# USE OF MOBILE TECHNOLOGY AMONG RURAL WOMEN IN PAKISTAN FOR AGRICULTURAL EXTENSION INFORMATION

By

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## ABSTRACT

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Drawing on the foundations of the theory of inclusive innovations, this study analyzes the extent to which a marginalized group—specifically, rural women in Pakistan—utilizes the innovation of mobile technology to access telecommunication-based agricultural extension information services. Agriculture is the backbone of Pakistan's economy, and women are around three-fourths of the total labor force employed in this sector. Despite their crucial role in the agricultural growth of the country, this segment is often deprived of updated agricultural extension information. The evolution of mobile technology can bridge this gap as it helps users to access information instantaneously, moving beyond the limitations of mobility and cultural barriers. A total of 80 rural women, in the five villages of the Lahore district, chosen by random sampling, were interviewed through a structured questionnaire to identify whether the women were aware of telecommunication-based agricultural extension information services, and whether those with a higher educational qualification were more likely to use mobile technology to access those services, compared with those who were unaware and had lower educational qualifications. The study found that being aware of such services was not the indicator that motivated the respondents to access the services. The cell phone is, no doubt, the most widely and frequently used means of accessing these services. The educational qualification was significantly related to the use of mobile technology to access telecommunication-based agricultural extension information services.

This work is dedicated to every individual who is striving to make human beings' lives better by contributing to the body of scientific knowledge.

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## KEY TO ABBREVIATIONS

| | |
|---|---|
| agri | Agriculture |
| i.e. | That is |
| ACT | Agriculture Commodity Trade |
| BBC | British Broadcasting Corporation |
| CABI | Commonwealth Agricultural Bureaux International |
| CEDAW | Convention on the Elimination of Discrimination Against Women |
| DFID | Department for International Development |
| FLL | Fixed Local Loop |
| GDP | Gross Domestic Product |
| GSMA | Groupe Speciale Mobile Association |
| HDI | Human Development Index |
| ICT | Information and Communication Technology |
| ICT4D | Information & Communication Technology for Development |
| ILO | International Labour Organization |
| ITU | International Telecommunication Union |
| IVR | Interactive Voice Response |
| MDGs | Millennium Development Goals |
| PAH | Punjab Agriculture Helpline |
| PTA | Pakistan Telecommunication Authority |
| PTCL | Pakistan Telecommunication Company Limited |
| SMS | Short Message Service |

| | |
|---|---|
| UN | United Nations |
| USAID | United States Agency for International Development |
| TII | Theory of Inclusive Innovations |
| WLL | Wireless Local Loop |

## 1. INTRODUCTION

Agriculture is the mainstay of Pakistan's economy, contributing to more than one-fifth of the country's total gross domestic product (GDP). It is also sharing in the growth of the manufacturing sector by providing raw materials to the textile and sugar industries. Of the country's total labor force, nearly 44% are engaged in agriculture, and women constitute 76% of this (Pakistan Economic Survey, 2014). Of the country's total rural population, 60% are dependent on agriculture for their livelihood (Pakistan Economic Survey, 2012). Similar to all other countries in the world, the Pakistan Government is also striving to improve the agricultural sector because the country has a primarily agrarian-based economy. However, with a growing population, the demand for food has added to the pressure on this sector to identify effective interventions that will increase agricultural production. Despite the enormous amount of arable land and the significant labor force employed in this sector, the yield being obtained is far from its actual potential. Changing climate patterns and soil conditions mandate that farmers have updated information to cope with these challenges without negatively affecting their productivity. This information can be relayed using different technological methods but its impact depends upon both the users' acceptance of the technology and the socio-economic factors prevalent in that area.

The efficacy of Information and Communications Technology (ICT) has been explored in the quest to design interventions that will provide farmers worldwide with relevant information. Due to their accessibility and affordability, ICTs have found traction among poor household farms. The prospective advantages of using ICT-based information systems as agricultural extension information dissemination tools were recognized in the 1980s. However, the solution failed to create a stir since these systems were designed without taking the skills and information needs of

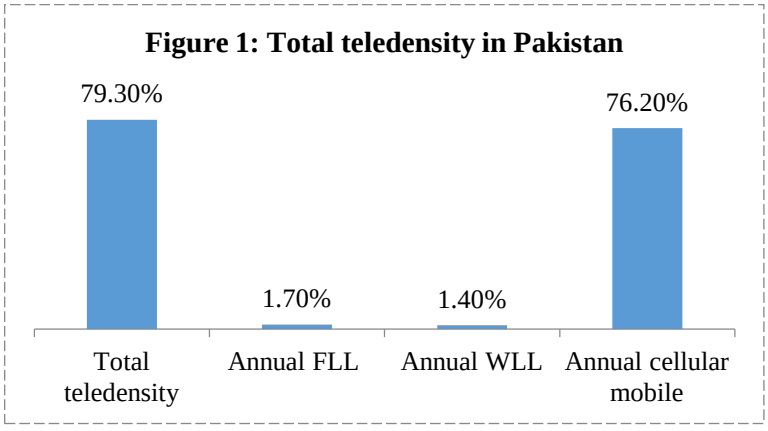
the users, in this case farmers, into consideration. There was too much information overall, and too little of the right information, thus completely ignoring the ergonomic dimensions (Harkin, 1987). With the passage of time, technology has become adaptable and affordable, making it useful to present-day farmers with limited education and exposure (World Bank, 2009).

The developing world has also witnessed the rapid proliferation of ICT, which has led to public and private information systems being involved in transferring agricultural knowledge. In the Indo-Gangetic plains, agricultural extension systems have been mandated at the state level to disseminate agricultural extension information to farmers. In Pakistan, each district has its own agency for agricultural extension services, separate from the nationwide advisory services for farmers (Balaji & Craufurd, 2011). Using ICT channels effectively to diffuse news about new agricultural technologies can steer farmers in the right direction. Conventional media, such as radio, with its time-bound transmissions, and newspapers, which are inaccessible to the illiterate masses, are not widely popular amongst the farmers. Mobile technology on the other hand, with its momentous recognition and adoption as a medium for the diffusion of all sorts of information, is one of the best examples of a successful ICT solution. With the worldwide growth in cellular technology coverage, mobile technology is rapidly replacing the traditional ICTs. The ease of use and accessibility of cellular technology has helped farmers to search for and find agricultural extension information and services in a small fraction of the time required for an extension agent's visit to the farmer. This makes the marginal cost of service provision much cheaper than any other mode of communication (Aker, 2010). In Africa, there are five major ICT services designed exclusively to assist farmers with various day-to-day problems, including agricultural advice, weather forecasts, natural resource management, and performance of extension workers (Siraj, n.d.). Likewise, there are eight ICT initiatives in India providing agricultural advisory

services. These initiatives are Nokia Life Tools, Reuters Market Light, IFFCO Kisan Sanchar, AgriFone 1-2-3, Bubbly, mKrishi, eChoupal 3.0 and SME Toolkit. All eight of these ICT initiatives operate using the mobile phone technology. Reuter Market Light is using the Internet as well as mobile phones. Among these initiatives, Bubbly voice blogging service is unique as it helps the subscriber/bubbler to record and broadcast messages from any mobile device; these can be listened to by followers of the 'bubbler.' The service has gained immense popularity in India. Advisories are disseminated using emerging mobile phones. Farmers who subscribe to these private companies' initiatives are facilitated through short message service (SMS) and interactive voice response (IVR). The Indian government has even started an agricultural forecasting system, communicating climate information with seasonal forecasts (Siraj, n.d.)s

In Pakistan, the telecommunications industry has also grown enormously. In 2008, Pakistan was ranked the third fastest-growing telecommunications market in the world (Wilson, 2008). About 90 percent of Pakistanis are residing in areas with cell phone coverage, and in 2014 more than three-fourths of the Pakistani nation had access to a cell phone (Pakistan Telecommunication Authority (PTA) Report, 2014). In May 2014, the total teledensity (inclusive of fixed local loop (FLL), wireless local loop (WLL) and mobile phones) was 79.3% (Figure 1).

**Figure 1: Total teledensity in Pakistan**

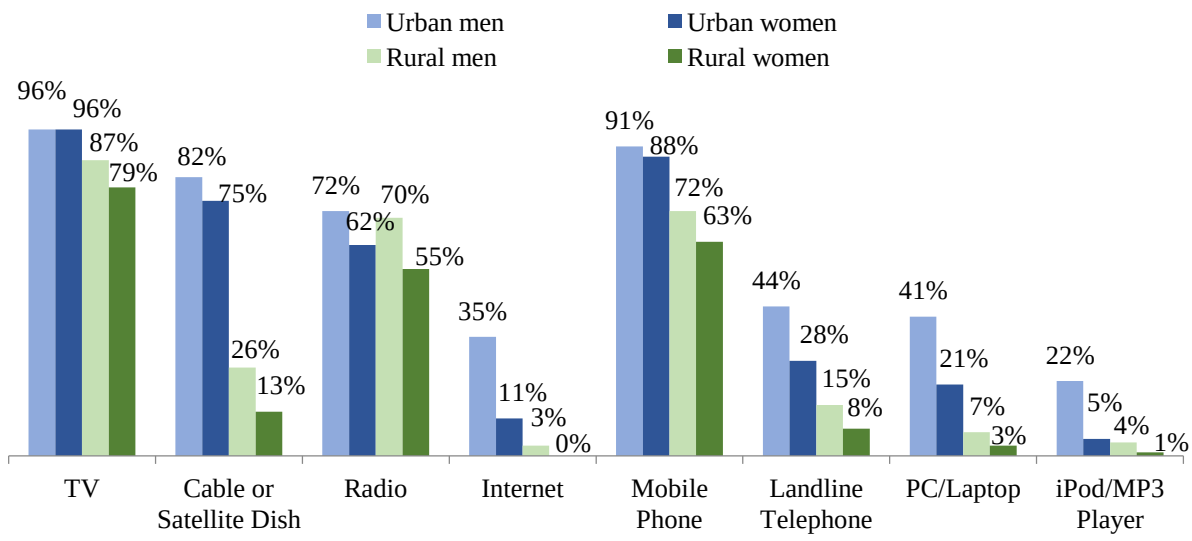



Source: Pakistan Telecommunication Authority Report 2014

It is interesting to note that the annual cellular mobile teledensity is much higher than the annual FLL and WLL teledensity (PTA Report, 2014). With this level of penetration, mobile phones are entirely appropriate for providing timely and low-cost communication between farmers and extension services. However, analyzing the viability of the mobile technology benefits to rural women across the world in general, and in Pakistan specifically, is still a bit complicated. The number of female cell phone subscribers is surprisingly low across the globe, compared to male cell phone subscribers. Women in low- and middle-income countries are reported to have limited access to cell phones, with South Asian women being 37% less likely to have cell phones than men (Women & Mobile: A Global Opportunity, 2010). For women in Pakistan, several factors, such as literacy and cultural barriers, act as inhibitors that lead to the ICT gender divide. Furthermore, there are public records missing about gender-segregated data for cellular phone subscriptions in the country. The researcher initially used different key words for online searches to find the public data on how many total women cell phone subscribers there are in the country, but the quest was not successful. Later on, the researcher reviewed the PTA's 2013 annual report to investigate whether the statistics about the total number of cell phone users in the country were broken down under a gender variable as "men" and "women," but no such information was available. As a last resort, the researcher contacted the Director of Public Relations for the PTA. He confirmed on behalf of PTA that no such data exists. Following this, browsing the websites of international organizations working within the ICT domain, like International Telecommunication Union (ITU) and Groupe Speciale Mobile Association (GSMA), revealed no data about the total number of women's cellular phone subscriptions in Pakistan. Finally, the search engine Google was used to explore this information. This revealed that the British Broadcasting Corporation (BBC) conducted a survey on its own in 2008 to find out how much

access the Pakistani population has to ICT devices (AudienceScapes, 2011). The survey reported that 63% of rural women have access to mobile phones, while their access to landline telephones is only 8% (Figure 2). After TV, the mobile phone is the second most widely accessible ICT format among rural women in the country. This survey, however, lacks information as to whether the rural women in Pakistan are using mobile technology to enhance their knowledge about agriculture. It is highly unlikely that such an endeavor would have undertaken to find out the extent to which the rural women in Pakistan use cell phones to access agricultural extension information. This area is still largely unexplored, creating a great deal of potential for research in this field.

**Figure 2: Access to ICT devices anywhere in Pakistan by gender**

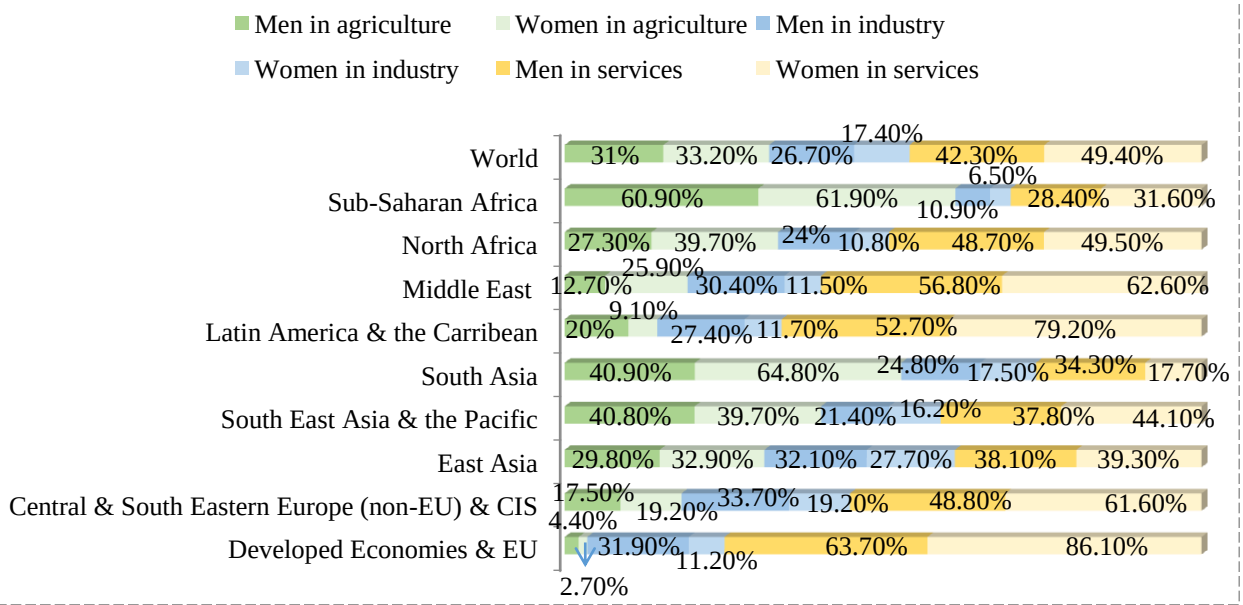



Source: BBC Survey 2008

## 1.1 The research problem

Women, the world over, play a significant role in agricultural production. They may work either as an individual food grower or an agricultural worker, and may be paid or unpaid. Although there was a decrease in the overall proportion of economically active populations engaged in the agricultural sector during the 1990s, women's participation worldwide remained considerable, almost 50% through 2000. The trend of women's employment in the agricultural sector is higher still in developing and least-developed countries, where their input in the agriculture sector is recorded at 61% and 79%, respectively (Food and Agriculture Organization, 2006). By the conclusion of 2013, the agricultural sectors in Sub-Saharan Africa and South Asia were still employing a larger chunk of the population than the industrial and service sectors. Women dominate the agricultural sector employment in these two regions (ILO Global Employment Trends, 2014) (Figure 3).

