

**ADOPTION OF MOBILE PHONE FOR AGRICULTURAL AND
BANKING SERVICES BY FARMERS**

By

**ANU ROY
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THESIS

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COLLEGE OF CO-OPERATION, BANKING & MANAGEMENT
VELLANIKKARA, THRISSUR-680656
KERALA, INDIA**

2020

DECLARATION

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I, hereby declare that this thesis entitled “**ADOPTION OF MOBILE PHONE FOR AGRICULTURAL AND BANKING SERVICES BY FARMERS**” is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.



Vellanikkara

17-12-2020

ANU ROY

(2018-15-003)

CERTIFICATES

CERTIFICATE

Certified that this thesis entitled “**ADOPTION OF MOBILE PHONE FOR AGRICULTURAL AND BANKING SERVICES BY FARMERS**” is a record of research work done independently by **Ms. Anu Roy** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

Vellanikkara

Date: 17-12-2020

Dr. E. G. Ranjit Kumar

Professor and Director, MBA (ABM) &
Head, Dept. of Banking and Finance Management
College of Co-operation, Banking and Management
Vellanikkara, Thrissur

CERTIFICATE

We, the undersigned members of the advisory committee of Ms. Anu Roy, a candidate for the degree of **Master of Science in Co-operation and Banking** with major in Rural Banking and Finance Management, agree that the thesis entitled "**ADOPTION OF MOBILE PHONE FOR AGRICULTURAL AND BANKING SERVICES BY FARMERS**" may be submitted by Ms. Anu Roy, in partial fulfilment of the requirement for the degree.

Dr. E.G Ranjit Kumar

*Professor and Director, MBA(ABM),
Head, Department of Banking & Finance Management
College of Co-operation, Banking and Management
Vellanikkara, Thrissur
(Chairman)*

Dr. Usha Devi K. N (Associate Dean i/c)
*Professor and Head
Department of Rural Marketing Management
College of Co-operation, Banking and Management
Vellanikkara, Thrissur
(Member)*

Dr. Anil Kuruvila
*Associate Professor
Department of Agricultural Economics
College of Horticulture
Vellanikkara, Thrissur
(Member)*

Shri. P. J. Boniface
*Associate Professor (Computer Science)
College of Co-operation, Banking and Management
Vellanikkara, Thrissur
(Member)*

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LIST OF ABBREVIATIONS

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GOI	: Government of India
ICT	: Information and Communications Technology
M-Banking	: Mobile Banking
SMS	: Short Message Service
TRAI	: Telecom Regulatory Authority of India
NRM	: National Resource Management
COVID-19	: Corona Virus Disease 2019
KCC	: Kisan Call Centre
SPSS	: Statistical Package for Social Sciences
TAM	: Technology Acceptance Model
GDP	: Gross Domestic Product
QIS	: Qamata Irrigation Scheme
MMS	: Multimedia Messaging Service
SEM	: Structural Equation Modeling
PEOU	: Perceived Ease of Use
PU	: Perceived Usefulness
ATM	: Automated Teller Machine
AMIS	: Agricultural Market Information Services
GPRS	: General Packet Radio Service
NABARD	: National Bank for Agriculture and Rural Development
AMIC	: Agricultural Market Intelligence Centre
IFFCO	: Indian Farmers Fertiliser Cooperative

IMD : Indian Meteorological Department
MoES : Ministry of Earth Sciences
AAS : Agro-Meteorological Advisory Services
KSEB : Kerala State Electricity Board Limited
KGB : Kerala Gramin Bank
Wi-Fi : Wireless Fidelity
KAU : Kerala Agricultural University

INTRODUCTION

CHAPTER-1

INTRODUCTION

Agriculture continues to be the most important sector of the Indian economy which provides the main source of food, income and employment to the rural and poor urban population. According to the annual report of Department of Agriculture, Co-operation and Farmers' welfare, 60.4 per cent of the population is engaged in agricultural and allied activities and contributes about 16.5 per cent to the country's gross value added for the year 2019-20. At present farmers need technology, investment, better quality inputs, real time information and most of all the latest know-how for sustaining commercial and cost effective sustainable agriculture. In India most of the smallholders farming systems are much less productive and profitable than they actually could be. The reasons include lack of access to inputs and credit, and the inability to bear risks. Another major contribution is the information and skills gap that constrains the adoption of available technologies and management practices, or reduced technical efficiency when adopted (World Bank Report, 2007). Public extension programs are often underfunded, suffer from weak agricultural research and lack adequate contact to farmers. Now a major shift in the methodology of delivering knowledge to the farm has taken place and various ICT tools like radio, television, mobile phone, newspaper etc have the advantage of reaching a wide audience at a very low cost.

Nowadays farming has become more time-critical and information-intense business. A push towards higher productivity will require an information-based decision-making agricultural system. Farmers must get information at the right time and at the right place. Information asymmetry is considered as one of the major limitation in the growth of agricultural productivity in India. At present, soft resources like knowledge and skills are considered as important as hard resources like inputs in the field of agriculture. Recent introduction of mobile-enabled information services and rapid growth of mobile telephony as compared to fixed line telephony provide a means to overcome existing information asymmetry. At least partially, it also helps to bridge gap between the availability and delivery of agricultural inputs and agricultural infrastructure. Recent advances in Information and Communication Technologies

have changed the way knowledge is produced, processed, stored, retrieved and transferred to different stakeholders in agriculture. Telecommunications, especially mobile phones, have the potential to provide solutions to the existing information asymmetry in various sectors especially agriculture. The gradual and regulated expansion of telecommunication infrastructure, especially mobile telephony, has greatly enhanced its access and reach.

Financial inclusion is the provision of affordable financial services to those who tend to be excluded. There is no single accepted definition for farmer's financial inclusion. But one can agree that farmer's financial inclusion occurs when farmers have effective access to a range of financial products and services that cater to their multiple agricultural and production needs. In the modern era, electronic banking can enhance the financial inclusion rapidly. With the rising use of mobile phone in the country, mobile banking (also known as M-Banking) has got a great potential for enabling financial services to the unbanked and under banked, particularly in rural areas. Mobile banking is an obvious extension of online banking which enables customers to initiate and/or perform banking tasks on their mobile phones. It also provides customers with the support needed to be able to bank anywhere, anytime using a mobile handheld device and service such as Short Message Service (SMS). Mobile banking is characterized as "a channel whereby the customer interacts with a bank via a mobile device, such as a mobile phone or personal digital assistant". It helps customers to access information related to their accounts and does remote transactions in their accounts at a low cost.

Mobile banking has provided temporal and spatial freedom to its customers, which is often considered as a key limitation of the customary mode of banking. It has also helped banks in cutting down their operational costs and expanding their reach to the customers. The prospects of mobile banking in India also look very bright due to the sheer size of its population, the number of internet users, impetus towards financial inclusion by the Government, and realization by the public of the ease and convenience of mobile banking. Despite the positive sides of mobile banking, there are many threats associated with it that also need to be considered. The biggest among these threats is the security of mobile banking transactions, as the internet or mobile

transactions are vulnerable to the risks of phishing, hacking of accounts, leakage of confidential information, etc. According to an estimate, two-thirds of online banking subscribers prefer to use the mobile wallets of nonbanking companies in comparison to the mobile banking applications developed by their banks for myriad reasons (Kumar et. al. 2020). Moreover, financial illiteracy, lack of financial inclusion, non-availability of the internet and other means of technology, and the perceived threat of online fraud are important reasons why most of the Indian population has not yet adopted this service.

1.1 Significance of the study

Nowadays use of ICT tools especially mobile phones are gaining importance among farmers. The emergence of various developments in mobile applications has allowed the farmers to work in a more efficient manner. Even though the very basic purpose of mobile phones is to communicate with family and friends, nowadays it is also used by farmers for availing agriculture and banking services. It enables farmers to access information from a host of information providers such as scientists, input dealers, government, agriculture extension officers, market commission agents/traders, banks and so on.

This huge reach, if harnessed in agricultural extension, can change the face of agriculture altogether in a developing country like India, by using it as a medium to disseminate agricultural information in multimodal form. If such information is available when the farmers need it, not only does it reduce transaction costs, but also improve the returns of the farmers from their produce. Timing of precise information is central to minimizing wastage and therefore increasing efficiency. Introduction of mobile banking has also brought about significant changes in the provision of financial services. Mobile banking has advantages of low cost and up-to-date technological innovation that allow users to perform financial transactions without approaching a bank. When compared with traditional banking channels, mobile banking which is considered as a major component of branchless banking can result in high level of convenience among farmers.

In India, increased penetration of mobile handsets, large number of potential users, increased spread of communication, and low cost of usage have led to growth of large number of mobile based information delivery models in different sectors. According to the latest press release of Telecom Regulatory Authority of India (TRAI), the number of wireless telephone subscribers in India at the end of July 2020 was stated as 1149.52 million which includes almost 83.2 per cent of the total population standing at 1380 million. This increased use of mobile phone has a tremendous scope of contributing to the development of the various sectors due to its special features, such as wireless connectivity, affordability, voice as well as text transfer services, reliability and above all its ability to reach the unreachable. Nowadays agriculture sector is gradually and progressively becoming time-critical and information-intense business, and hence, improved information flows have positive effects on the agricultural sector and individual producers, but gathering and distribution of information are found to be quite difficult and expensive (Milovanović, 2014). In this context, Information and Communication Technology (ICT), particularly mobile phones could be effective medium to link farmers with necessary information. Hence a study on the extent of adoption of mobile phone and various factors promoting usage of mobile phone by farmers for meeting their agricultural, credit and other banking services is quite significant and relevant.

1.2 Statement of the problem

India's first-ever mobile call was between Kolkata and New Delhi during 1995. At present, 25 years later India is the world's second largest smart phone market. Among the various ICT tools, mobile phone has immensely penetrated into every field of our life like education, business, commerce and agriculture. In the recent past, communication through mobile phone has rapidly grown and also it is considered as the major communication tool among all other ICT tools of current age.

Although Kerala is one of the states in the country where the mobile penetration is very high, most of the farmers in Kerala still use traditional information sources in the field of agriculture (Sruthy, 2015). They have limitations in receiving key information about credit facilities, agricultural marketing, weather based

information and also package of practices. For most of the farmers the sources of information required for their farming purposes is through other farmers, newspapers, radio and television. Generally, these media does not cover all the needed agricultural news and information. The main defect is that the availability of information may not be time specific and also the required information differs from one farmer to the other. Due to the unreliable market information farmers often depend on middlemen who take the advantage of their illiteracy or unawareness of market information which automatically leads to lower income. According to a study report of World Bank (2017), opportunities abound for agriculture to be enhanced through ICT, by improving market access and value chains, providing information on disease and climate, facilitating extension service delivery, providing a better market link and distribution channels as well as access to financial services which include payments, insurance, credit.

In the past adoption of mobile phone was primarily limited to rich people residing in urban areas. But nowadays mobile phones are extensively used by both urban and rural population. Mobile phones significantly reduce communication cost and also it can help farmers to be updated with latest information regarding farm practices, marketing of their produce, weather, credit etc. This technology provides new opportunities to obtain knowledge and information about various agriculture and banking related issues and its usage for overall development farm community. Hence the present study is in this direction to assess the extent of usage of mobile phones by farmers for acquiring agriculture and banking services

1.3 Objectives of the study

The main objectives of the study are:

- i. To assess the extent of usage of mobile phone by farmers for their agricultural and banking services.
- ii. To determine the factors promoting the adoption of mobile phone by farmers.
- iii. To identify the agricultural and banking services required by farmers through mobile phone and
- iv. To examine the constraints if any experienced by the farmers.

1.4 Utility, Scope and Limitation of the study

Mobile phone technology has the ability to provide producers with information and knowledge on the current market price, quantity, availability of particular produce, credit related information and technical advice. Access to appropriate knowledge and information is an overriding factor for successful Natural Resource Management (NRM) planning, implementation and evaluation process and it is known to be one of the most important determinants of agricultural productivity (Khinchiet et al., 2017). This technology can also reduce communication and information cost for the rural people and also it can provide opportunities for rural farmers to obtain knowledge and information about various agricultural aspects, agricultural and banking related services and its usage for the development of agriculture. Similarly use of ICTs in agricultural extension services especially mobile phone services in agricultural sector can provide information on market, weather, transportation, credit and agricultural techniques by contacting with concerned agencies and department (Aker, 2011).

The present study is proposed to identify the agricultural and banking services required by farmers and those which can be provided through mobile phones and the extent of usage of these services by farmers, thereby identifying the need – service gap in service delivery through mobile phones. The promoting as well as inhibiting or dissuading factors for adoption of mobile phone by farmers can be identified, which will enable the policy makers, agricultural scientists, extension officers, bankers and communication providers to take suitable steps for filling the present gap in the demand and supply of these services to farmers.

The major limitation of the study was that due to the outbreak of the pandemic COVID-19, it was challenging to design an effective telephonic survey because questions need to be short and precise for easy comprehension and also it was difficult to get people to elaborate on their responses through phone. Most of respondent farmers were new to various apps related to agriculture and banking hence addressing extent of use of mobile phone by farmers for agricultural and banking purposes seemed to be difficult. Area was restricted to four panchayats of Puzhakkal block

hence generalisations if any based on this could be restricted to areas with similar conditions.

1.5 Scheme of the study

The report of the study is presented in five chapters. The first chapter is devoted for design of the study encompassing significance of the study, statement of the problem, objectives, utility, scope and limitations of the study. The second chapter reviews the available review of literature on adoption of mobile phone by farmers for various agricultural and banking purposes which provides a theoretical support to the study. The third chapter deals with the materials and methods adopted in the process of investigation and for analysing the collected data. The fourth chapter presents the results and discussion of the study. The last chapter summarises the findings of the study and concludes the study, followed by references and abstract of the thesis.

REVIEW OF LITERATURE

CHAPTER-2

REVIEW OF LITERATURE

A review of pertinent works and thinking by others helps to enlarge, enrich and clarify one's own work and thinking - Young (1996)

A study of the related literature implies locating, reading and evaluating reports of research as well as casual observation and opinion that are related to the individuals planned research project - Agarwal (1966)

An intensive scrutiny of available literature is valuable in gaining an insight and understanding the research problem under study. A study of the past way for future endeavour. An acquaintance with earlier pertinent studies has been felt necessary to develop good understanding to the present study and to formulate appropriate research methodology. Review of literature is very much helpful in gaining a clear comprehension of the previous research efforts conducted in similar lines, which provide as sound base for scientific investigation. It also provides new ideas and approaches for evaluating research efforts in comparison with similar efforts done by others. Besides providing a basis for theoretical framework, this will help to find out the available information, which is related to the objectives of the proposed research and assists in delineation of the problem area. It facilitates to find out the gaps in selecting topics for research studies besides fetching the available techniques, which can be used to measure the factors under study and to compare the present results with that of the results of previous research.

In order to undertake a good research, review of literature relevant to the research problem is carried out and presented in this chapter under the following three sub headings:

2.1 Usage of mobile phone among farmers for agricultural purposes

2.2 Usage of mobile phone for banking purposes

2.3 Constraints experienced in availing agricultural and banking services through mobile phone

2.1 Usage of mobile phone among farmers for agricultural purposes

Usage refers to the quality of having utility and especially practical worth or applicability. So, usage of mobile phone among farmers means utility of mobile phone among farmers for availing various agricultural information and services. The abstract of various studies and articles concerning various uses of mobile phone in agriculture, reasons for their adoption and also various factors that promote the usage of mobile phone among farmers are discussed in this section.

Jensen (2007) in his study on the digital provide: information (technology) market performance and welfare in the south Indian fisheries sector had surveyed three northern districts of Kerala, Kasargod, kannur and Kozhikode. Data were collected through weekly survey of 300 sardine fishing units throughout the region of study on Tuesdays of every week from September 3, 1996 to May 29, 2001. Each study area was divided into 3 regions based on service provision and each region contained 5 markets. Using micro level survey data, study stated that the adoption of mobile phones by fishermen and wholesalers was associated with a dramatic reduction in price dispersion, the complete elimination of waste, and near-perfect adherence to the Law of One. The study also found that the use of mobile phone has increased both consumer and producer welfare.

Rhoades and Hall (2007) in their study on the agricultural blogosphere: a snapshot of new agricultural communicators online aimed at describing the current coverage of agriculture in the blogging world and to determine the authors behind the blogs. Authors noted that there was a large presence of blogs covering topics on agriculture and they adopted the uses and gratification theory which explained the motivation that makes users choose a certain media to satisfy their specific needs. These needs were developed out of the social environment. The theory stated that receivers select the types of media and media contents to fulfil their needs. Uses and gratification linked need gratification to a specific medium choice that rests with the audience member. Findings of the study indicated that blogging about agricultural topics tend to be well informed about communications and agriculture. Majority of

the rural bloggers involved in farming tend to be over the age of 30 years. Based on the study's findings on blog rolls and presence of links to other blogs, if males over 30 years were blogging about agriculture, it was assumed that they were also reading other blogs. Therefore the major recommendation was that communicators must take advantage of this and utilise blogs to reach other audiences. Extension can also capitalize on this trend by teaching rural audiences how to blog and get their information out to the thousands of blog readers in the world.

Mittal and Tripathi (2009) conducted a study on the role of mobile phone technology in improving small farm productivity based on the information collected through focus group discussions and in depth interviews carried out at village level and wholesale markets in some selected districts of the states of Uttar Pradesh, Rajasthan and Maharashtra. The team conducted 15 focus groups (with 8-10 people in each group) and 40 individual interviews of which 80 per cent were small farmers with less than 6 acres of land. The study attempted to find the use and impact of mobile phones and mobile enabled services on agricultural productivity and came up with the findings that although mobile phones can act as catalyst to improving farm productivity and rural incomes, the quality of information, timeliness of information and trustworthiness of information were the three important aspects that have to be delivered to the farmers to meet their needs and expectations.

Islam and Gronlund (2010) made an interpretive case study as well as an evaluation research on the efficiency and effectiveness of mobile phone based Agricultural Market Information Service (AMIS) in terms of users, technology, process and facilitating conditions in a rural context. The evaluation study which was based on small scale surveys and observations aimed at analysing the effectiveness of the system in processing and disseminating information to the farmers and the effectiveness of the services from their perspective. It was observed that the effectiveness of a rural e-service depends on the design and delivery of the service in accordance with the individual's information needs, adaptive technologies with easy accessibility within a given infrastructure, affordable services with a rational business model, adequate awareness, and efficient communication with the respective community. According to the authors, awareness of the usefulness of the services and

maintenance of efficient communication with the concerned community were the important aspects for service acceptability.

