6	17	38 %
High school (10 <sup>th</sup> , 11 <sup>th</sup> or 12 <sup>th</sup> standard)	6	5	4	15	33 %
Bachelor diploma	3	-	2	5	11 %
Master diploma	-	-	1	1	2 %
Total	20	12	13	45	100 %

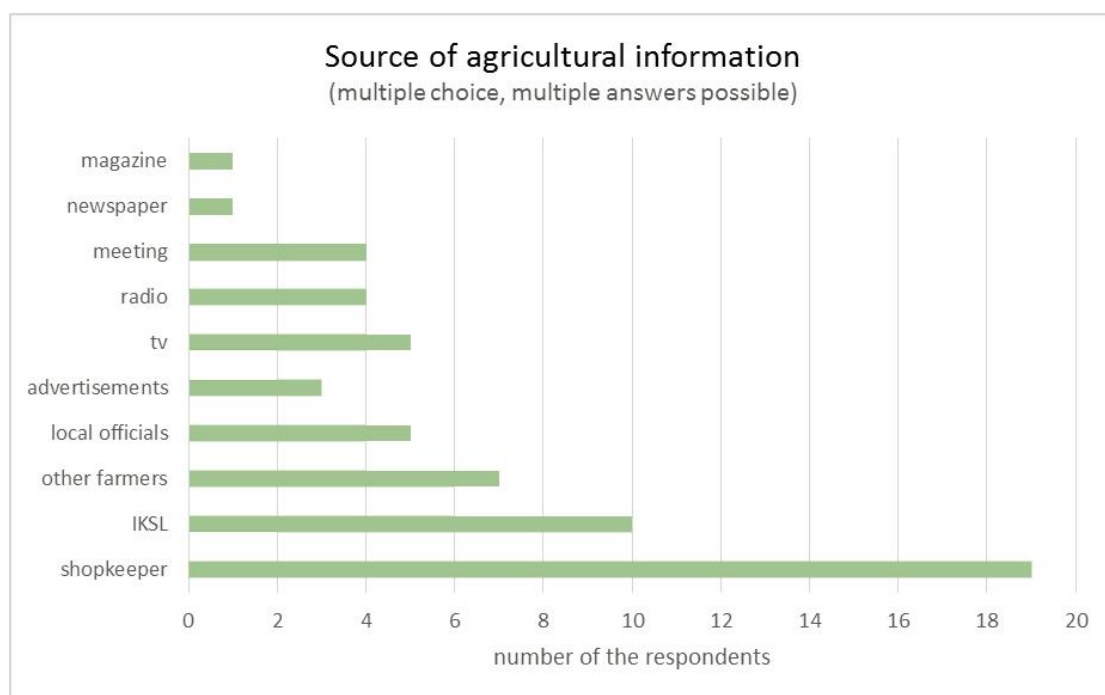
**Table 6:** education levels of the 45 respondents (head of the households)

The younger generation often enjoys more years of formal education than the respondents. But even for them, the quality of the received education is probably very low, as a nationwide survey on the quality of education shows (ASER, 2015). The report makes painstakingly clear how bad the education system is throughout India, but in particular in Uttar Pradesh. Although school enrolment nears 100%, attendance is low, and basic reading and arithmetic skills were shown to be poor (ibid.). It may be assumed that many farmers who did go to school have trouble with simple math and reading and writing. The lack of proper education is a considerable problem that limits farmers' ability to improve their yields and to find non-agricultural related employment. The newspaper is an important source of information, which contains weather forecasts, job vacancies and specific government schemes. These are not accessible to the illiterate farmers. Moreover, illiterate or semi-literate farmers face problems with following guidelines and instructions for fertilizers, risking damaging the crops or the soil.

For a farmer the predominant form of learning is not education but informal learning. Most farming skills and techniques are simply taught from father to son. For the respondents, family members are the most important source for learning anything related to farming. Only a small number of farmers received any information from a training program, or regular meetings with extension officers. Many respondents mentioned that they desire more information about farming. Most of the respondents did not receive help from extension officers. When asked whether farmers would like more help from extension officers, the answers were usually confirmative. They are, however, often unfamiliar with the extension officers and do not reach out to them. Respondents that do receive help from the extension officers always request help themselves.

### 6.3.2. Sources of agricultural information

In order to maintain and improve the farm, it is essential to receive agricultural information. Farmers regularly search for information on new crop varieties, fertilizers, pesticides and other chemicals. When asked where they received such information, most of the farmers cited one or two sources. Some of the respondents claimed that new information is not relevant or that they learned everything from experience. Figure 6 shows how often each source was mentioned.



**Figure 6** sources of agricultural information (n=45)

It is clear that most information comes from the shopkeeper, which is not surprising since they also sell the inputs that are required for the farm. For most of the green SIM owners, IKSL is an important source of information. This shows not only how farmers value the quality and ease of the messages, but also that they find other sources not sufficient. However, not all green SIM owners prefer the messages for agricultural information, which will be discussed in chapter 7.

Figure 6 shows that there are many sources available to the farmers. The preference for one or the other seems to depend on personal preference rather than availability. Interesting is that the media provide several channels to reach farmers; both radio and TV have channels dedicated to agricultural knowledge and many newspapers dedicate a weekly edition to farming.

Figure 6 also suggests, that most farmers do not use these media sources to gain information. Most farmers rely on the salesmen of the products they buy, or ask other farmers of advice. Moreover, the question from figure 6 does not include information about new farming practises, as most farmers think they are experienced enough or are not willing to take big risks. This shows that searching for new information is not always on farmers' mind.

### 6.3.3. IKSL's perspective on farmers' human capital

A combination of poor basic education and the absence of other forms of training means a severe lack in cognitive capital. The interviews with IKSL staff showed how this forms a big problem for them to get information to farmers. They try to make the messages as clear as possible and repeat the more important ones, but they remain uncertain to what extent the farmers understand and remember the information. To test their effectiveness, IKSL has multiple feedback mechanisms in place. One such mechanism is a monthly quiz that contains questions about important knowledge that is provided through the messages. Farmers can call to the helpline free of charge and give their answer. From the good answers a couple of winners are chosen whom will receive money in the form of call-time on their phone. Only a small number of the farmers participate in these quizzes. Most farmers have no time, are not interested in the quiz, or think that the calls are subject to charges. Based on IKSL's database, the number of people that answer the questions correctly is approximately 60%, depending on the difficulty and specificity of the question. This suggests that the information is still difficult for farmers to understand, remember and implement. Another reason for the wrong answers is that farmers do not listen to all the messages, because they don't have the time or are not interested in some topics. It seems likely that a large part of the information that IKSL sends out does not come across to most listeners. From this, it can be concluded that only farmers who are sufficiently attentive and interested, and have sufficient time, will be able to use the information.

## 6.4. Network-based assets

Social networks are based on relationships, trust and reciprocity. Especially for the poor, networks are an important asset for gaining a living, as it can be used to compensate for the lack of other assets. This section looks at the structure of farmers' networks, the specific bargaining traditions and the power inequality that farmers face.

### 6.4.1. Social capital

Few of the respondents are a member of a farming group or association. Only two respondents are currently members. Three farmers were members before but have left.

Remarkably, two of those who left did not benefit from the groups, but suffered from other members who stole their savings. The two farmers that are still members explain how it is useful for them, mainly to gain new information about farming. Some other respondents visited monthly meetings that were organized by the government on block level (group of villages). These meetings are also considered highly valuable and a main source of agricultural information. However, most farmers did not have the awareness about or ability to participate in such meetings.

The strongest networks of farmers are based on family relations and kinship. The strength and frequency of family relations is high, partly due to the extended families living in the same house. The average household size in the sample is 10 members. Due to marriages and various non-farming jobs by family members, such networks are spread to nearby villages as well as further away, such as to Lucknow. Such ties can be considered strong ties, with individuals that have frequent contact with each other through regular visits or by mobile phones. These networks are highly important culturally and also provide a safety net; whenever someone suffers from unexpected costs, due to crop failure or disease, they can usually rely on relatives for support. Most respondents explained that relatives will be the first to ask for help if they face any problems, financial or otherwise. Despite some exceptions of respondents who face difficulties with their relatives, generally the level of trust in these kin-based networks is high.

Networks that can be considered weaker, with less frequent contact, less emotional involvement and less trust are the circle of friends and villagers. These networks are also smaller, mostly around 4 farmers from the same village with whom the farmers discuss and meet multiple times a week. In these networks, farmers will discuss things such as the planning of crop cultivation and decisions to adopt new crop varieties. Within such social networks, an important role is given to progressive farmers. Respondents do not use this term, but refer to farmers that are bigger, more knowledgeable and more profitable. Respondents ask these progressive farmers questions from time to time. The sample also contained farmers that seem to take the role of the progressive farmer upon themselves. These farmers have much more knowledge about farming and gain much higher yields. They explained why they take on the role of helping others in their village, without getting much in return. One farmer that seemed to take a more central role:

*“I help other farmers in the village, sometimes they come to ask me something. But no-one in this village can help me, because I already know everything. Sometimes I visit farmers in other villages that are very good”* (45 year old farmer, Mal)

These farmers thus have a slightly larger social network. These progressive farmers often have good ties with farmers from other villages and extension officials. The Indian government purposely tries to connect with such progressive farmers and teach them the best farming practises, hoping that they will disseminate the knowledge throughout their village (Babu, Joshi, Glendenning, Asenso-Okyere & Sulaiman, 2013). Although some respondents benefit in these networks, others felt excluded and view the system as discriminatory towards big and progressive farmers. One respondent said the following:

*“No, they [extension officers] will never help me, they only help the big farmers”* (27 year old farmer, Dasher)

Interesting was a small group of farmers that attend informal meetings of 20-30 farmers, in which they discuss all farm related topics. Such informal meetings are not organised, but evolve weekly or daily in some villages. These meetings seem to be very useful for the spread of agricultural knowledge.

Besides the kinship-based and the villager-based networks, many farmers depend on the shopkeeper for information regarding agriculture. The respondents have access to two types of shops, government operated and commercial shops. The former are usually cheaper and with better quality products, but there are less of them so most farmers rely primarily on small commercial shops. These shops are the most important source for agricultural inputs such as seeds, fertilizer and pesticides, but also for advice. Most respondents rely on advice regarding the application of the products they use, in particular new ones. Moreover, the shopkeeper is for many an important source for new crop varieties. For some farmers, the shopkeepers is the first they would visit or call whenever they face a specific problem with their fields.



*Figure 7 Agricultural supply shop in Uttar Pradesh (Ganesh Gupta, 2010)*

One of the respondents is such a shopkeeper, although he sells primarily fertilizer. He confirms that farmers regularly ask him for advice on various topics. He also explained that he is very knowledgeable about agriculture because he regularly communicates with the IFFCO office. Some respondents, however, complained about such shops and claimed that the quality of the fertilizer has decreased and that the advice is not good. Although it is difficult to assess the quality of the information by the shopkeepers of the respondents, often the shopkeepers' advice should be questioned. According to Swanson (2008), shopkeepers' advice is often product driven rather than farmer driven; there is an incentive to sell those products that are the most profitable, rather than the best for the farmer. The author also emphasises that shopkeepers often lack adequate agricultural training. Nonetheless, both most respondents of this research, as well as farmers in Uttar Pradesh consider the advice of shopkeepers of good quality (NSSO, 2005).

#### 6.4.2. Cultural capital

Indian culture is highly hierarchic, with clear differences in social status based on caste and gender (Potnis, 2016). The Indian government has actively fought against the caste system for decades, but it is still today a source for discrimination and exclusion (Deshpande, 2010). Although problems related to the caste system have declined, lower castes are still poorer and are still discriminated against. Behind closed doors and in ceremonial functions, cast differences are abundantly clear (Ibid.). The importance of castes was also clear during the interviews. Often the interpreter was asked for his caste for example. This shows that the farmers are usually aware of the castes of people. During one interview, caste-awareness became clear when a farmer handed out tea for a group of neighbours. All the lower castes received their tea in different, disposable cups. Despite the cultural importance of castes, the respondents explained that the caste system does not negatively influence one's livelihood

opportunities. They explained that if lower casts are poorer than richer casts, it is due to their own lack of hard work. It might be true, or it might be the remaining (unconscious) discrimination inherent in the system.

Most of Indian society suffers from gender inequality in terms of healthcare, education and ownership of assets (Sen, 2001). Gender inequality was also visible in the villages that were visited. In rural households there is often a clear division of tasks, with men having more decision power. Although this research was not specifically focused on gender related issues, the intention was to include women into the sample. Unfortunately this proved more difficult than expected. Women seemed afraid that others might think badly about them for being interviewed by two men. Two interviews with women were cancelled very early on, when other men came to listen to the conversation. In virtually all of the households, women did not have any non-agricultural job, while men often did. However, it was also visible that women and men often work side by side on specific jobs, either in the field or in the house. During a number of interviews, women were also present and even contributed to the conversation, sometimes being much more vocal than their husbands.

Another phenomenon that is burdensome for the economic development of farmers are the costs that are related to the marriage of their daughters. The dowry system is officially illegal, but still almost universally kept in place. Weddings are usually paid by the bride's family, which include an elaborate ceremony and many gifts. In contrast with western countries, in India the costs of dowry have grown exponentially in recent decades (Anderson, 2003). The consequences of this are severe: The costs often lead to impoverishment of the bride's family. This has resulted among other things in the practise of infanticide of female babies and the most skewed male-female ratios in the world. The expenses related to the dowry system have a bigger impact on the life of the poor than on the rich (ibid.). Four respondents explained how their financial predicament is at least partly caused by the wedding of their daughter. Before a daughter is married, she can be perceived as a burden for a family, as one of the respondents points out:

I: *Is there anything in your life that you want to change?*

R: *I would like my daughter to marry, because she is a huge burden for me. (40 year old farmer, Bhudadeya)*

The farmer from Bhudadeya cultivates wheat and rice on 0.5 hectare on leased land, which is barely enough to feed his household of 5. Although his daughter will not marry before 5 to 10 years from now, he is already thinking about finding a husband and saving for the dowry.

#### 6.4.3. Sales of produce and bargaining traditions

An important part of the agricultural cycle is the marketing of produce. Farmers want to sell their crops as fast and for the highest price as possible. The marketing can happen in various ways and this influences the bargaining position of the farmer.