**Figure 3: Gender segregated employment trends, across the globe, in different sectors**




Source: ILO Global Employment Trends 2014

Likewise, the women in rural Pakistan are highly involved in several crop production activities such as seed cleaning and preparation, applying fertilizer, weeding, threshing, harvesting, drying and binding crops, grain storage and food preservation (Begum & Yasmeen, 2011). Despite the remarkable number of women participating in agriculture all over the world in general, and in Pakistan in particular, they lack access to modern agricultural information. Globally, women receive a mere 5% of the extension resources that men do, both in terms of frequency and volume of information (Food and Agriculture Organization, 1989). It has also been found that, most of the time, extension workers only approach male farmers to educate them about the use of modern agricultural technology and means of increasing yields, leaving the women farmers out of their contact circles. Correspondingly, women either remain unaware of new agricultural practices or receive second-hand knowledge form their male farmer peers (U.S. Agency for International Development, 1982). This alarming situation of rural women remaining deprived of up-to-date agricultural information needs to be addressed because women are often deemed responsible for the food security in the household. In most of the low and middle-income countries, women are studied as the major actors in the food security cycle because 80% of them are involved in cultivation (Food and Agriculture Organization, 2008). In addition, over the past few decades, the men in Pakistan have frequently migrated from rural to urban centers in search of jobs, leaving their women behind as the domestic caretakers, including managing farm-related activities (Begum & Yasmeen, 2011).

Pakistan is among those countries in which the ratio of female-headed households in rural areas is relatively high, compared with other Muslim countries where these ratios are lower: Sudan, Egypt, Morocco, Cyprus, Lebanon, Tunisia, Turkey, Syria and the Islamic Republic of Iran. In rural Pakistan, 25% of the women head their households. This ratio is increasing further, due to

the temporary and permanent migration of men from rural to urban areas and immigration abroad. Studies conducted around the world, during different decades, have found that most of the households headed by women are poorer than the households headed by men (Food and Agriculture Organization, 2010). A research study conducted in Pakistan found that 81.5% of households headed by women were food insecure (Sustainable Development Policy Institute, 2009).

It has been predicted that the mobile gender gap will be reduced in the next couple of years, and two out of every three new mobile subscribers will be women (Women & Mobile: A Global Opportunity, 2010). The likelihood is, therefore, quite high that these rural women who are cell phone subscribers would benefit from using this technology as their prime means of updating their knowledge about the latest agricultural interventions. Considering the worldwide growing trend of women mobile subscribers, and recognizing the central role of Pakistani rural women in the agricultural sector, it is essential that the prospects for utilizing this technology to disseminate agricultural extension information among rural women must be studied. The research questions are, therefore, as follows:

## 1.2 The research questions

RQ 1 – Are these rural women aware of any of the existing telecommunication based agricultural extension information services?

RQ 2 – To what extent, are these rural women who are aware of such services accessing them?

RQ 3 – How many and what type of telecommunication-based agricultural extension information services are available to women in Pakistan?

RQ 4 – Are there any factors that influence the rural women not to access such services, despite having the awareness?

RQ 5 – What are the reasons that explain the use by rural women accessing these telecommunication-based agricultural extension information services?

RQ 6 – To what extent are the rural women using mobile technology to access these telecommunication-based agricultural extension information services?

## 1.3 The purpose of the study

The findings of this study will be valuable to different national and international, public and private stakeholders in the design and execution of pro-gender policies to help rural women improve their access to agricultural extension information. It will contribute to poverty reduction, women's empowerment, rural development and food security. Some of the stakeholders are:

1. The Government of Punjab, specifically, and the Government of Pakistan, in general, to incorporate the gender component into forthcoming advisories about educating farmers on innovative agricultural techniques.

   The Government of Pakistan is a signatory of the Convention on the Elimination of Discrimination Against Women (CEDAW), and has pronounced that the gender equality aims found in the National Plan for the Development and Empowerment of Women, the National Plan of Action, and the Government's Poverty Reduction Strategy Papers are in consonance with the Millennium Development Goals (MDGs).
2. The agricultural extension workers who are responsible for devising strategies on how to approach rural women and engage female university students in agriculture and women's studies, in places where the social environment restricts interactions of rural women with male agricultural extension workers.
3. UN Women, a United Nations agency, mandated specifically to launch initiatives for the progress of women, can design programs and projects to identify how rural women can utilize mobile technology in a meaningful way, thereby fulfilling the essence of information and communication technology for development (ICT4D).
4. In addition to UN Women, other donors, like the Department for International Development (DFID), the United States Agency for International Development (USAID),

and several other UN agencies such as the World Food Program, Food and Agriculture Organization, and International Fund for Agricultural Development are doing the financial, technical and human resource capacity-building in Pakistan for the successful execution of interventions to avoid the hazards of food insecurity in the region. For instance, USAID is, at present, implementing The Agribusiness Project, while DFID is currently executing the Commonwealth Agricultural Bureaux International (CABI) project in Pakistan.

All of these stakeholders can design ICT campaigns to channel rural women's efforts into productive outcomes. Appropriate information about the preparation and cleaning of seeds, sowing, using the right quantity of fertilizer & pesticides, appropriate means of grain storage, knowledge about weather forecasts and climate change, and understanding methods of value-added food preservation can all improve food security in the household, as well as economic conditions for rural families. A good harvest means more income that can be used to ameliorate the state of maternal and neonatal health, improve the education of children, reduce the incidence of domestic violence, empower women's voices in the decision-making process for household affairs, and, thus, make rural women's status better in society overall.

## 2. THEORETICAL FRAMEWORK

The design for this research study was drawn from the Theory of Inclusive Innovations (TII). This theory posits that the process of development remains essentially incomplete if the marginalized communities in a society do not adopt the technological innovation designed for the diffusion of information. The innovation is termed to be inclusive if "it has a positive impact on the livelihoods of the excluded groups" (Richard Heeks, 2013), and this can only happen if the individuals, groups or communities with low levels of income are able to participate in the innovation process. Inclusive innovation is, therefore, often included in public policy goals. For instance, the Government of India has allocated budget money for programs that emphasize poverty reduction by creating employment opportunities, especially those that empower the poor by educating them and teaching them skills (George, McGahan & Prabhu, 2012). In the agricultural sector, the concept of inclusive innovation can be realized through a partnership approach between the public-private sectors and research-non research organizations (Hall, Bockett, Taylor, Sivamohan, & Clark, 2001). These can be established to diffuse agricultural innovation technology to uplift the poor. The partnerships help the excluded groups to both access and afford these services.

In South Asian countries, including Pakistan, the centuries old patriarchal system has ensured that women are mostly discriminated against and treated as secondary citizens. This is often true for rural women, as the gender disparity in literacy is relatively broad in rural Pakistan, as compared to the urban parts of the country. Among the major reasons for this disparity are poverty and the mindset of parents living in rural areas. Poor families are more willing to invest in their boys' education because sons are considered to be old-age support for parents in an extended family system, whereas daughter leave them after getting married. Likewise, most

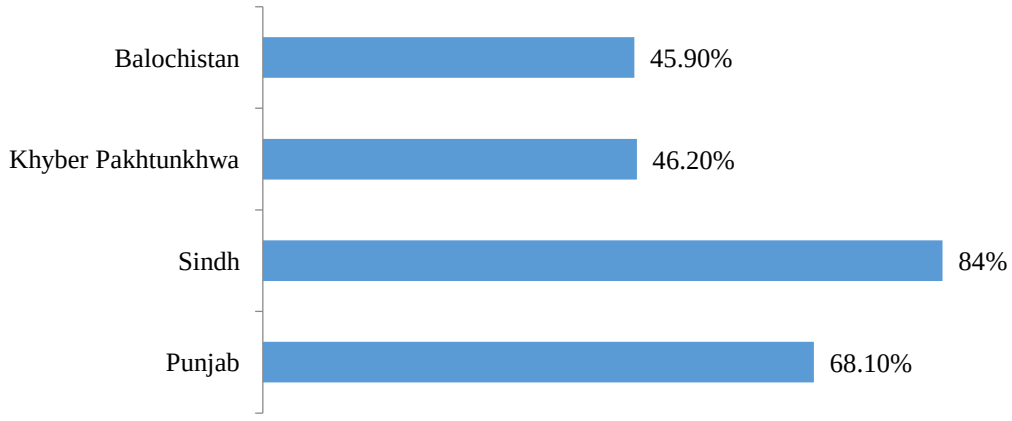
parents think that the prime responsibility of girls is to run the household's kitchen. In their opinion, therefore, running a kitchen doesn't require a good education. These rural women can thus be considered an "excluded group." In the agricultural sector of Pakistan, several information services have been adopted at different times, either as a solo venture of the public and private sectors or as a joint partnership of the public and private sectors. For instance, Punjab Agriculture Helpline (PAH) is a current public sector initiative designed to empower the farming community through the timely transmission of information; the telecommunications company Telenor has collaborated with the provincial governments of Khyber Pakhtoonkhwa and Punjab to facilitate farmers receiving updated information about modern farming methods and agricultural commodity prices. The available online literature was analyzed to determine whether researchers have studied the prospect of whether the excluded group of rural women benefit from this diffusion of agricultural extension information using mobile technology.

## 3. LITERATURE REVIEW

Dissemination of the latest agricultural extension information among farmers is the most crucial component in the current process of agricultural development to promote farming enterprises. Agricultural extension agencies have put a great emphasis on disseminating agricultural extension education to improve farmers' skills. Farmers are supposed to be equipped with the latest agricultural technology to meet the demands of achieving high productivity and export standards. Different means of communication are utilized to disseminate this information. These include different forms of print and electronic media such as pamphlets, posters, booklets, magazines, journals, radio and TV. In addition, there are other methods of informing farmers about agricultural extension information such as fellow farmers, agricultural extension field staff, websites designed for agricultural extension information promotion, agri-helplines and SMS services.

At 68.1%, the Punjab province in Pakistan ranks second in mobile phone penetration, with Sindh province first at 84% (Pakistan Telecommunication Authority, 2012) (Figure 4).

**Figure 4: Province wise cell phone penetration in Pakistan**




Source: Pakistan Telecommunication Authority 2012

The 1990s marked the advent of mobile communications in Pakistan, when Instaphone and Paktel pioneered this form of communication in the country. Mobilink and Ufone emerged in 1998 and 2001, respectively. Deregulation of the mobile telecommunications sector led Telenor and Warid to establish their presence in the country in 2005 (Wilson, 2008). Despite the growing tele-density of mobile phone subscribers in Pakistan, the technology has clearly failed to grab the attention of researchers on a large scale, at least with regards to their gauging its impact on the dissemination of agricultural extension information among farmers. Since there appears to be a dearth of online published research material on the subject of Pakistani rural women's reliance on mobile technology to access agricultural extension information services, this research study is, to a great extent, exploratory in nature. The researcher browsed the databases of ProQuest, JSTOR, Google and Google Scholar, using a Boolean logic methodology, i.e. using "AND" and "OR" to search the relevant literature. The key terms used in the searches were "mobile phone" OR "cell phone" OR "mobile technology" OR "agricultural extension information" AND "rural women in Pakistan" OR "women farmers in Pakistan" OR "Pakistani women in agriculture." A manual method of searching data was applied as well, by screening the reference indices of published research papers. In addition, three of the journals—the Journal of Agricultural & Food Information, the Journal of Agricultural Informatics, and the Journal of Information Technology in Agriculture—were sifted to find any relevant published literature.

There is plenty of literature available regarding Pakistan, highlighting the sources of information that farmers use to access knowledge on techniques to increase agricultural production, such as applying the latest agricultural technology, and the appropriate use of fertilizers or pesticides to enhance agricultural productivity. Surprisingly, except for three studies, the sources of information evaluated were restricted mostly to print and electronic media, ignoring mobile

technology. To overcome this dearth in the published literature, some studies outside the context of Pakistan were also reviewed, to identify whether those studies included mobile technology among the sources of agricultural extension information dissemination. The reviews of the Pakistani researchers' studies are discussed first.

## 3.1 Studies reviewed in the context of Pakistan

Altogether, seventeen studies were reviewed in this context

### 3.1.1 Research studies that evaluated multiple sources of agricultural extension information but excluded mobile technology

There are eight research studies (Arfan, Ali, Khan & Khan, 2013; Rehman, Muhammad, Ashraf, Ch., Ruby & Bibi, 2013; Arshed, Ch., Iqbal, & Hussain, 2012; Nosheen, Ali & Ahmad, 2010; Taj, Akmal, Sharif & Mahmood, 2009; Chaudhry, Muhammad, Saghir & Ashraf, 2008; Sadaf, Javed & Luqman, 2006; Abbas, Muhammad, Nabi and Kashif, 2003) that completely ignored mobile technology as a significant source for information diffusion among the sources analyzed for their effectiveness. The sources of information assessed in these studies were TV, radio, printed material (newspapers, magazines and books), fellow farmers, progressive farmers, agricultural extension field staff, dealers of seed, fertilizer and pesticide companies, the private sector, NGOs, growers' associations, agri-seminars, exhibitions, conferences and research institutions. Arfan et al. (2013) analyzed the effectiveness of the Punjab Agriculture Helpline (PAH) in meeting the information needs of the farming community. Their study concluded that all of the respondents were getting agricultural-related information from the PAH. Rehman et al. (2013) aimed to ascertain the socio-economic characteristics of the respondents, their access to sources of agricultural extension information and the relationship between the two. Arshed et al.