The findings of the study done by Masuki *et al.* (2010) on mobile phones in agricultural information delivery system for rural development in Eastern Africa: lesson from Western Uganda was simply a glimpse into the potential role mobile phones in improving agricultural production and its accessibility to lucrative markets. Mobile phones were distributed among the rural communities in 6 parishes of Rubaya, sub country in Kabale district where village information centres were established. Systematic action research and process documentation was used to monitor the use of various information and communication technologies. Monitoring and evaluation process was used to examine the usage of mobile phones through village phone usage tracking forms. Three information delivery methods were employed in the study area including paper based technology (leaflets, brochure, and posters), telephone and radio. One of the key findings was that mobile phones were increasingly accessible to lower-income groups in rural areas. From the discussions and observations made, it was found that farmers were more excited about using the phone to access information on agriculture, natural resources management and marketing. This, called for various actors along with the product value chain to look into the opportunities that mobile phones can best be utilised to boost agricultural development given the fast growth of mobile connectivity in the country. Opportunities emerging from the proliferation of mobile phones experienced in most developing countries like Uganda need to be explored especially in the absence of other ICT infrastructure, like fixed phones and internet. Given the growing interest in smallholder access to information, study recommended that the mobile phone service providers should plan for capacity building programmes for rural communities on the emerging innovations in mobile phone application in order to realise their usefulness in agriculture.

A study conducted by Mittal *et al.* (2010) on socio economic impact of mobile phones on agriculture investigated a series of questions that explore the topic: what kind of information do farmers value the most to improve agricultural productivity, do mobile phones and mobile-enabled agricultural services have an impact on

agriculture, and the factors that impede the realisation of full productivity enhancing the potential of mobile phone. Research was primarily based on a series of field investigations conducted from August 2008 to November 2008 in the states of Uttar Pradesh, Maharashtra, Rajasthan and New Delhi and the union territory of Pondicherry. The visits comprised a series of focus group discussions and individual interviews with farmers, fishermen, labourers, traders, commission agents, non-profit organisations and businesses involved in the agricultural sector. The team conducted 14 focus group discussions and 46 individual interviews in 11 districts and 20 villages. Around 187 farmers were interviewed in all, of whom 152 were small farmers with less than 6 acres of land. The study found that mobile phones were used in ways which contributed to production enhancement but to leverage the full potential of information dissemination enabled by mobile telephony required significant improvements in supporting infrastructure and capacity building amongst the farmers to enable them to use the information they access effectively. As mobile penetration continues to increase among farming communities and information services continue to adapt and proliferate, the scope exists for a much greater rural productivity impact in the future.

Furuholt and Matotay (2011) in their study on the developmental contribution from mobile phones across the agricultural value chain in rural Africa stated that the most widespread information and communication technology in developing countries today is the mobile phone. The study investigated the use of mobile phone among farmers in rural Tanzania in order to supply empirical data on developmental role of the technology. Babati district of Northern Tanzania was chosen as the research site. Thirteen surrounding villages were selected and one farmer within each village was invited for interview. Semi-structured face to face interviews was conducted with the farmers in two phases in 2009 and 2011. In addition, document analysis was performed during visits to different sources like Tanzania Communication Regulatory Authority (TCRA), Research on Poverty Alleviation (REPOA), Economic and Social Research Foundation (ESRF), Ministry of Agriculture, Food Security and Cooperatives, Ministry of Livestock and Fisheries and Ministry of Industry, Trade and Marketing, to solicit related information. The results of the study indicated

that the improved access to communication and information that mobile phones represent affect the entire cyclic farming life during the year and that has resulted in considerable changes in the entire livelihood constructs, increased opportunities and reduced risks for rural farmers.

Islam (2011) in his research investigated the factors influencing the adoption of mobile phone technology among farmers in Bangladesh. The paper used interpretive philosophy grounded on a mix of qualitative and quantitative data analysis approach investigating adoption factors by means of survey data, close observations and related studies on rural Bangladesh and technology acceptance. Based on a number of acceptance models from the literature, a conceptual Rural Technology Acceptance Model (RUTAM) was developed to analyze the arguments pertinent to a rural developing country context. The study found that social influence plays a bigger role than technology at early stages of adoption. 'Tech-service promotion' and 'tech-service attributes' was introduced as external factors which affected the behavioral intentions of an individual by means of perceived usefulness (PU) and perceived ease of use (PEU).

Alhassan and Kwaka (2012) in their study examined the use of mobile phones among small scale farmers in Kavilli community of the northern region of Ghana. A total of 111 small scale farmers were purposively selected and they came up with the observation that the mobile phones were predominantly used for communicating with family/friends and arranging for the procurement of farm inputs leading to improved communication with farm input sellers and efficient use of time. The mobile phones were used to call local dealers in seeds and fertilizers to know about new products and availability in local area which saves them time and money.

Ansari and Pandey (2012) undertook a study to assess the potential and use of mobile phones by farmers. The study sample comprised of 180 farmers, selected randomly from the farmers visiting kisan mela (farmers fair) at Pantnagar University. The study findings indicated that 83.34 % farmers owned a mobile for more than 2 years and 72.33 percent received information related to agriculture from 'fellow farmers'. All the respondents interviewed said that they would like to subscribe if

Pantnagar University starts mobile based advisory service, although only 45 % said that they would be willing to pay a nominal of fee Rs. 100 per month. As regards the type of services expected through such a mobile service, farmers identified various areas like disease identification and control measures (27.7 %), fertilizer application dose, method & time (27.77%), harvesting time (25%), marketing (22.23%) and sowing time (19.45%). The study also illustrated the need for a mobile based agri advisory services and possible policy implications for different stakeholders in NARS/ICAR.

A study by Crandall (2012) on Kenyan farmers' use of cell phones: calling preferred over SMS was conducted among 117 Kenyan farmers using questionnaire administered in 6 Kenyan provinces as well as 12 focus groups conducted in 4 locations around Kenya. Findings of the study revealed that Kenyan cell phone users preferred to call rather than SMS due to ease of calling and lack of practice of using SMS services. The main suggestion of the study was that the SMS – based information providers should consider adding a voice-based product to their services in order to expand their market reach.

Meti *et al.* (2012) explained the performance and operational mechanism of Kisan Call Centre (KCC) in the country in their article on performance of Kisan Call Center. A KCC consisted of a complex telecommunication infrastructure, computer support and human resources organised to manage effectively and efficiently the queries raised by farmers related to agriculture and allied activities instantly in local language. It is a sophisticated voice operation centre that provides a full range of inbound or outbound call handling of service including customer support, direct assistance and other services. According to the authors, KCC was significant in the Indian context, since the extension system was facing acute shortage of manpower and one extension worker has to take care of 1000 farmers which was an impossible task.

Mittal and Mehar (2012) have carried out a study on how mobile phones contribute to the growth of small farmers: evidence from India. Results of the study was based on focus group discussions and the interactions held with the farmers in a survey conducted in Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal during February 2011 and April 2011. The findings of the study highlighted that the use of mobile phones has encouraged poor farmers towards greater market participation and diversification high value crops and also this change had helped to increase farm earnings through higher price realisation and reduction wastages. Eventually, it was expected that mobile-based information services would influence the behaviour pattern of farmers and this would also facilitate adoption of improved techniques leading to better yields.

Tetty (2013) examined the usage of mobile phone in the business of farmers in the Eastern region of Ghana. A well-structured questionnaire was used to obtain information from 100 farmers in the district. Only farmers who own and use mobile phones in their farming business were selected. Information sought included the number of years they have been using mobile phone, the means of communication before the acquisition of mobile phone and the effects of mobile phone on their farming. The data collected was then analyzed using statistical software SPSS 16.0. The major findings of the study were that the majority of the respondents used mobile phone for 2-4 years and male respondents used the mobile phone earlier than female counterparts. Farmers used their phones for transactions that would be helpful to the business like purchasing of inputs, calling extension agents and interaction with workers. The study concluded by stating that the use of mobile phone has improved customer relation, enhanced communication with suppliers, extension officers and customers, and finally increased farmers' profit.

Sarvanan and Bhattacharjee (2014) in their article entitled "Mobile Phone Applications for Agricultural Extension in India" opined that in the present day agriculture, soft resources like knowledge and skills were as important as hard resources like inputs but estimates indicated that 60% of farmers do not access any source of information for advanced agricultural technologies resulting in huge adoption gap. The study further stated that if the huge reach of mobile phone was

harnessed in agriculture extension, it could change the face of agriculture altogether in a developing country like India. Many initiatives have been taken in this regard to utilize mobile phones by private sector and public sector in agricultural advisory service for agronomic practices, weather forecasts and market price. With increased dependency, the mobile phone has the ability to become a common communication platform of the world, especially in the field of agriculture.

In a case study done by Shah *et al.* (2014) examined the evolving mobile applications for the Indian farming community- e Mandi and Mandi trades, the variety of salient features they offer, the challenges and shortcomings mitigated by the applications. The study found that these applications offer innovative, dynamic and interdisciplinary services. It was found essential that the applications convey information in the regional/national language and cost was another consideration in the uptake of such applications; with free of cost access the best means for fast adoption. Training on using this application should be provided to get a mass buying, acceptability and to make the maximum utilisation of the application. The study concluded by stating that there is a huge potential for innovation through mobility in agriculture. By addressing or overcoming the shortcomings there will be immense opportunities that can be offered to the farming community at large.

Sruthy (2014) undertook a study with the objective of identifying the information needs of farmers in Thrissur district with respect to marketing and credit; study the extent of use of information and technology by farmers and analysing constraints in the use of ICT by farmers. A sample of 90 respondents from three panchayats of Thrissur district were selected on the basis of stratified purposive sampling and the required data were collected with the help of pre structured interview schedule. Collected data were analysed using various statistical tools like Chi square, ANOVA, Pearson's correlation coefficient and Indices. Findings of the study stated that most needed marketing information was about market trend and least needed are on export markets, futures trading and market research. Farmers had a better accessibility to marketing information through newspaper, telephone and television whereas computer, radio and farm magazines have less accessibility.

Ward (2014) conducted a case study on Mobile Phones and Agriculture in India has found out many factors that contributed to differences in national agricultural productivity levels, including small farm size, lack of access to credit to invest in more productive technologies, lack of insurance to manage weather risk, and lack of information on increasing crop productivity. An alternative to traditional agricultural extension services was to deliver agricultural information to farmers via low-cost information and communications technologies. Mobile phone was one such medium which was being used to deliver not only information but also a range of financial services such as payments, credits, insurance, and savings. The study further stated that there were considerable opportunities for improved agricultural productivity. However, multiple levels of collaboration among the public and private sectors were needed to realize this potential.

Bhagya and Vijayan (2015) undertook a study on impact of Kissan Kerala in information empowerment of farmers in Kerala during the year 2014-2015 in Alappuzha and Thrissur districts. Scheduled questionnaire was used to collect required information from a sample of 240 user farmers and 40 non user farmers from eight villages and the collected data were analysed using various statistical tools like frequency, percentages, mean, standard deviation, correlation, multiple linear regression and t test. From the study it was found out that there was a positive impact on information empowerment of farmers by KISSAN KERALA but a particular section of farmers has recorded low level of information seeking, information storage, information evaluation and information utilization pattern. The results of the study revealed that farmers should be equipped more with information so as to enable them to be a part of ICT revolution.

A study conducted by Rafiq (2015) tried to figure out better understanding of how could “Design of mobile phone services support farmers in developing countries”. Literature review method was used for finding the answers to the research questions. For that purpose previous research papers were collected. The study stated that using mobile based technologies for the spread of information, news, weather reports and market information has enhanced the farmers in a number of ways. Expert advice and solutions were now within the reach of the common farmer via these

technologies. On the other hand new inspirational work by the application and systems developers was under continuous development. Also mobile technology has given the farmers access to improve their efforts and financial gain thus helping in reduction of illiteracy and poverty. The answers to the research question addressed the gap between all agriculture stakeholders which can help in future directions of what were the requirements to design mobile phone services to support farmers in developing countries.

Tadesse and Bahgwa (2015) in their paper on mobile phones and farmers' marketing decisions in Ethiopia examined the impact of mobile phones on farmers marketing decisions and prices they receive. The study was based on a multistage sampling technique where in the first stage, six districts from the four administrative zones of the Oromia regional state, which is the largest region in Ethiopia were selected. In the second stage, sample villages, locally known as Kebeles were selected from each district. . In total, 1023 households were selected from 24 villages. Sample households were interviewed by experienced and well-trained enumerators who were hired for this purpose using a structured and pretested questionnaire. The empirical analyses on farm gate prices clearly indicated that the impact was almost always insignificant. These findings suggested that cell phones may be useful for certain farmers in certain types of circumstances but in the study area mobile phones do not seem to be an important channel to access price information. The absence of mobile phones as an effective means of price discovery suggested that there exists scope for alternative means of providing price information. The study also argued that even though many farmers participated in information searching, number of farmers who used it was very small. The reason stated for low use of mobile phones for information searching was lack of relevant information that can be accessed through phone. The study concluded by recommending the establishment of information centres either at farmers' cooperative centres or at local agricultural development centres which can serve farmers as a reliable source of information and knowledge.

Xiolan and Aktar (2015) attempted to study the impact of mobile phone technology on agricultural extension services delivery: evidence from India for examining the impact of mobile phone enhanced intervention in agricultural extension

service delivery in India. The study analyzed factors that affected the likelihood of adoption of different agriculture-related information sources by farmers. Primary data were collected from 1,200 farmer households of five Indo-Gangetic states of India, covering 120 villages and the analysis was done using a multivariate probit model. Findings of the study showed that the amount, quality and speed of service delivery have improved significantly because of the intervention. There were also benefits in terms of greater knowledge and awareness of new agricultural practices, farmers' aspiration to try new technology in the future and access to credit. The system does not discriminate against farmers from disadvantaged and low education backgrounds. Thus conclusion of the study was that a system of well-used technology assisted by trained village youths, can serve as a tool for inclusive development.

Amir *et al.* (2016) conducted a study on the role of mobile phone in accessing agricultural information by small holder farmers in Ethiopia to assess the status of mobile phone use and to determine the major factors affecting mobile phone use by small holder farmers. Descriptive statistics and a binary logistic regression model were used for analyzing the data. The study was carried out in the rural area of Haramaya district, Eastern Hararghe zone. Among the 120 sample respondents, majority (67.7%) were mobile phone users. The study indicated that education level, family size, off-farm income and perception of mobile phone use were significant determinants of mobile phone usage. The study also stated that the characteristics of farmers can be used to introduce and promote use of agricultural information through mobile phones to improve agricultural performance in Ethiopia.

Chhachhar *et al.* (2016) in their study on mobile phone impact on agriculture and price information among farmers attempted to study the awareness regarding behaviour intention and effect of mobile phone for agriculture, marketing and weather information among farmers in Sindh, Pakistan. Quantitative method was applied and the required data were collected from 1500 farmers from 10 districts of Sindh and Pakistan. The study found that although more than 97 per cent of the farmers have their own mobile phones, only 23.3 per cent of the respondents use internet on their mobile phone to get agricultural information. The study showed that farmers did not properly use mobile phone for connected market and call buyers to sell their produce

in good price while majority of the farmers did not have contact numbers of agriculture officers as well as meteorological department to get latest information of weather. Moreover, farmers did not discuss agriculture issues and problems with agriculture officers. However, majority of the farmers agreed to use mobile phone in the future for obtaining agriculture information. The major suggestion of the study was that the government should provide more facilities to farmers and create awareness on usage of mobile phone for agricultural development.

In a case study analysis done by Costupoulon *et al.* (2016) on mobile apps for agriculture had investigated the potential of mobile apps to support the agricultural stakeholders by providing access to information, markets and services. The study uncovered the current status of mobile agricultural apps in the global mobile ecosystem and also studied the interest and willingness to use mobile apps in the daily agricultural activities of agricultural stakeholders in Greece. The result of the empirical research was that a very small number of apps were available in relation to the significance of agriculture worldwide. The study finally proposed that the development of mobile apps should support agricultural activities by providing accurate, certified and validated content and services that would take into account the peculiarities of geographical areas. Also, the successful spread of mobile apps required the active involvement of public agencies and ministries.

Engotoit *et al.* (2016) attempted to study the influence of performance expectancy on commercial farmers' intention to use mobile-based communication technologies for agricultural market information dissemination in Uganda. A descriptive field survey method was adopted and a total of 302 commercial farmers and agribusiness traders in Eastern Uganda participated in the study. Data were collected using self-administered questionnaires and various statistical tools like descriptive statistics, factor analysis, correlation and regression analysis was used for analysis of the collected data. The findings of the study revealed a significant positive relationship between performance expectancy and behavioural intentions to use mobile-based communication technologies for agricultural information access and dissemination which implied that, commercial farmers' behavioural intentions to use mobile-based communication technologies for agricultural market information

dissemination and access will be influenced if they anticipate mobile-based communication technologies to offer greater performance in their daily transactions. The major recommendation was that policy makers need to ensure that policies are put in place that encourage third party software developers and telecommunication companies to provide software products and solutions that are beneficial to the commercial farmers and can enable them complete their agricultural transactions in time.

Koshy and Kumar (2016) in their study measured attitude of farmers in Kerala, India towards Kisan Call Centre (KCC). The study was conducted during October 2015 to January 2016. Scheduled questionnaire was used to collect the data from a sample of one hundred and fifty farmers who have utilized the Kisan Call Centre service selected from the database of KCC. Collected data were analysed using attitude scale constructed for measuring attitude of farmers towards KCC. The study revealed that fifty two per cent of the respondents using KCC belonged to the age category of 36-55 years of age and majority of them were male. Forty nine per cent of the respondents had high school level education. The respondents' contact with various extension agencies was found to be medium. The innovativeness of the respondents was found to be low as majority (59%) of the farmers preferred to take their own time before accepting an innovation. The experience in internet use was very less among the respondents. Only thirteen per cent of respondents had more than 6 years of experience in internet usage whereas sixty per cent of the respondents did not have any experience in internet usage. The respondents had medium level of information source utilization. Sixty four per cent farmers was found to have more than three years of temporal awareness on KCC and fifty two per cent of the farmers had utilized the service more than six times. The results of the study revealed that the respondents were found to have favourable attitude towards KCC. Factors like easiness to access the call centre, time saving factor, quick response and its advantages over the traditional extension system could have aided its favourableness. The factors like temporal awareness of KCC, utilization of KCC, satisfaction with KCC and the digital divide were found to have a positive influence on the attitude of respondents using KCC.

Kumar (2016) in his research had developed an application to educate farmers about the impact of sowing, harvesting and irrigation in increasing productivity. The developed software application was basically for dissemination of information to farmers about the proper way of performing various farming activities in regional language Punjabi, of two main crops of Punjab-wheat and paddy. Based on date of sowing, farmers will get notifications about farming activities. Additional advice will be provided along with the notification on the basis of weather conditions. This system was an android based application developed in regional language Punjabi for overcoming lingual barrier of farmers. The application was developed using Android Studio which was the official Integrated Development Environment (IDE) for developing an Android application.