In this research farmers typically sell their produce in one of two ways: they find some method of transportation and sell their products at the wholesale market or they sell it to a trader who then transports it to the wholesale market. The latter option is usually preferred as it is difficult and expensive to organise transportation. The sales are usually organised in a central location, where a collection of farmers display samples of their produce. Then a number of traders come and offer them a price, depending on the quality of the crops. Whenever farmers want to sell small amounts of produce, they have to sell it themselves. This is done by displaying their products on a mat in the local market, or selling it to local shops who then sell it for them. For some farmers the third option is preferred as it results in much higher prices and bargaining power.



When selling at the wholesale market or to a trader directly, farmers generally feel strongly exploited by the buyers; during the interviews they frequently emphasised the difference between the market price and the price they get for it. The sentiment is clear from the following quote:

*“They don't let me enter the wholesale market, they weigh my crops outside and even charge for weighing my crops”* (65 year old farmer, Tera)

In contrast, for a small minority, the relationship with the trader is seen as a friendship. These farmers trust their traders and have the feeling that they are offered a relatively good deal. When they decide to harvest and sell their products, they call them to set up a deal. This kind of farmer does not even think to call another trader, as it would be insulting towards his friend-trader.

Most farmers are not in the position to bargain with traders. When traders come to a village, they get offered products by many farmers and can afford to reject a deal with a specific farmer. In the eyes of the respondents there always seems to be a huge supply of products, but only limited demand. Traders can therefore be picky about their crops and prices. This makes for high competition among the farmers, but not among the traders. Although there are multiple traders that come to a single village, they usually ask the same price. When farmers go to the wholesale market, they face the same issue. The traders set the price and the farmers can only decide to accept it or not. Some farmers assert that they try to bargain but that it is completely useless. The following is an example of how the traders respond to bargaining:

*“If it is cheaper at some other place, why don't you go there and sell it there?”* (31 year old farmer, Chakpura)

In this particular instance, the higher market price was available at a distant market, but the farmer was not able to travel that far, which is known to the trader. This is why most farmers do not bargain for higher prices, they will accept either the market price or the judgement of the trader, based on the quality of the crops. A couple of farmers did claim to be able to successfully bargain for fruit crops. This makes sense, since the price of fruits are much more dependent on the quality of the crops, which is much more ambiguous. This was also theorised by Zanella et al. (2013), who argue that bargaining traditions depend on the heterogeneity of crops. Most fruit crop owners, however, are not able to successfully bargain but are dependent on the traders' decision.

One of the reasons that farmers do not bargain successfully, is their hurry in selling the crops. They explain that it is important for them to sell their crops as soon as possible, rather than wait for a rise in market prices, which might not come. The most important reason seems to be the perishability of crops and the lack of storing space. Farmers that cannot store their harvest for even one day, effectively have to accept any price. Farmers can choose to postpone harvest for some days, if they think the price will go up. The disadvantage of such a strategy is that future crop cycles will be delayed as well. Generally farmers are more afraid of not selling their crops, than of getting a low price. This seems to be inherent to the seasonality and variability of farm-income. Moreover, sometimes farmers have to repay their debt, which is often based on one agricultural cycle (6 months), after which interest will go up. This makes the quick sales of produce even more important. Respondents reported to have debts that need to be paid, as soon as possible.

For another group of respondents selling their crops as fast as possible is less important. For them a high price is the only relevant factor that influences their decision to sell their crops. These are the farmers that are generally better off and focus on crops that can be stored.

These farmers are not friends with the traders, but rather compare between different traders and sometimes let them bid for the highest price. Some of the farmers are able to bargain for the highest price. Although respondents often compare different traders, they usually do not consider travelling to different markets that are further away.

#### 6.4.4. Power inequality

As described in section 6.4.2., the respondents still live in a society where castes and gender are sources of inequality. These sensitive topics are quite difficult to discuss with respondents. Contrarily, power inequality within other economic and social relations are often the respondents' favourite topic. The subject that respondents are most vocal about is the corruption by various institutions such as the government, banks, hospitals, seed suppliers, and traders. As illustrated above, the farmers have very limited power over their own sales and depend mostly on the traders for setting the price. They feel powerless and often cheated by the traders, who appropriate too much of the profits. The following quote shows that farmers feel disadvantaged when selling to a trader:

- I: *When you decide to sell your product, how important is high price for you?*  
R: *High price is important, but it never happens. In a 100 times, once I will get a high price. Mostly I sell to the trader for whatever he asks. (40 year old farmer, Simramau)*

Another example of their lack of power is when they require a loan. Most respondents declare that they have to pay a bribe for taking a loan from the bank. One of the more wealthy respondents, a former government official, explained that the required bribes are lower for him because of his political network. He also said that he still needs to pay some amount of bribe (1-5% of the loan) because it was not worth fighting over. It was much more trouble to hire a lawyer from the city, than just pay the bribe, he argued. He explained that most farmers have to pay around 10% bribes when they take a loan, which is in line with many of the other respondents' statements. Whether farmers have to pay a bribe for getting a loan seems to be dependent on the area where farmers live, rather than their caste or financial assets.

Thirdly, the respondents feel subjected to the corruption of the various governmental bodies. An example that farmers mention is that they were promised a compensation fund for failed crops last season. Only one of the respondents stated to have actually received the funds he was promised. Another example is the availability of superior seeds or some chemical for a subsidized price, for which in reality the farmers have to pay the full price (in the government store). One respondent felt that he suffered more from government corruption because he was a small farmer:

- R: *Life has improved, but not for me. Because I am still poor. Small farmers cannot benefit from government schemes.*  
I: *Could you give an example of that?*  
R: *The price of wheat is lower due to a scheme, but we don't get it for that price because the officials don't give it to us, only to big farmers. (60 year old farmer, Dasher)*

### 6.5.Context of vulnerability

To understand the respondents in their context, this section describes the main vulnerabilities that influence their lives. The most problematic vulnerabilities are climate variability and the threat of wildlife.

### 6.5.1. Climate variability

Because India's climate is harsh, variable and unpredictable, it exerts persistent pressure on agriculture (Krishna Kumar, Rupa Kumar, Ashrit, Deshpande & Hansen, 2004). Because the rainfall dispersion is highly skewed, farmers are dependent on monsoon rains to come timely. If the monsoon rains come too late, too soon or the amount of water is too low, it hurts crop yields substantially. Moreover, unseasonal rains, hailstorms, and other extreme weather events throughout the year damage the crops. The effects of climate variability is difficult for farmers to estimate, due to a lack of bookkeeping. Nonetheless, they can make estimations of the crop losses due to extreme weather events, because the effects are so big. Although respondents were not specifically asked about their bad years, most of the farmers mentioned explicitly how much they suffered in a bad year. The reason is that the farmers suffered from a particularly bad harvest last year, when unseasonal rains destroyed most of the wheat and rice fields. They indicated that their crop yields were 50-80% lower than in a normal year. The government has a special compensation fund that gives farmers financial support against natural disasters. Based on the losses in a specific area, the local government decides a fixed price per hectare of cultivated land. Farmers are often aware of the existence of this law and when it is enacted because the government publishes it in the local newspapers. In the summer of 2015 farmers suffered from unseasonal rains and hailstorms, for which the government promised compensation in the area. According to some of the respondents, they should have gotten such a compensation but did not.

Because of the problematic rainfall distribution, farmers depend on the irrigation through canals or tube wells from underground qualifiers. Irrigation is, however, also dependent on rainfall and usage. Generally water levels are declining in most parts of India (Kumar, Singh & Sharma, 2005). This problem also occurs in the Lucknow region. One respondent explained that they took a loan to build a tube well, some years ago, only to find the water levels decline beyond the reach of the tube well. Now, they are stuck with a loan, can't use their tube well, and have to rely on the government tube well, which is much more expensive.

### 6.5.2. The threat of wildlife

In some of the Southern areas another persistent problem inflicts hardship upon the farmers. A wild group of large antelopes, called *Nilgai* (literally bluecow), have been eating all types of crops that are grown in the area. All respondents from this area suffered so much that they kept turning back to the subject during the interviews. The Nilgai has been active in the region for around 5 years, where it has made farming risky and unprofitable. The animals travel in groups of up to ~20 and are fast and strong, which makes them unstoppable by building small fences. Hunting the Nilgai is allowed if one has a permit, but these are difficult to obtain. One respondent told me that one person did shoot a Nilgai, and subsequently was arrested and imprisoned. Another reason that the Nilgai is not hunted on a large scale is the sanctity of animals, the cow specifically. Although the Nilgai is not technically a cow, its name suggests otherwise, which makes hunting it immoral according to Hindus. The amount of crops destroyed differs from 1/3<sup>rd</sup> of the yields to 100% of the yields. The severity of the problem was a reoccurring subject throughout the interviews. The answer to an unrelated question by one of the respondents explains it well:

I: *How do you get information about new crop varieties?*

R: *I don't care about new crops. Before, every crop was grown in the village, because the ground is really promising. But, now nothing grows, everything is destroyed by the Nilgai. (55 year old farmer, Vilas Kera)*

### 6.5.3. Health risk



*Figure 8: preparation of cow dung, used for cooking food*

The poverty of the respondents is also visible in the problems they face with their health. Generally, India suffers more than necessary from curable diseases such as TB and typhoid. The poor are often struck most, due to a lack of awareness about basic healthcare, sanitation, but also polluted water. These diseases are caused by poor living conditions such as lack of sanitation, subtropical climate and unhealthy diets. Figure 8 shows a picture of dry cow dung, which is used for cooking. Cooking with cow dung causes (indoor) pollution which is hazardous for health of particularly women. Respondents explained that besides diseases, accidents on the farm often lead to injuries. Shockingly, four of the respondents had a missing finger, arm or leg, due to some farming related accident. The problem with accidents and diseases is that the healthcare system often fails to address the poor properly. Although the respondents of this research are relatively close to proper hospitals, a lack of resources still hinders them from benefiting. Because of the large households, most families can endure the temporary loss of a working member and continue with cultivating the farm and generating enough income. Only in one case did the household suffer immensely from a serious illness, because he was the only male in the household.

### 6.6. Livelihood strategies

As clear from the diversity among the sample, various strategies are pursued – even in the same geographical and institutional context. It is important to realize that the path households take are not merely based on active decision making, but are largely dependent on the access to specific resource-based assets.

Three different strategies are distinguished on the basis of two aspects; subsistence vis-a-vis commercial farming and whether or not the households have non-agricultural sources of outcome. Table 7 shows a summary of the assets their physical assets.

### 6.6.1. Subsistence farmers

12 of the respondents are subsistence farmers. The strategy of subsistence farming is the consequence of not growing enough to sell on the market. Their average land size is much smaller than commercial farmers (1ha). Most of these farmers can be considered hanging on; they use their assets to maintain their current level of well-being. They have little savings (15,000) that can be used in the future to improve their situations. They are less inclined to take a loan and if they take one the size is lower, because they little opportunity to repay their debts. When they have unusually high costs, they will more likely ask a family member and sometimes resort to selling their assets (e.g. produce, land). Most of them depend on day labour for necessary for inputs, other investments or every-day expenditures such as food and clothing. Not all subsistence farmers are in insecure positions; some are retired and gain a pension, earn a considerable income with livestock, or have a full time job.

### 6.6.2. Commercial farmers

16 of the respondents are commercial farmers, meaning that they sell at least a portion of their produce. Some specialize in the cultivation of mango, wood, or mint, but most of them grow primarily wheat and rice and can be considered as hanging on. A few of them also keep one or two cows or buffaloes. Their income is on average higher than subsistence farmers, but also more vulnerable due to a lack of other sources of income.

### 6.6.3. Commercial farmers – diversified

17 of the households depend both on agriculture and non-agricultural work. These farmers earn more and are less vulnerable. Some of them work in a shop or have other variable incomes. Some of them are “stepping up” and have some savings and are able to invest in labourers, a tractor or land. They usually have enough money to buy sufficient inputs and gain higher productivity levels than the other two strategies. However, most of the income is still stemming from non-agricultural activities. Respondents that fit in this category are generally better off in terms of non-tangible resources as well. Their levels of education are higher, their social networks are bigger and more diverse. Also the three progressive farmers – farmers that have more than average agricultural knowledge, fit in this category. It makes sense that farmers with non-agricultural jobs increase their intangible assets and vice versa.

	<b>subsistence farming (N=12)</b>	<b>commercial farming (N=17)</b>	<b>commercial farming diversified (N=16)</b>
Household income ( ₹ /year )	87,104	103,842	179,743
Land size (ha)	1,1	1,6	2,0
Contract land (%)	0,33	0,35	0,19
Current savings <sup>2</sup> ( ₹ )	15,000	18,000	22,500
Outstanding loans <sup>2</sup> ( ₹ )	70,000	109,000	119,000
Education (class)	7.4	8.2	9.3
Network size	6.8	4.4	10.2

**Table 7** Comparison of different strategies of the households (N=45)

\*

<sup>2</sup> Only respondents that have a loan/saving at the time of the interview are taken into account.

## 7. PHONE USE

This chapter discusses the phone use by the respondents, thereby answering the second sub question:

**Sub question 2.** *What are the resource-, cognitive- and network-based assets of the farmers?*

The first two sections deal with reasons of respondents for adopting a phone or not. The next three sections discuss the phone use in general, for agricultural purposes and non-agricultural purposes. The last section specifically focuses on the use of the green SIM.



**Figure 9** *One of the respondents on the phone*

### 7.1. Reasons for adopting

As indicated above, the mobile phone is widely used among the farmers; 37 of the 45 respondents personally own a phone. Most respondents adopted the phone in the past 5 years. The reasons for adoption of a phone can roughly be divided in three arguments. These are given, in order of importance: The first argument is that many respondents bought the phone because their work demands it; respondents who do day labour require a phone to arrange a pick-up, others have pastime jobs and are called when needed. Some of the respondents own a shop for which a phone is useful for supplies. One of the respondents even opened a mobile charging shop. The phone can also be necessary in finding a job, either to call after newspaper advertisements or to give a contact number to a potential employee. Farmers that try to sell their products to customers directly in the village also adopted a phone to improve the organisation of sales. Second, respondents adopt a phone to keep in touch with friends and family. Often there is a specific relative that lives far away with whom they want more frequent contact. Sometimes such a person gives a phone as a gift to the household. Third, less often mentioned, is the adoption of the phone specifically for farming purposes. Some farmers want to call the trader, a shopkeeper, or a helpline.