(2012) investigated the effectiveness of the Rafhan Maize Products Company's[1] (RMPC) methods for disseminating information. These methods were broadly categorized into three types: individual contact, group contact and mass contact. The first type included telephone calls, and was rated as a 'good' means of information, as opposed to poor or very good, by 35% of the respondents. Due to low literacy rates, RMPC's use of electronic media was practically non-existent. The authors found that, among the respondents' preferences for information sources, the telephone ranked 4th after group discussion, lectures, and demonstrations, which occupied the 1st, 2nd, and 3rd rankings, respectively. Nosheen et al. (2010) conducted research in the Potohar region of the Punjab province, exploring the perceived credibility of different information sources among both men and women farmers. Likewise, Taj et al. (2009) found that relatives/friends, progressive farmers, and mass-media (T.V. and radio) were the most frequently used information sources among the two genders. Chaudhry et al. (2008) based their study on the premise that rural women have limited access to modern sources of information. Through interviews conducted in the rural setting of the tehsil[2] Faisalabad of district Faisalabad, they found an information gap prevalent amongst the women. Sadaf et al. (2006) also tried to identify the preferred agricultural extension information sources for women. A total of 125 women farmers were selected through multistage random sampling, while information sources were restricted to T.V/radio, print media, male family members, extension workers, coworkers and neighbors, and NGOs. Of these sources, the majority preferred their male family members as an information source. A significant number of respondents expressed the need for agricultural extension services, however, and showed a preference for female extension agents, followed by mass media and fellow farmers. Although the studies of Chaudhry et al. (2008) and Sadaf et al.

[1] Rafhan Maize Products Company is one of the leading agro-based industries in Pakistan offering extension education services to maize growers for improving their maize yield.
[2] Tehsil is an administrative tier of government that exists between the district and the union council.

(2006) focused exclusively on rural women, to analyze the specific type of information sources these women access, they once again did not consider the potential of mobile technology as a viable medium of agricultural extension information dissemination among the list of sources. Abbas et al. (2003) explored different categories of sugarcane farmers (small, medium and large, based on farm size) in the Faisalabad division, asking what type of information sources they seek for sugarcane-production-related information. The findings that emerged from the study indicated a strong relationship between the farmers' category and the information source used. Small farmers relied mostly on interpersonal relationships, whereas large farmers counted on agriculture departments, research institutions and mass media.

Despite the majority of these studies having been published in recent years, and the fact that most of the authors (Rehman et al. 2013; Taj et al., 2009; Chaudhry et al., 2008) have stressed higher utilization of mass media for agricultural technology promotion campaigns, mobile technology has continued to be excluded, even in recommendations for improving information dissemination sources. Likewise, it was startling to realize that while the telephone was considered among the information sources to be evaluated by Arshed et al. (2012), mobile technology was left out. Similarly, Sadaf et al. (2006) recommended government initiatives, including gender-based training and educational programs for women farmers, but overlooked the contributions of mobile technology.

### 3.1.2 Research studies to assess the role of television as a source of agricultural extension information dissemination

Two of the research studies (Chhachhar, Hassan, Omar, & Soomro, 2012; Muhammad, Butt & Ashraf, 2004) evaluated the role of television in diffusing agricultural extension information. Chhachhar et al. (2012) based their work on the postulate that ‘mass communication is one of the

most important methods' for agricultural extension information dissemination, utilizing communication tools like radio, TV, documentaries and print media. However, they restricted their scope of study to the use of TV as a source that the farmers in the district Jamshoro of Sindh province used to augment their agricultural extension knowledge. The findings of their study contradicted their basic premise, revealing the low role played by TV in disseminating information. In their study, the sample population was comprised entirely of male farmers, with no women representated, making it an overrated study in terms of the importance of men in the agricultural sector. Muhammad et al. (2004) found that TV's role as a communication medium was minimal, based on the responses of the target population in the Faisalabad tehsil. More than half of the respondents showed no familiarity with agricultural telecasts, which correspondingly indicated a low viewership amongst farmers.

### 3.1.3 Research studies to investigate the value of print media as an agricultural extension information source

Four of the research studies (Naveed & Anwar, 2013; Rehman, Muhammad, Ashraf, & Hassan, 2011; Shahzad et al., 2011; Farooq, Muhammad, Chauhdary, & Ashraf, 2007) evaluated the effectiveness of print media. Naveed and Anwar (2013) established the inefficacy of print media as an information source for farmers due to its unavailability to them. They studied the information needs of 84 adult men farmers in the Toba Tek Singh district of Punjab province, along with their information-seeking behaviors. The study was intended to serve as a policy document for designing information delivery systems that suit the needs of farmers. It found that informal channels and interpersonal networks, whose accuracy and relevance are questionable, were the methods these farmers most often relied on to acquire information. The target group revealed a generally low level of satisfaction with the sources of information they used. The

study revealed the lack of timely access to required information as the biggest problem faced by the majority, followed by education and language barriers. These factors led to information gaps that had an impact on the potential contribution of farmers in agricultural development. Rehman et al. (2011) also based their study on the observation that print media was not playing its expected role in information dissemination amongst farmers. The study was done in Punjab province, targeting subscribers to the three top agricultural magazines. Thus, the study was exploring the factors affecting the usefulness of print media, and it concluded that education had a significant impact on the awareness levels of farmers. They rated different sources of information based on the frequency of their utilization; print media was found to be at the top, followed by fellow farmers and TV. Shahzad et al. (2011) restricted their universe of study by targeting only literate farmers in district Faisalabad, and examined the role of agricultural publications in diffusing innovation amongst them. A total of 52 subscribers to five publications were interviewed. The results indicated a positive perception toward these publications in the younger group, as compared to older farmers. This impacted the adoption levels. However, they also indicated a need to improve the publication standards with regards to the practicality and usefulness of the information relayed. Farooq, Muhammad, Chauhdary, & Ashraf (2007) studied the role of print media in the dissemination of agricultural extension information among farmers of the Tando Allahyar tehsil of the district Hyderabad, Sindh province and found it to be ranked 3$^{rd}$, with fellow farmers and television in the first and second positions, respectively.

### 3.1.4 Research studies in which mobile technology was included as an information source for accessing agricultural extension information

Only three of the research studies (Asad, 2014; Khan, Muhammad, Chaudhry & Khan, 2010; Siraj, n.d.) considered mobile technology among the information sources studied. Asad (2014)

has done an interesting investigation into the link between cell phone coverage and the choice of crops grown by farmers in rural areas of Pakistan. One of the agricultural risks in developing countries is a post-harvest loss due to farmers' inability to sell their perishable crops in a timely manner. The emergence of mobile phone technology has improved communication between farmers and traders, thereby letting the former adjust their harvest times according to the buying prospects of the latter, preventing post-harvest losses for the farmers. The author has also studied the impact of mobile phone coverage on the well-being of rural households, and concluded that incomes increased by 10-15%. Khan et al. (2010) studied the awareness levels of farmers in district Faisalabad of Punjab province, and their usage of different types of electronic media including TV, radio, audio/video cassettes, internet, telephone, agricultural helplines and mobile phones for agricultural extension information. The results reported a reasonably good percentage of the sample population being aware of agri-radio broadcasts and TV advertisements, along with the PAH, though the exact helpline number was only known by a few. Only a small fraction expressed familiarity with the agri-services offered by private mobile phone companies. Based on the study's findings, TV was the most desirable source of agricultural extension information, followed by mobile phones, while radio, agricultural helplines and telephones were ranked as 3$^{rd}$, 4$^{th}$ and 5$^{th}$, respectively. Siraj (n.d.) led the research study, funded by the UK's Department for International Development, in ten districts of Northern, Central and Southern Punjab. It was aimed at understanding the problems faced by farmers, their information needs, and barriers to the adoption of new technology. Public and private extension service providers were also included, to measure the extent of their ICT usage. The study established the futility of the digital library (audio and video) maintained at the Directorate of Agricultural Information Punjab, since the timing of the telecasts did not suit the farmers. Similarly, toll free helplines had limitations,

such as the manual transcription of problems recorded on a voice recorder, the absence of technical backstopping support to the helpline staff, etc. The case studies covered in the report highlighted factors that have resulted in significant changes in the lives of farmers. Mobile phones turned out to be one of them. ‘Shaheen Weather service’ is a weather update service used by the farming community to get weather updates on a regular basis. Since its launch, this service has brought down the number of crop losses due to weather uncertainty. The study proved the concept of mobile phones, as they were highly lauded by respondents who endorsed the idea of using this medium to its utmost to reach out to the maximum number of farmers.

In addition to mobile technology being excluded from the agricultural extension information sources evaluated in all but three of the seventeen studies, ten of them (Asad, 2014; Arfan et al. 2013; Rehman et al., 2013; Arshed et al., 2012; Rehman et al., 2011; Shahzad et al., 2011; Khan et al., 2010; Farooq et. al., 2007; Muhammad et al., 2004; Abbas et al., 2003 ) had a major gap in that they did not consider the importance of the farmers’ gender when trying to understand their access to alternative modes of agricultural extension knowledge. The variable "gender" lacks visibility, as the key term "Farmers" does not explicitly state whether the respondents were “men" or "women" or both.

### 3.2 Studies reviewed outside of the Pakistan context

Four of the reviewed research studies (Devaraj & Ravichandran, 2014; Musa, Githeko, & El-Siddig, 2013; Aker, 2010; Gakuru, Winters, & Stepman, 2009) were conducted outside of the context of Pakistan. Devaraj & Ravichandran (2014) studied the role of mass media in changing behaviors, which lead to the adoption of innovation by the farming community in the Mandya district of Karnataka, India. According to the authors, radio and television were most popular methods of disseminating information and raising awareness through farm broadcast and

telecasts, respectively. However, the extent of their success can only be gauged if the end-users benefitted from these programs. The study concluded that because the farm telecasts were only allotted limited coverage on two channels, the majority of farmers were unaware of their existence. In addition, the quality of the programs was low, making them unpopular amongst the farmers who knew about them. The authors highlighted the need for policy makers and media planners to focus efforts on creating better programs. Despite this study's having been published recently, the potential role of mobile technology failed to surface.

Taking the continuing decline in the performance of the agriculture sector in Sudan into account, Musa, Githeko, & El-Siddig (2013) investigated the socio-economic, cultural, and technical factors inhibiting the effective use of ICT for agricultural extension information dissemination. The study targeted two population groups: researchers and farmers. Data gleaned from the study showed print media to be the most popular dissemination method for researchers, whereas farmers relied on the radio most for information purposes, followed by print media, TV and mobile phones. Socio-economically, the farmers' education levels surfaced as the biggest impediment to the effective use of ICT, followed by income-related factors, gender, and issues related to farm size. The researchers, on the other hand, viewed political and institutional leadership as hindering factors. Though the study included mobile phone technology within its scope, its effectiveness was not studied in depth.

Aker (2010) reviewed public sector agricultural extension programs in developing countries that have shown a low adoption rate, despite the programs being operational for decades. According to the author, this has created space for mobile technology to serve as an ICT source for agricultural extension information, and facilitate new technology adoption amongst farmers. Although it is more expensive than landlines or radio, mobile phones' accessibility to the literate

and illiterate alike gives them an edge over other ICT sources. Not only can mobile phones increase access to information through extension services, they can also help farmers manage input and output supply chains. While the growth of ICT-based agricultural extensions has its benefits, it is not without challenges. The author emphasized the need for pilot programs to gauge the impact and sustainability of all of the mechanisms introduced for information dissemination.

Prompted by the rise in the use of ICT in Africa, Gakuru, Winters, & Stepman (2009) critically analyzed several innovative donor-funded projects developed to focus on agricultural extension information dissemination through ICTs. They gauged the sustainability and upscaling scenarios for these projects. Their work highlighted the need for carefully designed projects with a blend of learning mechanisms that convert generic information into location-specific information.