A research was designed by Rashid *et al.* (2016) to investigate the impact of e-Agriculture on empowerment stratified as economic, family, social, political, knowledge and psychological empowerment. The methodology of the study was an integration of quantitative and qualitative methods based on data collection in Bhatbour block of Dhighi union under Sadar Upazila of Minikgani district. Data were collected from 133 e- Agriculture users and 45 controls. Descriptive statistics, t-test, multiple regression were used for analysis. Most of the farmers (53.4 per cent) gained low empowerment through e- Agriculture, while 46.6 per of them had medium empowerment. The result showed that e-Agriculture had significant impact on the empowerment of farmers in Bangladesh. Based on the findings, it was recommended that government should implement and popularise e- Agriculture based projects on a massive scale for the empowerment of farmers.

Wyche and Steinfield (2016) conducted a study on why don't farmers use cell phones to access market prices: Technology affordances and barriers to market information services adoption in rural Kenya to understand what factors impede the adoption and these services. Qualitative study was conducted among Kenyan farmers on their mobile usage patterns and their interactions with *MFarm*, a commercially available MIS through focus group discussions, interview using semi-structured interview schedule, and observation methods to investigate rural farmers' mobile phone usage and non-usage patterns. The study population included fourteen groups,

or 76 farmers (44 men and 32 women), who gave informed consent to participate and who had a mobile phone. Analysis was done using affordance theory and study discovered a mismatch between the design of MIS and smallholder farmers perceptions of their mobile phones' communication capabilities. Findings of the study revealed that a design agenda should be motivated that encourages software developers and development practitioners to adopt an ecological perspective when creating mobile applications for sub-Saharan Africa's rural farmers. Strategies for implementing this approach included reconsidering the design of mobile phones, and developing innovative educational interventions.

Asa and Uwem (2017) ascertained the agricultural purposes of mobile phones used by farmers in Itu Local Government Area of Akwa Ibom State, Nigeria using the data obtained from 150 farmers by means of a multi-stage sampling procedure. The first stage involved the random selection of 10 villages out of the 79 villages in Itu Local Government Area. The second stage involved the purposive selection of 15 farming households out of each of the selected villages. The third stage of the multi-stage sampling procedure involved the purposive selection of active farmers in the farming households. Furthermore, one active farmer from each of the fifteen farming households was randomly selected for the study thereby resulting in a total sample size of 150. Findings revealed that 98.7 per cent of the respondents had access to mobile phones in the study area, but only 90.5 per cent actually owned their own mobile phones. Majority of farmers in Itu Area, Nigeria used mobile phones for getting information from fellow farmers, marketing of their agricultural produce, accessing inputs for farming, getting agricultural information from the radio and the internet as well as accessing extension services. It was recommended that the agricultural extension agencies in the State should focus their attention on these identified agricultural uses of mobile phones to ensure increased effectiveness of their extension efforts.

Asif *et al.* (2017) in their study focused on identifying the factors affecting the use of mobile phone by the farmers and determining the extent of use of mobile phone by the farmers in receiving information on vegetable cultivation. The study was carried out at three villages of Mymensingh district in Bangladesh. Seventy farmers

were interviewed using structured questionnaire. Both descriptive and inferential statistics were used to analyze the collected data. The majority (70 %) of the vegetable farmers were low user of mobile phone compared to 30 percent were medium user. None of them was found under high mobile phone user. Vegetable farmers' characteristics such as education and social participation had significant positive relationships with their use of mobile phone while age and farming experience had significant relationships with negative trend. Among them age alone explained 33.1 per cent of the variations to mobile phone usage was confirmed by the step-wise multiple regression model. However, age and social participation were the influential factors affecting the use of mobile phone by the farmers. The study concluded with the recommendation that initiative steps should be taken by the Government to ensure proper electricity supply in the village area and provide subsidy for easy purchase of mobile phone by the farmers. Besides, field extension agents should also encourage and assist farmers to use mobile phone in receiving information on vegetable cultivation.

Balkrishna and Deshmukh (2017) conducted a study on role of social media in agricultural marketing and its scope among the farmers who use social media in Sangamner district. The study was based on descriptive research over a social media purposively because researcher wanted to know the use of social media who meets the characteristic of the study. A sample of 100 resonances was selected randomly. The required data from farmers were collected through focus group discussion. The results of the study indicated that the role of social media in agricultural marketing was dominated by males. The age group of farmers was mostly between 30- 40 years who were using social media effectively. Most of the farmers were using mobile phones with internet and social media applications in it. Farmers were also making use of social media for innovative practices, sharing information etc. The most popular social media in agricultural marketing was Facebook, YouTube, WhatsApp, Twitter and LinkedIn. Most of them login to social sites daily. Various problems in use of social media in agricultural marketing were also studied. These social media outlets also provided a platform for those who do not approve of modern agriculture

practices. Many officials were having their official pages, blogs, and groups on social media and it helped them in getting information and solving the problems.

Issahaku *et al.* (2017) in their study on effect on productivity by use of mobile phones among small holder maize farmers in Ghana evaluated the effects of mobile technology on productivity and the channels of transmission of these effects. Using propensity score matching procedures, the results of the study showed that mobile phone ownership and use has significantly improved agricultural productivity. Specifically, the mobile phone has improved the productivity of user-farmers by at least 261.20 kg/ha per production season. The identified channels of effect were extension services, adoption of modern technology and market participation. These results had key policy implications for Ghana and developing economies at large.

The main objective of the study conducted by Lubua (2017) on social patterns influencing adoption of mobile phones in the farming community was to find out whether social factors contribute to the adoption of mobile phones in the farming society. The study was conducted among the small farmers in the African city and its population was drawn from Tanzania. Among the various models regarding adoption of new innovation by users the study selected the model which had social factors as common aspect. Study considered farmers spending ability, influence of the success of others and the adoption on demand as factors within several variables. Other variables included perceived economic benefits, perceived intention to use and the rate of usage. Systematic random sampling was used to collect data from 140 respondents through a survey questionnaire and hypothesis testing was used as basis for decision making. The findings of the study suggested that farmers' spending ability relates to their willingness to learn new mobile tools, peer influence relates to the intention to learn, adoption on demand influences the perceived usefulness of mobile tools, and the perceived usefulness relates with the rate of mobile use. The general view of this study was that social factors influence the adoption of mobile phones in the farming community, either directly or indirectly. Hence these factors may be applied to enhance the adoption of mobile phones in the farming community for improved production.

A study by Otena *et al.* (2017) assessed the usage of mobile phones among farmers in the Keana Local Government Area of Nasarawa State, Nigeria. One hundred and fifty-eight respondents were selected using purposive and random sampling. Primary data were collected using a well-structured questionnaire which consisted of three sections. Section A covered information on the socioeconomic characteristics of the respondents; Section B covered information on the level of use of mobile phones and the mobile network preferred by the respondents, while Section C covered information on the factors affecting the use of mobile phones. The collected data were analyzed using both descriptive and inferential statistics. The objectives were analyzed using descriptive statistics such as frequencies and percentages. Level of use of mobile phones was measured using a 3-point Likert type scale of Low, Medium, and High. Logit regression analysis was used to test the hypothesis. The logit model was a binary technique which can be used to predict the effect of the socioeconomic characteristics of respondents on their level of use of mobile phones. Research revealed that a majority of the respondents (60.1%) had a medium level of use of mobile phones. The mobile phone network preferred by respondents was MTN (32.3%). The major factor affecting the use of mobile phones was poor network coverage (22.1%). Possession of formal education, income, and sex of the respondents significantly affected their level of use of mobile phones. The study therefore recommended that network providers should be supervised by the Government to improve and ensure quality service delivery.

A study by Folitse *et al.* (2018) was undertaken with the main objective of examining the dynamics of the use of mobile phone among poultry farmers in the Greater Accra region of Ghana. Random sampling was done to select one hundred and fifty poultry farmers from the Great Accra region. The required data were collected from a database of poultry farmers obtained from the Poultry Farmers Association in the Great Accra Region of Northern Ghana using structured questionnaire. The data obtained from the respondents were carefully analysed using Statistical Package of Social Sciences (SPSS) version 2.1. The study showed a high penetration of among poultry farmers and underlined the importance of the mobile phone as a driver of business operations. This fact found wider expression in the

reasons offered by respondents for the use of mobile phone and farmers' motivation for the use of the mobile phone. The study showed information on the health of poultry birds and credit as the kinds of information mostly frequently exchanged through mobile phones. Most of the respondents indicated that they use the mobile phone to communicate with colleague farmers and veterinary officers. An appreciable percentage of the respondents also indicated that they used the mobile phone because it enabled faster access to information. Statistical tool like regression analysis indicated the influence of demographic variables such as respondents' age, sex, educational level, experience, and number of birds on the use of mobile phone to communicate with actors in the poultry industry. The study concluded by stating that there was enough empirical bases for the integration of ICT, especially the mobile phone, in extension programme planning and implementation. Hence the Department of Agriculture in the various metropolitan, municipal and district assemblies should therefore encourage the use of ICT to facilitate agricultural development in their localities. Additionally, the right policy environment should be provided to facilitate the operations of mobile phones companies to improve their services and bring in better efficiency in the use of mobile phone.

Kabbiri *et al.* (2018) in their article on mobile phone adoption in agri-food sector has extended the applicability of the Technology Acceptance Model (TAM) without altering its parsimony and information technology focus, in mobile phone adoption. The study relied on a sample of 300 dairy farmers in Uganda and the analysis was done using structural equation model. Data for this study were collected from three Ugandan districts (Kabarole, Kiruhura and Kyegegwa. Respondents were dairy farmers with access to mobile phones. The questionnaire was administered by trained research assistants, using a mobile phone (with an application called Kobo Collect). Findings of the study stated that perceived ease of use was a major antecedent to mobile phone adoption. Also, perceived advantage and perceived usefulness influenced mobile phone adoption negatively. To some extent, this was anticipated since majority of the farmers who participated in the study used mobile phones mainly for normal communication and not for marketing their produce by searching for and exchanging information on prices. This therefore calls for

awareness campaigns by relevant stakeholders in order to change the mind-set of these farmers towards mobile phone use. The study has also showed that socio-economic characteristics had a positive and significant impact on both perceived usefulness and perceived ease of use of mobile phones. These findings of the study would contribute to the promotion of mobile phone usage in farming communities beyond normal communication and also it came up with a strong practical implication for farmers as well as other stakeholders from the agri-food sector.

Kaske *et al.* (2018) conducted a study on mobile phone usage for accessing agricultural information in Southern Ethiopia to determine the use of mobile phones in agriculture. The study included 320 household heads who owned mobile phones and the required data were collected using an interview schedule. The results revealed that the majority (90.6%) of household heads made phone calls for agricultural purposes. Over three quarters (85.9%) of the household heads received phone calls related to agriculture. Short message service (SMS) was poorly used. From the study it was concluded that mobile phones were playing an important role as an informational medium. Major recommendation of the study was that the Ministry of Agriculture in Ethiopia needs to develop a mobile-based agricultural information dissemination system for enhancing information delivery to rural farming households.

Mwalukasa *et al.* (2018) undertook a study with the main purpose of examining the socio-demographic factors influencing the use of mobile phones in accessing rice information on climate change adaptation by rain-fed farmers in Tanzania with reference to Morogoro region. A cross-sectional research design was used to collect data from 400 randomly selected rain-fed rice farmers owning mobile phones. Semi-structured questionnaires were used for data collection in eight selected wards in two districts of Kilombero and Kilosa districts in Morogoro Region, Tanzania. The findings of the study showed that the use of mobile phones to access rice information on climate change adaptation was statistically significantly influenced by respondents' sex, age, education level, marital status, farm size, farming experience, radio ownership and off-farm incomes. The study provided practical recommendations on how to improve accessibility of rice information through mobile phones on climate change adaptation. Implementation of information delivery system

to farmers using mobile phones without ascertaining farmers' socio-demographic characteristics leads to resource underutilization.

A study conducted by Olaniyi (2018) examined the non-linear relationship between mobile phones, internet and agricultural development in Africa for the period 2001-2015 using system generalized method of moments. The data on official exchange rate, individuals using the internet (% of population), mobile cellular subscriptions (% of population), primary school enrolment, gross fixed capital formation (% of GDP), general government final consumption expenditure (% of GDP), domestic credit to private sector (% of GDP), agriculture value added (% of GDP), and GDP per capita growth were sourced from World Bank (2017) database. Data on corruption, regulatory quality and political stability and absence of violence were collected from Economist Intelligence Unit (2016). The empirical results of the study showed a non-linear relationship between mobile phones, internet and agricultural development. Mobile penetration and squared mobile penetration was found to have significant positive effects on agricultural value added, implying that mobile penetration has an increasing effect on agricultural value added. In contrast, internet usage has significant negative effects on agricultural value added, but squared internet usage has significant positive effects. The study concluded that mobile phones and internet play significant roles in agricultural development, as agricultural development also plays important roles in the expansion of mobile phones and internet.

The main purpose of the research by Seenuankaew *et. al.*, (2018) was to study the information needs and information-seeking among Thai farmers that lead the development of a mobile phone application for the purpose of production and marketing promotion. Qualitative research was performed by in-depth interviews, observations, field notes and content analysis. The selected 48 primary informants were the best-practice farmers around Songkhla Lake Basin. The results of the study demonstrated the farmers' need for information on the following topics: increasing production, developing quality, reducing costs, manufacturing products, increasing marketing and sales channels and changing to short-lived crops. It was also found that farmers acquired information directly targeted to their needs and behaviours by

making inquiries, exchanging ideas and joining study trips and training, which resulted in production and marketing promotion and, hence, higher incomes.

Sikundla *et al.* (2018) investigated the adoption of mobile phone for marketing agricultural produce among Qamata Irrigation Scheme (QIS) small holder farmers in South Africa and the determinants of adoption. Two stage random sampling technique was used to interview 97 smallholder farmers employing a semi-structured questionnaire. Data generated were analysed using descriptive statistics and probit regression model. Analysis result showed that 71% of the smallholder farmers currently use mobile phone for agricultural marketing. Majority of the respondents (55%) used mobile phone to market their produce among relatives and neighbours. Probit regression result indicated that gender, social grant, private traders, local market marketing channel, monthly income, political and economic factors as the main factors that influenced mobile phone adoption in agricultural marketing. Study concluded with the major recommendation that concerted efforts should be made to address erratic network and high airtime tariff challenges to encourage mobile phone adoption in marketing among smallholder farmers in the country.

Khan *et al.* (2019) conducted a study on farmers' usage of mobile phone for accessing agricultural information in Pakistan among the farmers of district Muzaffargarh, Punjab, Pakistan. Multistage sampling technique was used to collect data from the two tehsils (cities/sub-districts) of Muzaffargarh formulating a total sample of 180 farmers. SPSS computer-based Software was used for analyzing the data. Results revealed that 91.2% of the farmers indicated mobile phone ownership. It was further reported that 87.20 % of the farmers used private sectors advisory staff to obtain agriculture information. Market information was ranked as the highest accessed information among the rest of farm-related use. Easy access to updated information and connectivity with stakeholders were reported as the highest perceived benefits of mobile phone use (4.63 & 4.72 mean). On the basis of findings, the study provided recommendations and policy implications for utilizing the true potential of these ICT-enabled solutions in agriculture.

The study undertaken by Rashit *et al.* (2019) endeavours the usefulness of cell phones for crop farmers in selected region of Bangladesh. For adequate findings and to achieve its purpose, structured interview schedule was adopted to collect data from 281 randomly selected farmers and findings of the study revealed that a little over 60% of them found cell phones very useful, while only 5.3% respondents found the cell phone as less useful. Based on average talk time hours spend in the last six months, top three sources of agricultural information were friends and relatives, distributors and middlemen, and farmers in advanced categories. The results of the ordered logit model showed that their usefulness was significantly determined by age, farm size, per month call charges, and experience in using cell phones. The recommendations suggested that there is a need to connect farmers with reliable and rich information sources, use of MMS and SMS, voice call activities, providing subsidized SIM cards, and ultimately undertake widespread campaigns for training of aged farmers to persuade their interest towards the use of cell phones and mobile-based information sources.

Krell *et al.* (2020) conducted a study on smallholder farmers' use of mobile phone services in central Kenya and examined factors affecting the likelihood of Kenyan farmers' adoption of m-services specifically related to agriculture and livestock information, buying and selling products, and alerts about agricultural or livestock activities. Data were collected from 35 smallholder farming communities within the following sub-counties: Laikipia North and Laikipia East (Laikipia), Buuri, North and Central (Meru), and Kieni East (Nyeri). According to the survey conducted among 577 farming households, 98% of respondents owned a mobile phone. Approximately 25% used it to access information about agriculture and livestock, 23% accessed information about buying and selling products, and 18% received alerts. Personal smartphone ownership increased the likelihood of m-services use ($p < .001$), also membership in farmer organizations ($p < .001$). Study found that age and income was not significantly related to m-service use, and result was discussed in terms of intersections between smartphone ownership, gender, and education. Quantitative results further supported the need for m-services providers to design for

basic or feature phone users for improved dissemination of agro-meteorological information.

2.2 Usage of mobile phone for banking purposes

Mobile banking is enjoying a tremendous growth in India. It has successfully crossed the stage of introduction. The service of mobile banking is being channelled from metropolitan cities to urban areas and then to the rural areas. The effectiveness and popularity of mobile banking mainly rely on the banking system in India and their connection with supporting and regulatory system. There are lots of supporting factors which promotes the mobile banking in India. Here in this section the extend usage of mobile phone for availing various banking services; factors promoting the usage are discussed.

Kirui *et al.* (2010) conducted a study to examine the awareness and use of m-banking services among rural farmers in Kenya. It also assessed the factors conditioning the use of such services. This study used data collected from smallholder farmers located in Kirinyaga, Bungoma and Migori districts. The required data were collected from a total of 379 farmers through personal interviews using pre-tested questionnaire. The data collected included household characteristics, demographic and economic characteristics, household asset endowments, use of mobile phone-based money transfer, among others. The study found high awareness of m-banking services among the smallholder farmers. More than 96 percent of the farmers were aware of mobile phone-based money transfer services. However, the level of awareness had not translated into usage. Only 52 per cent of the farmers were found to be the users. The study also found that awareness of m-banking services does not vary much among the study regions. However, the usage of mobile phone was significantly higher in regions with greater level of agricultural commercialization. The study also finds that the largest proportion of money received via m-banking (32%) was used on agricultural related purposes (purchase of seed, fertilizer for planting and topdressing, farm equipment/implements, leasing of land for farming, paying for labour). It also indicated that education, distance to a commercial bank, membership to farmer organizations, and endowment with physical and financial

assets affected the use of m-banking services. The implication of these findings stated that there was a need to expand the coverage of m-banking services in rural areas since it can resolve idiosyncratic market failures farmers face namely access to financial services. In addition, attention should also be given to infrastructural constraints faced in rural areas such as the lack of electricity (needed to charge mobile phones). It also implied that m-banking service providers should consider expanding the availability of sufficient “float” of funds to expedite transfers into and from farming communities. These findings therefore indicated the priorities for policymakers and the private sector to invest in linking farmers to financial services. They also highlighted the importance of improving rural literacy level of the farming communities.