Of the 37 respondents with a phone, 14 have a green SIM and thus receive the daily voice messages containing agricultural information. The adoption of the green SIM is motivated by straightforward reasons; farmers are convinced of the usefulness of the messages. Generally

farmers like to receive more information on farming that make them less dependent on others. Moreover, the risk is negligible since the costs of a SIM is considered very cheap. Some of the respondents have been a member since the beginning of the program and received the SIM as part of a training program. Most of the farmers, however, learned about the green SIM from a friend or IKSL salesmen and decided to buy the SIM. The most important reason that farmers do not adopt, given they are aware of the SIM, is the hassle that comes with changing ones' phone number.

## 7.2.Reasons for not adopting

The eight respondents that did not have a phone usually don't see the importance of phone ownership, because they can easily use the phone owned by one of their family members. When asked why farmers didn't buy a phone, most of them explained not to be able to operate the phone themselves. Especially for completely illiterate farmers a mobile phone is difficult to operate. They can pick up the phone, but even that creates problems sometimes, as is seen in the following quote:

I: *Why don't you have a mobile phone?*

R: *I don't understand how to use it. Never did anyone give me information about how to operate the phone.*

I: *Did you never ask your son to explain how it works?*

R: *My son did explain some times, but I always forget. When he is away, I answer calls sometimes. But, sometimes, when I try to answer the phone, I end the call. And when I am calling I don't know how to end the phone call.*  
(45 year old farmer, Gopalhera)

The costs of a phone was for two respondents a reason not to buy a phone. One of them was interested in getting one, but he hoped that the government would provide it for him in the future. The other was not interested, as all information is available on the radio or shopkeeper, he argued.

## 7.3.General phone use

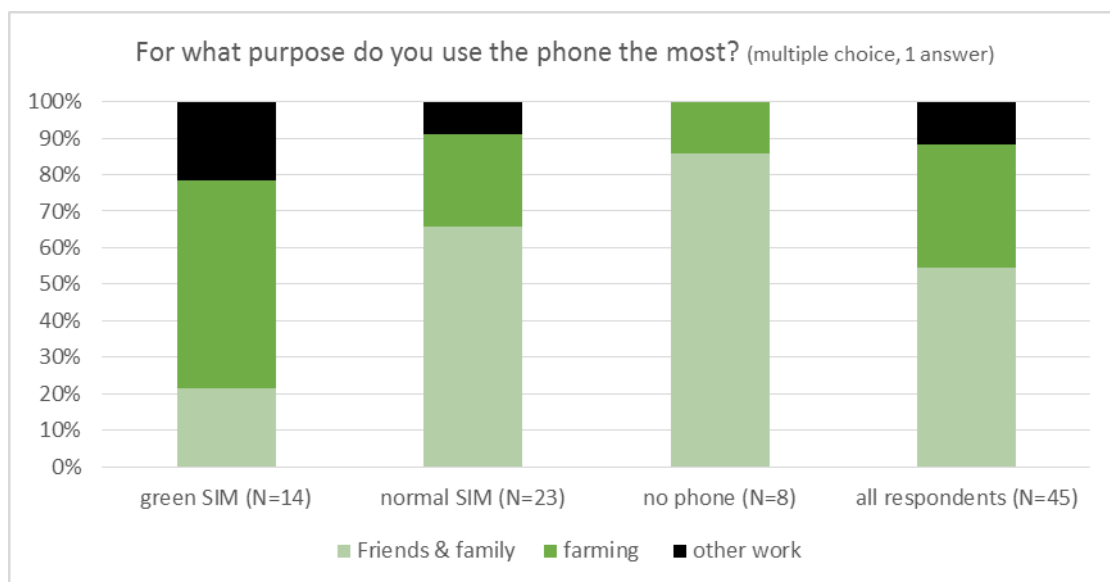
During the field visits it became evident that the mobile phone plays a central part in farmers' everyday lives. Not only the respondents, but villagers are often seen with a phone in their hands. During interviews farmers always keep their phone within reach and grab it without a conscious thought. At first, it seemed that the respondents were showing their phone due to the topic of the interview, but this thought seemed unlikely when I noticed how often farmers received phone calls during the interviews; on average around once per interview. For the sampling of respondents, an effort was made to find households in which no-one owns a phone, but this proved to be impossible. The sample includes nine farmers that do not own a phone, but seven of them use the phones of their family members. Phone use is not limited to the head of the households, as households have on average 3 phones. Adult children often own their own phone and sometimes use it much more than the head of the household, though not always.

The average amount spent on phones is ~200 ₹ (~ € 2) per month, but the numbers vary widely. Many farmers spend around 50-100 ₹/month, while others spend 500-700 ₹/month. The latter amounts are exceptionally high and are accounted for by non-farm work that

require phone calls throughout the day. Most of the respondents are of the opinion that the costs of using a phone are quite cheap and affordable.

It is important to realize that phone use primarily entails making phone calls; rarely do farmers text, or use other functionalities of the phone. With exception of some of households in which younger members have smartphones, including one of the respondents himself. Smartphones are valued highly and used for most of its uses. Internet is quite cheaply available in the area and it is easy to buy a data pack for a limited period. Smartphones are used by people who have a basic understanding of written English, to operate the various apps such as Facebook or WhatsApp. Although the smartphone is currently not used by most respondents, it provides many opportunities for them. An example is one of the farmers who could check his bank account on his son's smartphone.

Figure 10 shows what the main goal is of general phone use by farmers. Interesting is that for most of the green SIM owners, the phone is mostly used for agricultural purposes. In contrast, for most of the normal SIM owners, the phone is mostly used for social relations. This makes sense, as green SIM owners purposely bought a SIM to listen to daily messages about farming-related content. Many normal SIM users also use their phone for agricultural purposes, but much more for social relations. The respondents that do not own a phone, but use one occasionally, use it mainly to call friends and family, with the exception of one farmer who used his son's phone for listening to the green SIM messages.



**Figure 10:** purpose of phone use

#### 7.4. Non-agricultural phone use

The respondents view the phone as invaluable for keeping in touch with friends and relatives. Often the respondents have a relative living in the city with whom they keep in touch through weekly phone-calls. Phone calls with such relatives are usually simply to discuss basic things that are going on in life. Due to the phone, they have more frequent communication with their friends and family. The respondents also stated that organizing functions was done by phone. For marriages or other traditional ceremonies, calling people saves a lot of time.

One respondent related that his father suffered from a serious disease and that they called the ambulance to pick him up. This is more often alluded to by respondents, but not by most.



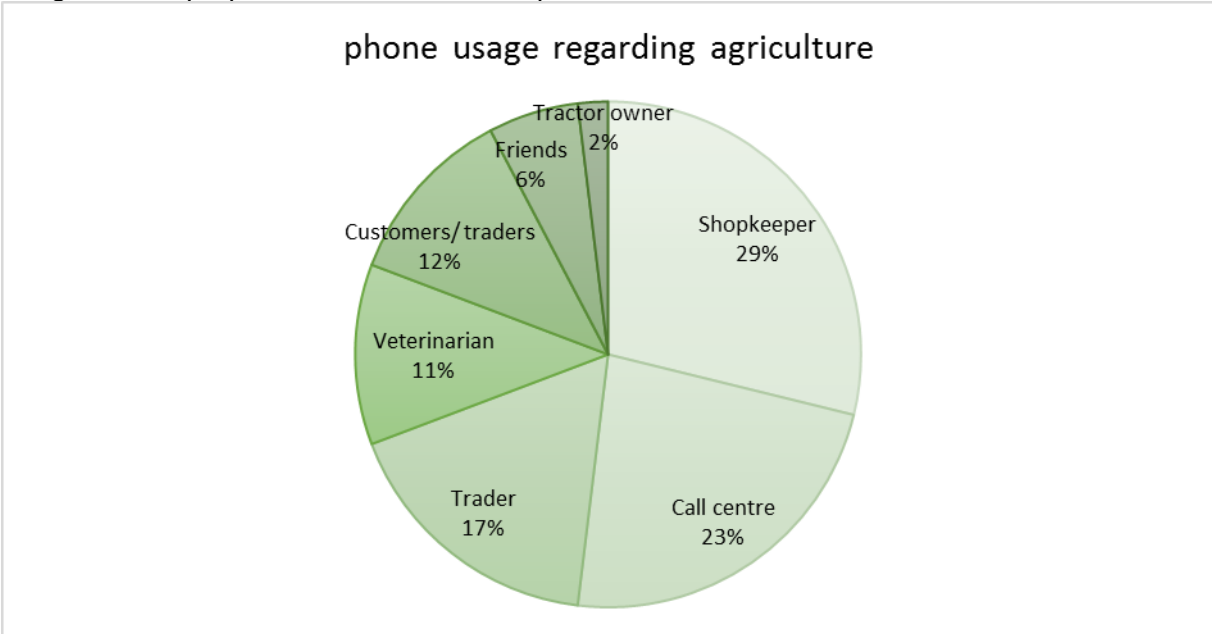
Nevertheless, presumably all respondents have the same possibility - calling a hospital or someone else in case of an emergency. The benefits of this are substantial; some research points out that in a specific area mortality rates have decreased due to adoption of mobile phones (Sife, Kiondo & Lyimo-Macha, 2010).

The respondents rarely use the phone to make phone-calls within the household, such as to call their partner for being late. Often when the husband leaves the house to work in the field, he will leave the phone at home. The reason is that during fieldwork the phone might be damaged by water from the irrigation or dropping on the field. When the husband is away from home, the wife will usually answer the phone. Although it is often stated that the wife cannot operate the phone properly, most of them can answer and end a phone call. This was also observed when trying to contact the respondents to set up a meeting, because often the wife took the call and explained that their husband was somewhere else.

Besides connecting to friends and relatives, much of phone use seems to be work-related. Farmers that do day-labour call a company that picks them up from the village. Many respondents use their phone to set up meetings, or to call for job-advertisements in the newspaper. As indicated before, one respondent even opened a phone balance shop. The green SIM messages also sometimes contain information about non-agricultural topics, among other things health advice, cultural information and information about the latest job opportunities in the region. Respondents' valuation of these services is mixed.

**7.5.Agricultural phone use**

As figure 10 shows, many respondents use their phone mostly for farming, however, even farmers that mostly use their phone for something else also use it for farming. Only 14 farmers do not use their phone for agricultural purpose at all. Figure 11 shows for which type of agricultural purpose, farmers use their phone the most.



**Figure 11:** whom respondents call regarding agriculture (31 farmers use a phone for agriculture)

The phone use by farmers depends highly on the seasonal cycles of farming. At first, in the preparation stage, farmers have to make decisions about what and when to grow, followed by which and how many inputs are required. For all these questions farmers sometimes require the help of others. Although some farmers stick with their traditional crops, many

farmers are constantly searching for new crop varieties that will provide higher yields. The main source of information is the seeds shop. Many farmers view the shopkeeper as an expert and trust his advice on which seeds to buy. Other respondents indicated the opportunistic behaviour of shopkeepers; they tried to sell specific goods for which they get higher margins. Nevertheless, most farmers will visit the shop and ask the owner for advice. As seen in figure 11, many farmers take his advice partially through phone-calls. To understand the role of the shopkeeper better an interview was conducted with such a shopkeeper. He explained that he did receive many phone calls, but it was limited to the availability and application of his products. Such phone calls are really important because the required products are often not available and the shops can be up to 30 km away. Of course they will still visit the shop, as they need to buy the supplies. During this phase green SIM holders receive many useful messages. Information on new crop varieties, as provided by the green SIM, is considered valuable and useful by 9 of the 14. For two respondents this information is not useful, because the specific seeds are often not available at their shop and the three remaining are not interested in changing their crops.

In the second stage, when the crops mature, farmers might come across problems that require external help. Most mentioned are problems with crops due to certain insects or bacterial blight. Most respondents will ask either their neighbours, friends or shopkeeper for advice on such problems. They do call these, but many prefer to pay a visit for such advice. Some farmers prefer a call centre when they have a specific problem with their crops. Another constant concern for the respondents is to maintain the irrigation of their land, for which most are dependent on others. They use a phone to organize the rent of a diesel pump or tube well. An important source of information related to this is weather forecasts. Farmers are diverse in their appraisal of weather forecasts as reliable. On the one end of the spectrum are those who don't trust on the weather forecast and rather rely on their own experience. One respondent explained:

*"In the morning I look outside, and if it is sunny it will not rain... If the wind is coming from a certain direction, it will rain."*(67 year old farmer, Vilas Kera)

On the other end of the spectrum are farmers who love weather forecasts and listen to it daily. They can easily access the weather forecast from various media sources (TV, radio & newspaper), or from friends and villagers. They like the weather, mostly for planning irrigation, which can help to avoid extra costs of irrigation as well as save the crops from flooding. However, the weather forecasts are always based on probability and inevitably give wrong predictions from time to time. This variability in trustworthiness, seems to be part of the reason for the wide variety in farmers' likings for weather forecasts. Farmers that do not like the forecasts, mention how wrong predictions indirectly destroyed their crops, while farmers that like the forecasts, relate how it saved them a lot of money. Also among the green SIM holders many do value the weather forecasts highly, but not all of them.

The medium sized farmers often employ other labourers, whom they have to call for setting up appointments. Also, many farmers run a side business, such as selling seedlings or renting tractors, which requires phone calls to set-up meetings as well. The importance of sharing tools such as tractors is essential for small scale farmers because of the high investment costs. The benefit of having a phone to coordinate sharing and renting of such tools cannot be overstated. Due to better coordination between owner and users, tools and machinery can be put to use much more efficiently.

The third period is a hectic one, when farmers need to plan their harvest and try to sell their crops as fast as possible as well as for the highest price. As mentioned in the previous chapter, farmers will enquire about the market price regularly. About 2/3rds of the respondents are generally aware of the current market prices. Mostly, farmers will visit or call

the market to enquire about the market price for certain crops. Often the market is quite far away and farmers will just call each other to enquire about the market rate. Some respondents ask their friends or neighbours for the market price, by phone or visitation. Interestingly, there are quite a number of farmers who do not care for the market rate much. Especially farmers that grow crops for which the price is more or less stable, such as rice and wheat the daily market price is less important. For the farmers for whom the quick sales are most important, a visit to the market doesn't require the use of a phone to enquire about the price beforehand. Generally farmers do not contact the trader for setting up sales, because the trader knows when harvesting season is and will visit the village anyway. Only when a trader is late will a farmer call to set up a meeting for the collection of the produce.

During all of these stages, many farmers make ample use of their phones. There are also non-seasonal problems that require phone use, such as problem with animals. Also some of the green SIM messages on agriculture are not specific to a certain time, such as information on useful schemes and government rules.