Overall, the reviewed literature highlighted barriers to technology adoption based on several factors that included education levels, and access to information and learning. This study is, therefore, a humble effort to study the level 2 of the TII, which deals with the "consumption of innovation," by taking into account whether the excluded group of rural women has the motivation and capability of absorbing innovations through telecommunication-based agricultural extension information services via mobile technology. Based on the theoretical framework and literature review, the hypotheses can be drawn as follows:

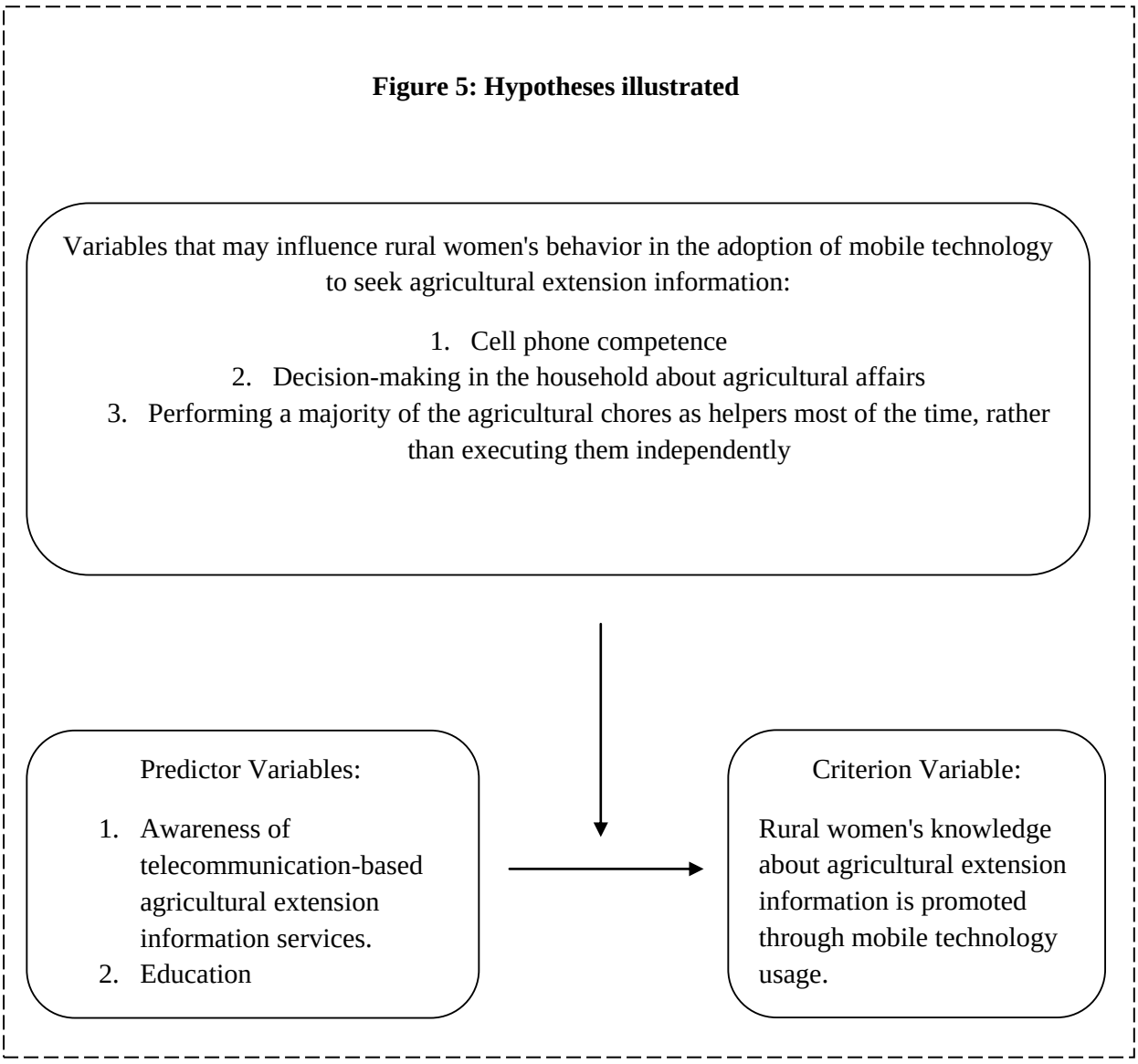
### 3.3 Hypotheses of the study

H 1 - Rural women who are aware of telecommunication based agricultural extension information services are more likely to use mobile technology to access such services than a landline telephone..

H 2 - The higher the educational level, the greater the use of mobile technology among rural women to access agricultural extension information.

The predicting variables are awareness about telecommunication-based agricultural extension information services and education. The criterion variable is the use of mobile technology to access agricultural extension information. The study will also identify whether any variables exist that may influence rural women's behavior in the adoption of mobile technology to seek agricultural extension information. These variables can be "cell phone competence," "decision-making in the household about agricultural affairs," "Performing a majority of the agricultural chores as helpers most of the time, rather than executing them independently" (Figure 5).

**Figure 5: Hypotheses illustrated**



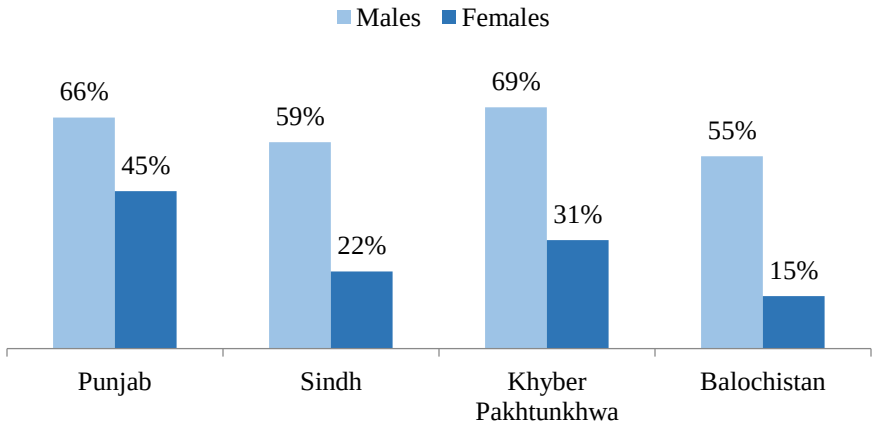
## 4. METHODOLOGY

As the researcher is a Pakistani citizen, based on her previous observations and experiences, a mixed-method research design, comprised of qualitative and quantitative methodology, was adopted. For the qualitative part of the study, the data sources are the in-depth interviews conducted with representatives of the telecommunication-based agricultural extension information services. The database www.gsmaintelligence.com was used to identify what types of telecommunication-based agricultural extension information services were available to rural women in the Lahore district of the Punjab province. Three private services were identified: Mobilink Kisan SMS service, Telenor's ACT SMS service, and Agriculture Corner's mFarmer SMS service. In addition, the researcher reviewed the website of the Agriculture Department, Government of Punjab – Pakistan http://www.agripunjab.gov.pk/ to see if there were any public services available. The PAH and the Punjab Agriculture SMS helpline were identified as being under this department's umbrella. Representatives from all five of these services were contacted to conduct in-depth interviews. The contacts made with the customer service representatives of these services revealed that the Mobilink Kisan SMS service was no longer operational, so no one was available for an in-depth interview. Three individuals were interviewed from the remaining four services. The PAH and the Punjab Agriculture SMS helpline were represented by the same individual.

Interviews for the quantitative part of the study were done through a survey conducted with rural women residing in the villages of the Lahore district in Punjab province. Lahore was chosen as the research site because Punjab province provides the majority of the country's total production of staple and cash crops, with about 80% of the cotton, nearly 70% of the wheat, approximately 60% of the sugarcane, and almost 60% of the rice being cultivated there. This province is the

most populated and, area-wise, is the second largest province in the country. It is known as the Food Factory, covering 70% of the area of the Indus basin (The World Bank, 2012). In addition, the gender literacy gap is minimal in rural Punjab, compared to the rural parts of other provinces (Pakistan Economic Survey, 2012) (Figure 6). The data gleaned from Pakistan Social and Living Standards Measurement Survey, 2013 also reflects a greater literacy rate among rural women in Punjab province as compared to the other three provinces. It can be anticipated, therefore, that the likelihood of rural women owning mobile technology is higher in rural Punjab, in comparison to other rural regions of the country, as the literacy rate is higher and cultural norms are likely to be more flexible than in rural areas of other provinces. Furthermore, Lahore is the provincial capital of Punjab province, with almost all of the modern amenities required for a good quality of life, and is ranked among those districts with a higher Human Development Index (HDI) (UNDP, 2003); it is presumed that a larger number of rural women will utilize mobile technology in the villages of the Lahore district.

**Figure 6: Province wise literacy rates in Pakistan**




Source: Pakistan Economic Survey 2012

A sample of five villages and 80 rural women was selected through a random sampling method. The five villages were selected in the first stage; this was followed by preparing a list of the rural women in the second stage. The criteria set for the rural women's inclusion consisted of asking two screening questions (Appendix A) of every woman living in each of the five villages. The women who responded "Yes" to the first question and selected at least one option in the second question were included in the list. For stage three, 16 rural women from this list were randomly selected from each of the five villages, thus comprising the 80 research study subjects. These women were interviewed using a structured questionnaire (Appendix B).

For data collection purposes, the questionnaire was divided into four major sections to identify how many of the rural women were aware of the ability to utilize mobile technology to access telecommunication-based agricultural extension information services: 1) socio-economic demographics; 2) information about the rural women's performance of agricultural chores and their role in decision-making about agricultural affairs; 3) information about the rural women's usage of cell phones; and 4) the rural women's knowledge about using cell phones to receive agricultural extension information.

Before implementing the study, the researcher sought written approval from the Michigan State University Human Research Protection Program to verify that the essence of research ethics and integrity were met prior to initiating the field research. The study was designed to ensure that the identity of all of the research participants would remain confidential. Each research subject also provided verbal consent to participate.

Pre-testing was conducted with 10 respondents before the survey was rolled out on a large scale. The pre-testing phase helped to verify that the rural women understood the questions in the manner they were meant to be understood. The data was analyzed using SPSS.

## 4.1 Definition of key terms, concepts & variables

### 4.1.1 Key terms

The four chief key terms used in this research study are:

#### 4.1.1.1 Rural women

This key term is conceptualized as predominantly indigenous women who are among the major contributors to agricultural enhancement and rural development, and who play a critical role in improving food security and eradicating rural poverty (United Nations, 2008). In this research study, the rural women represent those women of Pakistan who live in rural areas and are involved in performing either one or many agricultural chores: seed cleaning and preparation, buying seeds, sowing, buying fertilizer, applying fertilizer, buying pesticides, applying pesticides, weeding, threshing, harvesting, drying and binding crops, grain storage, and food preservation.

#### 4.1.1.2 Mobile technology

This key term is universally conceptualized as a wireless, portable, handheld device (Jarvenpaa & Lang, 2005). With every passing moment, the adoption of this technology is on the rise globally. In this research study, the term mobile technology is used to represent cellular communication. This type of communication provides people with the liberty to both develop contacts and access information that are otherwise beyond their physical reach. Unlike desktop computers, users have the ability to receive the benefits of cell phones at all times, as the technology is capable of being accessed wherever the users are. It is because of these cell phones that the users have the liberty to learn in any setting, formal or informal, thereby facilitating the communication, collaboration and sharing of information. It is through the wonders of this mobile technology that the concept of agricultural informatics has evolved.

#### 4.1.1.3 Agricultural extension information

This is a type of information required to enhance agricultural productivity, covering a wide range of areas ranging from land preparation to financial investment. Hence, agricultural organizations disseminate such information to farmers through extension agents, print and electronic media, and ICTs to improve their yields, get better market prices, and, eventually, raise their living standards (Demiryurek, Erdem, Ceyhan, Atasever, & Uysal, 2008).

#### 4.1.1.4 Telecommunication-based agricultural extension information services

These are the services that are operated through public and private initiatives to reach out to farmers, instantaneously overcoming physical geographic limitations. In this research study, respondents were surveyed about three such services: PAH, Telenor's ACT SMS Service, and Agriculture Corner's mFarmer SMS Service.

### 4.1.2 Variables

The **first predicting variable,** "Awareness of any telecommunication-based agricultural extension information services" is a concept used in this research study to assess whether the rural women in Pakistan know about any such service. This variable is operationalized through Q. 18 in the questionnaire (Appendix B).

The **second predicting variable,** "Educational qualification" was incorporated in the study design because education is one of the most significant of the socio-economic demographic variables, and it has a strong relationship with human resource development (Cho & Boland, 2003). In rural areas of Pakistan, women suffer from several constraints because of their low educational qualifications (Luqman, Ashraf, Hassan, & Sami Ullah, 2011). Educational qualification is, therefore, asked "in years" from the respondents. However, it was categorized during data analysis as "primary," i.e. respondents who have attained an education from grades 1-5; "middle," meaning those respondents who were educated through grades 6-8; and "secondary & above," i.e. those respondents who have acquired an education beyond grade 8.

The **criterion variable** of "Using cell phone ever to access agricultural extension information" is operationalized through Q. 17 in the questionnaire (Appendix B), and is dichotomous, i.e., it is measured through "Yes" or "No" categories.

Other **variables** used in the study are cell phone competence, age, marital status, head-of-household, acting household head, farm ownership, average monthly household income, decision-making about agricultural affairs, and performing agricultural chores.

A variable of **cell-phone competence** deals with the ability of the user to handle the technology. This concept is operationalized through four categories: receiving calls, making calls, receiving texts and sending texts. During the data analysis, this variable was measured as dichotomous,

using the breakdown of "Yes" or "No." If the last three categories of "making calls," "sending texts," and "receiving texts" were coded as "Yes," then the respondents were considered to be cell phone competent. All three of these categories involve some technical skills, such as typing on the keypad and number-pad for sending texts and making calls, respectively. Conversely, all of the individuals/respondents can receive calls because it is just a matter of pressing one button to receive the call.

A variable of **age** is generally perceived as being related to the mental maturity of the individual. It is commonly considered that with an increase in age, an individual is grown enough to make rational decisions and behave responsibly (Khan, 1991). During the survey, respondents were asked to state their age in years, which was categorized into four age groups in the data analysis: 20-29, 30-39, 40-49 & 50 + years.

A variable of **marital status** is significant because marriage in patriarchal societies bestows some additional privileges to women that they don't have while unmarried, which is the case in Pakistan. Hence, this variable can have a strong relationship with the use of cell phones for accessing agricultural extension information, as married women in Pakistan have responsibility for managing the dietary needs of their households.

The concepts of **household head** and **acting household head in the absence of the head-of-the-household** elucidate how the individual playing this role has the greater responsibility of running the overall domestic and financial affairs of the household. These variables were included in this research study to assess whether they mediate any relationship between the predictor and criterion variables.

A concept of **farm ownership**, also termed as land ownership, explains entitlement to the farm/land. This is another important variable that can mediate cell phone usage, as this variable

is directly related to income generation. In this research study, this variable is used to analyze whether rural women who have farm ownership are using cell phones to access agricultural extension information for the execution of their farm activities.

The variable **average monthly household income** is used to assess whether the households are food secure.

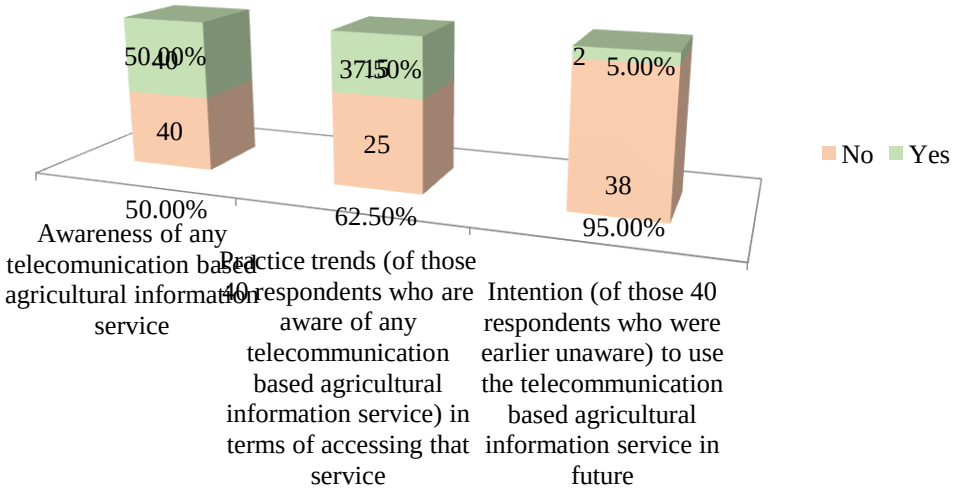
A phenomenon of **decision-making** explains whether an individual is independent in deciding one's affairs. In this study, the variable is used to analyze the rural women's autonomy in decision-making about agricultural affairs because if a woman is the decision-maker, then she will also, of course, be looking forward to receiving agricultural extension information to develop better agricultural products.