A study conducted by Kalairasi and Srividya (2013) on online banking adoption identified the factors influencing adoption of online banking services using Roger’s innovation diffusion theory. The sample consisted of 85 students pursuing engineering degree selected randomly from different engineering colleges of five fast growing cities of Tamil Nadu. Students with more than 3 years of internet experience were considered as the sample. The perception of risk was found to be a significant factor influencing the adoption of new technology which was also included as one of the dimension along with Roger’s innovation attributes. The findings of the study suggested that, the young users adopt online banking when it was suitable for their lifestyle and if the website is user-friendly. Online banking was not perceived as either relatively advantageous than other banking channels nor risky by young users.

Kikalwe *et al.* (2014) in their study on mobile money, small farmers and household welfare in Kenya analysed impacts of mobile money technology on the welfare of small holder farm households in Kenya. Panel survey was used for data collection and regression analysis was used as for analysis. A sample of 320 households was surveyed using structured questionnaire. Results showed that mobile money use had a positive net impact on household income. One important impact pathway was through remittances received, which were much higher for users of mobile money. In comparison to traditional formal and informal mechanisms of transferring money between relatives and friends, mobile money services reduced the

transaction costs substantially. These services also provided new incentives for saving. And, mobile money contributed to more commercially-oriented farming. The study also revealed that mobile money users applied significantly more purchased inputs – such as fertilizer, pesticides, and hired labour – and sold a larger proportion of their harvest in the market. On the one hand, this was related to lower transaction costs in terms of paying and receiving money from business partners. The study also suggested that mobile money can help to overcome some of the important smallholder market access constraints that obstruct rural development and poverty reduction.

Siddik *et al.* (2014) in his study on financial inclusion through mobile banking: a case of Bangladesh identified the factors influencing behavioural intention to adopt (or continue to use) mobile banking in Bangladesh. With an aim to expand financial inclusion through mobile banking, using innovation diffusion theory and decomposed theory of planned behaviour together, the study added a variable, namely perceived financial cost to the combined model in order to identify and examine the factors influencing behavioural intention to adopt (or continue to use) of mobile banking in Bangladesh. The results of Structural Equation Modeling (SEM) indicated that perceived financial cost, perceived risk and subjective norm were the most influencing factors that affected people's behavioural intention to adopt (or continue to use) mobile banking. Findings of this study had greater significance for the mobile banking service providers and policy makers of Bangladesh to design mobile banking services in such a way so that access and usage of this service could be increased which ultimately would have a positive impact on the country's financial inclusion campaign.

Asfaw (2015) in his study on 'financial inclusion through mobile banking: challenges and prospects' identified the major challenges and opportunities for mobile banking development in Ethiopia. An exploratory research design was adopted and both primary and secondary data were collected to meet the objectives of the study. The primary data were collected from banking institutions using semi-structured interview. Secondary data were collected from NBE, Ethio-Telcom and other sources. The collected primary data were analyzed using qualitative approach. The study revealed that there were no operational challenges that hinder the flourish of mobile

banking development in Ethiopia. High PCI and mobile phone penetration rate were found out to be the most important potential for the development of mobile banking in Ethiopia.

Deb and Agrawal (2016) conducted a study on factors impacting the adoption of m-banking: understanding brand India's potential for financial inclusion. The main purpose of the study was to understand brand India's potential for financial inclusion in the future. Based on convenience sampling, a sample of 300 respondents; 75 each from major four economic cities of India namely Delhi, Mumbai, Kolkata and Bangalore were selected based on their knowledge of m-banking generally and m-banking at their current banks. Measurement model, structural model and hypothesis testing were used for analysis of primary data and IBMSPSS and Amos software were also used to test the conceptual model developed using secondary data. The study found a positive relationship between Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU). The relative advantage of m-banking over the existing technology, i.e. debit card/credit card transactions and online transactions using computers or laptops, made it useful for customers. Also, the ease of use of m-banking technology was found to have a positive impact on customers' perceptions of Perceived Usefulness (PU). The findings of the study suggested that subjective norm, output quality and personal innovativeness had impacts on the perceived usefulness and attitudes towards the ultimate adoption of m-banking. . Furthermore, in an emerging nation like India, it was found that m-banking service providers' benevolence and privacy and security factors were not perceived positively by customers, indicating that there was a need to improve these factors across market segments. Improvements in these factors would be expected to increase the adoption of m-banking.

The main objective of the study conducted by Lalitha and Sudha (2016) was to explore the factors that affected mobile banking services in India with reference to Chennai city. Primary data were collected from 300 various bank customers and secondary data were collected from different articles, expert opinions extracted from internet and Text books. Collected data were analysed using SPSS, KMO and Bartlett's test, Communalities and Rotated Component Matrix. The findings of the study revealed a few factors that mostly affected the usage of mobile banking services

like high annual charges levied by banks towards such services, safety and security issues, technically unsound customers, lack of providing ready information. The study concluded with suggestions on various factors affecting mobile banking namely giving importance and taking immediate measures on security issues so that the customer shall not face the factor such as in-complete transaction and problem of network. Providing awareness and training to customers regarding the technical aspects and making them feel confident in adapting the mobile banking in their daily life.

Majoma (2016) undertook a study on role of branchless banking among rural small holder farmers in Zimbabwe. A survey through a structured interview with rural small holder farmers was the main means of data collection. Descriptive statistics design allowed the study to generate a quantified profile of rural households' choices of financial service providers and summarisation of data through graphs. In addition quantitative analysis was also done in order to understand the relationships among socio-economic variables and mobile banking adoption, and to generalise the findings to a wider population. Software SPSS version 22 was used for the analysis of data. Descriptive statistics such as frequencies, tables and appropriate graphs were also used. The findings of the study revealed a high rate of adoption of mobile banking among rural people. Even though mobile banking was cheaper and more accessible, traditional banking channels were still cited as being an important need for the rural poor. Further it was recommended that besides traditional uses, branchless banking should be further developed and enhanced to provide insurance services and credit needs by farmers and for enhancing customer uptake mobile network operators were recommended to consider a segmentation approach.

Shankar (2016) in his study on mobile banking adoption behaviour in India explored the factors affecting mobile banking adoption behaviour of Indian consumers and also identified the factors which had major influence on adoption intention in context with m-banking. Data were collected through an online survey of mobile user respondents and a total of 248 utilizable cases were selected. Hypothesis was established using previous literature reviews and exploratory factor analysis and multiple regression was used to check the significant factors affecting adoption of m-

banking in India. A total of eight factors were identified which affected m banking adoption in India. They were awareness, usefulness, ease of use, compatibility, social influence and privacy risk, self efficacy and financial cost. Out of this usefulness was found to have more impact and social influence was found to be the least influential factor with reference to m banking adoption. The study provided a comprehensive understanding of the factors which affected m banking adoption behaviour of consumers in India which might help banks to understand consumer intention and make strategy accordingly to ensure financial inclusion.

Sreelakshmi (2016) in her research attempted to examine the extent of financial inclusion among farmers through electronic banking services in Thanniam Panchayat of Thrissur district. The study was entirely based on primary data collected from 60 farmers through semi-structured interview schedule. Percentages and descriptive analysis used for analysis of data. The study found that the extent of financial inclusion among farmers with respect to electronic banking services was very low. The awareness level about electronic banking services was very low among farmers except in the case of ATM. Even though the farmers were having electronic banking mechanisms like smart phones, ATM cards, or internet access, they were not aware of the benefits or uses of these services. Electronic banking services were mainly used for fund transfer, payment of bills, online purchases and for withdrawal of cash. None of them used it for online purchases and other online transactions. Mobile banking can also be used for fund transfer, but the respondents were using it for payment of bills only. The study concluded by stating that the awareness and usage of electronic banking services among farmers could be considerably increased through Financial Literacy Programmes from the part of banks. By disbursing more number of crop loans, the usage of credit cards could be increased.

Yadav (2016) in his article on active drivers of adoption of internet banking have identified the active factors that influence customers' intention regarding use of internet banking in Himachal Pradesh. The data were collected from a sample of 120 bank customers of 40 different public sector bank branches through a well structured questionnaire. For analysis and interpretation basic structural tools like chi square test (test of independence) and logical regression analysis were used. Relation between

socio-demographic characteristics of bank customers and intention to adopt internet banking was examined and it found a significant statistical difference in gender, residential area, type of family, education of customers and the interest to adopt i-banking. Further the study indicated three significant factors i.e., perceived risk, perceived usefulness and quality of services would actively influence future adoption intention to adopt internet banking. The study also exhibited that perceived usefulness and perceived quality of service positively influenced the intention to adopt internet banking while perceived risk negatively affected the future adoption intention of internet banking.

Chiu *et al.* (2017) made a study on the challenges and factors influencing initial trust and behavioural intention to use mobile banking services in the Philippines. The study tested the models of theory of reasoned action and theory of planned behaviour to evaluate potential antecedents of trust (diffusion of trust, infrastructure quality, perceived costs, privacy and security) moderators (demographic variables) and mediators (initial trust) that will influence behavioural intention to use mobile banking. The Hayes' Process Macro was used as a statistical analysis in SPSS to estimate the path coefficients using multiple regression. The results of the study showed that non-adopters of mobile banking asserted that the antecedents of initial trust played a significant influence on behavioural intention to use online banking services.

Rao (2017) in his study explored the demand and adoption of e-banking services of Bihar. Study was conducted for two months among 324 respondents. Every third bank customer who visited commercial banks to deal with any transactions was selected for the survey. One way analysis of variance (ANNOVA) and reliability analysis was carried out to check the success of factors generated through factor analysis. Customers were satisfied with the network availability and access to account. The study also indicated that the adoption rate of e-banking services with respect to different segmentation of income level, age group, education level. The results of the study were expected to provide a concrete contribution in the area of retail banking and in understanding consumer behaviour in the state of Bihar using banking services.

2.3 Constraints experienced in availing agricultural and banking services through mobile phone

Among the various ICT tools in the field of agriculture, mobile phone is gaining popularity among farmers nowadays. Farmers extensively use it for their agricultural and banking purposes. There are many challenges associated with its practical application. The foremost issue yet to be addressed is the problems faced by farmers in using mobile phone in availing agricultural and banking services. The study would be incomplete without going through the available literature on constraints and challenges faced by the farmers in using mobile phone in the field of agriculture. Hence the abstracts of literature related to constraints, problems and challenges faced by the farmers in availing information related to agriculture through ICT tools are discussed in this section.

Mittal and Tripathi (2009) in their study provided a first look at the potential of mobile phones in affecting the agricultural sector as a whole. The findings of the study stated that the realization of full potential impact of mobile phones was constrained by shortcomings in physical infrastructure affecting access to markets, storage and irrigation. Issues also arose with the availability of inputs and credit. Equally, to make full use of delivered information, farmers must have sufficient risk-taking capacity and willingness to experiment with new strategies and techniques disseminated. Social networks like ITC must play an important role in building trust and confidence required to influence the adoption of new mindsets and actions by small farmers. Increased public and private investments were found to be necessary to bridge the critical infrastructural gaps. Policy changes must also be needed to encourage better access to high-quality inputs and credit for small farmers. Increased extension services and capacity building efforts could complement information dissemination via mobile phones and associated services to accelerate the adoption of new techniques. However, even in the case of poor farmers facing significant constraints, it was found that there were opportunities to realize productivity gains from the adoption of new farming practices and actions to mitigate crop losses.

Islam and Gronlund (2010) in their interpretive case study as well as an evaluation research on the efficiency and effectiveness of mobile phone based Agricultural Market Information Service (AMIS) found that the weaknesses of the services such as inadequate awareness and language difficulty in accessing the contents were the major constraints faced by farmers in using mobile phone.

The study done by Masuki *et. al.*, (2010) on mobile phones in agricultural information delivery system for rural development in Eastern Africa pointed out various challenges faced in using mobile applications. Language barrier and illiteracy were the main challenges faced by most of the respondents followed by unreliable network.

Alhassan and Kwaka (2012) in their study on the use of mobile phones by small scale farmers in Northern Ghana examined the constraints in usage of mobile phone and found that farmers mainly faced challenges like no reception, calls ending unexpectedly and poor sound/breaking up of sound.

Constraints identified by Tetty (2013) in his study on usage of mobile phone in the business of farmers in the Eastern region of Ghana included inability to have access to calling cards regularly, fluctuations in network receptions and lack of supply of constant energy to charge their mobile phone for rural agriculturalists.

Asfaw (2015) in his study on ‘financial inclusion through mobile banking: challenges and prospects’ identified the major challenges for mobile banking development in Ethiopia. The challenges were broadly classified into four groups such as regulatory challenge, legal challenge, operational challenge, reputational challenge and personal information. Among the various challenges the study found that lack of timely approval of new products by regulatory body, lack of interoperability system and lack of aggregators between service provider and retail agents were the major problems stated by the respondents.

Bhagya and Vijayan (2015) undertook a study on impact of Kissan Kerala in information empowerment of farmers in Kerala and found that the major constraint faced by the farmers was ineffective feedback system and suggestion offered was to strengthen it.

Rafiq (2015) in his study on “Design of mobile phone services support farmers in developing countries” pointed out that there were many challenges to use mobile phone in rural developing countries. Majority of the farmers still pertain to traditional agriculture system. They were still reluctant to use mobile phone to do agricultural and banking transactions because of lower literacy level, lack of proper technical knowledge, gender differences, trust, securities issues, low income and high cost etc. The study further recommended various methods for enhancing mobile phone application such as designing mobile phone software with speech technology and local language, education programme to farmers regarding security issues etc, support by government and infrastructure enhancement in rural areas.

Sreelakshmi (2016) in her research to examine the extent of financial inclusion among farmers through electronic banking services in Thanniam Panchayat of Thrissur district found that lack of knowledge about technology, lack of interest and fear of using electronic banking services hinders the respondent farmers from using electronic banking services. The major suggestion of the study was that the awareness and usage of electronic banking services among farmers can be considerably increased through Financial Literacy Programmes from the part of banks.

Asif *et al.* (2017) in their study on extent of use of mobile phone by the farmers in receiving information on vegetable cultivation pointed out that lack of mobile servicing centre, expensiveness and electricity problem were the major constraints that caused hindrance to the use of mobile phone in receiving information on vegetables cultivation.

Balkrishna and Deshmukh (2017) conducted a study on role of social media in agricultural marketing and found that the main challenges stated by the respondents were that people were less trusted on e-buying, e-selling of agricultural commodity on social media.

Rajneesh *et al.* (2017) undertook a study among the farmers in Bundi district of Rajasthan for identifying the constraints faced by the farmers in the use of mobile phone services for getting agriculture information for crop management. From the two tehsils of Bundi a sample of 80 respondents using mobile phone was selected using simple random sampling. Structured interview schedule was used for collection of data and analyses of the collected data were done using percentages, frequency, mean and standard deviation. The results showed that the majority of farmers (60 per cent) faced medium level of constraints because of less technical knowledge about the use of mobile phone services like inability to operate mobile phone, illiteracy that affect the use of internet, SMS etc. Further the study indicated that infrastructural constraints like “fluctuating telecommunication network” and “non availability of KCC services on Sundays and holidays” were most and least important constraints respectively. In case of technical constraints “inability to use GPRS and 3G services” and “inability to understand language of service provider” were most and least important constraints respectively. In economic constraints “inability to purchase recharge cards” and “high cost of telecommunication network services” were most and least important constraints respectively. In miscellaneous constraints “lack of satisfactory solution of individual problem” and “lack of contact details (number) of agricultural advisory system” were most and least important constraints, respectively. The most severe constraints faced by respondents were “inability to use GPRS and 3G services”, “lack of timely availability of agriculture information” and “difficulty in making the use of given theoretical information”.

Results indicated by Rao (2017) in his the study on demand and adoption of e-banking services of Bihar indicated that privacy and security were the major point of dissatisfaction of customers which has significantly impacted users. Low literacy rate was the major reason for dissatisfaction in the adoption of e-banking services in rural areas. Rural areas were in much concern than the urban areas in terms of trust issues, lack of information and also the service availability.

Folitse *et al.* (2018) cited network failure as the major constraint in using mobile phone among poultry farmers and suggested that there was a strong need for the required investment to build a more robust infrastructural base for the use of mobile phones as it remains a critical tool to support agricultural extension delivery among Ghanaian farmers.

Findings of the study done by Khan *et al.* (2019) reported that farmers' limited aptitude of mobile phone usage and lack of awareness of information sources was the major constraints faced by them in farm-related use of the mobile phone.

According to Rashid *et al.* (2019) higher call rates, lack of awareness and paucity of mobile-based information sources were major bottlenecks in using cell phones for agricultural information.

The above reviews emphasised on the fast growth of mobile telephony, its extensive use among farmers and also various constraints faced by farmers in availing various agricultural and banking purposes. Mobile phone has the ability to reduce information search costs, information asymmetries, market inefficiencies, promoting cashless transactions etc. Most of the authors have concluded that the use of mobile phones has been found to encourage poor farmers towards greater market participation and diversification to high-value crops. In the present era, increased use of mobile phone among farmers for banking purposes can also enhance financial inclusion rapidly. Hence adoption of mobile phone for agricultural and banking purposes by farmers can lead to their overall development by acting as instrument to deliver extension services and creating awareness among farmers.

MATERIALS AND METHODS

CHAPTER- 3

MATERIALS AND METHODS

The study entitled “Adoption of mobile phone for agricultural and banking services by farmers” has been conducted with the objectives of studying the extent of use of mobile phone by farmers for their agricultural and banking services, to determine the factors promoting adoption of mobile phone by farmers, to identify the agricultural and banking services required by farmers through mobile phone and to examine the constraints if any experienced by farmers. This chapter explicates the methodology and data sources employed in conducting the study, which are presented as follows.

3.1 Concepts used in the study

3.2 Locale of the study

3.3 Sources of data

3.4 Selection of the sample

3.5 Statistical tools used for the study

3.1 Concepts used in the study

The major concepts used in the study are given below:

3.1.1 Marginal Farmers

Farmers with land holdings of up to 1 hectare are considered as Marginal farmers.

3.1.2 Small Farmers

Farmers with a land holding of more than 1 hectare and up to 2 hectares are considered as small farmers.

3.1.3 Other Farmers

Farmers whose land holding exceeds 2 hectares are considered as other farmers.

3.1.4 Mobile phone

A mobile phone is a wireless handheld device that allows users to make and receive calls. While the earliest generation of mobile phones could only make and receive calls, today's mobile phones do a lot more, accommodating web browsers, apps, games, camera, video player and navigational system.

3.1.5 Agricultural services

Agricultural services include information, consulting, equipment, and supplies to the farming community and agricultural industry.