## 7.6. Use of the green SIM

The previous section demonstrates how farmers require different forms of information during the three stages of the agricultural cycle. This section discusses more broadly how the green SIM messages are used and valued by the respondents.

The free voice messages are sent three or four times a day and each have a duration of one minute. 14 respondents are owners of a green SIM and are subscribed to the voice messages. By and large respondents claim to like the messages and listen to them whenever they can. When they receive a call, they will listen to the beginning and decide whether the particular information is relevant to them and hang up otherwise. However, much of the information is generic because it is sent throughout the entire state. Mango farmers, for example, usually don't grow rice and have no animals, so much of the information they receive is not relevant. This effect was also indicated by Mittal et al. (2010), who call this a "hit or miss approach" and compares it to another m-service which allows for crop-specific subscriptions. Since Mittal's research of the green SIM, IKSL has made some of its messages more region specific, but within a certain region all green SIM owners receive the same messages. Also, because the information is often repeated, much of their messages are seen as superfluous. As one respondents put it:

*"The information is 50 years old. I know most of it."* (25 year old farmer, Tera)

On the other hand, for many farmers the content is quite dense and sometimes difficult to understand, as is shown in the following quote.

*"It is so fast, only 1 or 2 minutes, so sometimes I don't understand. Also, sometimes I don't understand the names of medicines because they are in English."* (48 year old farmer, Sameysi)

Like the 48 year old farmer from Sameysi, virtually all listeners have trouble understanding the names of the seeds and pesticides. This is understandable, since these names are quite difficult and new for the farmers. In fact, they are so alien to them that all farmers think the names are English, which is not true. According to a content creator from IKSL, an alternative would be to mention the products by brand name, but not all brands are available in the same areas. Moreover, they don't like to promote certain brands, as it is not important which brand the farmers use and brands come and go. Some of the respondents explained

to systematically call the IKSL call centre after hearing about some new product for clarification on the name.

Although not all farmers make full use of the messages, all respondents like the service, as it is free of costs and combines all sorts of information in one place. Farmers have complete trust in the messages, often because they implemented some of the suggestions and found successful results. After hearing interesting messages, farmers discuss them with others who don't have the green SIM.

## 8. INFLUENCE OF ASSETS ON PHONE USE

This chapter will answer the following question:

**Sub question 3.** *To what extent does the asset endowment enable or constrain mobile phone use?*

This section describes how differences in resource-based, cognitive-based and network-based assets influence phone use.

### 8.1. Resource-based assets

#### 8.1.1. Financial assets

Interestingly, there seems to be no relationship between income and how mobile phones are used. Most farmers like their phones and frequently call their friends and family and use their phones for various farming purposes. The difference is that richer farmers have much more need for business related calls, because they buy more, sell more and are generally involved in more side businesses. This means that richer farmers do use their phones more, but not because their views are different, or because they have more money to spend, but merely because they require the use of a phone more. To compare the different views, a closer look will be made at the five richest farmers and five poorest farmers of the sample.

The five richest farmers earn on average 400,000 ₹ (~€ 5.700) annually. The reasons these farmers earn so much more is because they have higher yields and some have extra sources of substantial income. These sources are pensions, full-time jobs and owning a shop. High yields and external income sources are interrelated as farmers can invest earned income in order to increase productivity. A simple example by one the respondents:

*“Because I pay for [buying] a diesel pump, I can irrigate my land when there is no electricity. Therefore, I can grow more than my neighbours.”* (60 year old farmer, Sameysi)

These households have much larger lands (average 3ha), and also much bigger families (average of 13). Because these households have much more income to spend, they can afford to spend more on mobile phones. This is partly shown in the data. The farmers have many more phones, and even some smartphones, but per person they do not spend more on calling or other use of the phone. Because many of these farmers have extra work like running a shop or renting a tractor, these respondents use their phones relatively more for farming and work than for friends and family. Also, most of these farmers hire labourers to work on their land, with which they frequently call. Interestingly, two of these richer respondents own a green SIM. Both of them are much more knowledgeable than most farmers and are in frequent contact with extension officers. One of them even runs an agricultural supply shop. Nonetheless, both enjoy the messages and listen frequently. The next quote illustrates this point:

R: *When a message comes I always listen, they are very useful.*

I: *What if a message comes and you are dealing with a customer?*

R: *I will just put the phone on the speaker. The customer might also be interested.* (45 year old farmer, Mal)

The five respondents that earn the least income earn on average ~24,000 ₹ (~€ 340) per year. Their households are smaller than average with 9 members. None of them has animals

or other extra income generating assets, except for day labour. The average land size is 0,7 hectare, but 3 of them are landless and lease their plots. Since their financial situation is so dire, they spend much less on non-food products, including phone use. However, they use their phones in similar ways, both for agricultural and non-agricultural purposes. The price of phones is not a big problem, as they are considered to be affordable and often received as a gift from a friend or relative. At the local phone shops, farmers can buy credit for as little as 10 ₹, which is enough to call for 10 minutes. Generally, farmers that do not have credit, often give a missed call to someone, after which that person simply calls back. Two of the lowest earners also own a green SIM. They have similar views of the messages and implement them whenever possible. Because the service is free of charge, it is equally available to all.

### 8.1.2. Electricity- and network problems

Other research has suggested that the adoption and use of mobile phones could be limited due to a lack of electricity and network problems (Nyamba & Mlozi, 2012). This has not been the case in this research. The availability of electricity varies from 8-22 hours per day, but that is considered enough for charging according to the respondents. A common phenomenon among the farmers is that farmers who own a phone, but have no electricity, charge their phones at a friend or neighbours' house. Although this is considered annoying, it does not seem to be a mayor inhibition for either the adoption or use of phones. Another problem that is mentioned in previous research is connectivity problems. Many respondents did state to suffer from a lack of connectivity at times, but not to the extent that it influences their behaviour. One farmer explained that he knew precisely which specific areas have better reception. A solution to connectivity problems is available, as one of the telecom providers has much more connectivity in the regions. That telecom provider, as most respondents know, is more expensive.

### 8.1.3. Crop-type

The perishability of crops influences how farmers sell their crops. Crops that are more perishable, fruits and vegetables, make farmers more inclined to sell crops fast. Besides that, the market rates for perishable crops are much more volatile, the prices change every hour, so farmers will call the market more often to inform about the rate. For perishable crops, variability in market rates is not only higher over time, but over distance and traders as well. The respondents that grow fruits do not call to more traders to compare the rates, but they do call more often. In other words, it seems that for fruit farmers, the mobile phone does lead to arbitrage over time, but not over distance.

## 8.2. Cognitive-based assets

### 8.2.1. Age

As previous research pointed out, the adoption of ICT is influenced by age (Venkatesh, Morris, Davis, & Davis, 2003). Although unable, because of the nature of the sample of this research, to give a definitive conclusion, this seems to be the case among Indian farmers as well, as indicated by the age differences. On average, the green SIM owners are 42 years old, the normal SIM owners are 48 years old and the ones without phone 52 years old. One of the reasons is purely physical. The eyesight problems of the elderly severely inhibits their ease in dealing with a phone. This problem is largely overcome with the help of (younger) family members; for example adding or changing contact numbers in the phone is usually done by a younger member of the family. Although a lack of understanding of the phone is often used as argument for not buying a phone, an underlying reason seems to be a lack of interest. An example in which this seems to be the case is the following:

- I: *Why don't you own a phone yourself?*  
 R: *I have no choice. I cannot operate the phone. I don't want to carry a phone that I cannot operate.*  
 I: *Why don't you ask your son to explain how it works?*  
 R: *I don't like it. I am not interested. I don't want to learn. (40 year old farmer, Gaura)*

Astonishingly the respondent eventually turned around, without any convincing on our part, and explained to want to buy a phone in order to buy a green SIM. This suggests that the reason for not having a phone, is rather a lack of interest than a lack of phone-skills.

Another respondent that did have a green SIM explained the following:

- R: *I listen to the messages most of the time.*  
 I: *Do you listen to it with your family?*  
 R: *Many times, I say to my father: listen to the messages, but he never wants to. Sometimes I give him the phone when a message comes. Then he likes it. (27 year old farmer, Dasher)*

Interviews with the youngest respondents showed that they are more capable in operating the phone. The seven youngest respondents are around 30 and have had more formal education and seem to have no problems with the phone whatsoever. These respondents seem to be more technology-savvy, as they watch more TV and radio. Some of them use SMS texts, and one even regularly visits internet cafés. It is less clear, however, whether these young farmers use their phones more. One of them doesn't own a phone and another one hardly ever uses it. The others do use it regularly and find it very useful, but not more than older farmers in their 40's or 50's.

### 8.2.2. Human capital

Despite low levels of education, most farmers at least use a phone. It is, however, clear that phone usage is influenced by the lack of literacy and ICT-relevant skills. Most farmers do not use the SMS option of phones, and many require help for more complicated tasks. An added difficulty is that most phones are completely in English and do not support Hindi script. Although virtually everyone can accept and end phone-calls – all you need to know is green for answer and red for ending – dialling a number requires basic navigation through the phone, for which at least recognition of the English alphabet is required. Most of the farmers are also able to do this. More problematic is adding phone numbers, which many of the farmers were not able to do. This is why many farmers have a very short list of contacts (5-10).

One might think that the problems with changing numbers in the contact lists and texting would be less of a problem for higher educated farmers, but this is not the case. Three farmers that completed a bachelor or master degree, still faced some problems with this. One of them explained that he preferred voice messages instead of SMS to receive the green SIM messages, because he would understand it better.

### 8.2.3. Green SIM

With regards to the adoption of the green SIM, the lack of phone-skills does form a severe hindrance. Many of the respondents that use the SIM try to convince their friends, but most will not change their SIM because of the hassle it creates for them. One farmer put it this way:

*“I discuss all the messages with my friends. They like to hear about it, but they only want the service if they can keep their own number. They say: How can my family call me if they don't have my number?” (27 year old farmer, Gaura)*

This highlights the problems farmers have with changing their SIM. Another explanation could be that farmers exaggerate their and their friends' liking for the green SIM during the interviews and mention the hassle of SIM change merely as an excuse. This explanation might hold some truth, but since the hassle of changing SIM was mentioned many times, it seems a legitimate problem.

### 8.3. Network-based assets

#### 8.3.1. Social capital

Previous research suggests that the size of social networks and the number of phones in those networks influence poor people's inclination to adopt a mobile phone (de Silva, Ratnadiwakara & Zainudeen, 2011). The authors found a statistical relationship between network size and strength with the adoption of phones. The data in this research does not reflect such a relationship. The 9 respondents that did not own a phone do not have smaller networks or weaker ties within those networks. In every visited village, phones were practically ubiquitous and virtually all farmers are always within walking distance of a phone. More precise, in every household that was visited, at least one working phone was available. Moreover, most people at least use mobile phones, so even non-adopters are always in the vicinity of a phone. Nevertheless, some respondents are not interested in owning a phone. The reason is that owning a phone is not an important goal for the farmers and there is no specific status related to it. Although many material things seem to have particular value of status such as proper clothing or a house of bricks, the mobile phone does not. At least, the respondents are not consciously aware of that social status. Therefore, more phones in one's vicinity does not seem to stimulate the adoption anymore. If anything, ownership by more people in one's network – especially, but not exclusively, within the household – makes a farmer less likely to own a phone.

To see why farmers do not desire to personally own a phone, it is useful to understand how the phone is used. As the previous chapter pointed out, roughly 40 % of the respondents use their phone primarily for farming, and 50 % use their phone primarily for social relations (figure 10). If the phone is used for farming, personal ownership is not important, as these farming related phone-calls are mostly outgoing and thus do not require to be available all the time. Social phone-calls are often with relatives that live far away, in another village. Thus, the availability of long distance social connections over long distances are an important reason for using a phone. Many respondents bought a phone to contact a specific relative in another place. Thus, a wider social network seems to foster the adoption of mobile phones. Social connections over short distances, however, are much less important reasons for adoption of phones. Moreover, calling with members from within the household is rarely done by the respondents. This is illustrated by a joke that one of the respondents made:

I: *Do you call your wife sometimes?*  
R: *Yes. When I am in this room and I want tea, I call my wife in that room. Then she will make tea and bring it me. [starts laughing] (59 year old farmer, Gopalhera)*

This is why not every individual needs to own a phone. For the use of a green SIM, ownership is much more important, but not for all; one farmer did not own a phone, but used a family member's phone to listen to the messages daily.



The impact of social capital on green SIM is highly important. Because farmers view the adoption of the green SIM as a hassle, they will not easily adopt it. However, farmers are more likely to adopt the green SIM if a friend of them owns one and shows them the benefits. IKSL's strategy of selling the SIM's is by employing "farmer's friends". These are farmers that promote and sell the green SIM to farmers in their communities. According to IKSL, these farmers are much more successful regular marketing associates. This strategy seems confirmed by the respondents. It seems that if farmers have stronger connections to green SIM owners, they will be more likely to adopt it. Moreover, most farmers are unaware about the green SIM. None of the respondents that were selected at random were familiar with the green SIM.

### 8.3.2. Gender gap

- I: *Does your wife own a phone?*  
R: *No. What does she need it for?*  
I: *Maybe she is interested in calling her relatives?*  
R: *Sometimes she calls relatives with my phone. I will dial the number and give it to her. (55 year old farmer, Chakpura)*

There is a shocking difference in phone ownership between men and women. Whereas 37 of the respondents own a phone, only one of their wives personally owns a phone. Although part of this can be explained by an unwanted selection bias, a clear gender divide is in line with previous research, such as de Silva et al. (2009). Those authors found that among the poor in India, males are 5 times more like to personally own a phone than women. The author explains that when a household adopts a piece of ICT, whether that is a radio or a phone, it will probably be used more – and therefore owned – by the man. The analogy with the radio is insightful regarding its use and ownership; many families only own 1 phone and the natural owner is the man, because he uses it the most. Personal ownership of the mobile phone is not important for many of the respondents, as it is not used for inter-household calls, but rather to call with relatives far away and shopkeepers or market traders. That's why some of the respondents act surprised when asked whether their spouse owns a phone. A common reply is simply: *No, why would she?*

The argument becomes weaker for households that have many phones, each of which is owned and used by men. But it still makes sense, men are usually the ones who do income generating work and are generally the most active in farming related activities. Nevertheless, women also participate in the latter, as well as in social phone-calls. It is clear that ownership of the phone is at least somewhat important for farmers, as there is never any doubt about who owns the phone. The question remains why women own their own phone less often.