Likewise, **performing agricultural chores** is a variable used to identify what agricultural tasks women are performing and in what capacity; whether they are performing them alone, or are helping someone in the household or outside of the household.

## 5. DATA ANALYSIS & DISCUSSION

Roger's diffusion of innovation theory indicates that every innovation is adopted on a gradual level, which was witnessed in this research. **The study found that even if rural women are aware of telecommunication-based agricultural extension information services, it does not necessarily mean that they are motivated to access such services.** Figure 7 shows that half of the rural women were aware of such services but only slightly more than one-third of these women, i.e. 37.5% were accessing them. When the rural women who were previously unaware of such services were asked if they had any intention of accessing them in future, only 5% of them expressed a willingness to do so.

**Figure 7: Awareness, practice trends & future intentions of rural women about any telecommunication-based agricultural extension information service**



Among the remaining 95% who had no intentions of accessing this service in the future, around one-fourth of them gave "don't know how to dial the phone" as their reason; this means they were cell phone incompetent. The remaining three-fourths of respondents were of the opinion that "male members in the household will take care of it if required." The rural women's high dependence on either their husbands or other men in the household for contacting the telecommunication-based agricultural extension information service providers in case of need, is because the majority of the husbands, 85.93%, live with their wives in the households. This is contrary to other rural areas of the country, where men often migrate to earn better incomes, leaving their women behind with the responsibility for the agricultural-related activities in addition to doing the household chores.

**Another possible reason for the relatively low percentage of women accessing these services emerged during the research**: **fewer telecommunication-based agricultural extension information services are available to these rural women.**

During the interviews conducted with the personnel of the Agriculture Department, Government of the Punjab, Telenor's ACT SMS, and Agriculture Corner's mFarmer SMS service, it was stated that there are only two services currently available to the rural women in the Lahore district. These are the PAH and PAH SMS service. The other two, i.e. Telenor's ACT SMS, and Agriculture Corner's mFarmer SMS service, are no longer operational. A brief description of all of these services, derived from the in-depth interviews, is presented below:

i. Punjab Agriculture Helpline

The Directorate of Agriculture Information, under the umbrella of the Agriculture Department, Government of Punjab, launched the Punjab Agriculture Helpline in 2002. Initially, one toll-free number, 0800 15000, was operational. The purpose was to facilitate and guide the farmers in

response to their agricultural-related queries on seeds, fertilizers, pesticides, crops, agricultural machinery etc. A second-toll free number, 0800 29000, was launched in 2007, to address the rising number of queries from the farmers. Until 2007, there was no computer interface associated with the helpline, and the queries were recorded on audio cassette recorders. From 2007 forward, the helpline was computerized. The farmers' calls are now digitally recorded, with the caller ID displaying the date and time of the call. The practice of manually maintaining the callers' records by noting them on registers remains in place. Newspapers and TV channels are used to publicize the helpline.

The helpline operates 12 hours daily, from 8 Am to 8 Pm. Calls placed to the two toll-free numbers from a PTCL landline are free of charge. Efforts have been made to facilitate mobile phone callers too, since they constitute 50% of the total callers, but every mobile operator defines their own tariff rates, so the idea of allowing calls to be free of charge when dialed from mobile phones has not materialized. Agricultural technical experts provide feedback to farmers on the same day. Each call is recorded, and an expert later returns the call with the required information. This procedure was adopted in order to maintain the database of callers' queries.

Through this public initiative, agricultural extension information and knowledge is being dispensed to farmers in far-flung areas. In addition, women whose mobility is restricted by cultural barriers in Pakistan’s patriarchal society have also found assistance through this service, and now have the privilege of becoming first-hand recipients of agricultural extension knowledge. Illiterate or semi-literate rural women often do not find the IVR service to be user-friendly, though, and instead of leaving a recorded message, they often hang up without doing so. Sometimes they record their messages without revealing their identities, unlike urban women who are more confident in these matters. Up until 2007, the helpline did not receive any queries

from women callers. Today, 20% of the total calls are received from women. Keeping the women's comfort in mind, their names are never asked; they must willingly offer it themselves. It has also been observed that sometimes when calls from women callers are returned, a male family member receiving the call will deny that any call was placed to the helpline by one of their women. Though the queries put forward by women are diverse, they are mostly related to kitchen gardening, with some of them about the use of pesticides, fertilizers and modern methods of food preservation.

According to the Agriculture Department Punjab, more than 12,000 telephone calls are currently being recorded annually, with this Directorate providing feedback on the same day. Although the density of calls is significant all year round, whenever there is a public campaign about installment-based tractor schemes or subsidized seed and fertilizer distribution, call volumes rise immensely. They are considering upgrading the system to a full-fledged call center to address this need. (Deputy Director Agriculture Department Government of Punjab, Pakistan, personal communication, August 19, 2014).

ii. Punjab Agriculture SMS Helpline

The Directorate of Agricultural Information, Government of Punjab, has initiated an SMS Helpline Service that uses mobile phones to provide technical guidance to farmers. When seeking agri-information and guidance related to their field problems, farmers may send an SMS to 0304-4000172. This service has augmented the efforts of the Directorate in agri-technology transfers, as farmers are becoming increasingly aware of scientific advancements and other initiatives through the government and development projects (Deputy Director Agriculture Department Government of Punjab, Pakistan, personal communication, August 19, 2014).

iii. Telenor's Agriculture Commodity Trade (ACT) SMS Service

Telenor is the second largest mobile operator in Pakistan. As one of the fastest growing networks in the country, it has a rich portfolio of products and services, and is continuously implementing a range of services for the previously unconnected. Using mobile phones as a tool to serve Pakistan's farmers, Telenor, in collaboration with the Agha Khan Rural Support Programme, launched a pilot service called ACT to collect and distribute market prices on a day-to-day basis. The service was initiated as an outcome of a survey conducted with farmers who expressed a desire to know the current prices of goods in Pakistan's agricultural markets. The service entails an SMS alert system for which farmers could sign up and get the price information. The pilot was a success, with more than 4000 farmers subscribing to the SMS service. In 2011, Telenor expanded the business venture in collaboration with 1) Multan, a company selling fertilizers, seeds and pesticides, and 2) Telenor's mobile-based banking service, Easypaisa, to facilitate farmers in buying these products at wholesale prices. In 2012, Telenor joined with the Governments of Punjab in Bahawalpur, and of Khyber Pakhtunkhawa in Mardan, to launch an information service for famers of these two cities. The service uses SMS texts to share advanced farming techniques and market prices with farmers throughout the region. Keeping the literacy divide in mind, outbound IVRs are also used to relay information. Telecenters were set up in the third phase of the pilot. These are used to relay audio and visual content for educating the farmers. Four thousand farmers currently benefit from this service.

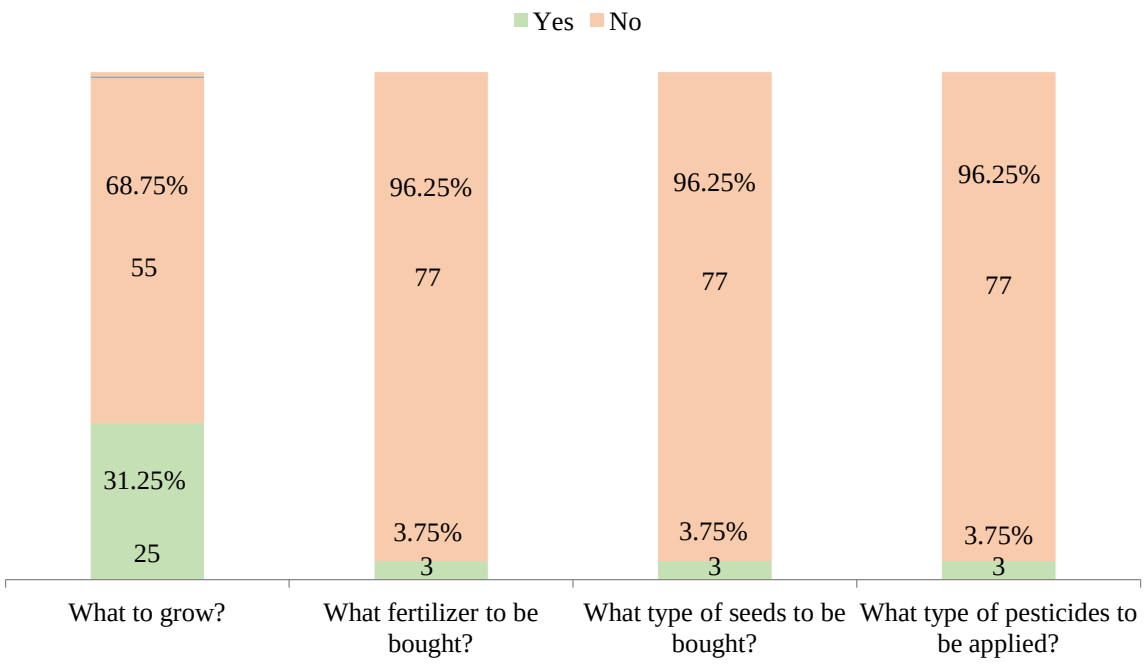
iv. Agriculture Corner's mFarmer SMS Service

Agricorner.com (Agriculture Corner) is a social networking forum that allows farmers in any part of Pakistan to directly connect with other farmers, extension workers, scientists, and related

professionals and institutes. The SMS service was launched on a pilot basis by the organizers of this platform but the service was suspended due to financial constraints.

**The majority of rural women have comparatively less autonomy in decision-making about the mainstream agricultural production activities in the household.** Only 10.62%[3] of rural women have the discretion of decision-making in their households. Responses to questions in the survey regarding decision-making about four different agricultural affairs revealed that these women are relatively more involved in deciding "What to grow," as compared to buying fertilizer, seeds and pesticide applications. However, even in the process of deciding what to grow, less than one-third of the participants have the liberty to decide (Figure 8).

**Figure 8: Decision making among repsondents about different agricultural affairs**



Likewise, about one-third of these rural women were consulted within the household about different agricultural matters. The types of agricultural matters for which they are consulted were most often about the quantity of grain to be stored for household consumption, followed by what to grow, food preservation, and the amount of financial investment to be made in agriculture. Only 2% of rural women were consulted about the type of fertilizer to be bought and the quantity of the agricultural yield to be sold in the market.

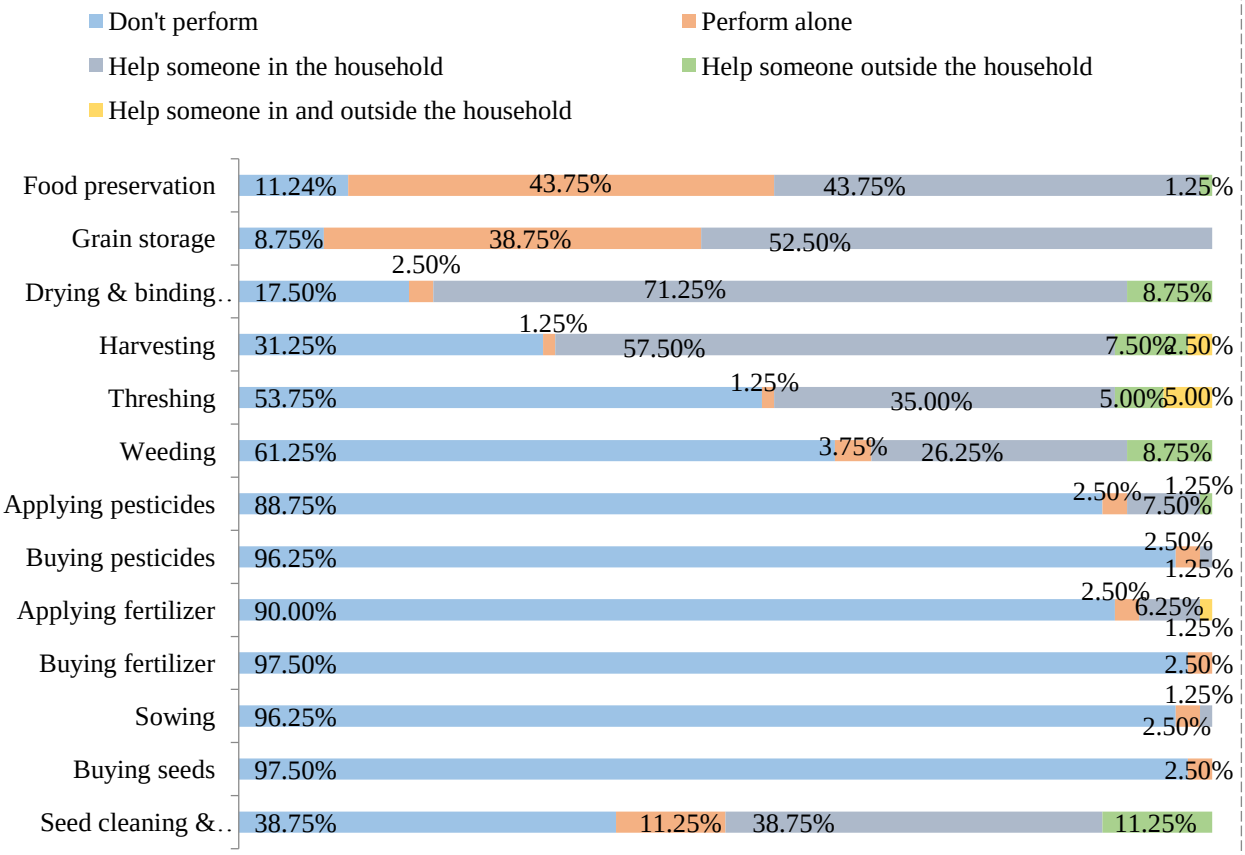
**Most of the time, these rural women perform the agricultural chores as helpers rather than executing them independently.** The highest rate of performance for these rural women was observed in the chores of food preservation, grain storage, drying and binding of crops, harvesting, seed cleaning and preparation, threshing and weeding. In mainstream agricultural production activities such as buying seed, fertilizer and pesticides, or sowing and applying fertilizer and pesticides, their performance share was almost minimal. Overall, except for food preservation followed by grain storage, and seed cleaning and preparation, their "perform alone" rate for these agricultural chores was very low; they mostly performed these chores as “helpers of someone in their households" (Figure 9).