3.1.6 Banking services

Banking as a service is an end-to-end process ensuring the overall execution of a financial service provided over a web or through mobile phone.

3.1.7 Mobile banking

Mobile banking facility is an extension of internet banking. It is a system of accessing accounts and general information on banking products and services through a mobile phone. With recent developments in handset designs and mobile software, this is a trend which has already caught focus of majority of the banks.

3.2 Locale of the study

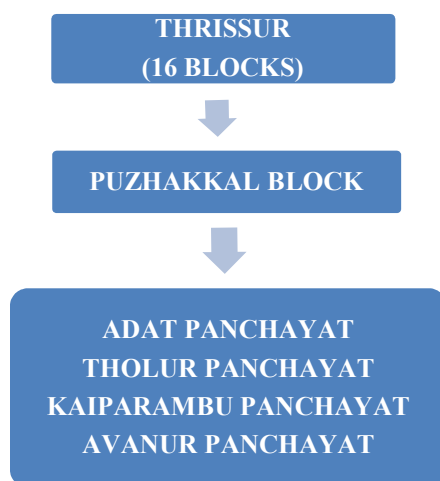
For examining the adoption of mobile phone for agricultural and banking services by farmers in Puzhakkal block, four panchayats were selected from six panchayats based on highest agricultural production. The selected panchayats were Adat, Tholur, Kaiparambu and Avanur.

3.3 Sources of data

The study has been fundamentally based on primary data. For the purpose of the four objectives, viz., accessing extent of usage of mobile phone for agricultural and banking services by farmers, to determine the factors promoting adoption of mobile phone, to identify the agricultural and banking services required by farmers

through mobile phone and to examine constraints if any faced by farmers in availing such information, primary data regarding socio economic profile, farming and banking related details, awareness, accessibility, usage and frequency of usage of mobile phone for various agricultural and banking services, agricultural and banking services required by farmers through mobile phone and constraints faced in using mobile phone for availing such services have been collected from twenty five farmers of each of the selected panchayats using a pre-tested structured interview schedule.

3.4 Selection of sample



Out of the sixteen blocks of Thrissur district, Puzhakkal block was purposively selected. Puzhakkal block lies in the central region of Thrissur district. It is an important agricultural region in Thrissur district with cultivation of main crops such as paddy, coconut and banana. In the second stage as already stated, out of six panchayats in the block, four panchayats namely Adat, Tholur, Kaiparambu and Avanur was selected on the basis of highest agricultural production. A sample of 25 farmers using mobile phone for agricultural and banking purposes from each of the four panchayats was selected constituting a total of 100 farmers.

3.5 Variables used under study

Variables for each objective were listed out based on the review of literature and also based on expert's opinion. Objectives of the study, variables and tools used for analysis are given below.

Objectives	Variables	Tools
To assess the extent of usage of mobile phone by farmers for their agricultural and banking services	<ul style="list-style-type: none"> • Usage of mobile phone by farmers for their agricultural services • Usage of mobile phone by farmers for their banking services • Apps and Whatsapp groups related to agriculture • Mobile banking apps used by farmers • Agencies providing source of information • Purpose of using mobile for agricultural services • Purpose of using mobile phone for banking services 	Awareness Index, Accessibility Index, Usage Index, Frequency of Usage Index
To determine the factors promoting the adoption of mobile phone by farmers	<ul style="list-style-type: none"> • Awareness, • Accessibility • Affordability • Adequacy • Availability • User friendly 	Factor analysis, Influence Index
To identify the agricultural and banking services required by farmers through mobile phone	<ul style="list-style-type: none"> • Agricultural services required by farmers through mobile phone • Banking services required by farmers through mobile phone 	Information need Index
To examine the constraints if any experienced by the farmers	<ul style="list-style-type: none"> • Constraints experienced by the farmers in availing agricultural services • Constraints experienced by the farmers in availing banking services 	Kendall's coefficient of concordance

3.6 Statistical tools used for the study

The collected data were analysed using Simple percentages, Indices, Factor analysis and Kendall's co-efficient of Concordance.

3.6.1 Index Numbers

An index is a type of composite measure that summarises, ranks and orders several specific observations and represents some more general dimension. An index is an accumulation of scores from a variety of individual items.

Indices were calculated based on Likert Scale of summated rating.

$$Index = \frac{\sum_{i=1}^n \sum_{j=1}^q S_{ij} \times 100}{\sum \max S_j}$$

i= Respondents

j=Factors

S_j=Score of the jth factor

S_{ij}=Total score for the jth factor of the ith respondent

Max_{s_j}=Maximum score for the jth factor

Five indices were developed for the study namely Awareness Index, Accessibility Index, Usage Index, Frequency of Usage Index and Information Need Index.

3.6.1.1 Awareness Index

For measuring the level of awareness of respondents on various agricultural and banking services availed through mobile phone, awareness index was developed. For construction of awareness index, respondents were asked to rate their level of awareness of various agricultural and banking services on a five point scale i.e. fully aware, partially aware, moderately aware, very little awareness and unaware and the respondents opinion were assigned marks of 5, 4, 3, 2 and 1 representing fully aware to unaware. The scores of all the respondents for each service were summed up to arrive at the total score. The total score obtained by service was then divided by maximum possible score for that service to obtain the index of that service.

3.6.1.2 Accessibility Index

For measuring the accessibility of respondents to various agricultural and banking services availed through mobile phone, accessibility index was developed. For construction of accessibility index, respondents were asked to rate their accessibility to various agricultural and banking services on a five point scale i.e. always, often, sometimes, seldom and never and the respondents opinion were assigned marks of 5, 4, 3, 2 and 1 representing always to never. The scores of all the respondents for each service were summed up to arrive at the total score. The total score obtained by service was then divided by maximum possible score for that service to obtain the index of that information.

3.6.1.3 Usage Index

For measuring the level of usage of various agricultural and banking services by respondents through mobile phone, usage index was developed. For construction of usage index, respondents were asked to rate their level of usage of various agricultural and banking services on a five point scale i.e. very frequently, frequently, occasionally, rarely and never and the respondents opinion were assigned marks of 5, 4, 3, 2 and 1 representing very frequently to never. The scores of all the respondents for each service were summed up to arrive at the total score. The total score obtained by service was then divided by maximum possible score for that service to obtain the index of that service.

3.6.1.4 Frequency of Usage Index

For measuring the frequency of usage of various agricultural and banking services availed through mobile phone by respondents, frequency of usage index was developed. For construction of this index, respondents were asked to rate their frequency of usage of various agricultural and banking services on a five point scale i.e. once in three days, fortnightly, weekly, monthly and rarely and the respondents opinion were assigned marks of 5, 4, 3, 2 and 1 representing once in three days to rarely. The scores of all the respondents for each service were summed up to arrive at

the total score. The total score obtained by service was then divided by maximum possible score for that service to obtain the index of that service.

To make it simple farmers were asked to score themselves their own level of awareness, accessibility, usage and frequency of usage of various agricultural information and services out of 0-100. Based on the scores, classification of different level of awareness, accessibility, usage and frequency of usage of various services was assessed.

<u>Awareness</u>	<u>Accessibility</u>	<u>Usage</u>	<u>Frequency of usage</u>
81-100 : Fully aware	81-100 :Always	81-100 :Very frequently	81-100 : Once in 3 days
61-80 : Partially aware	61-80 :Often	61- 80 :Frequently	61-80 : Weekly
41-60 : Moderately aware	41-60 :Sometimes	41-60 :Occasionally	41-60 : Fortnightly
21-40 : Very little awareness	21-40 :Seldom	21-40 :Rarely	21-40 : Monthly
0-20 : Unaware	0-20:Never	0-20: Never	0-20 : Rarely

After their scoring in 100, for the purpose of calculation of index these scores were further converted into a 5 point scale i.e.

81-100	61-80	41-60	21-40	0-20
5	4	3	2	1

Based on this scoring awareness index, accessibility index, usage index and frequency of usage index was calculated according to their responses. Index was constructed using the formula:

$$\frac{\text{Total Score Obtained for each of the information and services}}{(\text{Maximum Score for each information and service} \times \text{Number of respondents})} \times 100$$

3.6.1.5 Information Need Index

For measuring the information needs of farmers, information need indices were developed. For the construction of information need index, the respondents were asked to rate their information needs with respect to general agricultural services, marketing services and banking related information and services on a five point scale i.e., highly needed, needed, moderately needed, less needed, and not at all needed and

the opinion of the respondents were assigned the marks of 5,4,3,2, and 1 representing highly needed to not at all needed.

The scores of all the respondents for each service were summed up to arrive at the total score. The total score obtained by each service was then divided by maximum possible score for that service to obtain the index of that service. Respondents were asked to rate their need of services by assigning marks ranging from 0-100.

Response Code	Highly Needed (HN)	Needed (N)	Moderately Needed (MN)	Less Needed (LN)	Not at all Needed (NN)
Marks/100	81-100	61-80	41-60	21-40	0-20

Later for the analysis purpose these rates were converted into 5 point scale

Marks/100	81-100	61-80	41-60	21-40	0-20
Scale	5	4	3	2	1

Information needs were rated using a five point scale and information index was developed for each information needs.

Information Need Index:

$$\frac{\text{Total Score Obtained for each of the information and services}}{(\text{Maximum Score for each information and service} \times \text{Number of respondents})} \times 100$$

3.6.1.6 Influence Index

For finding out the various factors promoting adoption of mobile phone for agricultural and banking services, the influence level of each factor was measured using an influence index. Influential levels of respondents were collected in a five point scale. For each factors scores were allocated. The total score obtained by each factor was also calculated. The responses from respondents were collected using five point scale like strongly agree, agree, moderately agree, disagree and strongly disagree and each scale was allotted with scores ranging from five to one respectively. The index was calculated separately for each statement by using the following formula.

Index score for each statement:

$$= \frac{\textit{Total Score Obtained by each statement}}{(\textit{Maximum Score for each statement} \times \textit{Number of respondents})} \times 100$$

3.6.2 Factor Analysis

A factor is a linear combination of variables. It is a data reduction technique designed to represent a wide range of attributes on a small number of dimension.

Definition: “A statistical approach that can be used to analysed interrelationship among a large number of variables and explain these variable in terms of their common underlying dimension (factor).”

Variables are not classified as either dependent or independent instead whole set of interdependent relationships among variables are examined in order to define a set of common dimensions called factors.

Purpose

- To identify underlying dimensions called factors that explain the correlations among a set of variables.
- To identify a new, small set of uncorrelated variable to replace the original set of correlated variables for subsequent analysis such as Regression or Discriminant analysis.

Two commonly employed factor analytical procedures are Principal Component Analysis and Common Factor Analysis. Principal Component Analysis is used when need is to summarise information into a larger set of variables to a small set of factors. Common Factor Analysis is used uncover underlying dimensions surrounding the original variables.

3.6.3 Kendall's Co-efficient of Concordance

Proposed by Maurice G. Kendall and Bernard Babington Smith, Kendall's coefficient of concordance (W) is a measure of the agreement among several (m) quantitative or semi quantitative variables that are assessing a set of n objects of

interest. Kendall's W (also known as Kendall's coefficient of concordance) is a non-parametric statistic. It is a normalization of the statistic of the Friedman test, and can be used for assessing agreement among raters. Kendall's W ranges from 0 (no agreement) to 1 (complete agreement).

Suppose, for instance, that a number of people have been asked to rank a list of political concerns, from most important to least important. Kendall's W can be calculated from these data. If the test statistic W is 1, then all the survey respondents have been unanimous, and each respondent has assigned the same order to the list of concerns. If W is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. Intermediate values of W indicate a greater or lesser degree of unanimity among the various responses. In the social sciences, the variables are often people, called judges, assessing different subjects or situations. There is a close relationship between Milton Friedman's two-way analysis of variance without replication by ranks and Kendall's coefficient of concordance. They address hypotheses concerning the same data table, and they use the same χ^2 statistic for testing. They differ only in the formulation of their respective null hypothesis. A lower mean rank indicates the importance of the constraint and vice versa.

The formula for the W statistic is:

$$W = \frac{12S}{m^2(n^3 - n)}.$$

Where:

- S is the sum of squared deviations,
- m is the number of judges (raters),
- n is the total number of objects being ranked.

A Second formula can also be used that gives the same results, where T is a correction factor for tied ranks:

$$W = \frac{12S' - 3m^2n(n + 1)^2}{m^2(n^3 - n) - mT}$$

Kendall's coefficient value W indicates the respondents' agreement to the order of ranking.

Based on the methodologies stated above, the objectives of the study were analysed and the results and discussions are presented in Chapter IV.

RESULTS AND DISCUSSIONS

CHAPTER-4

RESULTS AND DISCUSSIONS

Technology has advanced to a high level and farmers have the option of asking their queries, getting weather updates, getting the economic outlook of their crops and how they are going to perform in the market with a single click. An alternative to traditional agricultural extension services is to deliver agricultural information to farmers via low-cost information and communication technologies. In this current scenario, it is expected that the integration of ICTs in agricultural extension will provide much needed impetus to the agricultural sector and ICTs can complement the traditional extension system for “Knowledge Resource” delivery to the millions of farmers (Saravanan, 2010).

Among ICTs, impressive penetration of mobile phones in many of the developing countries is changing the agricultural communication process and mobile phones have made personal communications readily accessible, for the first time to women and men, poor and prosperous, rural and urban dwellers in developing as well as in Industrial countries (Colle, 2010). Mobile phones are being used to deliver not only information but also a range of financial services such as payments, credit etc. It has the potential to effectively supplement the efforts of existing extension services and synergise the whole process. The fast growth of mobile penetration and the rapid expansion in the mobile communication networks by the telecom players provide a fertile ground for looking at this medium seriously.

The discussion of the analysis of the present study is undertaken with the objectives of assessing the extent of usage of mobile phone by farmers for their agriculture and banking services, to determine the factors promoting the adoption of mobile phone by farmers, to identify the agricultural and banking services required by farmers through mobile phone and to examine the constraints experienced by farmers in availing such information and services has been depicted under eight main sections. A bird’s eye view of the area under study, viz., Puzhakkal Block forms the first section of the chapter. The study has been conducted using primary data collected from 100 farmers. A social and economic profile of the respondents is a key element

of their social assessment. Hence the discussion of socio-economic profile of the respondent farmers forms the second section of the chapter. The third section is devoted for analysing the pattern of usage of mobile phone by farmers. Section four deals with farm related details of the respondents and section five deals with banking related details of the respondents. The extent of usage of mobile phone for agriculture and banking purposes is discussed in section six. The next section deals with factors promoting adoption of mobile phone for agricultural and banking services. Section eight discusses various agricultural and banking services required by farmers and last section is all about various constraints faced by farmers for availing agricultural and banking related services through mobile phone.

As such, the chapter is presented as follows:

- 4.1 Puzhakkal Block: A bird's eye view
- 4.2 Socio economic profile of the respondents
- 4.3 Pattern of usage of mobile phone by farmers
- 4.4 Farm related details of the farmer respondents
- 4.5 Banking related details of the farmer respondents
- 4.6 Extent of usage of mobile phone for agricultural and banking purposes
- 4.7 Factors promoting adoption of mobile phone by farmers for availing agricultural and banking services
- 4.8 Agricultural and banking services required by farmers through mobile phone
- 4.9 Constraints faced by farmers in availing agriculture and banking related services

4.1 Puzhakkal Block: A bird's eye view

Puzhakkal Block Panchayat is a major Block Panchayat in Thrissur Taluk, Thrissur District. It is located 6.8 kilometres north of Thrissur City. It is named after Puzhakkal River that passes through this region. The districts granary paddy fields are mainly included in Adat and Tholur panchayats of the block. The hallmark of this block is the rurality that is integrated with the agricultural sector. Kaiparambu, Adat, Tholur, Avanur and Mulamkunathukavu panchayats which are associated with the

Vairakkal region make the block a prominent place in the industrial map of the district. As major revenue and business block and a residential area of Thrissur City, it is mostly both industrial and agricultural. Now it has become most developed suburban area of Thrissur City. Many of the major nerve centres of Thrissur City, including the Thrissur Collectorate, Government Medical College, Vilangan Hills, Kerala Institute of Local Administration, Amala Institute of Medical Sciences, Rashtriya Sanskrit Sansthan, Government Law College, Kendriya Vidyalaya, District Industries Centre of Kerala Government, Ministry of Micro Small and Medium Enterprises under Government of India and many more are in the block.

About three quarters of century ago, literally all the villages in the puzhakkal block panchayat area were agricultural areas. Paddy cultivation was associated with the daily life of the people of that time. Most of the cultivation was rain dependent. Paddy was cultivated here on lease basis before the land laws came into force. Most of the land was owned by Dewasvom and big landlords. Indigenous varieties such as vattan, motan, thavalakannan, athiyan, chembavu, navara and ivory were used in the main paddy growing areas of kolnil and virippu mudakan. Kamuk was the main garden crop at that time. Coconut, ginger, turmeric, pepper, banana and tapioca were the other major crops in the block. At present Puzhakkal block is an important agricultural region of Thrissur district. Now Paddy, coconut and banana are the major crops cultivated in the block. Paddy is cultivated in more than 7500 acres and kole lands spreads in panchayat of Adat, Tholur, and Kaiparambu. Coconut is cultivated in more than 3000 acres of land. Out of the six gram panchayats Adat, Tholur, Kaiparambu and Avanur are the selected area for the study.

Adat Grama Panchayat

Adat panchayat is spread over the villages of Puranatukara, Chittilappily, Puzhakkal and Adat and has an area of 23.02 sq km. The headquarters of the panchayat is located on the outskirts. Situated at a distance of 6 km northwest of the city of Thrissur, this village is surrounded by low-lying hills and is a scenic tourist destination. Vilangkunnu is a tourist destination located in the block close to the city of Thrissur. It can be said that the kolpadavas surround the adat panchayat like a chain. Nalumuri, arthani, Payipprasav, Puthenkol, Ompathumuri, Chathankol,

Cheerukandath padav, Karikakil, Aryambadam, Pandarakol, Churakottukarappadam, Muthuvarathazham and many other adjoining kolpadavasa are rich in gram panchayats. Enamakal Chira protects fertile paddy fields from seawater. Agriculture is the main occupation of the villagers. The major crops are paddy, coconut and pepper.

Tholur Gram Panchayat

Parapur is the headquarters of the Grama Panchayat, which falls under the villages of Edakkalathur, Tholur and Chalakkal. Tholur panchayat covers an area of 17.20 sq km and is bounded on the north by Kaiparambu and Kandanassery panchayats, on the east by Kaiparambu and Adat panchayats, on the south by Adat and Mullassery panchayats and on the west by Vadakkancherry River. Temples, ponds and a boat dock are some of the remnants of the rule of the Brahmins, landlords and landlords. Peachy irrigation canals and water sources connecting the Cole lands enrich the water resources of the panchayat. The main crop in the panchayath is paddy. Coconut, banana and squash are the other major crops grown in the panchayat.