It is difficult to discover the actual phone usage by women, since it is a sensitive topic. When asked, respondents often promptly say she doesn't use it, but when asked more specific questions it seems that women are very much interested in using the phones and almost always do. According to most male respondents, women are not able to operate the phone, so it would be pointless for them to own a phone. This seems logical to some extent, women might lack technical literacy due to difference in education and previous experience with phones and other ICT. However, a lack of education does not form an important barrier for phone ownership or usage. It seems that phone access for women is guarded by their husbands. If a woman wants to use a phone, she often has to ask their husband to dial the number, either because he has the phone on him or because she doesn't know how to dial a number. One respondent simply explained that his wife was not allowed to use the phone at all. He feared that other men might harass her over the phone. It might be that this is the

case for more respondents. In fact, it seems that the lack of phone skills by women is caused by not using them, rather than the other way around.

Although women own a phone less often, this does not mean they don't use it at all. Women seem to use it regularly, especially to call with their family. Moreover, when trying to reach farmers on their phone to make an appointment, often women answer the phone because their husbands are working in the field. The respondents explain they often leave their phone at home. For example if they have to work with irrigation, they leave their phone at home to protect it from getting wet.

In conclusion, there is a stark gender gap in terms of phone ownership and to a lesser extent in phone use and phone skills. This is caused by a combination of a cultural inclination to protect women, as well as the simple fact that men do the most phone-requiring activities.

#### 8.4. Livelihood strategies

There are considerable differences in how the three livelihood strategies influence phone use. Differences in monthly expenses on phone use are moderate and can be explained by whether respondents use their phone for non-agricultural work; subsistence farmers pay 186 ₹ per month, commercial farmers without work only 142 ₹ per month, and commercial farmers with work 257 ₹ per month. The subsistence farmers use their phone different than the other two categories. Most of the subsistence farmers use their phone primarily for social relations, rather than agriculture or work. It makes sense that farmers use their phone less for agriculture, because they don't sell their produce on the market. Also they use their phone less for calling shopkeepers, call centres, or friends to ask for advice regarding agriculture. This seems to be caused by the lack of resources that many of the subsistence farmers have, specifically the ones that are merely "hanging on". They seem less interested in information regarding their farm, because they often lack the money to pay for or the access to productivity enhancing measurements, such as high quality seeds. Subsistence farmers that have a green SIM do receive a lot of information regarding such measurements. They are similar to other green SIM users and do actually use their phone largely for agricultural purposes. Commercial farmers use their phone much more for farming, not only for marketing their crops, but also for calling the shopkeeper, call centre and others for information. The difference between commercial farmers that do not have non-agricultural work and ones that do is that the latter use their phone also for their work.

## 9. IMPACT OF MOBILE PHONE USE

This chapter tries to answer the question:

**Sub question 4.** *To what extent does mobile phone use substitute, enhance, disembody, exchange and combine the various assets?*

The first section deals with the impact on resource-based assets; first, the benefits of substitution for travelling; second, other impact for general phone use; and third, the impact for farmers with a green SIM specifically. The second and third sections deal with the cognitive- and network-based assets respectively.

### 9.1. Resource-based assets

The impact of mobile phone use on resource-based assets is limited, because they are rather rigid. The main problems that farmers face such as shortage of land and (timely) irrigation facilities are not directly influenced by the use of mobile phones. That said, most respondents claim that the mobile phone did increase their income from agricultural production, albeit not by much. It is difficult for respondents to estimate how much the adoption of mobile phones resulted in higher income, partly due to extreme variability in income caused by other factors. However, they can explain the various ways in which mobile phones lead to increased income. The causes can be divided into two categories: (1) substituting travelling costs for calling, thereby reducing the transaction costs and (2) enhancing the existing resources and thereby improving production.

#### 9.1.1. Substitution of travelling

One of the biggest benefits of using a phone is the substitution of travelling for making a phone call. Virtually all respondents mentioned to have benefited from this, but in particular the ones that live farther away from a market or specific shop. As most farmers' main transportation mode is the bicycle, travelling takes up a considerable part of their day. If farmers require something from Lucknow, they have to travel for hours. The phone therefore creates a considerable comfort for the farmers. Besides comfort, reduced costs of communication leads to increased income. Remarkably, the respondents in this research gave different explanations which were expected based on previous literature. Next sections describe the expected mechanisms followed by the observed mechanisms.

#### **Expected mechanisms**

Previous literature has described various ways how the substitution of the phone leads to benefits for farmers. The most important ones are mentioned in chapter 2, distinguished two mechanisms. The first mechanism (see section 2.2.2.), as studied by Muto & Yamano (2009) is as follows: Due to phones, transportation costs are lower, because traders don't have to travel randomly, but rather arrange meetings with the farmers. This means they can travel to more remote village and waste less travelling. This leads in theory to increased market participation. The respondents in this research did not mention this effect. The reason that this was not the case, might be that all farmers are within reach of markets and traders. This effect might be important in more remote areas in the state.

The second mechanism (see section 2.2.3), as studied Zanello et al. (2014), is as follows. Because of the phone, farmers can learn about the market-price more cheaply, for example by calling the market for example. When they are negotiating the price of their crops with a trader, they can bargain for higher prices because they have the knowledge of the actual market price. The second mechanism does not seem to take place for the farmers in the

sample. The simple reason is that most farmers hardly negotiate at all during transactions. As described in section 6.4.3., there is several reasons for the bargaining position of farmers, such as friendly relationship with the trader, the oversupply and urgency of completing the sales.

Some farmers do try to negotiate the price, in particular farmers that grow the more heterogeneous crops, such as mango. That makes sense since the value of mangoes is more subjective than the value of wheat. However, unlike Zanella et al. (2014) suggested, the use of the phone does not influence the bargaining position during these negotiations. This is because the phone only helps farmers gain knowledge about crop rates from other markets. The respondents cannot use that information in their advantage. This counts for farmers that use the phone for calling friends or traders to learn about the market rates, but the market information from the green SIM messages seems even less useful, as the following quote shows:

*“No bargaining. Prices that IFFCO [IKSL] mentioned are for example 1600 - 1700 while here it is only 1400-1500. If the trader says 1400, I tell the trader 1600, but the trader says 1400 again.”* (45 year old farmer, Mal)

The conception that market information on the general market prices influence farmers' bargaining position seem false. The market rate information that IKSL send is based on a central market that is often too far away to impress traders. The traders are not impressed by this information and easily dominate the negotiation process.

### **Observed mechanisms**

Although the above-described mechanisms are not found, respondents did experience the following three mechanisms. Firstly, farmers have more accurate and timely knowledge about the crop prices, farmers can plan their sales of crops in such a way that they get higher prices. This does not mean that farmers will visit more or different markets because of their phone. Farmers rather use knowledge about market rates to better plan the sales. Besides the traditional channels for market price information, such as TV, radio, visits to the market and friends, respondents now often call a friend at the market or the trader directly, or they receive the green SIM messages. Before farmers had a phone, they were completely dependent on these other sources of information for the market. This meant that their market price knowledge was less accurate because it was older. Knowing the true market prices on a daily basis enables farmers to better estimate when to harvest, store or sell their crops. For some farmers, this means they can get higher prices for their crops. One of the respondents who didn't own a phone by himself explained the following:

*I ask someone in the village and call to the market. If the price is high, I will go then [to sell his crops].* (60 year old farmer, Dasher)

Far from all respondents are interested in daily updates of the market prices. Most will simply ask someone face to face whenever they meet them. And even for the farmers that do desire timely and accurate market prices, many different sources are available. Therefore it cannot be concluded that the mobile phone substantially influences the price of crops because of more timely and accurate knowledge.



**Figure 12:** How farmers receive market-rate information (N=45)

As is seen in figure 12, most people do not use the messages as a main source of market-rate information. The reasons are threefold: first, the market rates that are provided by IKSL are based on wholesale markets at Lucknow, rather than local wholesale markets. This means that there is often a discrepancy between the two. Second, the green SIM messages only report on the most grown crops, mainly wheat and rice. Third, the messages are sent in large intervals, monthly or weekly, while market rates change by the hour.

Secondly, as explained in section 7.2.2., most poor farmers choose to sell their crop as fast as possible, due to loans and limited storage possibility. Farmers can sell their crops faster, because they can call the traders to collect their produce as soon as they harvest, rather than wait for them to come. Because the produce will be sold more fresh, the price will be higher and the losses lower.

*“I sell my crops faster, because I call the trader when my crops are ready for harvest. Before I had to wait for the trader to come to our village and he does not come every day.”* (40 year old farmer, Simramau)

Thirdly, farmers can sell their products directly to customers much more easily due to the phone. This has major effects on the prices they receive, because it eliminates the middle man and often saves transportation costs. However, the amount that is sold this way is only a small portion of the total sales.

### 9.1.2. Enhancing resource-based assets

Another way that farmers' incomes increase is the improvement in production methods, thereby increasing the efficiency of resource use. The most important mechanism that was mentioned by the respondents was better damage control; whenever a crop is showing unexpected damage, farmers can call a helpline and learn how to deal with their specific problem. This help is extremely valuable for farmers as the advice they receive is tailor-made for their specific problem. A small group of respondents frequently calls helplines, up to once a week. They ask for advice for various purposes, but it seems the most beneficial for pest control. Although the helpline is very popular among some, others don't like the helpline because of a bad experience. For example, one respondent explained how he tried to receive help from a helpline once, but they were not able to help him, after which he never

asked them again. In this particular case the respondent asked how to improve his yields, which is presumably too vague for a helpline. Moreover, many farmers indicated to have called the helpline, but the call was not received. This was confirmed by an employee of the IKSL office, who explained that they can answer hardly 30 % of the incoming phone-calls.

### 9.1.3. How the green SIM enhances resource-based assets

Most respondents did claim to have benefited from increased production as a result of the green SIM. The respondents reported 5 ways through which the green SIM messages have led to specific benefits. They will be discussed in order of importance:

#### **Weather information**

For 1/3<sup>rd</sup> of the green SIM owners, weather information has been the most useful with regard to increasing their production. Unexpected rain can wash away recent planted seeds or fertilizer or damage fruits. Because farmers are more aware of the expected rain, they can largely avoid such catastrophes. Moreover, predictions of rainfall can improve the planning of irrigation, which saves money spent on irrigation as well as avoid flooding. Many respondents prefer receiving the weather forecasts from the green SIM messages, even though it is available from countless other sources as well.

*Like this morning, there was rain. IFFCO [IKSL] had told me that I didn't have to irrigate my land. It saves a lot of money, because I don't have my own tube well (31 year old farmer, Chakpura)*

#### **Animal health**

For the farmers who own cattle, information on animals was often considered as the most useful. The information that is provided ranges from sanitation, breeding, diseases and general care. Respondents value all of that information, as it is usually not available to them. In some villages a veterinarian visits every 6 or 12 months, but others had to take their cow to another village when it is ill. It is difficult to estimate how much this influences the animals' health, but it is a substantial impact according to the respondents. Respondents stated for example that their animals were ill less often due to the messages. Advice regarding animals is highly valued because it is frequent and there are few other sources for it.

#### **Plant protection**

Information on plant protection helps farmers deal with, or prevent damaged crops from pesticides and extreme weather conditions. This is highly important information for farmers, but is available from other sources as well for most farmers. Shopkeepers that sell the relevant products are the main source of information for most farmers. The green SIM messages are potentially very useful, but some problems reduce its implementation. As aforementioned, farmers often don't understand the names that IKSL mentioned, which makes it difficult to remember them. Also, particular products are often not available or too expensive.

#### **Changed production techniques**

Two of the respondents made big changes in their crop selection and cultivation methods. Growing more high-yield crops in combination with careful planning and implementing of specific steps in the growth cycle gave yield increases of around 10 %. Many respondents, could not take such action because they lack the access to the specific products or the money to invest.

## **Health of soil**

The green messages also include information about how to apply organic, as well as chemical fertilizer. This information is widely available, however, so for most respondents it did not change their behaviour due to the green messages.

The effects described by the farmers might be exaggerated because it is difficult to isolate the effects. The information that is given through the ISKL service is largely available through other channels, such as newspapers, TV, radio, friends and family, shopkeepers and in some instances government officials. Only some respondents say that the green SIM is their only source for specific information. Nonetheless, the importance of the green SIM should be acknowledged as at least partially responsible for the improvements on the farms.

## **9.2 Cognitive-based assets**

The previous section has analysed to what extent the phone can substitute and enhance tangible assets, but these are mainly indirect. Much more direct is the impact of phone use on the cognitive assets, although also more difficult to establish. This section analyses to what extent mobile phones actually increase farmers' human and psychological capital.

### **9.2.1 Human capital**

As mentioned before, the mobile phone is used during all stages of the farming cycle. It forms a potential channel of information, either to connect with other farmers, a shopkeeper, or experts on agriculture. This increases their knowledge base on farming in three ways:

#### **New knowledge**

It provides them with new knowledge. This is surprisingly not the most important way a farmer improves his knowledge base. Most of the knowledge farmers actively search for through the phone, they searched for by visiting someone in the past. If they call a shopkeeper for information, they will receive largely the same information as when they visited the shop. The exception is the access to experts, either from the government or from the IKSL office, which can provide them with information previously unavailable. Although this possibility is open to all, only a small portion of the respondents frequently calls help centres and benefits from truly more information. Even among the respondents that regularly contact call centres, very few have translated the new information into radical changes in their farms, such as changing crops or improving techniques. The helpline is thus primarily used for answering the same questions that they asked before they had a phone.

#### **Timely knowledge**

Farmers can access the knowledge they require at the exact time that it is needed, without having to travel long distances. Most farmers, however, do not perceive the mobile phone as having increased their ability to deal with problems. Many farmers still prefer to visit a shopkeeper, rather than call him, for inquiries about his products. The exception, as previously discussed, is market-rate information for which time does make a considerable difference.

#### **Knowledge in one place**

Some respondents highly value the availability of all necessary knowledge in one place. For some, that one place is the shopkeeper, for others a friend. The green SIM is also mentioned as a good all-in-one source of agricultural information.