**Of the 50% rural women who were aware of telecommunication-based agricultural extension information services**, all of them were aware of PAH, while only 13% were aware of Telenor's ACT SMS Service, and none of them were aware of Agriculture Corner's mFarmer SMS service. However, these rural women were only accessing PAH.

**Among the reasons to access PAH**, the primary purpose was to acquire information about kitchen gardening while buying seeds, fertilizers, or pesticides; applying fertilizers and pesticides, grain storage, and food preservation were the secondary purposes. Most of the time,

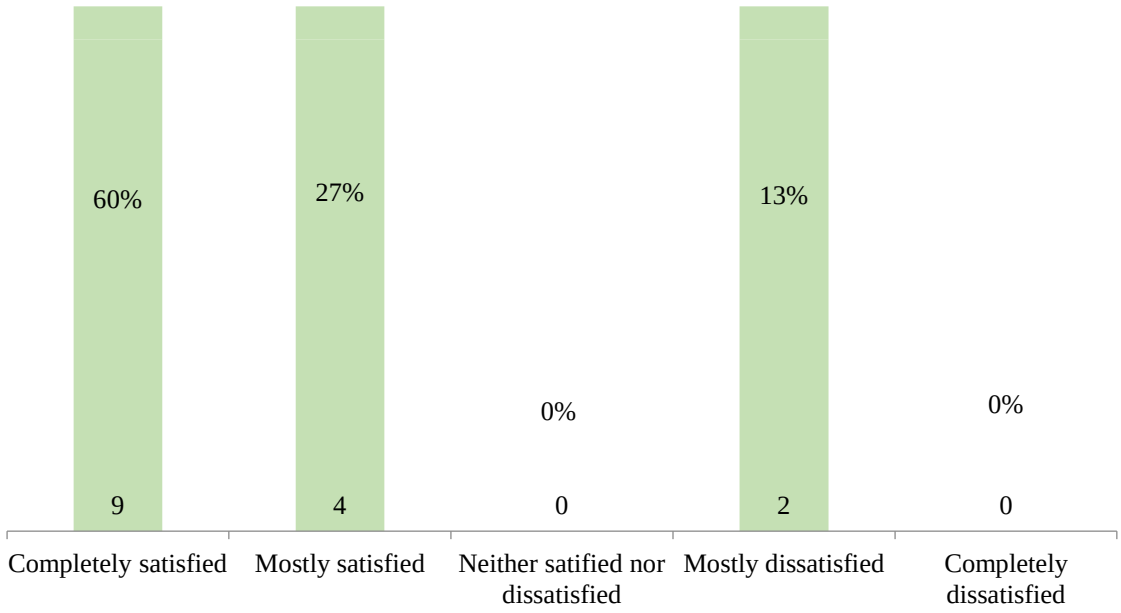
the information requested regarding the secondary purposes was required to enhance the primary purpose of kitchen gardening.

**Figure 9: Type of agrcicultural chores that rural women perform**



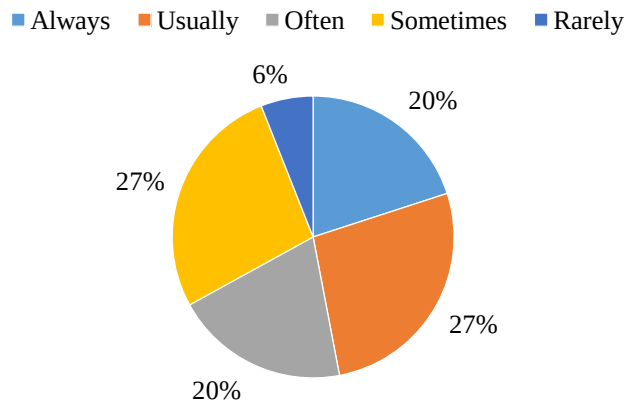

The majority of the respondents, 60%, were completely satisfied with the value of the agricultural extension information received through PAH, 27% were mostly satisfied, and only 13% were mostly dissatisfied (Figure 10).

**Figure 10: Respondents' satisfaction level about the value of information received**



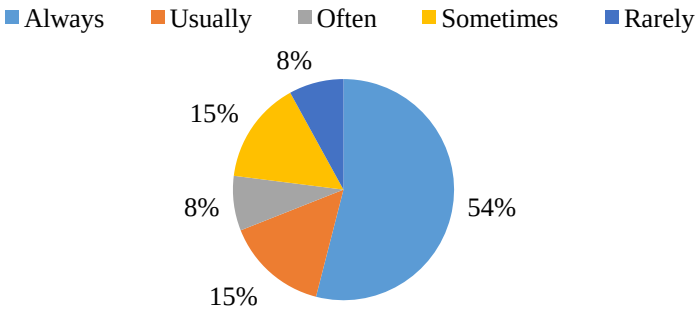

**Among these rural women, it appears that a majority of the women accessed this service frequently:** 20% were "always" accessing it, 27% accessed it "usually," and 20% accessed it "often," whereas one-third did not access the helpline frequently, with 27% who accessed it "sometimes," and 6% who only "rarely" accessed it (Figure 11).

**Figure 11: Frequency of accessing the telecommunication-based agricultural extension information service**



**The cell phone was found to be the most widely and most frequently used (Figure 12) means of communication among the 37.5% of rural women who access telecommunication-based agricultural extension information services.** Of these, 13% used landlines phones, 67% used cell phones, and 20% used both landlines and cell phones to access PAH. H 1 is, therefore, positively proved; the women who are aware of the telecommunication-based agricultural extension information services are more likely to use mobile technology to access such services.

**Figure 12: Frequency of using cell phone to access the telecommunication-based agricultural extension information service**




**The study also analyzed how the pattern of utilizing the cell phone to access agricultural extension information services occurred among the different age groups and marital status of the rural women who participated**. It has become evident that their use of the cell phone to access agricultural extension information decreases as the rural women progress in age (Figure 13). A similar pattern was found in relation to marital status (Figure 14). Unmarried rural women are more likely to use a cell phone than married rural women. Hence, it can be deduced that young rural women are more likely to use a cell phone to receive agricultural extension information.

**Figure 13: Use of cell phone ever (to access agricultural extension information) among different age groups of respondents**

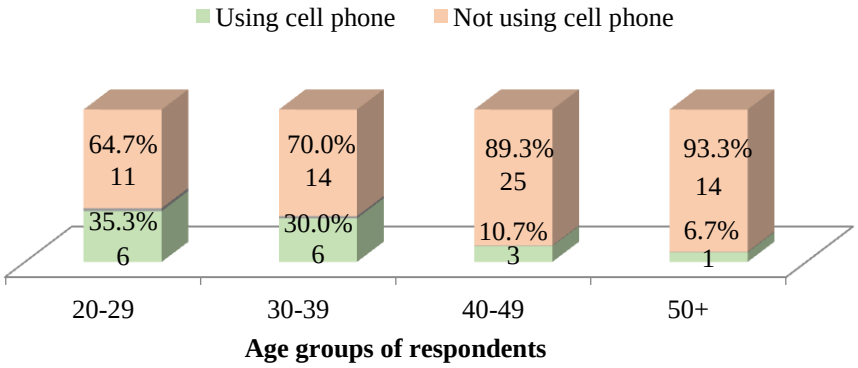
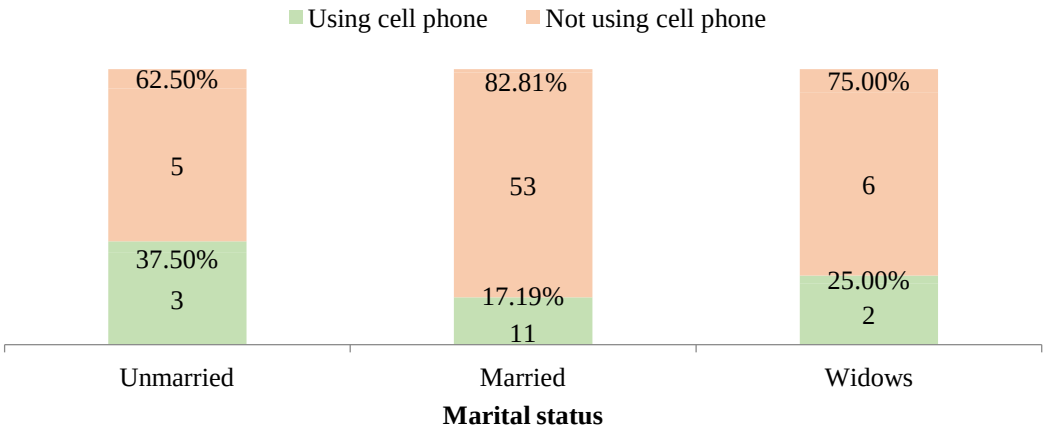



**Figure 14: Use of cell phone ever (to access agricultural extension information) among respondents of different marital status**




**The study also assessed whether there was any difference in the use of cell phones to access agricultural extension information among rural women who are the household head (Figure 15), the acting household head (Figure 16), and farm owners (Figure 17).** Except in the category of "acting household head," the percentage of women who used mobile technology for this purpose is higher than it is for their husbands and others in the household. The "others" include the sub-categories of father, father-in-law, mother, mother-in-law, brother, brother-in-

law, son and son-in-law. However, in the case of "joint ownership,"[4] none of the rural women were found using the cell phone to receive agricultural extension information.

**Figure 15: Use of cell phone ever (to access agricultural extension information) among different categories of household heads**

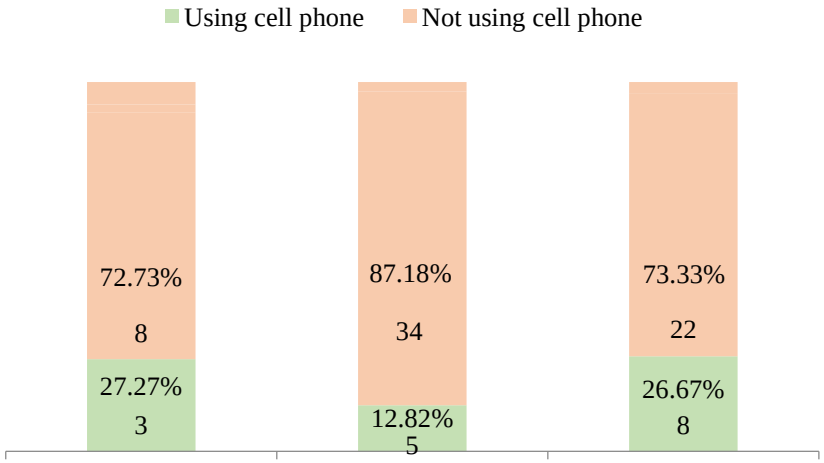
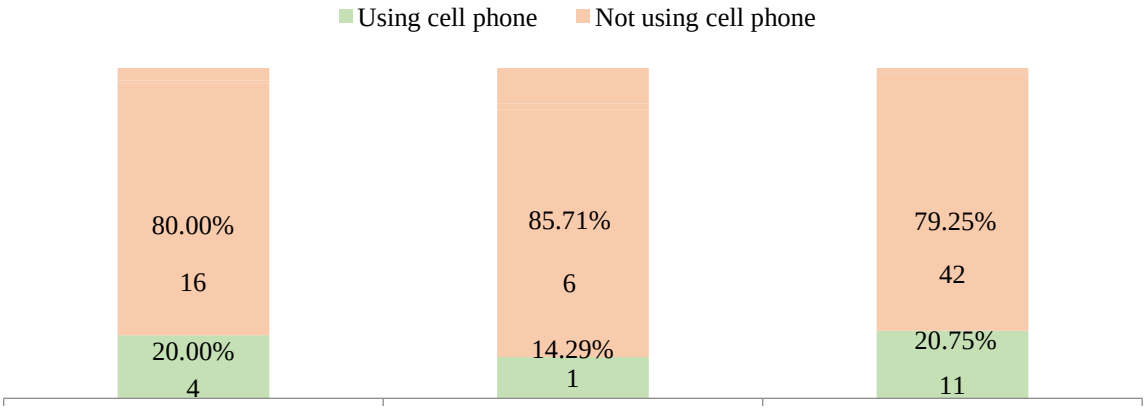
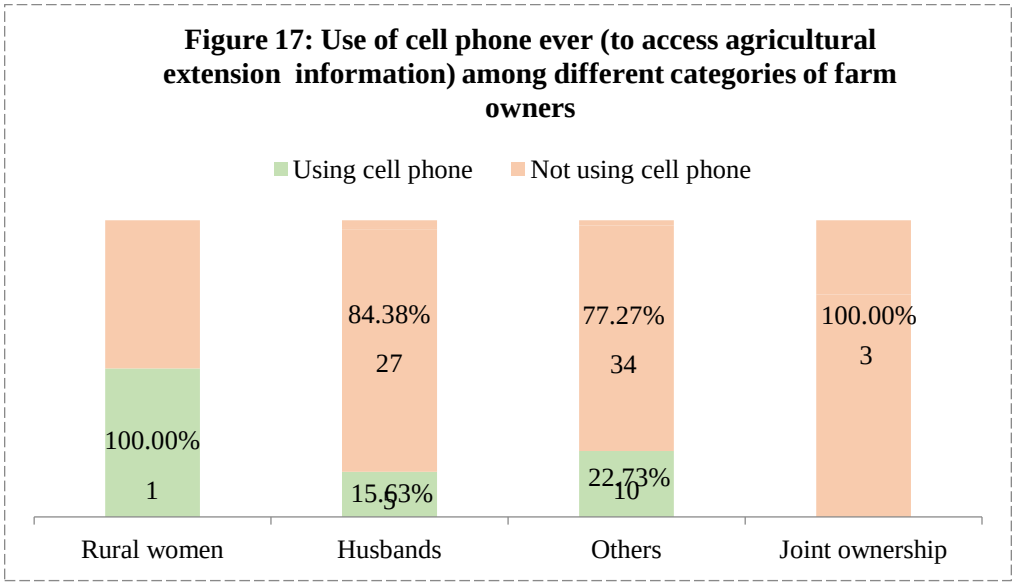