Kaiparambu Grama Panchayat

The panchayat has 18 wards and is bounded on the east by Avanur and Vellore panchayats, on the west by Tholur panchayt, on the south Adat panchayat and on the north by Chundal panchayat. Kaiparambu Gram Panchayat is located 10 km west of Thrissur city with its headquarters at Mundur. Despite the influence of civilisation, kaipparambu, which retains its rural elegance, is one of the leading diamond processing industries in Kerala in the world market.

Avanur Grama Panchayat

The panchayat covers an area of 18.25 sq. km. and is spread over the villages of Avanur, Choolissery, Velappaya and Thangalur. Avanur is an intermediate region. In the early days paddy was the major crop. Apart from pepper, coconut, banana, squash, paddy and other vegetables are also cultivated in the panchayat. The paddy processing center in Avanur panchayat is one of the existing paddy processing centers in India. The wings of this panchayat are mainly supplied by the Vazhani and Peechi reservoirs

4.2 Socio economic profile of the respondents

Socio – economic profile is an indicator of the economic and social position of an individual or a group in relation to others in the society. It has a vital role in determining one’s accessibility to the common resources and livelihood pattern. There are a lot of social and economic variables which collectively define socio – economic profile of the respondents.

Size of landholding of farmer is an important indicator of socio – economic characteristics of farmers. Since socio – economic characteristics and related analysis has been done on the basis of the landholding size of the farmers, the classification of farmers has been given separately before the Table depicting socio – economic characteristics, in order to enable meaningful presentation.

The farmer respondents have been classified into three categories, viz. Marginal, Small and Other farmers. As per NABARD classification marginal farmers are those having less than 1 hectare (2.5 acres), small farmers with landholding of 1 hectare to 2 hectares (upto 5 acres) and other farmers with more than 2 hectares (more than 5 acres). Based on this, from the collected data farmers have been classified into three categorised and summarised in Table 4.1

Table 4.1 Classification of farmer respondents: Landholding size-wise

Sl. No.	Farmer Classification	No. of farmers	Percentage Share
1	Marginal	58	58
2	Small	22	22
3	Others	20	20
	Total	100	100

Source: Compiled from primary data

Table 4.1 makes it clear that more than 50 per cent of the respondent farmers are marginal based on NABARD classification. A considerable number of farmers fall into the category of both small farmers and others. The sample is representative of the block. Puzhakkal block is dominated by marginal farmers. Hence the major users of mobile phone for various agricultural and banking purposes are marginal farmers.

Indicators like age, gender, religion, marital status, educational qualification, economic status and occupational category have been taken for analysis of socio – economic characteristics of the farmers. Results drawn from the analysis is clearly depicted in Table 4.2

Table 4.2 Socio – economic profile of the respondents

Sl. No.	Characteristics	Marginal Farmers	Small Farmers	Others	Total
1	Age (in years)				
	Less than 35	10(17)	4(18)	0	14(14)
	35-45	10(17)	0	4(20)	14(14)
	45-55	22(38)	18(82)	8(40)	48(48)
	55-65	16(28)	0	4(20)	20(20)
	More than 65	0	0	4(20)	4(4)
	Total	58(100)	22(100)	20(100)	100(100)
2	Gender				
	Male	38(66)	16(73)	16(80)	70(70)
	Female	20(34)	6(27)	4(20)	30(30)
	Total	58(100)	22(100)	20(100)	100(100)
3	Religion				
	Hindu	42(72)	20(91)	18(90)	80(80)
	Christian	16(28)	2(9)	2(10)	20(20)
	Total	58(100)	22(100)	20(100)	100(100)
4	Marital Status				
	Married	57(98)	22(100)	19(95)	98(98)
	Widowed	1(2)	0	1(5)	2(2)
	Total	58(100)	22(100)	20(100)	100(100)
5	Educational Qualification				
	8 th Std	6(10)	4(18)	4(20)	14(14)
	SSLC	30(52)	4(18)	6(30)	40(40)
	Plus Two	14(24)	10(46)	4(20)	28(28)

	Technical	2(4)	4(18)	2(10)	8(8)
	Graduation and above	6(10)	0	4(20)	10(10)
	Total	58(100)	22(100)	20(100)	100(100)
6	Economic Status				
	BPL	10(17)	2(9)	6(30)	18(18)
	APL	48(83)	20(91)	14(70)	82(82)
	Total	58(100)	22(100)	20(100)	100(100)
7	Occupational Category				
	Pensioners	0	0	2(10)	2(2)
	Private Sector	6(10)	2(9)	0	8(8)
	Self Employed – Agriculture	44(76)	20(91)	12(60)	76(76)
	Daily wage workers	8(14)	0	6(30)	14(14)
	Total	58(100)	22(100)	20(100)	100(100)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

Age is considered as one of the important variables which determine a person's ability to accept information from relevant sources and using it appropriately. The most prominent age group is 45-55 years. This indicates that mainly middle aged respondents are into the field of agriculture and they make use of mobile phone for accessing agricultural and banking services. Usage of mobile phone by farmers above the age of 65 years was found less (Koshy and Kumar, 2016).

Gender-wise breakup of the respondents reveals that a large majority of them are male (70 per cent) and the rest of the respondents are female (Balkrishna and Deshmukh, 2017). This indicates that male domination in agriculture is more in the study area when compared to female respondents. Almost majority of the respondents i.e. 80 per cent belongs to Hindu Community and the remaining are Christians. All the respondents except two are married.

Even though usage of mobile phone does not require any basic qualification educational level of the respondents can influence their perceptions and also their level of knowledge. Formal education is an important determinant of individuals understanding ability. From the study it is seen that highest educational status was among marginal farmers i.e. six of them have graduation and above. Majority of the respondents (40 per cent) has completed their tenth standard. This shows that all the respondents have a minimum qualification level and they have the ability to read and write. Level of education attainment is sufficient to support adoption of technology as reported by Aphunu and Atoma (2011).

It is evident that farmers lead a better standard of living as 82 per cent of them belong to APL category and the rest 18 per cent belongs to BPL category. Agricultural is the primary occupation for 76 per cent of the respondents followed by 14 per cent of the respondents are daily wage earners.

4.3 Pattern of usage of mobile phone

Other than the socio – economic characteristics discussed above the pattern of usage of mobile phone by the respondent farmers need to be considered. Hence the second section is devoted for discussion of pattern of usage of mobile phone by farmers.

Table 4.3 Pattern of usage of mobile phone

Sl. No.	Particulars	Marginal Farmers	Small Farmers	Others	Total
1	Duration of holding mobile phone				
	Less than 2 years	8(14)	2(9)	1(5)	11(11)
	2-4 years	18(31)	4(18)	7(35)	29(29)
	4-6 years	32(55)	16(73)	6(30)	54(54)
	More than 6 years	0	0	6(30)	6(6)
	Total	58(100)	22(100)	20(100)	100(100)

2	Frequency of usage				
	Daily	58(100)	22(100)	20(100)	100(100)
	Total	58(100)	22(100)	20(100)	100(100)
3	Familiarity of various functionalities*				
	Call	58(100)	22(100)	20(100)	100(100)
	SMS	48(83)	18(82)	14(70)	80(80)
	Internet	58(100)	22(100)	20(100)	100(100)
	Wi-Fi	26(45)	16(73)	4(20)	46(46)
	Apps	48(83)	20(91)	14(70)	82(82)
	Social Apps	58(100)	22(100)	20(100)	100(100)
	Player	46(79)	14(64)	12(60)	72(72)
	Radio	34(59)	14(64)	14(70)	62(62)
	Camera	58(100)	22(100)	20(100)	100(100)
4	Recharging Amount				
	Less than Rs. 500	32(55)	16(73)	10(50)	58(58)
	More than Rs. 500	26(45)	6(27)	10(50)	42(42)
	Total	58(100)	22(100)	20(100)	100(100)
5	Postpaid/ Prepaid				
	Prepaid	58(100)	22(100)	20(100)	100(100)
	Total	58(100)	22(100)	20(100)	100(100)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

*Multiple responses

Mobile phones have become a major form of communication in the world. All the respondents under the study are having their own mobile phone and 54 per cent of them are using it for the past 4-6 years (Ansari and Pandey, 2012). The frequency of usage of mobile phone is same among all the farmers. All the farmers use it daily.

Mobile operators in India cater different services for their clients. Grossly these services include voice call, text message, internet service, Wi-Fi, various social and other applications, music player, radio and camera. However the farmers' use of these services varies abruptly. According to Table 4.3 all the farmers make use of voice call service, internet, social apps and camera. Farmers are also aware about various applications in the mobile phone and SMS services. More than half of the respondents make use of mobile phone for listening music and radio. Very few farmers have awareness about the Wi-Fi facility in their mobile phone.

With the rising competition there are a number of variety data plans offered by different mobile operators in India suitable for poor to rich. Most of the data plans offer customers with three months of free voice call service along with free SMS service for 100 days and internet package for 3 months. More than half of the respondents (58 per cent) spend less than 500 for 3 month and rest spend more than 500 for 3 months. Different data plans ranging from Rs. 143 to Rs 699 were common among the respondents and all preferred prepaid recharge.

4.4 Farm-related details of the respondent

After analysing the pattern of usage of mobile phone by the farmer respondents, an attempt is made to understand the distinctive features of agricultural operation of the respondents. Hence in this section various farm details regarding nature of farming, year of experience, cropping pattern, cost of cultivation, net income from agricultural activities, purchase of inputs, marketing of outputs and source of fund for various agricultural activities are analysed.

Table 4.4 Farm - related details of the respondents

Sl. No.	Particulars	Marginal Farmers	Small Farmers	Others	Total
1	Nature of farming*				
	Traditional	58(100)	22(100)	20(100)	100(100)
	Innovative	32(55)	18(82)	17(85)	67(67)
2	Years of experience in Farming				
	Less than 10 years	28(48)	10(46)	8(40)	46(46)
	10-20 years	12(21)	8(36)	8(40)	28(28)
	20-30 years	18(31)	4(18)	4(20)	26(26)
	Total	58(100)	22(100)	20(100)	100(100)
3	Cropping Pattern				
3.1	Paddy				
	Below 2 acre	55(95)	0	0	55(55)
	2-4 acre	3(5)	18(82)	0	21(21)
	Above 4 acre	0	4(18)	20(100)	24(4)
	Total	58(100)	22(100)	20(100)	100(100)
3.2	Vegetables*				
	Cowpea	43(74)	19(86)	18(90)	18(18)
	Bitter guard	34(59)	10(45)	14(70)	58(58)
	Brinjal	38(66)	21(95)	9(45)	68(68)
	Chinese potato	26(45)	12(54)	4(20)	42(42)
	Tomato	32(55)	8(36)	11(55)	51(51)
	Tapioca	22(38)	9(41)	7(35)	38(38)
3.3	Banana				
	Below 100 plants	43(74)	6(27)	3(15)	52(52)
	100-200 plants	9(16)	12(55)	10(50)	31(31)
	Above 200 plants	6(10)	4(18)	7(35)	17(17)
	Total	58(100)	22(100)	20(100)	100(100)

4	Cost of Cultivation per annum (in Rs.)				
	Less than 50000	25(43)	0	0	25(25)
	50000-100000	33(57)	13(59)	0	46(46)
	100000-150000	0	1(5)	2(10)	3(3)
	150000-200000	0	8(36)	12(60)	20(20)
	Above 200000	0	0	6(30)	6(6)
	Total	58(100)	22(100)	20(100)	100(100)
5	Net Income from agriculture (in Rs)				
	Less than 50000	50(86)	4(18)	0	54(54)
	50000-100000	8(14)	12(56)	12(60)	32(32)
	Above 100000	0	6(28)	8(40)	14(14)
	Total	58(100)	22(100)	20(100)	100(100)
6	Source of input supply*				
	Private traders	16(27)	8(36)	4(20)	28(28)
	Krishibhavan	58(100)	22(100)	20(100)	100(100)
	KAU	34(59)	8(36)	10(50)	52(52)
	Private Nursery	12(55)	6(27)	6(30)	24(24)
	Cooperative banks	4(7)	2(9)	2(10)	8(8)
	Fellow farmers	44(76)	20(91)	20(100)	84(84)
7	Marketing of Farm outputs*				
	SUPPLYCO	58(100)	22(100)	20(100)	100(100)
	Wholesalers	32(55)	18(82)	10(50)	60(60)
	Retailers	26(45)	14(64)	12(60)	52(52)
	Direct sale	54(93)	22(100)	16(80)	92(92)
8	Source of fund*				
	Commercial bank	12(21)	2(9)	6(30)	20(20)
	Co-operative society	6(10)	0	2(10)	8(8)
	RRB's	2(34)	0	2(10)	4(4)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

*Multiple responses

All the farmer respondents under the study make use of traditional farming techniques (Rafiq, 2015). Along with traditional farming 67 per cent of them are adopting innovative farming techniques like use of hybrid seeds, technologically advanced equipments, fertilisers and pesticides in their field for better yield.

It is seen that 46 per cent of the farmers have less than 10 years of experience in farming followed by 28 per cent of them with 20-30 years of experience in farming.

Marginal farmers dominated more in the study area. They usually go in for food crops on their small farms in preference to commercial crops since food crops constitute the major expenditure items in their lives and account for the major part of their income. An enquiry is made here to find out the different crops cultivated by the farmer respondents in their landholdings. The major crop cultivated by the farmers in order of priority in the study area includes paddy, vegetables and banana.

All the farmers are having cultivation of paddy. In case of marginal farmers, majority of them (55 per cent) have undertaken paddy cultivation below 2 acres and 20 per cent of the respondents have paddy cultivation above 4 acres.

Among vegetables, majority of the farmers cultivated brinjal which constitute about 68 per cent of the total farmers out of which 66 per cent of the farmers are marginal. The other vegetables cultivated by the farmers are bitter guard (58 per cent), tomato (51 per cent), chinese potato (42 per cent), tapioca (38 per cent) and cowpea (18 per cent).

Cultivation of banana is the next common crop among the respondent farmers. Large scale cultivation of banana i.e. above 200 plants is undertaken by 17 per cent of the farmers.

Cost of cultivation incurred by farmers for all their crops in a year are calculated from details of production/ yield and price fetched by them. Cost of cultivation of majority of farmers ranged from Rs. 50000 to Rs. 100000.

From the gross income of the farmers from agriculture, the cost of cultivation has been deducted to arrive at their net income from agriculture. Table 4.4 reveals that 54 per cent of the respondents are earning a net income of less than Rs. 50000 per year. Out of 54 per cent of respondents 86 per cent of them are marginal farmers. Only 14 per cent of the farmers are earning a net income of more than Rs. 100000 per year.

Backward linkage i.e. sources from which inputs are purchased and forward linkages i.e. channels through which respondents sold their farm produce are discussed in Table 4.4. Generally farmers have specific reasons for their choice of source of input supplies such as seed, fertiliser, equipments, pesticides etc. The different sources through which farmers procure different inputs are classified as krishibhavan, KAU, private nurseries, cooperative banks and from fellow farmers.

Krishibhavan is the first choice of all the respondent farmers irrespective of the category to which they belong to. All inputs mainly seed and fertilisers are being provided to farmers at subsidised rates from their respective krishibhavan under different schemes such as “subhiksha padhathi” etc. The paddy farmers are supplied with seeds for their fields for free through krishibhavan. These subsidised inputs will help the farmers to reduce their cost of cultivation. Next preferred source of purchase of inputs for 84 per cent of farmers is from their fellow farmers followed by KAU. Cooperative societies are least preferred by the respondent farmers.

Agricultural marketing refers to all the services involved in moving an agricultural produce from farm to customers. Cultivation of paddy is common among all the respondent farmers and all of them preferred SUPPLYCO for the marketing of their produce as it ensures reasonable and stable price. Direct sale of mainly vegetables are preferred by 92 per cent of the farmers. They stated that local people in and around their area prefer purchase of vegetables directly from the farm. More than half of the farmers (60 per cent) prefer wholesalers in case of sale of banana and coconut and 52 per cent of the farmers go for retailers.

Credit can do wonders to farmers living even in remote village in improving their economic condition and protecting them from the clutches of the village moneylenders. With the help of credit they can improve their economic condition, by utilising credit for income generating activities. Access to credit encourages active involvement and participation of the farmers. Efforts are being taken by Government and Reserve Bank of India to provide hassle free credit at concessional rates of interest to the farmers for their agricultural operation. From Table 4.3 it is clear that only 20 per cent of the respondent farmers avail credit from commercial banks for agricultural purposes. All the farmers use their own fund more for their cultivation purposes. It is a striking feature that none of the farmers are depending upon non – institutional agencies like money lenders for their cultivation expenses, when many farmers in India are still under the clutches of unscrupulous money lenders.

4.5 Banking related details of the respondents

Along with farm related details of the respondents, basic banking related details of the respondents are also analysed in order to get a brief idea about their banking behaviour. The various banking related details considered here are: type of bank, type of account, nature of banking transactions, period of customership and frequency of banking transactions.

Table 4.5 Banking related details of the respondents

Sl. No.	Variables	Marginal Farmers	Small Farmers	Others	Total
1	Type of bank*				
	Public sector banks	26(45)	18(82)	13(65)	57(57)
	Private sector banks	31(53)	12(55)	9(45)	52(52)
	Cooperative banks	4(7)	3(14)	2(10)	9(9)
	RRB's	2(3)	1(5)	0	3(3)
2	Type of Account				
	Savings Account	58(100)	22(100)	20(100)	100(100)
	Total	58(100)	22(100)	20(100)	100(100)

3	Nature of banking Transactions				
	Offline	32(55)	20(91)	8(40)	60(60)
	Online	26(45)	2(9)	12(60)	40(40)
	Total	58(100)	22(100)	20(100)	100(100)
4	Period of Customership				
	Less than 10 years	18(31)	6(27)	8(40)	32(32)
	10-20 years	34(59)	16(73)	10(50)	60(60)
	More than 20 years	6(10)	0	2(10)	8(8)
	Total	58(100)	22(100)	20(100)	100(100)
5	Frequency of banking transactions				
	Occasionally	58(100)	22(100)	20(100)	100(100)
	Total	58(100)	22(100)	20(100)	100(100)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

*Multiple responses

All the respondent farmers are having their own bank account. While looking into the type of bank in which the respondents have their account shows that 57 per cent of them have their account in public sector banks. Most of respondents stated that they have more than one account in different banks and in case of type of account all of them have opened savings account.

Banking industry provides both modes of transactions to its customers i.e. offline and online banking. Only 40 percent of the respondent farmers are using online mode for various banking transactions.

Period of customership has been classified as less than 10 years, 10-20 years, more than 20 years. It could be understood from the table 4.5 that majority of the farmers (60 per cent) are having 10- 20 years of customership.

The frequency with which customers transact their business with the bank varies from customer to customer. All the respondents have their transactions done occasionally.