## Better knowledge

The knowledge that farmers can attain through the mobile phone is potentially truer, because it can be accessed repeatedly. Since farmers lack literacy skills, it can be assumed that farmers make mistakes in remembering new instructions. Moreover, the information provided through helplines and the green SIM messages are less likely to contain mistakes. This is important because respondents are generally trusting towards their sources of information, including shopkeepers and neighbours. The green SIM greatly enhances farmers' knowledge set, because it sends daily consistent qualitative messages. The respondents claim to understand most of the messages, discuss them with their friends, and are able to memorize the lessons. Some problems are indicated, however. Often problems occur with specific names of new chemicals on the market, but interested farmers frequently call the helpline when they lack understanding. However, as discussed before, from the knowledge that is sent by IKSL only a portion is received by the target group. Many respondents explain to be too busy with work to listen to all the messages, while others are not interested or not able to understand everything. Moreover, the messages are limited by 1 minute and are spoken slowly for clarity. This means that the information that is transferred is limited. Thus, although the information is highly useful, it cannot transform the knowledge and skill set base of farmers in a radical way by itself.

Moreover, many farmers do not feel they are in need of new or better information. They are in need of more land, cheaper seeds, or free irrigation facilities. Many respondents said something similar to the following:

*“I don't need information because I have just a small piece of land and I have knowledge from experience. My family has been farming for many years.”* (55 year old farmer, Wasi Udain)

Besides agricultural knowledge, the phone potentially improves knowledge ranging from health, to government schemes, to the English language. Most respondents did not mention any of these benefits. A few respondents did use their phone for contacting schools and one respondent explained to access his bank account. It does seem that the practise with the mobile phone does make farmers more ready for future developments in ICT, such as the smartphone.

## 9.3 Network-based assets

This section describes how the phone enhances pre-existing social relations, both for strong and weak ties.

### 9.3.1 Strong ties

As mentioned in the previous chapter, mobile phones are used to keep in touch with friends and neighbours within the village, as well as friends and relatives from other villages. Most of the respondents experienced a stronger relationship due to the mobile phone. Especially when a relative or acquaintance lives somewhere else, a weekly phone call makes a big difference.

These strong social ties improve access to resources from another village or city. One respondent joyfully explained the benefits of his mobile phone:

*“When I need something, I just call someone and ask him to buy it. I don't even have to pay, I do that later.”* (27 year old farmer, Dasherri)



This shows how the mobile phone can stimulate helping each other and initiate reciprocity. Assumingly, farmers can become more inclined to ask for favours, but primarily within their community, for a certain level of trust and social cohesion is needed.

Interestingly, contact by phone does not entail that farmers see each other less. If anything, farmers see the people in their social network more often. As one of the respondents put it:

I: *Do you travel less, since you have the phone?*

R: *No. I travel more. A person will call me on the phone and ask me to come over. (31 year old, Chakpura)*

### 9.3.2 Weak ties

The mobile phone also strengthens farmers' existing networks of weak ties. As indicated above, the shopkeeper is an important contact with whom farmers frequently communicate. The possibility to call with seed shops limits the need to actually visit the shops. This is very useful, as products farmers want are often not available. Many respondents complain about the availability and quality of the seeds. Most respondents explain that they will call the seeds shop first, before they visit them. The distance of the seeds shop ranges from 5 to 30 km, which is quite far to traverse by foot or bicycle. The same accounts for other shops, which sell essential products such as medicines.

The mobile phone is also commonly used to contact traders and acquaintances who work at the market. This forms their primary source of information on the market prices.

Due to the mobile phone, farmers can more easily reach many customers directly, thereby bypassing the trader. This reduces the fees of the trader and gives the farmer more bargaining power. However, this form of selling crops remains relatively little used.

In addition to this, respondents indicate they frequently contact call centres, either from IKSL or the government to ask for specific information about their farm. This is potentially a highly useful source of information, but respondents' experience is mixed. Some farmers claimed that they could not reach anyone, and others felt they could not help. Nevertheless, most of the respondents that tried the helpline once were satisfied and used it more often. Many farmers call such a helpline frequently, up to 15 times a month. The reason this service is so successful is that it is personal, elaborate and truthful. The main reason farmers call the helpline is when they face a new problem such as a pest in their fields, or a problem with their animals.

Although the primary goal of the green SIM is to provide a one-way channel of information, it can be used as a two way channel, which makes it an important link in farmers' networks. Previous research on the IKSL service has pointed to the weakness of m-services that provide information in a one-way fashion. The respondents in this research did use the helpline, often right after they received a message to be informed about something that was unclear.

## 10. CONCLUSION & DISCUSSION

This thesis analyses mobile phone use by poor farmers in a holistic and systematic way. This chapter summarises the findings and places them within the context of the scientific literature. The research question is:

**How does the use of a mobile phone, and of IKSL's green SIM specifically, influence the resource-, cognitive- and network-based assets of poor farmers in Lucknow?**

To answer the research question, 45 farmers have been interviewed that live in villages surrounding Lucknow. The interviews contained primarily open-ended non-suggestive questions, intended to elicit elaborate and truthful answers. The analysis was based on Duncombe's (2014) framework which takes into account three different asset classes. This research shows the benefits as well as the downsides from using Duncombe's (2014) approach. The shift towards more intangible assets has proven useful, because it is here that the impact is most keenly felt. The mobile phone directly influences farmers' social networks, by strengthening their relations, as well as cognitive capital by giving them a timely and easier connection to various sources information. The difficulties of this approach have also become clear, as it is both very difficult to take into account every part of a household's livelihood. It has proven impractical to thoroughly investigate all assets, in particular psychological capital. Nonetheless, most of the indicators have been analyzed sufficiently to answer the sub questions, which are discussed below.

***Sub question 1.** What are the resource-, cognitive- and network-based assets of the farmers?*

Farmers in the Lucknow area grow a wide variety of crops. Some focus on staple crops such as wheat, rice or potato, while others focus on cash crops such as mint or mango. The challenge for farmers is to grow enough crops to support their families on very small plots. The respondents have varying sizes of land, ranging from marginal (0.25 ha) to very big (10 ha). Marginal farmers often lease part or all of their land, which means they have to pay the landowner part of their profit. Due to the highly skewed pattern of rainfall, the cultivation of winter crops require proper irrigation infrastructure, such as tube wells and electricity. This is another problem, in particular for poor farmers who often decide not to irrigate the land to save on costs, which results in lower yields. These poor farmers sell their crops for around 20 thousand rupees annually, only 10% of what many of the medium sized farms produce.

The lack in these resource-based assets is easy to observe, but they tell an incomplete story. Farmers lack basic education and modern farming skills and knowledge, which inhibits their ability to achieve the potential yields. In order to improve their productivity, farmers need to access agricultural information about new techniques, better crop varieties and application instructions. For such information, the respondents rely mostly on their social networks, while information—of presumably better quality—is available through various media. Furthermore, virtually none of the farmers is actively trying to improve their farming practices, as they think their own experience will carry them through.

Another reason that farmers are not more actively searching for more information seems to be psychological. According to Duncombe (2014), psychological capital can be an important asset for farmers, however, due to practical limitations, it was not possible to investigate this properly in this study. However, the interviews with the respondents do seem to suggest the importance. Farmers feel powerless towards other actors in their environment; government officials who are supposed to help them, only act in their own interest, bank employees will not give them loans without a bribe, and shopkeepers try to sell them the wrong products.

Some farmers have resigned themselves to the idea of low profits and instead of trying to improve their productivity, pin their hopes on getting a better job for themselves or their children. It is easier to earn a living from a fulltime job, or even from doing day-labour, than by selling their crops. Future research into the psychological assets of poor farmers might be useful for understanding their capabilities as well as their restraints in this area.

The lack of resource-based and cognitive-based assets are also found in previous research in Lucknow (Kumar, 2008; NABARD, 2009). Although network-based assets are not as extensively investigated in Lucknow, research elsewhere shows how network-based assets of farmers compensate for the lack of other forms of capital (e.g. Fafchamps & Lund, 2003; de Weerd & Dercon, 2006). Such compensation mechanism seems equally important in the Lucknow area. This research shows that the most important network is based on kinship, with strong links and frequent contact, which can be a safety net for a rainy day. Most respondents ask their family or friends for help when they are in financial problems. Also, networks are an important source of agricultural related information, from market-rates to new crop varieties. Central roles in these networks are often more progressive farmers and shopkeepers, who are sources for agricultural information. In theory such networks can be efficient in spreading new knowledge and innovations, but the skills and know-how of the central persons can be questioned. An important part of the agricultural cycle is the marketing of the produce, which is done in various ways. Most farmers sell their crops at a whole sale market or sell it to a trader who comes to collect it at the village. In both situations, farmers are generally not in the position to bargain, because they are in a hurry to sell their products. Other research such as Lee and Bellmare (2013) and Zanella et al. (2014) and have probably overestimated farmers potential for bargaining. Other research has pointed to the lack of bargaining power due to seasonal variation and unorganized and imperfect market system (e.g. Pandey, Kumar, & Singh, 2011; Cherukuri & Reddy, 2014)). This research shows that farmers feel utterly powerless towards the trader, but in other economic relations as well. They also feel powerless towards shopkeepers who will not sell them proper products, or the government officials who only act out of self-interest.

It is useful to view the assets endowments of farmers in the context of vulnerability. In a regular year, the respondents live a reasonable life and can afford their day-to-day expenses. It is only when they are struck by unexpected high costs that they can get into trouble. The main source of uncertainty is the variability and unpredictability of the climate. Besides the unequal spread of rainfall throughout the year, farms are often struck by unseasonal rains, hailstorm or drought. At the time of the interviews, most of the respondents had suffered in the previous season from unseasonal rains, leading to crop losses up to 80%. Another source of frustration in some areas around Lucknow is the Nilgai, a wild animal that feeds on farmers' crops. Moreover, the respondents suffer disproportionately from health problems and accidents. Then again, the government is actively trying to assist farmers, by compensating them financially during crop loss for example. According to the respondents, however, farmers hardly receive the appropriate compensation.

The differences in resource endowments make for different livelihoods-strategies; a distinction is made for subsistence farmers, commercial farmers without- and commercial farmers with non-agricultural work. The first two groups are mostly "hanging on"—they use their assets to maintain their current living conditions, rather than improving it. The farmers with non-agricultural work are able to use some of their resources to extend their livelihood activities, thereby improving their living conditions.

***Sub question 2.*** *How is the mobile phone used for agricultural and non-agricultural purposes?*

Phone use among the respondents is widespread; from all 45 respondents only 2 do not use a phone regularly. 7 of the respondents didn't own a phone personally, but did use a phone that was available in the household. This illustrates how little important actual ownership is for the respondents. There seems to be no social status related to it, and according to many respondents no benefit either. One of the reasons might be that the mobile phone is their first phone; they have no experience with landlines and therefore confer less importance to the "mobile" part. Phones are not even used to call with relatives within the household, but rather to relatives who live far away. For some respondents, the mobile phone is primarily used for work, whether that is day-labour, or some full time job that entails direct contact with customers (such as a plumber or a shopkeeper).

For many of the farmers, the phone is used for agricultural related purposes. Farmers are in frequent contact with shopkeepers, traders, friends at the market, and some even with helplines. Remarkably, for 65 % of the green SIM owners agriculture is the main purpose of using their phone. By comparison, 25 % of the normal SIM owners use their phone for agricultural purposes. This shows a big difference in applications of the mobile phone, whether it is perceived as a social tool or an instrumental tool for development of the farm. The difference is largely based on the use of the free messages, but green SIM owners also make more use of farmers-helplines. It seems that merely owning a green SIM leads to using a phone more for agriculture, but confirmative conclusions cannot be drawn from this research alone. Future research that is based on a before-and-after with a larger sample size might confirm the causal relationship. The numbers of normal SIM owners correspond roughly to previous literature; all-India numbers show that around 70 % of rural livelihoods use their phone for purely social purposes (Zainudeen, Iqbal & Samarajiva, 2010).

Regarding the specific use of mobile phones for agriculture, this research also roughly confirms previous literature, such as Martin and Abbott (2011), who conducted a comprehensive study on phone use in rural areas in Uganda. Martin & Abbott describe similar mobile phone use by farmers; the farmers that use the phone for agriculture, mostly use it to coordinate sales of inputs (80%), followed by contacting the market for crop rates (70%), agricultural emergence (60 %) and consulting expert advice (50 %). All these categories have been found to be important in Lucknow as well. The similarities suggest that the poor farmers who are the subjects in this research do not use their phones substantially different from the average farmers who are the subjects in Martin and Abbot's research. Two important differences can largely be attributed to the differences in sampling. Martin and Abbot found that 50 % of the farmers use their phone for monitoring financial transactions, while this research found no evidence of such behaviour. Besides the availability of credit in the Lucknow region, the difference is caused by Martin and Abbot's selection of farmers affiliated with VEDCO, an NGO that provides microcredit. Another, difference is the use of agricultural helplines for advice, which is higher in the current research due to the sampling of green SIM owners.

The green SIM messages contain useful information, but the reception by the audience varies widely. The respondents find the information really useful and listen to the messages carefully. A problem with the messages seems to be what Mittal et al. (2010) describe as a hit-or-miss approach. Since all respondent within a certain area receive the same messages, they content is not always useful for any individual. A similar problem is with the difficulty of the messages. For some the information is too simple, too often repeated and not specific enough. For others, the information is too short, quick and difficult. Despite the problems of understanding and suitability of the specific messages, all respondents purport to enjoy listening to them and do so whenever they can. However, in reality the perspective of users on the green SIM might be less positive due to two forms of bias inherent in this research. Besides the selection bias caused by non-response, the respondents may have been (unconsciously) more positive towards the service because the interviewer was perceived to

be affiliated with IKSL. The second type of bias seemed limited, as respondents seemed at ease and even openly criticised IKSL as well.

***Sub question 3. To what extent does the asset endowment enable or constrain mobile phone use?***

The mobile phone seems a useful tool for development, because it is almost equally available to the poor as to the rich. Contrary to expectations, farmers that have fewer financial resources do not use their phone any different than others. Virtually all farmers consider the use of mobile phones and the green SIM affordable. Moreover, poor farmers have an equal regard for the mobile phone as other farmers do and perceive the benefits similarly. Although poor farmers have less money to spend on calling, they can still use the phone for agricultural and other purposes. Even more striking is that the lack of electricity does not seem to be a problem for farmers. Multiple respondents do have a phone, but no electricity; they just charge their phone at a friend's place. Thus, physical assets seem to have no influence on mobile phone use by farmers. The mediating effect of cognitive capital on phone use is less clear-cut. It seems that formal education has no influence on farmers' inclination to own or use a phone. As other research has indicated, psychological capital does point to perceptions (Source). Farmers in Lucknow seem to have a very positive attitude towards phones, primarily because it makes communication with friends and families so easy and cheap. Personal ownership seems determined by the need for instrumental practices, such as a job.