**Figure 16: Use of cell phone ever (to access agricultural extension information) among different categories of acting household heads**

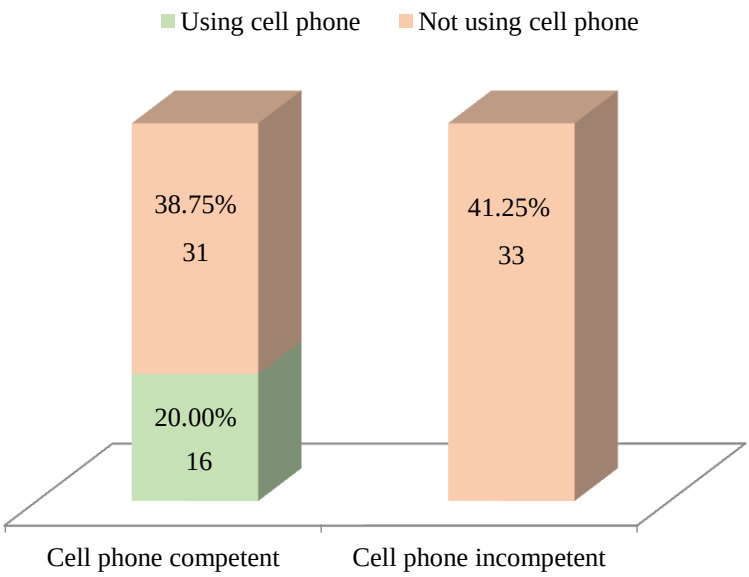



[4] Joint ownership represents two owners in the household. One of these owners is a rural woman. This type of ownership often exists when the rural woman brings farm/land in her dowry, or when the husband gives the farm entitlement to his wife as a part of the dower.



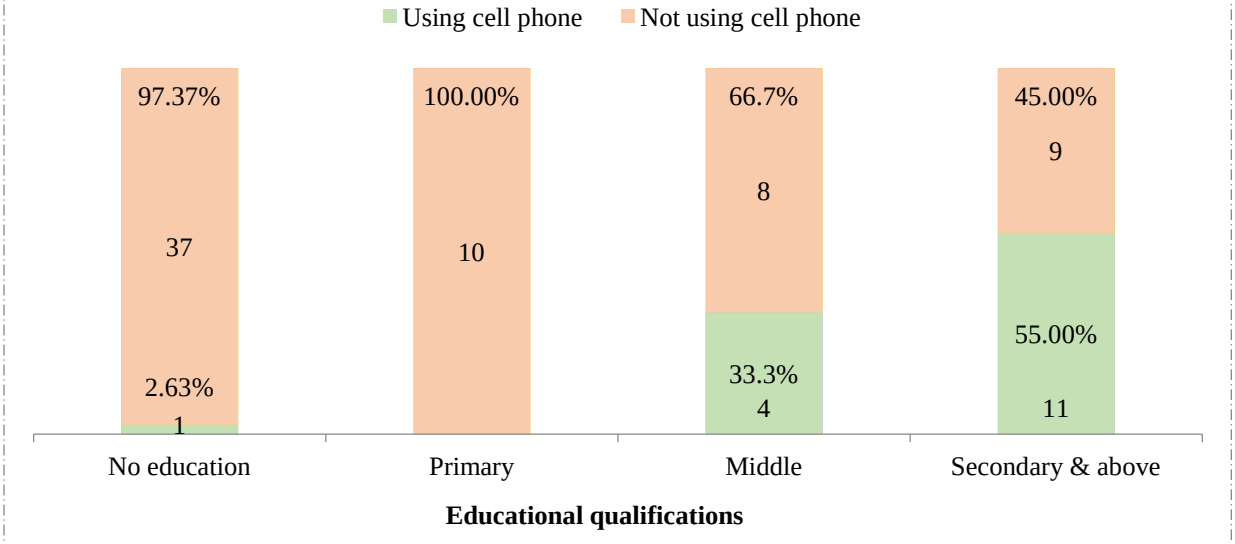

**The study examined whether cell phone competence influenced the use of cell phones to access agricultural extension information services**, and found that the cell phone competence of rural women who are involved in some sort of agricultural activity did not necessarily also mean they used this technology to access agricultural extension information. Of the 47 rural women in this study who were cell-phone competent, only about one-third of them used the technology to ask someone about agricultural extension information (Figure 18).

**Figure 18: Use of cell phone ever (to ask someone about agricultural extension information) among cell phone competent and incompetent repondents**




**The relationship between educational qualifications and the use of cell phones to access agricultural information was found to be strongly significant.** As educational qualifications increased, the use of cell phones to access agricultural information among the respondents also increased. Only 1% of the rural women with no education, and none of those with a primary education, were found to use a cell phone to access agricultural information, whereas 5% with a middle educational qualification, and 14% with a secondary or higher educational qualification used the cell phone for this purpose (Figure 19). Furthermore, the absence of the education, i.e. no schooling, also seems to be related to cell-phone incompetence as 41% of the rural women are cell-phone incompetent (Figure 18), and 46% have no schooling. Hence, H 2, that rural women with higher educational qualifications are more likely to use cell phones to access agricultural information, compared with those who have lower qualifications was positively proven.

**Figure 19: Use of cell phone ever (to access agricultural extension information) among respondents having different educational qualifications.**




In addition to the bivariate analysis of the predictor variables of awareness about telecommunication-based information services and educational qualifications, a multivariate analysis (Table 1) was run to verify whether the predictor variables had the same results when combined together in a binary logistic regression method. When the variables of education and age were entered using an ordinal scale in the presence of awareness, decision-making and average household income, decision-making became slightly significant, indicating that this variable plays some role in the use of cell phones to access agricultural extension information. The aforementioned probability of linking the low usage of cell phones for accessing agricultural extension information with decision-making is, therefore, proved. The analysis was also run with the variables of household head, information source for knowing about any telecommunication-based agricultural extension information services, and cell phone competence but they did not bring any results, so they were then removed from the multivariate regression analysis.

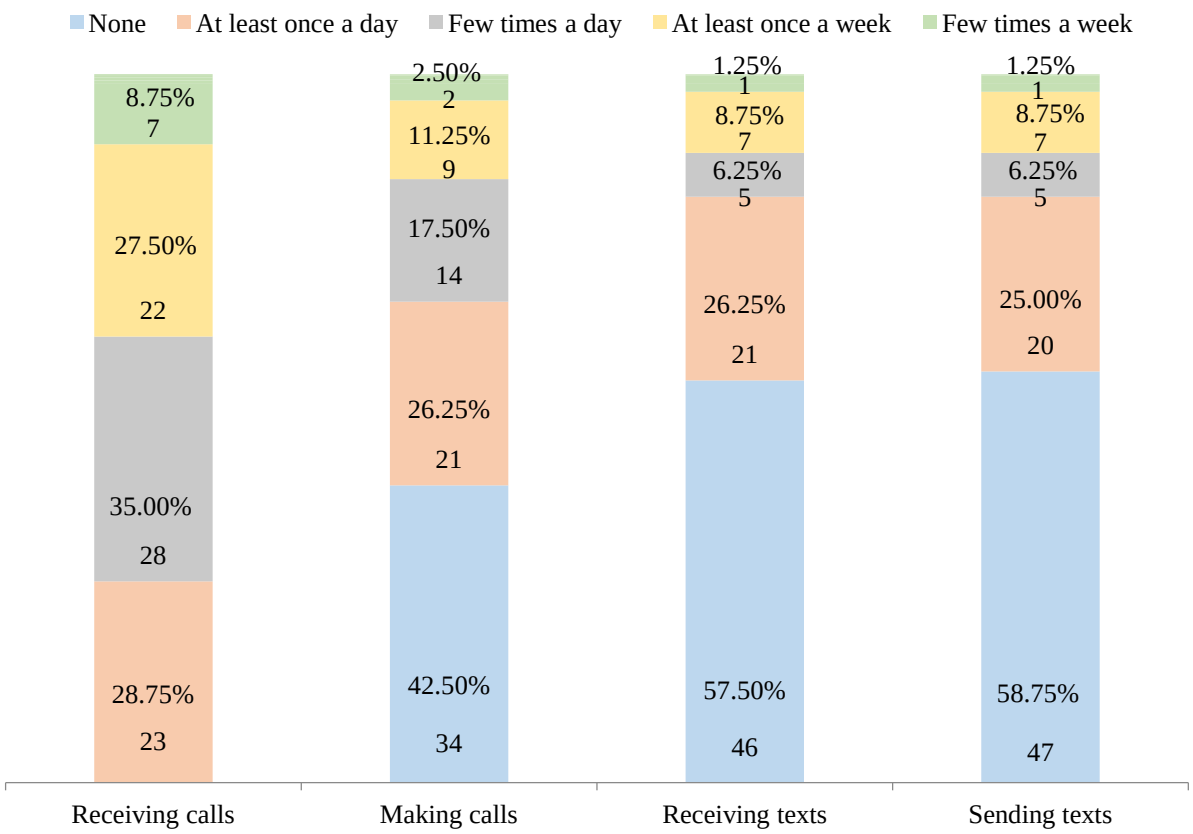
**Table 1: Multivariate analysis**

| | |
|---|---|
| Education | 4.769** |
| Awareness | |
| No | --------- |
| Yes | 5.322 |
| Age | 1.379 |
| Decision making | 5.507* |
| Average household income | 1.000 |
| Constant | .001*** |

*p < .10 **p < .05 ***p < .01

The majority of the rural women did not spend time making calls or receiving and sending texts (Figure 20), and were, therefore, termed as cell phone incompetent. Among the 50% of the rural women who were earlier unaware of any telecommunication-based agricultural extension information services, 95 % replied negatively when asked about their future intentions to access the service, with about one-fourth of them citing the reason, "don't know how to dial the phone."

**Figure 20: Cell phone usage in terms of calling & texting**




**Broadly speaking, it was found that these rural women used cell phones for interacting with immediate family members, friends, and relatives, as compared with using cell phones to make and receive business calls.** Only a very small percentage of the women, up to 16%, used the cell phone to seek information and even fewer used it to get help for emergencies; a small fraction of the rural women also used cell phones for recreational purposes, as 30% listened to the radio and 18% played games (Figure 21).

**Figure 21: Reasons for cell phone usage among rural women**

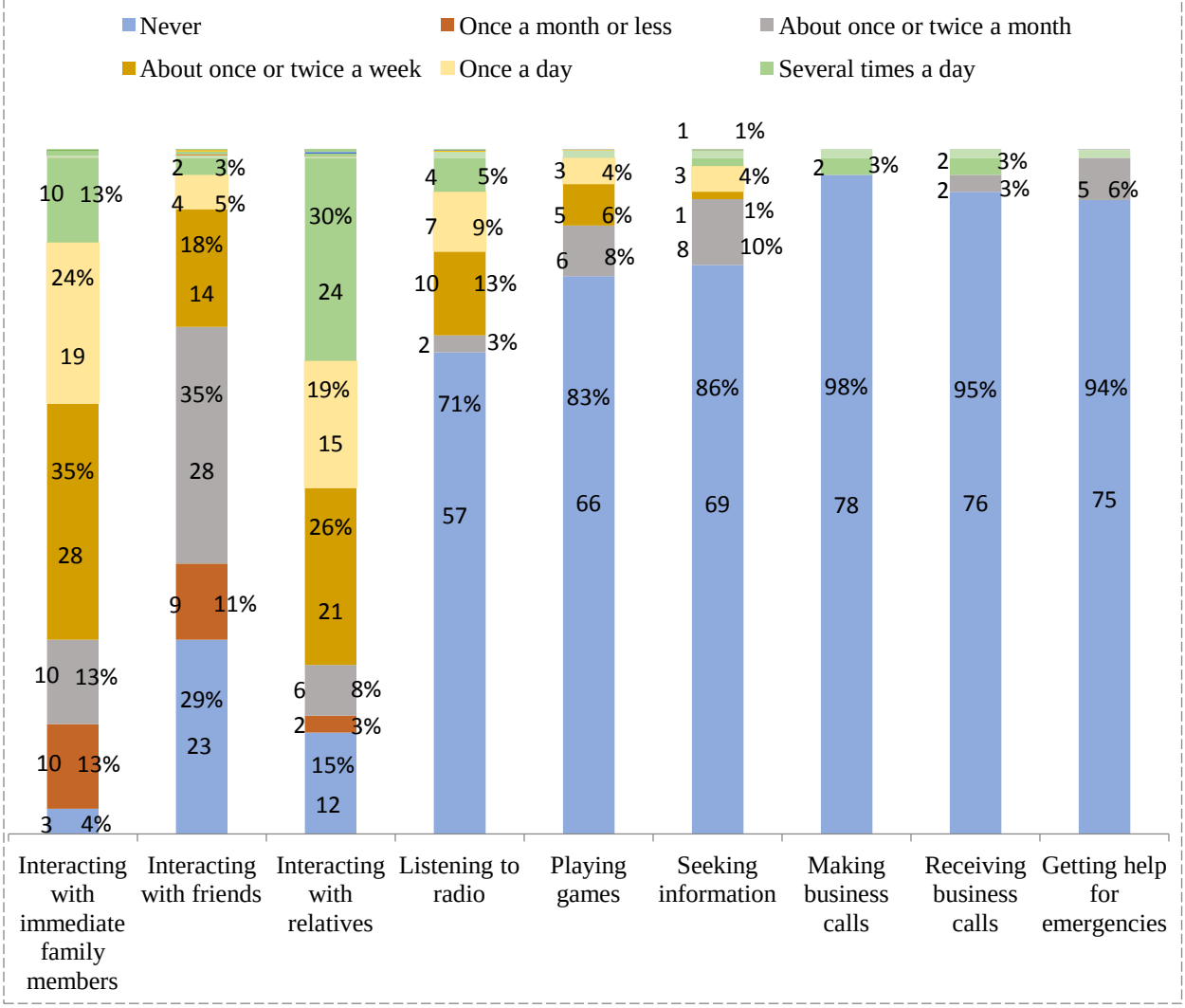


**Table 2: Socio-economic demographics, cell phone competence, awareness and practice trends of using cell phones to access agricultural extension information**

| Variables | Categories | Descriptive statistics | |
|---|---|---|---|
| | | Frequency /Count | Percentage/Mean |
| Use of cell phone ever to access agricultural extension information | Yes | 16 | 20 % |
| | No | 64 | 80 % |
| Age | 20 - 29 | 17 | 21.3 % |
| | 30 - 39 | 20 | 25.0 % |
| | 40 - 49 | 28 | 35.0 % |
| | 50 + | 15 | 18.8 % |
| Education | No schooling | 38 | 47.5 % |
| | Primary | 10 | 12.5 % |
| | Middle | 12 | 15 % |
| | Secondary & above | 20 | 25.0 % |
| Marital status | Unmarried | 8 | 10 % |
| | Married | 64 | 80 % |
| | Separated | 0 | 0 % |
| | Divorced | 0 | 0 % |
| | Widowed | 8 | 10 % |
| Head of the household | Herself | 11 | 13.8 % |
| | Husband | 39 | 48.8 % |
| | Other | 30 | 37.5 % |
| Acting head of the household | Herself | 20 | 25 % |
| | Husband | 7 | 8.75 % |
| | Other | 53 | 66.25 % |