4.6 Extent of usage of mobile phone by farmers for their agricultural and banking services

For the first objective of the study that is to access the extent of utilisation of mobile phone for agricultural and banking services by farmers, their awareness level, accessibility, usage and frequency of usage of various agricultural and banking information and services are analysed in this section. Awareness is the state of being conscious of something. More specifically it is ability to directly know or perceive, to feel, or to be cognizant of events. Awareness with respect to information and services in agriculture and banking means whether farmers have enough knowledge about various agricultural and banking services available through mobile phone. Accessibility in simple words is referred as “ability to access” i.e. quality of being able to be reached or entered. Here access to agricultural and banking services denotes whether the services are available for use and respondents has approachability to the services which will add to the existing level of knowledge about a particular aspect. Usage refers to the act of using something or fact of being used. Here in this context usage means the use of mobile phone for various agricultural and banking services. Frequency of usage means how often the respondent farmers make use of various agricultural and banking services. The extent of use mobile phone for agricultural and banking services is shown separately to make the analysis more clear.

Table 4.6 Extent of usage of mobile phone by farmers for agricultural purposes

Sl. No.	Agricultural related information & services	Awareness Index	Accessibility Index	Usage Index	Frequency of Usage Index
1	Agricultural Apps				
	Marginal farmers	78	53	51	37
	Small farmers	77	54	52	37
	Others	80	68	62	61
	Total Index	78	58	55	45

2	Social Media				
	Marginal farmers	89	82	77	80
	Small farmers	88	81	80	80
	Others	89	85	83	81
	Total Index	89	83	80	80
3	Browsing websites related to agriculture				
	Marginal farmers	38	35	25	24
	Small farmers	35	30	23	22
	Others	25	23	21	21
	Total Index	33	29	23	22
4	Call to experts for information and advisory services				
	Marginal farmers	93	78	60	32
	Small farmers	92	78	60	32
	Others	93	79	62	30
	Total Index	93	78	61	31
5	Call for input/ Marketing				
	Marginal farmers	90	70	62	42
	Small farmers	90	70	63	41
	Others	90	69	62	41
	Total Index	90	70	62	41
6	Call to fellow farmers				
	Marginal farmers	100	94	63	38
	Small farmers	100	93	64	39
	Others	100	96	63	38
	Total Index	100	94	63	38

7	SMS based weather information				
	Marginal farmers	67	37	33	20
	Small farmers	66	37	32	20
	Others	69	38	35	20
	Total Index	67	37	33	20

Source: Compiled from primary data

As one of the technology's most prominent offspring's, the smart phone has established its practicality and versatility in a myriad of sectors, including offbeat and conventional ones such as agriculture. There are a variety of apps related to agriculture that is available in mobile phone play store which provides various services related to marketing of produce, pest management, Package of Practices etc. From the study it is clear that almost all the farmers are partially aware about the various apps related to agriculture and regarding the accessibility, farmers access these apps sometimes. The usage of various agricultural related apps among the respondent farmers was occasional and they use it atleast once in a week. Most of the farmers are new to most of the apps related to agriculture. They stated that they have recently started using these apps and that is the reason for their low usage.

Social media is the new upcoming area in agriculture that has blogs, pages, groups etc. Social media overcomes geographical boundaries and creates communities who share common interests. Various social media tools like Facebook, WhatsApp and Youtube are becoming greater ways to sharing information about agricultural produce and agricultural marketing (Balakrishnan and Deshmukh, 2017). A higher index is found among the farmers in case of awareness, accessibility, usage and frequency of usage of mobile phone for various agricultural related information and services through social media. All the respondent farmers use facebook, whatsapp and access youtube videos for agricultural information and services. In case of facebook some farmers are having their own pages like Ayurjack, Athira Honey etc. All the farmers are having whatsapp. The respective krishibhavans of all the four panchayats that is Adat, Tholur, Kaiparambu and Avanur are having a whatsapp group with the Krishi Officer as the group admin. All the information related to availability of seeds,

fertilisers, farm equipments etc are communicated through this whatsapp group. Farmers also have other groups of Padashekara samithis where information about paddy cultivation is discussed. Usage of youtube for watching agricultural related videos is also common among all the farmers.

In case of browsing websites related to agriculture farmers have very little awareness, accessibility and usage is found to be rare and frequency of usage is also rare.

In Kerala, agricultural extension system uses mobile phone in disseminating information through Kisan Call Centres, IFFCO Kisan Sanchar Ltd. etc. Kisan call centre is part of national initiative which can be accessed by farmers all over India. IKSL which is also a national level initiative has started an Agri Market Intelligence helpline at Agricultural Market Intelligence Centre (AMIC) functioning in Kerala Agricultural University. The pepper, cardamom and coconut farmers can avail the services of AMIC helpline. The service is provided absolutely free of cost to the farmers irrespective of the connection they are using. Almost all the respondent farmers make use of mobile phone for contacting experts for clearing doubts and queries related to various agricultural issues. Here from Table 4.6.1 it is clear that all the respondent farmers are fully aware of this facility and all stated that accessibility is often. While analyzing the usage, it is found that marginal and small farmers used it occasionally and in case of other farmers they are using it twice in a week.

In case of purchase of input and marketing of their farm produce all farmers often contact Krishibhavan, Kerala Agricultural University, various Padashekara samithis, Supplyco etc. They frequently make calls to these input suppliers and marketing channels for availing information regarding kind and quality of inputs to be used for the crops, quantity, timing of inputs, market price of the produces and market availability. They also have access to the secretaries of padaskeharam. Frequency of usage of mobile phone for making calls for input purchase and marketing of their produce was done twice in a month.

All the farmers irrespective of their category make use of mobile phone for contacting fellow farmers for discussing any farm related matters, input purchase etc. They always have accessibility to call their fellow farmers. The usage of mobile phone for contacting other farmers is found occasional that is according to their need and the frequency of contact is on a monthly basis as stated by respondents.

Extreme weather conditions like heavy rain, drought can cause not only loss of life but also loss of livelihood for many of the farmers. Well documented and timely warnings can help the farmers reduce the risk of loss and harm to their farm incomes. To counter this risk SMS based weather information is delivered through mobile phone to the farmers by different agencies. One such agency that provides up-to-date information on weather is Agro-Meteorological Field Units (AMFU). Indian Meteorological Department (IMD), Ministry of Earth Sciences (MoES), Government of India (GoI), New Delhi is operating an integrated Agro- Meteorological Advisory Services (AAS) at district level, in India which represents a small step towards agricultural management in rhythm with weather and climate variability leading to weather proofing for farm production. Location specific weather forecast is done by IMD along with KAU and is delivered to the farmers in the form of SMS in their mobile phone as message from ADKISAN. Among the surveyed respondents most of them receive such SMS but they are not fully aware about this facility and its accessibility is also low among the farmers. All the respondents rarely use it hence frequency of usage is also rare.

Usage of mobile phone for banking related purposes includes usage of banking related apps, payment apps, browsing websites of banks, call to banks, call to banks for queries and customer care centres, account balance enquiry through miscall, mini statement of accounts through miscall and SMS.

Table 4.7 Extent of usage of mobile phone by farmers for banking purposes

Sl. No.	Banking related information & services	Awareness Index	Accessibility Index	Usage Index	Frequency of Usage Index
1	Banking related Apps				
	Marginal farmers	75	59	46	34
	Small farmers	73	56	44	32
	Others	70	54	42	29
	Total Index	73	56	44	32
2	Payment Apps				
	Marginal farmers	76	53	38	36
	Small farmers	74	51	37	35
	Others	72	48	35	31
	Total Index	74	51	37	34
3	Web browsing				
	Marginal farmers	60	39	33	24
	Small farmers	58	37	33	23
	Others	54	36	31	22
	Total Index	57	37	32	23
4	Call to customer care				
	Marginal farmers	74	53	44	23
	Small farmers	73	54	43	24
	Others	70	51	41	23
	Total Index	72	53	43	23
5	Mini statement-Missed Call				
	Marginal farmers	71	49	47	32
	Small farmers	69	48	47	31
	Others	67	44	46	29
	Total Index	69	48	47	31

6	Mini statement-SMS				
	Marginal farmers	71	45	41	34
	Small farmers	69	46	42	35
	Others	67	45	40	32
	Total Index	69	45	41	34
7	Transactional Notification				
	Marginal farmers	91	91	85	47
	Small farmers	90	90	85	45
	Others	89	89	83	42
	Total Index	90	90	84	45

Source: Compiled from primary data

Introduction of many mobile applications of various banks has enabled the customers to perform their financial transactions efficiently. All the respondents are having partial awareness related to various apps of banks but only 40 per cent of the farmers have the apps in their mobile phone. Even though they have the apps, their accessibility index was 56 which denote that access is limited to sometimes. Usage of apps is done by the respondents occasionally and their frequency of usage is on a monthly basis.

Along with various apps related to banks, there are many other payment apps which can be accessed through mobile phones. Here also respondents have partial awareness about various apps but accessibility is low. In case of usage they use it rarely that is the frequency of usage of payment apps was once in a month.

In case of browsing websites of banks respondent farmers have moderate awareness and they stated that don't have much accessibility to this. In case of usage of mobile phone for banking purposes respondents rarely use websites of banks and frequency of usage is also low.

Respondent farmers make use of their mobile phone for contacting customer care centres of particular banks in order to share their doubts, queries etc. All the respondents have partial awareness about this facility through mobile phone and also they stated their accessibility to this service as “sometimes”. Respondent make use of this facility occasionally according to their need and the frequency of usage is stated as monthly usage.

Nowadays banks offer the mini statement of their customers last five banking transaction through miscall and SMS. Customers just need to give one miscall or sent an SMS from their registered mobile number on the banks balance enquiry toll free number. In few seconds customers will receive their account balance details on their mobile phone. Respondents are having partial awareness of this facility of knowing account details through miscall and SMS and the accessibility stated by them was “Sometimes”. They used these services occasionally and frequency of usage was on a monthly basis.

The entire customers while opening a bank account will register their mobile number with their account and opt the option of receiving SMS of their transactions through mobile phone. This facility is available both in normal and android mobiles. All the respondents are fully aware of this service through mobile phone and they always have accessibility to this service. Usage and frequency of usage of this service is according to their account transactions.

4.6.1 Usage of apps related to agriculture by the respondents

Mobile communications technology has quickly become the world’s most common way of transmitting voice, data, and services. Given this dramatic change, mobile applications (m-apps) in general and mobile applications for agricultural and banking in particular hold significant potential for advancing development. They could provide the most affordable ways for millions of people to access information, markets, finance, and governance systems previously unavailable to them. Various agriculture related mobile applications used by the respondents are given below in Table 4.8.

Table 4.8 Apps used by farmers related to agriculture

Sl. No.	Apps related to Agriculture	Agency providing source of information	Type of information retrieved
1	e- Vipani	Dept. Of Agricultural development and farmers welfare	Buy and sell platform for agriculture produce
2	Karshika Vivara Sanketham	Dept. Of Agricultural development and farmers welfare	Latest information about agriculture business
3	KVK Mobile App	ICAR-IASRI	All details of facilities provided through KVK

Source: Compiled from primary data

4.6.2 Whatsapp groups related to agriculture

Table 4.9 depicts various Whatsapp groups related to agriculture in which the respondents are active members.

Table 4.9 Whatsapp groups used by farmers related to agriculture

Sl. No	Name of the WhatsApp group	Type of information retrieved
1	Harithasamridhi	Tholur Krishi Officer
2	Avanoor Krishibhavan Ariyipukal	Avanur Krishi Officer
3	Kaiparambu Grama Panchayat Krishibhavan	Kaiparambu Krishi Officer
4	Adat Krishibavan	Adat Krishi Officer
5	Thrissur Krishikootam	A group formed by farmers in Thrissur. Information related to price of farm produces in different markets.
6	Ksheerasagaram	A group of dairy farmers in kaiparambu – Information related to dairy farming
7	Avanoor Padasekhara Samiti	A group formed by Secretary of Avanur Padasekhara Samiti – Information related to paddy cultivation, availability of inputs etc
8	Drafting and Budding	Information related to drafting and budding
9	Krishikalam	Group formed by farmers to form a cooperative society in Pavarty
10	Chuttuvatam	Group formed during COVID-19 which acts a medium for marketing of farm produce during lockdown
11	Thrissur Krishi Chandha	Information related to marketing of farm produce

Source: Compiled from primary data

4.6.3 Banking and payment apps used by the respondents

Only 40 per cent of the respondents were making use of their mobile phone for various banking purposes. The various banking and payment apps used by the respondents were Fed Mobile, YONO SBI, KGB-mPAY, Google Pay, PhonePe and KSEB App.

Fed Mobile

Fed Mobile is Federal banks highly popular mobile banking application which is a complete package, which enables users to access and manage their accounts anywhere any time. Specific features include recharge and bill payment, transfer of funds, fedbook, account services, merchant services etc.

YONO SBI

YONO SBI is SBI's mobile banking app. It lets its users bank digitally, invest, shop, book movie tickets, flights etc.

KGB-mPay

Kerala Gramin Bank offers KGB mPay, mobile banking services, facilitating customers to get bank services such as balance enquiry, mini statement, fund transfer etc.

Google Pay

Google Pay is a digital wallet platform and online payment system developed by google to power in-app and tap-to-pay purchases on mobile devices, enabling users to make payments with an android phone.

PhonePe

It is also a payment app that allows users to use BHIM UPI, credit and debit card or wallet to recharge mobile phone, pay all utility bills and also make instant payments at offline and online stores.

KSEB App

Official app of Kerala State Electricity Board which offers self service facility for customers from KSEB limit which extents a host of features such as quick pay facility, check billing dates, check consumption details, notification alerting due date, payment confirmation etc.

4.6.4 Purpose of using mobile phone for agricultural and banking services

For knowing the extent of usage of mobile phone by farmers for various agricultural and banking services their level of awareness, accessibility, usage and frequency of usage of various services is assessed in the above section. In this section the various purposes for which respondents make use of the mobile phone is analysed.

Table 4.10 Purpose of using mobile phone for agricultural related services

Sl. No.	Information and advisory services*	Marginal Farmers	Small Farmers	Others	Total
1	Farm operation	58(100)	22(100)	20(100)	100(100)
2	Input supply	58(100)	22(100)	20(100)	100(100)
3	Crop management	38(66)	17(77)	13(65)	68(68)
4	Pest management	32(55)	12(54)	12(60)	56(56)
5	Market price	58(100)	22(100)	20(100)	100(100)
6	Market availability	58(100)	22(100)	20(100)	100(100)
7	Crop insurance	23(40)	7(32)	6(30)	36(36)
8	Weather	8(14)	8(36)	4(20)	20(20)
9	Climate	9(16)	8(36)	3(15)	20(20)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

*Multiple responses

From the Table 4.10 it is clear that all the respondents make use of their mobile phone for accessing information related to farm operations, input supply, market price and market availability of their produce. Farmers make least use of their mobile phone for knowing weather and climate updates.

Table 4.11 Purpose of using mobile phone for banking related services

Sl. No.	Banking Services*	Marginal Farmers	Small Farmers	Others	Total
1	Checking account balance	24(41)	6(27)	10(50)	40(40)
2	Inter account fund transfer	24(41)	6(27)	10(50)	40(40)
3	Transaction notification from banks through SMS	58(100)	22(100)	20(100)	100(100)
4	Mobile recharging	24(41)	6(27)	8(40)	37(37)
5	Online purchases	16(28)	7(36)	10(50)	31(31)
6	Payment of various utility bills	20(34)	6(27)	9(45)	35(35)
7	Information related to General/Life Insurance	2(3)	2(9)	8(40)	12(12)
8	Credit related information	8(14)	2(9)	10(50)	20(20)

Source: Compiled from primary data

Note: Figures in the parenthesis represents percentage share of each to total in each category

*Multiple responses

From Table 4.11 it is evident that all the farmers make use of their mobile phone for getting notification of their account transactions. Only 12 per cent of the respondents use their mobile phone for accessing information related to General/ Life insurance services

4.7 Factors promoting adoption of mobile phone by farmers for availing agricultural and banking services.

There are many factors that influence the respondents to adopt mobile phone for various agricultural and banking services. To determine the factors that promote adoption of mobile phone for agricultural and banking services by farmers, an exploratory factor analysis is performed separately for factors promoting adoption of mobile phone for agricultural services and factors promoting adoption of mobile phone for banking services.

4.7.1 Factors promoting adoption of mobile phone by farmers for agricultural services

In case of promoting adoption of mobile phone for agricultural services by farmers, an exploratory factor analysis is performed using 15 items. The Principal Component analysis by using Varimax rotation technique is done for identifying factors. Factor analysis is performed based on the assumption of unequal variance.

Table 4.12 Communalities using Principal Component Analysis

Communalities		
Items	Initial	Extraction
Simple and Easy to operate	1.000	.721
Up to date information	1.000	.616
Quick mode for accessing agricultural information	1.000	.975
Accessibility of information at any time	1.000	.434
Network quality and faster internet access	1.000	.993
Act as a single source of information	1.000	.430
Required information at finger tips	1.000	.724
Economical for low income groups	1.000	.899
Location specific information delivery	1.000	.935
Farmer specific information	1.000	.874
Effective handling of doubts and queries	1.000	.822
Communication in regional language	1.000	.993
Easy to handle	1.000	.975
Authentic and reliable	1.000	.751
Enhance better access to marketing channels	1.000	.993

The items with communalities above 0.5 are selected and the selected items are shown in Table 4.13

Table 4.13 Eigen values and Rotation Sum of Squared Loadings

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.009	30.842	30.842	3.748	28.828	28.828
2	3.119	23.989	54.830	3.054	23.490	52.318
3	2.053	15.794	70.625	1.963	15.097	67.415
4	1.402	10.783	81.408	1.646	12.664	80.079
5	1.054	8.111	89.519	1.227	9.440	89.519
6	.700	5.381	94.900			
7	.317	2.442	97.342			
8	.215	1.655	98.997			
9	.077	.592	99.590			
10	.053	.410	100.000			
11	4.179E-16	3.214E-15	100.000			
12	1.861E-16	1.432E-15	100.000			
13	-7.921E-17	-6.093E-16	100.000			

According to Eigen value rule (Kaiser, 1950) asserts those factors with Eigen value less than 1.0 should not be retained. There are five factors having Eigen value greater than 1.0 and these factors explained 89.519 % of total variance.

Table 4.14 Rotated component matrix (factor loading) from Principal Component Analysis

Name of the factor	Items	Factor Loading
Accessibility	Quick mode for accessing agricultural information	.984
	Location specific information delivery	.959
	Effective handling of doubts and queries	.903
	Easy to handle	.984
Adequacy	Network quality and faster internet access	.992
	Communication in regional language	.992
	Enhance better access to markets	.992
User friendly	Simple and easy to operate	.962
	Required information at finger tips	.947
	Authentic and reliable	.892
Availability	Economical for low income groups	.888
	Farmer specific info	.849
Awareness	Up to date Information	.782

There are five factors identified under PCA. The factor loadings ranged from .782 to .992. The identified factors are termed as accessibility, adequacy, user friendly, availability and awareness.