Differences in phone ownership and usage can be partly explained by age differences. The argument is twofold. Older farmers (~60) are less capable of using the phone because they are less educated and suffer from eyesight problems. However, since these problems seem to be overcome with the help of others, more important seems to be a lack of interest. Younger farmers also tend to make more use of other media such as TV and radio. Interestingly, no difference was found between the very young farmers (~30) and the average farmer (~50) in terms of interest and phone use.

Much more pronounced is the gender gap in the sample. Whereas 39 farmers possess their own mobile phone, only 1 of their wives does. Although the gender gap in phone use has been described before, for instance by Zainudeen et al. (2010), this research shows that it might be even stronger among poor farmers in India than previously expected, as virtually none of the respondents had a wife who owns a phone. This gap is partly explained by the use of the phone, as men are the ones that have jobs and organize most of the farming. However, there also seem to be a culturally embedded reason for this; protecting women from contact with other men out of fear for harassment. Still the gender gap is less pronounced than mere ownership tends to suggest. Phones are often shared throughout the household and women often answer phone-calls when men are away from home. Personal ownership is less important since phones are usually not used to call within households, but rather between households. However, the cultural and practical reasons for the gender gap might not change in the immediate future and both research as well as policy ought to address this problem.

***Sub question 4. To what extent does mobile phone use substitute, enhance, disembody, exchange and combine the various assets?***

Probably the greatest benefit of the mobile phone is how it is used as a *substitute* for travelling, thereby reducing transaction costs associated with marketing. The mechanisms through which reduced transaction costs lead to increased welfare for farmers have been examined and theorized in previous research, but the findings have not been clear-cut. The present research has given more insight into these mechanisms because of its inductive approach. Previous studies have suggested a relationship between lower marketing costs and

increased market participation. This was not found in this research; although respondents are not always near a market, selling the crops was not a big problem for the farmers. Moreover, the risks associated with deciding what and how much to grow is not alleviated by knowing the market rates more precisely and timely, as was suggested by Muto & Yamano (2009). In other words, the adoption of the mobile phone does not seem to lead to increased market participation. Other research (e.g. Lee & Bellemare, 2013; Zanello et al, 2014) has suggested a relationship between lower marketing costs and increased bargaining power. Already in 2010, Mittal et al. (2010) found no consistent evidence for the perceived idea that farmers' bargaining power will increase if they are "armed with market price information". Based on the findings of this research, there seems consistent evidence that farmers do not gain bargaining power from increased market knowledge, either collected by calling someone or from the voice messages. This is partly because farmers hardly negotiate at all, but also because the market-information does not impress buyers. Buyers are not impressed due to the plenitude of farmers that try to sell their crops.

This research did find three different mechanisms through which farmers benefitted:

1. Farmers have more accurate and timely knowledge about market rates, because they frequently call someone at the market. This knowledge can be used, not for bargaining with traders, but to time their sales better and receive higher prices.
2. Farmers can sell their products more quickly. Whenever they harvest their crops, they call for traders to come, rather than wait for them. This is particular useful for perishable crops and farmers with limited storage space.
3. Farmers sell their crops more easily directly to consumers because of the phone. This gives them more bargaining power and eliminates the margin that the trader absorbs. However, these sales make only a small part of their total sales.

The extent to which these effects result in income gains is difficult to measure, because they are presumably small, farmers do not keep a record, and the effects are obscured by the large variations in farmers' income. Nevertheless, these mechanisms enrich the existing understanding of the effects of mobile phones on farmers' income.

The mobile phone can also be seen as *enhancing* farmers' current access to resources. The phone is used to attract knowledge that increases land- and labour- productivity. The level of increased productivity is moderate, because the mobile phone does not lead to the search for new knowledge. Much of the knowledge has always been available from a multitude of sources, such as radio and TV, as well as face-to-face communication with shopkeepers and in some cases government officials. Much more important than access to new knowledge, is the access to better knowledge the phone provides. Knowledge about markets, the weather or how to deal with specific pests that are gained through shopkeepers, friends and family are not always up-to-date and reliable. The phone is used to access that knowledge much more often, at the time that it is needed. Therefore farmers will make fewer mistakes by forgetting or miscommunication. The knowledge that farmers access through phone use can be assessed as more accurate, timely and easily accessible. This can be considered as enhanced cognitive capital, which enables them to make better farm related decisions, potentially leading to enhanced physical capital. It is clear that access to qualitative knowledge has improved and that farmers implement the knowledge, however, further research is needed to confirm to what extent farmers learn from owning a phone or receiving the green SIM messages. Besides the content, farmers seem to learn basic ICT skills.

More pronounced seems the impact resulting from the green SIM messages. Respondents especially like the weather forecasts and livestock advice. The findings are in line with earlier findings on the IKSL service from Mittal et al. (2010) who found that farmers prioritized forecasts, plant protection, seed information and market prices as the most important. This research confirms the findings by the authors, which entails that farmers are hardly looking for information about radically transforming their farm, such as changing their cropping

patterns and cultivation techniques. The authors emphasize that the messages are liked because of the quality of the information that is received through the phones, as compared to information that was available to them before. This research confirms that farmers value the information because it is more accurate, timely and always accessible. A distinctive feature of the green SIM is that the content of the messages is decided by experts and pushed towards the farmers, rather than that farmer's request (pull) the information themselves. This gives farmers access to knowledge that they are not searching for. This is invaluable, since the farmers are generally not searching for new knowledge, despite its usefulness.

Respondents also reported that their social networks have improved, in particular relationships with friends and family in far-off places. Independent of the type of SIM, phones enhance farmers' social networks, both with friends and family, as well as looser ties such as with shops and acquaintances. The strengthening of these networks is not only a purpose in itself, but can result in additional benefits. For example, when an emergency occurs farmers can call a relative to come help, or when a farmer needs something from a shop he can ask his friend to bring it. It seems that due to the phone, farmers are more inclined to ask each other for favours. It seems, then, that the phone might improve social cohesion within communities.

Although the phone saves many trips, farmers do not report to see their friends and family less often. Some farmers even claimed to pay more social visits due to the phone. This remarkable finding is at odds with previous research such as Souter et al. (2005), who found that most respondents have reduced the number of social visits due to the mobile phone. The discrepancy might be caused by different samples; whereas Souter et al. focus on all rural communities in three countries, this research's main focus is on mostly poor farmers. The phone use by poor farmers largely directed at relatives that live far away and work related purposes. Other rural people might use the phone more as a substitute for face-to-face meetings.

Two of the effects that were expected from Duncombe's (2014) framework have not been found in this research. The theory describes how the phone's contact list is a *disembodiment of social relations*, which can potentially help to remember contacts. This effect did not occur for any of the respondents, at least not consciously. This might be due to the relatively small networks that farmers have. The second effect is the *combination and exchange* of assets, such as m-money or the use of talk-time as a saving instrument. This effect has not been confirmed in this investigation.

The research design does not allow for the measurement of long-term impact of the mobile phone. Further research is required to establish whether increased connectivity and access to better information lead to permanent livelihood improvements. It seems, however, that such impact is limited, since the effects of the mobile phone seem not substantial enough to solve farmers' structural problems. In particular for the poor who cultivate a marginal plot and lack financial resources to apply the required inputs, extra connectivity or improved knowledge will not improve livelihood. More broadly, for most farmers, a lack of knowledge, or a lack of connectivity is not the bottle-neck that impedes their development. The structural problems that many of the respondents—in particular the ones that are “hanging on”—face, are related to resource base assets. Firstly, farmers do not have access to the proper seeds, chemicals and fertilizer, due to limited supply in government shops, or over the top prices. Secondly, farmers lack affordable and consistent irrigation facilities. Thirdly, farmers lack storage facilities to store their crops in order to wait for higher prices. Although the mobile phone improves farmers' cognitive- and network-based assets, these cannot completely substitute for the lack of resource-based assets. Even though poor farmers have equal access to the phone and the green SIM, some of them are not able to make use of its full potential. The mobile phone is not a panacea, but since its spread is driven by sheer market

forces it should be applauded nonetheless. Moreover, IKSL's green SIM shows how a for-profit company can successfully address rural poverty.

It is important, however, to note the limitations of this research. Since the sample is small, geographically focussed, and non-random, the results cannot be blindly extrapolated to all poor farmers in India. Moreover, due to difficulties for respondents to remember and understand things that happened in the past, the findings might not always be accurate. However, respondents can describe their behaviour, their problems, and how the phone influences their lives. It is up to future research to measure the exact effects of phone use among poor farmers.



## REFERENCES

- Aker, J.C. (2008). *Does Digital Divide or Provide? The Impact of Mobile phones on Grain Markets in Niger* (Working paper No. 154). Berkeley: University of California Press.
- Aker, J.C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics*, 2(3), 46-59.
- Anderson, S. (2003). Why Dowry Payments Declined with Modernization in Europe but Are Rising in India. *Journal of Political Economy*, 111(2), 269–310.
- ASER, Annual Status of Education (2015). *Annual Status of Education Report 2014 - rural*. New Delhi: ASER Centre
- Babu, S.C., Joshi, P.K., Glendenning, C., Asenso-Okyere, K., & Sulaiman, V.R. (2013). The state of agricultural extension reforms in India: strategic priorities and policy options. *Agricultural Economics Research Review*, 26 (2), 159-172.
- Banerjee, S., Mukherjee, V., & Haldar, S. K. (2015). *Understanding Development: An Indian Perspective on Legal and Economic Policy*. New Delhi: Springer
- Burrell, J., & Oreglia, E. (2015). The myth of market price information: mobile phones and the application of economic knowledge in ICTD. *Economy and Society*, 44(2), 271–292.
- Bryman, A. (2008). *Social research methods* (3rd ed.). Oxford: Oxford University Press.
- Camacho, A., & Conover, E. (2011). *The Impact of Receiving Price and Climate Information in the Agricultural Sector* (IDB Working Paper No. IDB-WP-220). Washington DC: Inter-American Development Bank.
- Carmody, P. (2012). The Informationalization of Poverty in Africa? Mobile Phones and Economic Structures. *Information Technologies & International Development* 8(3): 1-17.
- Cherukuri, R.R., & Reddy, A.A. (2014). Producer organisations in indian agriculture: Their role in improving services and intermediation. *South Asia Research*, 34(3), 209-224.
- CIA, Central Intelligence Agency (2015). The world factbook, South Asia: India. Retrieved November 9, 2015, from <https://www.cia.gov/library/publications/the-world-factbook/geos/in.html>
- Courtois, P., & Subervie, J. (2015). Farmer Bargaining Power and Market Information Services. *American Journal of Agricultural Economics*, 97(3), 953–977.
- Das, D., & Pathak, M. (2012). The Growing Rural-Urban Disparity in India: Some Issues. *International Journal of Advancements in Research & Technology*, 1(5), 145-151.
- de Haan, L., & Zoomers, A. (2005). Exploring the frontier of livelihoods research. *Development and Change*, 36(1), 27-47.
- de Weerd, J., & Dercon, S. (2006). Risk-sharing networks and insurance against illness. *Journal of Development Economics*, 81(2), 337–356
- de Silva, H., Ratnadiwakara, D., & Zainudeen, A. (2011). Social influence in mobile phone adoption: Evidence from the bottom of pyramid in emerging Asia. *Information Technologies and International Development*, 7(3):1-18.
- Deshpande, M.S. (2010). *History of the Indian caste system and its impact on India today*. San Luis Obispo: California Polytechnic State University
- Donner, J. (2015). After access: Inclusion, global development, and a more mobile Internet. Cambridge, MA: MIT Press.
- Dorward, A., Anderson, S., Bernal, Y. N., Vera, E.S., Rushton, J., Pattison, J., & Paz, R. (2009). Hanging in, Stepping up and Stepping Out: Livelihood Aspirations and Strategies of the Poor. *Development in Practice*, 19(2), 240–247.
- Duncombe, R.A. (2012). *Mobile Phones for Agricultural and Rural Development: A Literature Review and Future Research Directions* (Working paper No. 50). Manchester: Centre for Development Informatics
- Duncombe, R.A. (2014). Understanding the Impact of Mobile Phones on Livelihoods in Developing Countries. *Development Policy Review*, 32(5), 567–588.

- Duncombe, R.A., & Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: A review of concepts, methods, issues, evidence and future research directions. *Third World Quarterly* 30(7), 1237–58.
- Egyir, I.S., Al-hassan, R.M., & Abakah, J.K. (2011). The effect of ICT-based market information services on the performance of agricultural markets: experiences from Ghana. *International Journal of ICT Research and Development in Africa*, 2 (2):1-13. [9]
- Fafchamps, M., & Lund, S. (2003). Risk-sharing networks in rural Philippines. *Journal of Development Economics*, 71(2), 261-287.
- Fafchamps, M., & Minten, B. (2012). Impact of SMS-based agricultural information on Indian farmers. *The World Bank Economic Review*, 26(3), 383-414.
- FAO, Food and Agricultural Organisation (2002). Smallholder farmers in India: Food security and agricultural responsibility. Bangkok: FAO
- Furuholt, B., & Matotay, E. (2011). The Developmental Contribution from Mobile Phones Across the Agricultural Value Chain in Rural Africa. *The Electronic Journal on Information Systems in Developing Countries*, 48(7): 1–16.
- Ganesh Gupta (photographer). (2010). Fertilizer shop. Retrieved from <http://www.panoramio.com/photo/31036326>
- GIPC, Government of India Planning Commission (2014). *Report of the expert group to review methodology for measurement of poverty*. New Delhi: GIPC
- Glendenning, C.J., & Ficarelli, P.P. (2011). Content development and management processes of ICT initiatives in Indian agriculture. *Information Development*, 27(4), 301–314.
- GSMA (2014). *mKisan Midline*. London: GSMA
- GSMA (2015a). *The Mobile Economy*. London: GSMA
- GSMA (2015b). *Case study: Airtel Green Card*. London: GSMA
- Hildebrandt, N., Nyarko, Y., Romagnoli, G., & Soldani, E. (2015). Price Information, Inter-Village Networks, and “Bargaining Spillovers”: Experimental Evidence from Ghana (Preliminary draft). Retrieved from [http://sites.bu.edu/neudc/files/2014/10/paper\\_345.pdf](http://sites.bu.edu/neudc/files/2014/10/paper_345.pdf)
- IHDR, India Human Development Report, (2011). *Towards Social Inclusion*. Institute of Applied Manpower Research. New Delhi: GIPC
- Islam, S. M., & Grönlund, Å. (2011). Factors Influencing the Adoption of Mobile Phones among the Farmers in Bangladesh: Theories and Practices, *International Journal on Advances in ICT for Emerging Regions*, 4(1), 4–14.
- ITU, International Telecommunication Union (2015). *Yearbook of statistics 2015*. Geneva: ITU
- Jensen, R. (2007). The Digital Divide: Information (technology), market performance, and welfare in the South Indian fisheries sector. *The Quarterly Journal of Economics*, 122(3), 879–924.
- Kaag, M., Brons, J., de Bruijn, M., van Dijk H., de Haan, L., Nooteboom, G., Zoomers, A. (2004). Ways forward in livelihood research. In: D. Kalb, W. Pansters & H. Siebers, *Globalization & Development. Themes and Concepts in Current Research*, pp. 49-74. Dordrecht, Boston and London: Kluwer
- Krishna Kumar, K., Rupa Kumar, K., Ashrit, R.G., Deshpande, N.R., & Hansen, J. W. (2004). Climate impacts on Indian agriculture. *International Journal of Climatology*, 24(11), 1375-1393.
- Kumar, N.P. (2008). *Base line survey in the minority*. Lucknow: Giri Institute of Development Studies
- Kumar, R., Singh, R. D., & Sharma, K. D. (2005). Water resources of India. *Current science*, 89(5), 794-811.
- Kleine, D. (2010). ICT4What? – Using the choice framework to operationalise the capability approach to development. *Journal of International Development* 22(5): 674–92.