**Table 2 (Cont'd)**

| | | | |
|---|---|---|---|
| Farm ownership | Herself | 1 | 1.25 % |
| | Husband | 32 | 40 % |
| | Other | 44 | 55 % |
| | Joint ownership | 3 | 3.75 % |
| Decision-making about agricultural affairs | Yes | 34 | 10.62 % |
| | No | 286 | 89.37 % |
| Cell-phone-competent rural women | Yes | 47 | 58.8 % |
| | No | 33 | 41.3 % |
| Awareness of any telecommunication-based agricultural extension information services | Yes | 40 | 50 % |
| | No | 40 | 50 % |
| Information source for knowing about any telecommunication-based agricultural extension information services | Friends and family | 26 | 65 % |
| | Media | 14 | 35 % |
| Accessing the known telecommunication-based agricultural extension information service | Yes | 15 | 37.5 % |
| | No | 25 | 62.5 % |
| Means of accessing the known telecommunication-based agricultural extension information service | Cell phone | 10 | 67 % |
| | Landline | 2 | 13 % |
| | Both cell phone & landline | 3 | 20 % |

## 6. CONCLUSION & RECOMMENDATIONS

At present, only 37.5% of women access the telecommunication-based agricultural extension information services, and only 5% of those who were previously unaware of these telecommunication-based agricultural extension information services have expressed an interest in accessing the PAH in the future. In terms of the motivations and capabilities of these rural women, it appears that the innovation is not yet largely inclusive, but these statistics are significant when analyzed in light of the in-depth interview conducted with an executive officer of PAH. According to him, there were no calls from women prior to 2007, yet rural women now comprise one-fifth of the total queries received. The data analysis also indicated that women who are more educated were more likely to use such services, even if their major purpose for accessing the helpline was to get information about kitchen gardening, indicating that they were more interested in small-scale farming within their households. This practice of kitchen gardening can be promoted on a wider scale, as it helps rural households to reduce their financial budgets by cultivating seasonal vegetables, thereby cherishing the spirit of self-reliance to make their households food secure. These services, therefore, must be promoted because, in countries like Pakistan, where women are often restricted due to low mobility and having to observe the practices of the veil, these helplines assist them in accessing information while staying inside the home. Furthermore, women agricultural technical experts should be hired to answer the queries received from women. This will facilitate the use of these services by rural women, as they are more comfortable talking to a person of their own gender. The provincial government of Punjab province often conducts kitchen-gardening competitions to encourage micro-level farming among women. In the future, several projects could be designed for these women to market their

surplus produce. These helplines could then prove to be their best source for timely and updated information.

## 7. LIMITATIONS & FUTURE DIRECTIONS

This research study was restricted to the villages of district Lahore due to time, financial, and human resource constraints. The topic of this research study, cell phone usage among rural women to access agricultural extension information, made the villages of district Lahore the logical choice for a research site. Cell phone usage is somewhat related to literacy level. As indicated earlier in the study, the rural women in Punjab have comparatively higher literacy rates to women in the rural parts of other provinces. It is, therefore, assumed that rural Lahore must have more literate women. Moreover, the cultural norms in Lahore are not as stringent as they tend to be in most of the other parts of the country, and these norms play a large role in cell phone usage among women.

A sample size of 80 respondents was chosen through a random sampling method, both to accommodate time restrictions, and because stratified sampling in terms of age, education, marital status, household head, acting household head and farm ownership was not feasible since the Agriculture Department, Government of Punjab, Pakistan has reported that no such data about rural women's involvement in agriculture is maintained at the union council, district or provincial levels. Hence, the researcher had to develop lists of such women on her own, making random sampling based on screening questions (Appendix I) the most feasible strategy. A possibility, therefore, exists that if an equal number of respondents from each variable were to be interviewed, the findings about their cell phone usage might vary.

Furthermore, the migration trend among the men in district Lahore is not as high as it is in other districts of Punjab province, such as Chakwal and Jehlum. During the data analysis, it was found that, among the total respondents, 80% were married, and among these women, 70% of their husbands were living with them. Another possibility, therefore, exists that the rural women of the

latter districts may be more likely to utilize mobile technology to access agricultural extension information, compared with the rural women of district Lahore, as they are more responsible for the farm field activities. Hence, there is a need to replicate the study on a larger scale, with a bigger sample, stratified on the aforementioned variables. Overall, this study is only a humble effort to generate an initial debate on a national level, and then on a regional level in South Asia, so as to determine the extent to which rural women use the most portable and affordable technology, cell phones, to access agricultural extension information because, as seen in Figure 3, this region has a primarily agrarian-based economy, like Sub-Saharan Africa, South East Asia, and the Pacific.

# APPENDICES

## Appendix A

### Screening Questions

1. Do you have a cell phone? ☐ Yes ☐ No
2. Are you involved in performing any of the agricultural chores? ☐ Yes ☐ No

If "Yes", what type of the following agricultural chores do you perform?

Please select all that apply.

| | | | |
|---|---|---|---|
| ☐ | Seed cleaning and preparation | ☐ | Buying seeds |
| ☐ | Sowing | ☐ | Buying fertilizer |
| ☐ | Applying fertilizer | ☐ | Buying pesticides |
| ☐ | Applying pesticides | ☐ | Weeding |
| ☐ | Threshing | ☐ | Harvesting |
| ☐ | Drying and binding of crop | ☐ | Grain storage |
| ☐ | Food preservation | ☐ | Other (please specify) _____ |

## Appendix B

## Questionnaire

### A. Profile and demographics information

1. Your age? _____
2. Your education level (In years)? _____
3. Your marital status?
   - ☐ Unmarried
   - ☐ Married
   - ☐ Separated
   - ☐ Divorced
   - ☐ Widowed
4. Do you have any living children?

   ☐ Yes ☐ No

   If "Yes" then please tell us:

   How many children do you have? _____

   The age and gender of the eldest and youngest child _____

   How many of your total children are living with you and how many have left? _____
5. What are your husband's primary income generating activities? _____
6. Does your husband live with you?

   ☐ Yes ☐ No (If "No", where does he live? _____ )
7. Who is the head of your household?

☐ You ☐ Father ☐ Father-in-law ☐ Mother ☐ Mother-in-law

☐ Husband ☐ Brother ☐ Brother-in-law ☐ Son ☐ Son-in-law

☐ Other (Please specify) _____

8. Whenever the head of the household is away from home, who will be the acting household head?

☐ You ☐ Father ☐ Father-in-law ☐ Mother ☐ Mother-in-law

☐ Husband ☐ Brother ☐ Brother-in-law ☐ Son ☐ Son-in-law

☐ Other (Please specify) _____

9. Who owns the farm?

☐ You ☐ Father ☐ Father-in-law ☐ Mother ☐ Mother-in-law

☐ Husband ☐ Brother ☐ Brother-in-law ☐ Son ☐ Son-in-law

☐ Other (Please specify) _____

10. Most of the time what is the average monthly income of your household? _____

**B. Information about agricultural chores' performance and decision making**

11. Please tell us what type of agricultural chores, given below, do you perform? Please answer for each agricultural chore.

| Sr. No. | Agricultural chores that you perform | Yes | No | If "No" who does perform this? | Do you perform this alone or help someone in performing it? (Whom do you help?) | Do you hire Someone else outside your family to perform this agricultural chore? |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Seed cleaning and preparation | | | | | |
| 2 | Buying seeds | | | | | |
| 3 | Sowing | | | | | |
| 4 | Buying fertilizer | | | | | |
| 5 | Applying fertilizer | | | | | |
| 6 | Buying pesticides | | | | | |
| 7 | Applying pesticides | | | | | |
| 8 | Weeding | | | | | |
| 9 | Threshing | | | | | |
| 10 | Harvesting | | | | | |
| 11 | Drying and binding of crop | | | | | |
| 12 | Grain storage | | | | | |
| 13 | Food preservation | | | | | |
| 14 | Other (Please specify) | | | | | |

12. Do you make decisions about any of the following agricultural affairs in your household? Please answer for each agricultural affair.

| Sr. No. | Agricultural affair about which you decide? | Yes | No | If "No" who does make the decision then? |
|---|---|---|---|---|
| 1 | What to grow? | | | |

| | | | | |
|---|---|---|---|---|
| 2 | What fertilizer to be bought? | | | |
| 3 | What type of seeds to be bought? | | | |
| 4 | What type of pesticides to be applied? | | | |
| 5 | Any other type of agricultural affair?<br>(Please specify) | | | |

13. If you don't make the decisions, have you ever been consulted in the decision making process about agricultural affairs in your household?

☐ Yes ☐ No

If "Yes", in what type of agricultural affairs are you consulted? _____

**C. Information about your cell phone usage**

| 14. You use your cell phone for ..... (Please check all that apply) | | | | | | |
|---|---|---|---|---|---|---|
| Use of cell phone | Yes | No | If "Yes" how frequently do you use? | | | |
| | | | At least once a day | Few times a day | At least once week | Few times a week |
| Receiving calls | | | | | | |
| Making calls | | | | | | |
| Receiving texts | | | | | | |
| Sending texts | | | | | | |
| Other (Please specify) | | | | | | |

15. When did you start using the cell phone? ————————

| 16. Broadly speaking, for what reasons, given below, do you use your cell phone? (Please select all that apply). Please also indicate the frequency of each use. | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sr. No. | Use of cell phone | Frequency of each use | | | | | |
| | | Never | Once a month or less | About once or twice a month | About once or twice a week | Once a day | Several times a day |
| 1 | Interacting with immediate family members | | | | | | |
| 2 | Interacting with friends | | | | | | |
| 3 | Interacting with relatives | | | | | | |
| 4 | Listening to radio | | | | | | |
| 5 | Playing games | | | | | | |
| 6 | Seeking information | | | | | | |
| 7 | Making business calls | | | | | | |
| 8 | Receiving business calls | | | | | | |
| 9 | Getting help for emergencies | | | | | | |
| 10 | Other (Please specify) | | | | | | |

**D. Knowledge, Attitude and Practice of using cell phone to access telecommunication-based agricultural extension information services**

17. Have you ever used your cell phone to ask someone about any agricultural information?

☐ Yes (Whom? _____ ) ☐ No

If "No" then do you intend to use your mobile phone for agricultural information related purposes in future?

☐ Yes ☐ No (Why not? _____ )

18. Are you aware of any telecommunication based agricultural information services?

☐ Yes ☐ No

If "Yes", please name the service _____

If "No", do you intend to use the known telecommunication-based agricultural information service in future?

☐ Yes ☐ No If "No" then why not? _____

19. How did you come to know about the service(s)?

□ Husband □ Father □ Son □ Brother □ Mother □ Daughter
□ Sister □ Friend □ Relative (Which one?) _____ □ Newspaper □ Radio
□ TV □ Other (Please specify) _____

20. Did you access the known telecommunication service providing the agricultural information?

☐ Yes ☐ No

If "Yes" then please tell us what type of agricultural information, given below, did you access? Please select all that apply.

| Sr. No. | Type of agricultural information | Did you access it? Yes or No | Did you use the information? (Yes or No) | If "No" why did not you use the information? | Please rate the value of information on the scale of 1 - 5 where 1 is unsatisfactory and 5 is satisfactory<br><br>1 2 3 4 5 |
|---|---|---|---|---|---|
| 1 | Seed cleaning and preparation | | | | |
| 2 | Buying seeds | | | | |
| 3 | Sowing | | | | |
| 4 | Buying fertilizer | | | | |
| 5 | Applying fertilizer | | | | |
| 6 | Buying pesticides | | | | |
| 7 | Applying pesticides | | | | |
| 8 | Weeding | | | | |
| 9 | Threshing | | | | |
| 10 | Harvesting | | | | |
| 11 | Drying and binding of crop | | | | |
| 12 | Grain storage | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 13 | Food preservation | | | | |
| 14 | Accessing agricultural market informa | | | | |
| 15 | Seeking agricultural emerg assistance | | | | |
| 16 | Other (Please specify) | | | | |

21. Using the scale given below, please tell us how frequently you access the known telecommunication based agricultural information service?

☐ Always ☐ Usually ☐ Often ☐ Sometimes ☐ Rarely

22. Did you use your cell phone to access this telecommunication information service?

☐ Yes ☐ No

23. How frequently do you use your cell phone to access this telecommunication information service? Rate the frequency of using your cell phone on the scale given below.

☐ Always ☐ Usually ☐ Often ☐ Sometimes ☐ Rarely

24. Are you aware of any of the following telecommunication services providing agricultural information?

1. Punjab Agriculture Helpline ☐ Yes ☐ No
2. Telenor's Agriculture Commodity Trade SMS Service ☐ Yes ☐ No
3. Agriculture Corner's mFarmer SMS Service ☐ Yes ☐ No

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