- Krantz, L. (2001). *The sustainable livelihood approach to poverty reduction*. Stockholm: Swedish International Development Cooperation Agency
- Lee, K.H., & Bellemare, M.F. (2013). Look Who's Talking: The Impacts of the Intrahousehold Allocation of Mobile Phones on Agricultural Prices. *Journal of Development Studies*, 49(5), 624–640.
- Long, N. & van der Ploeg, J.D. (1994). Heterogeneity, actor and structure: towards a reconstitution of the concept of structure. In Booth, D. (Ed.), *Rethinking Social Development: Theory, Research and Practice*. Longman, Harlow
- MAGI, Ministry of Agriculture Government of India (2014). *mKisan Portal – Mobile Based Services for Farmers*. New Delhi: Ministry of Agriculture Government of India
- Martin, B.L., & Abbott, E. (2011). Mobile phones and rural livelihoods: diffusion, uses and perceived impacts among farmers in rural Uganda. *Information Technologies and International Development*, 7(4):17-34. [26]
- Matous, P., Todo, Y., & Pratiwi, A. (2015). The role of motorized transport and mobile phones in the diffusion of agricultural information in tanggamus regency, indonesia. *Transportation*, 42(5), 771-790.
- Mittal, S., Gandhi, S., & Tripathi G. (2010). *Socio-economic impact of mobile phones on Indian agriculture* (Working paper No. 246). New Delhi: ICR IER
- Muto, M., & Yamano, T. (2009). The impact of mobile phone coverage expansion on market participation: panel data evidence from Uganda, *World Development*, 37(12), 1887-1896 [31]
- NABARD, National Bank for Agricultural and Rural Development (2009). *Potential Linked Credit Plan*. Mumbai: NABARD
- Nakasone E. (2013). *The Role of Price Information in Agricultural Markets: Experimental Evidence from Rural Peru*. College Park: Mimeo
- Nakasone, E., Torero, M., & Minten, B. (2014). The Power of Information: The ICT Revolution in Agricultural Development. *Annual Review of Resource Economics*, 6(1), 533–550.
- NSSO, National Sample Survey (2005). Situation Assessment survey of farmers: Access to modern technology for farming. 59th round (January- December 2003). Report 499(59/33/2). New Delhi: GIMSPI
- Nyamba, S.Y., & Mlozi, M.R.S. (2012). Factors Influencing the Use of Mobile Phones in Communicating Agricultural Information : A Case of Kilolo District, Iringa, Tanzania. *International Journal of Information and Communication Technology Research*, 2(7), 558–563.
- Pandey, D., Kumar, A., & Singh, R. (2011). Marketing of sweet orange (malta) in kumaon region of uttarakhand. *Journal of Recent Advances in Applied Sciences*, 26, 6-11.
- Pew Research Center (2016, February) Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies. Retrieved from <http://www.pewglobal.org/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/>
- Pick, J.B., & Sarkar, A. (2015). *The Global Digital Divides*. Berlin, Heidelberg: Springer-Verlag
- Potnis, D. (2016). Telematics and Informatics Culture ' s consequences : Economic barriers to owning mobile phones experienced by women in India. *Telematics and Informatics*, 33(2), 356–369.
- Qiang, C.Z., Kuek, S.C., Dymond, A., & Esselaar, S. (2011). *Mobile applications for agriculture and rural development*. Washington, DC: World Bank
- Sachs, J. (2008). The war on digital poverty. Retrieved November 9, 2015, from <http://www.theguardian.com/commentisfree/2008/aug/21/digitalmedia.mobilephones>
- Salia, M., Nsawah-Nuamah, N.N.N., & Steel, W.F. (2011). Effects of mobile phone use on artisanal fishing market efficiency and livelihoods in Ghana, *The Electronic Journal of Information Systems in Developing Countries*, 47(6):1-26. [36]

- Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis, IDS Working Paper 72, Brighton: IDS.
- Sen, A. (1997). Editorial: Human Capital and Human Capability. *World Development*, 25 (12), 1959-1961.
- Sen, A. (2001). The many faces of gender inequality. *Frontline*, 18(22), 4-14.
- Sharma, K.C. (2015). *Study on Credit Demand of Farm Households – A Farmers' Perspective From Lucknow District of Uttar Pradesh*. Lucknow: Bankers Institute of Rural Development
- Sharma, S.D. (1997). Agricultural growth and 'trickle-down' reconsidered: Evidence from rural India. *Development in Practice*, 7(3), 267-275.
- Sife, A.S., Kiondo, E., & Lyimo-Macha, J.G. (2010). Contribution of Mobile Phones to Rural Livelihoods and Poverty Reduction in Morogoro Region, Tanzania, *The Electronic Journal of Information Systems in Developing Countries*, 42 (3), 1-5.
- Smith, M.L., Spence, R., & Rashid, A.T. (2011). Mobile phones and expanding human capabilities. *Information Technologies & International Development*, 7(3), 77.
- Souter, D., Scott, N., Garforth, C., Jain, R., Mascarenhas, O., & McKemey, K. (2005). The Economic Impact of Telecommunications on Rural Livelihoods and Poverty Reduction: A study of rural communities in India (Gujarat), Mozambique and Tanzania. London: CTO for DFID
- Swanson, B. (2008). *Global Review of Good Agricultural Extension and Advisory Service Practices*. Rome: FAO.
- Tack, J., & Aker, J. C. (2014). Information, mobile telephony, and traders' search behavior in Niger. *American Journal of Agricultural Economics*, 96(5), 1439-1454.
- Tadesse, G., & Bahiigwa, G. (2015). Mobile Phones and Farmers' Marketing Decisions in Ethiopia. *World development*, 68, 296–307.
- Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User Acceptance of Information Technology: Toward a unified view. *MIS Quarterly* 27(3), 425–78.
- Wijetunga, D. (2014). The digital divide objectified in the design: Use of the mobile telephone by underprivileged youth in Sri Lanka. *Journal of Computer-Mediated Communication*, 19(3), 712-726.
- World Bank (2011). *ICT IN AGRICULTURE Connecting Smallholders to Knowledge, Networks, and Institutions*. Washington, DC: The World Bank
- World Bank (2014). *Accelerating Agricultural Productivity Growth*. Washington, DC: The World Bank
- Wyche, S., & Steinfield, C. (2015). Why Don't Farmers Use Cell Phones to Access Market Prices? Technology Affordances and Barriers to Market Information Services Adoption in Rural Kenya. *Information Technology for Development*, (July 2015), 1–14.
- Zainudeen, A., Iqbal, T., & Samarajiva, R. (2010). Who's got the phone? gender and the use of the telephone at the bottom of the pyramid. *New Media and Society*, 12(4), 549-566.
- Zanello, G., Srinivasan, C.S., & Shankar, B. (2014). Transaction costs, information technologies, and the choice of marketplace among farmers in northern Ghana. *Journal of Development Studies*, 50(9), 1226-1239.

## APPENDIX – FARMERS INTERVIEWS

Note: most of the questions that are stroked through proven to not adequately measuring psychological capital. The answers are left out of the analysis.

### A. General info

1. Are you the head of your household?
2. What is your age?
3. How many members has your household?
4. Do all the adults of your household work on the farm?

### B. Resource-based assets

5. What type of farmland do you cultivate?

- My own land
- Contract farming

If both, please indicate how much of each.

6. What is the size of your land?
7. Which crops do you grow, and can you give an estimation of your yearly production?

Season	Crop	Production (Kg/year)
Summer	1	
	2	
Rainy	3	
	4	
Winter	5	
	6	

8. What percentage of your produce you consume/sell to others?
9. Do you irrigate your lands?  
If so: how?
10. Do you have electricity?  
If so: how many hours a day?
11. Do you have any animals?
12. Does any family member have any other sources of income?
13. Could you give an estimation of your total income per year or month?
14. Do you currently save money?
15. Do you have any outstanding loans?

If so: how much and from who?

### C. Cognitive-based assets

16. What is the highest formal education you received?

17. Did you learn about farming from any other source than your family?

Prompt: please elaborate.

18. Do you receive help on farming from the government or extension officer?

19. Do you have sufficient knowledge to generate high yields?

~~20. What are the reasons that make you a good farmer?~~

~~21. Do you feel that your life has improved over the previous 10 years?~~

If yes: how did it improve?

And: why did that happen?

~~22. Is there anything in your life that you want to change?~~

~~23. When do you think this will happen?~~

### D. Network-based assets

24. How do you sell your produce?

Prompt: do you sell crops differently? Do you sell grains in the same way as veg/fruit?

25. When you sell the crop, how is the price determined?

Prompt: do you bargain for a better price, or is there a set price?

26. When you decide to sell your produce, how important are the following?

Criterion	Importance
1. High price	
2. Quick sales & immediate cash	
3. Good Relationship with buyer	
4. Short distance to the market	

27. There are various types of information that might be useful for your farm. Could you explain how you get to know about the following 6 types of information?

Type of information	Information source
1. Market prices	
2. Weather forecast	
3. New crop varieties	
4. New Farming techniques	

5. Government schemes	
6. Job opportunities	

If the green SIM is the most important source of information: How did you obtain the information before you had a green SIM?

28. Are you a member of any group or association?

If yes: why are you a member of that group?

29. Is your wife a member of any group or association?

30. With how many farmers do you discuss farm-related decisions?

31. Do you work together with other farmers?

32. Suppose you suffered an economic loss, such as crop failure, who would you ask for help?

~~33. Do you think people from a higher caste can get a job easier?<sup>3</sup>~~

~~34. Do you think lower castes have less income?–~~

~~If so: why?~~

~~35. Do you think lower castes suffer in any other way?~~

~~36. Are there any facilities in this area that you don't have access to?–~~

~~If so: why is that?~~

## E. Mobile phone use

37. Do you own a mobile phone?

No, continue with question 38

Yes, continue with question 40

38. Do you use some else's phone?

No, continue with question 67

Yes, continue with question 39

39. Why don't you own a phone?

40. How many phones does your household have in total?

How many are smartphones?

~~41. Can you tell me which 2 persons you call the most?<sup>4</sup>~~

~~42. How far do they live from your house?~~

~~Prompt: Who did you call today?–~~

<sup>3</sup> Questions 33-36 are related to inequality. These questions were taken out because (1) they are not relevant enough and (2) these created a feeling of awkwardness for the translator and respondent

<sup>4</sup> Questions 41-42 deal with recent phone calls. These were taken out because they were not relevant.

~~How far from here does that person live?~~

~~Why did you call?~~

43. What are the total expenses on phone use each month?

Do you consider that is cheap or expensive?

44. Does your wife own a phone?

If not, why not?

45. For what purpose do you mostly use the phone? (*only 1 answer possible*)

Farming related work

Other work

To keep in touch with friends and family

46. How do you use your mobile phone for agricultural practices?

47. Do you call the following people for agricultural advice?

person	Please explain... (how often, why)
1. Shop keeper	
2. Trader	
3. Veterinarian (animal doctor)	
4. Helpline	
5. Other farmers	

48. How has the use of a mobile phone influenced your life?

49. Do you sell your crops differently, because you have a mobile phone?

50. Do you travel less, because you have a mobile phone?

If yes, please indicate how much traveling it saves.

51. Do you sell more crops, since you use a mobile phone?

If yes, why?

52. Has the mobile phone increased your knowledge about farming?

53. Has the mobile phone increased your farming skills?

~~54. Does the mobile phone make you happy?~~

*The next questions are only relevant for green SIM users.*

## F. Use of green SIM

55. Did the green SIM change your way of farming?

If so: how?

56. Do you prefer to receive the messages as text or voice message?

57. Do you listen to all the voice messages if possible?



If not: why?

58. Do you carry out all the relevant advice on agricultural practices that you receive through daily messages?

If not: Why?

59. Do you often discuss the messages with others?

If so, with whom?

60. When you listen to the messages, do you understand everything?

61. How important are the following types of information that you receive through the messages:

<b>Information on:</b>	<b>Importance:</b>
1. New crop varieties	
2. Plant protection	
3. Irrigation	
4. Crop rotation	
5. Animal husbandry	
6. Weather info	
7. Govt. Schemes	
8. Market rate	

62. Do you use the market information to bargain for higher prices?

If yes: What are prices you receive with the market information and what where they before?

63. What is the most important benefit that you perceived due to the free messages?

64. Did the following effects also occur:

<b>Impact of messages</b>	<b>If yes, please explain</b>
1. Increased production	
2. Reduced costs	
3. Reduced manual labour	
4. Improved quality of crops	
5. Increased health of animals	
6. Increased fertility of the land	

~~65. Did the daily messages change your emotions about farming?~~

~~Prompt: do you like farming better?~~

66. Just to be clear, the voice and text messages will always be free. However, suppose it were not free, would you be willing to pay for the service?

Prompt: What would you approximately be willing to pay?

## G. For respondents that don't use a phone

67. Why don't you use a phone?

68. Do other members in your house use a phone?

69. How many phones does your household have in total?

70. How many of them are a smartphone?

71. Do other members of your household use their phone for agricultural purpose?

If yes: how?

If not: do you think the purchase of a mobile phone can improve your farm?