4.7.2 Factors promoting adoption of mobile phone by farmers for banking services

In case of promoting adoption of mobile phone for banking services by farmers, an exploratory factor analysis is performed using 15 items. The Principal Component analysis by using Varimax rotation technique is done for identifying factors. Factor analysis is performed based on the assumption of unequal variance.

Table 4.15 Communalities using Principal Component Analysis

Communalities		
Items	Initial	Extraction
Easy to operate	1.000	.606
Up to date information on various banking aspects	1.000	.722
Quick accomplishment of banking tasks	1.000	.822
Faster internet access and network quality	1.000	.636
Required services at fingertips	1.000	.692
Cost effective accessibility anywhere anytime	1.000	.930
Economical for low income groups	1.000	.631
Reduces transaction cost	1.000	.848
Easy tracking of banking activities	1.000	.891
Promotes cashless transaction	1.000	.955
Effective handling of complaints and queries	1.000	.462
24 hours free customer care services	1.000	.891
Communication in regional language	1.000	.691
Safe and secure	1.000	.911
Authentic and reliable information	1.000	.901

Extraction Method: Principal Component Analysis.

The items with communalities above 0.5 are selected and the selected items are shown in Table 4. 16

Table 4.16 Eigen values and Rotation Sum of Squared Loadings

Component	Total Variance Explained					
	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.103	22.163	22.163	3.103	22.163	22.163
2	2.469	17.639	39.802	2.469	17.639	39.802
3	1.888	13.486	53.287	1.888	13.486	53.287
4	1.517	10.834	64.121	1.517	10.834	64.121
5	1.221	8.722	72.843	1.221	8.722	72.843
6	1.107	7.904	80.747	1.107	7.904	80.747
7	.836	5.971	86.718			
8	.723	5.167	91.885			
9	.493	3.519	95.405			
10	.398	2.845	98.249			
11	.184	1.316	99.566			
12	.050	.359	99.925			
13	.011	.075	100.000			
14	-5.551E-17	-3.965E-16	100.000			

Extraction Method: Principal Component Analysis.

According to Eigen value rule (Kaiser, 1950) asserts those factors with Eigen value less than 1.0 should not be retained. There are six factors having Eigen value greater than 1.0 and these factors explained 80.747 % of total variance.

Table 4.17 Rotated component matrix (factor loading) from Principal Component Analysis

Name of the factor	Items	Factor Loading
Accessibility	Cost effective accessibility anywhere anytime	.912
	Reduces transaction cost	.819
	Promotes cashless transaction	.915
	Easy to operate	.390
Adequacy	Safe and secure	.782
	Authentic and reliable information	.787
Availability	Easy tracking of banking activities	.562
	Network quality and faster internet access	.562
	Required services at fingertips	.477
Affordability	24 hours free customer care services	.421
	Economical for low income groups	.701
User friendly	Quick accomplishment of banking tasks	.445
	Communication in regional language	.507
Awareness	Up to date information on various banking aspects	.557

There are six factors identified under PCA. The factor loadings ranged from .390 to .915. The identified factors are termed as accessibility, adequacy, availability, affordability, user friendly and awareness.

There are so many factors that promote adoption of mobile phone by farmers for availing agricultural and banking services and it may differ from person to person. To determine the factors that influence the adoption of mobile phone for availing these services factors like accessibility, adequacy, user friendly, availability affordability and awareness are taken. Degree of influence of these factors on farmers' adoption of mobile phone may vary from one farmer to another.

For identifying factors, an influence index is constructed. Influential levels of respondents are collected in a five point scale. For each factors scores are allocated. The total score obtained by each factor are also calculated. Responses from respondents are collected using five point scale like strongly agree, agree, moderately agree, disagree and strongly disagree and each scale is allotted with scores ranging from five to one respectively. The index is calculated separately for each statement by using the following formula.

Index score for each statement:

$$= \frac{\text{Total Score Obtained by each statement}}{(\text{Maximum Score for each statement} \times \text{Number of respondents})} \times 100$$

Table 4.18 Factors promoting adoption of mobile phone for agricultural services by farmers

Sl. No	Factors	Influence Index			
		Marginal Farmers	Small Farmers	Others	Total
1	Accessibility				
	Quick mode for accessing agricultural information	91	85	82	86
	Location specific information delivery	89	85	86	87
	Effective handling of doubts and queries	90	81	84	85
	Easy to handle	91	85	89	88
2	Adequacy				
	Network quality and faster internet access	92	90	95	92
	Communication in regional language	80	90	95	88
	Enhance better access to markets	81	82	80	81
3	User friendly				
	Simple and easy to operate	89	78	90	86
	Required information at finger tips	88	92	89	90
	Authentic and reliable	82	72	88	81

4	Availability				
	Economical for low income group	84	91	89	88
	Farmer specific info	83	88	89	87
5	Awareness				
	Up to date Information	83	88	87	86

Source: Compiled from primary data

Accessibility to various agricultural services through mobile phone is one of the important factors in promoting adoption of mobile phone by farmers. Accessibility means quality of being easy to obtain or use. Here in this context it refers to various services that are accessible through mobile phone like agricultural information, location specific information, clearing of doubts and queries and along with this farmers' easiness in handling that is their ease of using mobile phone is also included. Among these a high index is found in the case of easy to handle because all respondents stated that handling of mobile phone is easy and it can be carried anywhere hence accessibility to agricultural services at any time is possible.

Adequacy refers to state or quality of being adequate; sufficiency for a particular purpose. A higher index of 92 is obtained for network quality and faster internet access. Respondents stated that the quality of network and faster internet access is adequate enough for using various apps, browsing sites related to agriculture. Among various agricultural services offered through mobile phone, farmers have the option to choose their own regional language while communicating with various agencies providing source of information which promote them to use mobile phone for availing more such information and services related to agriculture. This particular statement has acquired an index of 88. A least index is found in the case of access to markets which indicates that various agricultural services provided through is not adequate enough to built better accessibility to markets.

User friendly is the next factor that promotes adoption of mobile phone among farmers for accessing agricultural information. User friendly describes a hardware or software interface that is easy to use. A higher index is obtained in the case of availability of information at finger tips which shows that whatever agricultural related information and services needed to farmers are available to them at a single

click and they also find using mobile phone for availing such services as simple and easy. A lower index is found in the case of “authentic and reliable”. Respondent farmers stated that some of the apps, websites related to agriculture are not updated hence they find using those apps are not much useful.

Availability refers to the quality of being able to be used or obtained. Higher index of 88 is found in case of economical for lower income groups. At present, all mobile companies offer different mobile sets at different price ranges suitable for even lower income groups and also variety of internet plans are available. Hence availability of mobile phone along with internet at lower rates promotes the usage of mobile phone among farmers for availing agricultural services. Availability of farmer specific information also influences farmers to use mobile phone for availing agricultural related services.

Awareness refers to knowledge or perception of a situation or a fact. Here there is only one statement that is up-to-date information with an index of 86. Mobile phone enables farmers to keep updated with latest information and services. This will help farmers to take timely decisions which will lead to their overall development.

Table 4.19 Overall Influence index- Agricultural services

Sl. No	Factors	Total Influence Index
1	Accessibility	87
2	Adequacy	87
3	User friendly	85
4	Availability	88
5	Awareness	86

Source: Compiled from primary data

From Table 4.19 it can be identified that availability is the most influencing factor that promotes adoption of mobile phone for availing agricultural services and the lowest influential index is obtained for user friendly factor

Table 4.20 shows the factors that promotes adoption of mobile phone by farmers for availing banking services

Table 4.20 Factors promoting adoption of mobile phone for banking services by farmers

Sl. No	Factors	Influence Index			
		Marginal Farmers	Small Farmers	Others	Total
1	Accessibility				
	Cost effective accessibility anywhere anytime	89	70	94	84
	Reduces transaction cost	90	69	100	86
	Promotes cashless transaction	73	70	81	75
	Easy to operate	53	43	64	53
2	Adequacy				
	Safe and secure	63	52	76	64
	Authentic and reliable information	61	52	68	60
3	Availability				
	Easy tracking of banking activities	91	71	100	87
	Network quality and faster internet access	84	73	89	82
	Required services at fingertips	90	84	91	88
4	Affordability				
	24 hours free customer care services	80	79	91	83
	Economical for low income groups	89	83	91	88
5	User friendly				
	Quick accomplishment of banking tasks	80	77	88	82
	Communication in regional language	77	73	94	81
6	Awareness				
	Up to date information on various banking aspects	87	89	90	89

Source: Compiled from primary data

Accessibility as stated earlier is the quality of being easy to obtain or use. Accessibility to the banking apps can reduce the transaction cost to a great extent and this has got the highest influential index followed by cost effective accessibility anywhere anytime. Accessibility to various banking services through mobile phone doesn't require any extra cost. Only data connectivity is needed for browsing various sites and using any banking or payment apps. Usage of banking apps and payment apps can also promote cashless transactions. A lower index is found in case of easy to operate. Usage of apps related to banking is limited to few farmers. Those who are using it also opined that sometimes they face difficulty in operating it.

Adequacy is the state or quality of being adequate. Both "safe and secure" and "authentic and reliable information" obtained lower influence index. The major constraint faced by farmers in using various banking apps through mobile phone was fear of security issues. They think that providing their account number and other details would lead to fraud. Also respondents are not much influenced by the authenticity and reliability of various sites and apps related to banking.

Availability of various services such as easy tracking of banking activities, faster internet access and availability of needed services at finger tips can highly promote the adoption of mobile phone by farmers for various banking services.

Affordability refers to the ability to be afforded/ inexpensiveness. Using mobile phone for availing banking services through mobile phone is economical for even low income groups as usage of various apps related to banking doesn't cost any extra charges. Hence a higher index of 88 is obtained for economical for even low income groups. Farmers are also influenced by 24 hours free customer care service provided through mobile phone for clear any doubts, queries etc.

User friendly is another factor that can promote the adoption of mobile phone by farmers for availing banking services. An influence index of 82 is obtained for quick accomplishment of banking tasks. Respondent farmers stated that using mobile banking services enable them to perform financial transactions quickly without giving a visit to bank branches. Farmers opined that while calling customer care, toll free

numbers of the banks gives the option of selecting regional languages which enable them to express their doubts/queries and understand the instructions given by them.

Up to date information related to banking activities is informed to the respondents through their registered mobile number by the banks in which they have accounts. Transactional notification via SMS, balance enquiry etc can be done through mobile phone. Hence awareness of latest updates regarding respondents banking activities can be easily known and this factor also highly promotes adoption of mobile phone by farmers.

Table 4.21 Overall Influence Index- Banking services

Sl. No	Factors	Total Influence Index
1	Accessibility	75
2	Adequacy	62
3	Availability	86
4	Affordability	86
5	User friendly	82
6	Awareness	89

Source: Compiled from primary data

It is evident from Table 4.12 that the most influencing factor that promotes adoption of mobile phone for banking services by farmers is awareness and the lowest influence index is obtained by adequacy factor

4.8 Agricultural and Banking services required by farmers through mobile phone

The third objective of the study is to identify the agricultural and banking services required by farmers through mobile phone. The information needs of farmers with respect to agricultural and banking services are identified separately.

Farmers' general agricultural needs and market information needs are those that enable him to make rational and relevant decisions. General agricultural information and advisory services includes production information, information on

post harvest techniques, market information, information on weather, information on agricultural credit, insurance, Govt schemes, Package of Practices etc.

Table 4.22 Agricultural services required by farmers through phone-General

Sl. No.	General Agricultural Services	Information needs index				Rank
		Marginal Farmers	Small farmers	Large Farmers	Total	
1	Credit information	73	72	75	73	IV
2	Production information	77	76	78	77	III
3	Package of Practices	88	88	89	88	I
4	Agricultural insurance	52	53	48	51	VII
5	Government schemes	55	56	53	55	V
6	Information on weather	55	54	54	54	VI
7	Information on Post Harvest Techniques	86	85	88	86	II

Source: Compiled from primary data

Among the various general agricultural information needed by the respondent farmers through mobile phone, the highest index is found in the case of Package of practices. Package of practices of various crops include all the information related to cultivation. The next required information need of the respondent farmers is related to post harvest techniques of crops. It is clear from the Table 4.22 that information related to agricultural insurance is least needed one among all.

Day to day market trend of different variety of crops is necessary for the farmers to ensure reasonable price for their produce. Marketing information need of the farmers were identified and classified into ten categories viz, input supply, market profile, grades and standards, market research, market trend, better market links and distribution network, export market, improved marketing practices, warehouse facilities and future trading.

Table 4.23 Agricultural services required by farmers- Marketing

Sl. No.	Marketing Services	Information needs index				Rank
		Marginal Farmers	Small farmers	Large Farmers	Total	
1	Input supply	80	80	83	81	IV
2	Market profile	97	95	98	96	II
3	Grades and standards	65	63	67	65	VI
4	Market research	52	49	52	51	VIII
5	Market trend	100	98	100	99	I
6	Better market links and distribution networks	82	83	88	84	III
7	Export market	44	47	47	46	IX
8	Improved marketing practices	69	71	68	69	V
9	Warehouse facilities	55	57	50	54	VII
10	Futures trading	31	30	30	30	X

Source: Compiled from primary data

The highest index on market trend indicates that majority of farmers highly needed information related to market trend. Prevailing market price of commodities and comparative prices in the nearby markets are the major information needs of the farmers. Market profile secured second rank which shows that respondent farmers are interested in finding out new markets for produce for taking advantage of price difference in different markets. The lowest indices are obtained for information needs on futures trading, export market and market research which implies that these are the information which are least needed by the respondent farmers. Modern innovative marketing mechanism like futures trading is not known to most of the respondent farmers irrespective of farmer category. Regarding export market, only a small portion of the farmers expressed their desire to get information about it. The results of market research studies have not reached them and hence the farmers suggested that authorities should take necessary action to make these findings beneficial to them.

Along with farmers agricultural information needs, their banking related information needs through mobile phone are also accessed.

Table 4.24 Banking services required by farmers

Sl. No.	Services	Information needs index				Rank
		Marginal Farmers	Small Farmers	Large Farmers	Total	
1	Account details	95	95	95	95	II
2	Balance enquiry	98	97	100	99	I
3	Interest rates	80	77	81	79	IV
4	Charges imposed on banking services	88	85	89	87	III
5	Credit related queries	66	67	66	66	VI
6	Account related queries	74	75	80	76	V
7	Various insurance schemes	45	44	42	44	VII

Source: Compiled from primary data

Among the various banking related services, the most required service is to know the account balance where and when the respondent needs it. Introduction to various payment apps is providing this service nowadays and also through miscall or SMS respondents can know the details of their last five account transactions. Even though respondents are aware of these facilities through mobile phone, their usage is very low. The main reason stated by them for their non usage of these facilities was because of security issues. The least needed service as stated by the respondents through mobile phone is information related to various insurance schemes.

4.9 Constraints faced by farmers in availing agricultural and banking related services through mobile phone

The fourth and final objective of the study is to examine various constraints faced by farmers for availing agricultural and banking services by farmers so as to enable policy makers to design strategies for effective use of mobile phones for agricultural and banking services. The constraints faced by farmers are shown separately as constraints faced in availing agricultural services and constraints faced in availing banking related services through mobile phone.

To examine the constraints faced by farmers in availing agricultural and banking services through mobile phone, Kendall's Co-efficient of Concordance is used to rank the constraints. Kendall's Co-efficient of Concordance is a measure of extent of agreement and disagreement among farmers and it can range from 0 to 1.

Table 4.25: Constraints faced by farmers in availing agricultural services through mobile phone

Sl. No.	Particulars	Mean Rank	Rank
1	Lack of skills and inability to use	9.28	X
2	Illiteracy	5.78	IV
3	Lack of awareness	6.24	V
4	Network failures	10.08	XII
5	Lack of interest	6.86	VII
6	High internet cost	10.90	XIII
7	Fear of security issues	9.34	XI
8	Time constraints	4.54	III
9	Lack of training	2.26	I
10	Inadequate extension services	8.02	VIII
11	Lack of confidence	8.04	IX
12	Lack of locally relevant information	6.32	VI
13	Impediments like age, knowledge, language, motivation	3.34	II
Chi-Square : 610.543		Sig: 000*	
Kendall's <i>W</i> : .509			

Source: Compiled from primary data

*** Significant at 1% level

Farmers encountered numerous constraints in using mobile phone for availing agricultural services. Among the confronted constraints, lack of training is ranked first. Most of the farmers stated that they lack skills in operating mobile phone hence if they are given enough training on using of various applications of agriculture that is available in mobile phone will encourage their usage. Based on the mean rank the other constraints identified include impediments like age, knowledge, language etc followed by time constraints and illiteracy. All the respondent farmers strongly disagree that the reason for non usage of mobile phone for availing agricultural services is not because of high internet cost. P value significance at 1 % level indicated that the all the respondents rated their constraints differently.

Kendall's coefficient value of 0.509 implies that about 51% of the respondent farmers agreed to the order of ranking.

Table 4.26: Constraints faced by farmers in availing banking related services through mobile phone

Sl. No.	Particulars	Mean Rank	Rank
1	Mobile banking would make feel frustrated	9.30	IX
2	Network failures	11.32	XIV
3	Limited scope for personal advice on banking transactions	10.24	XIII
4	Lack of knowledge	7.60	VII
5	Not easy to use –Lack of training	3.60	II
6	Non availability of all banking services	9.92	XII
7	Fear of security issues	2.46	I
8	Encourage impulsive purchases	9.76	XI
9	Mobile phone could be stolen	9.74	X
10	Fraudulent apps	5.16	IV
11	Low confidence in usage	7.00	VI
12	Delay in services	9.10	VIII
13	Difficulty in understanding technical terms related to banking	4.04	III
14	Language barrier	5.76	V
Chi-Square: 660.980		Sig:000***	
Kendall's <i>W</i> : .508			

Source: Compiled from primary data

*** Significant at 1% level

Among the various constraints faced by farmers in availing banking services through mobile phone, fear of security issues is having the first rank which means all the respondents are reluctant to use mobile phone for banking services because of security issues. As most of the respondents are middle aged they don't have much positive attitude like youth towards online banking. They think that providing account details while using any applications related to banking would lead to security problems. Respondents also lack skills in using various banking related apps; they face difficulty in understanding the technical terms of banking while using the apps. Respondents stated that they don't find any network failure issues while using internet

in their mobile phone. P value significance at 1 % level indicated that the all the respondents rated their constraints differently.

Kendall's coefficient value of 0.508 implies that about 51% of the respondent farmers agreed to the order of ranking.

A detailed analysis of extend of usage and factors promoting adoption of mobile phone by farmers for agricultural and banking services , various agricultural and banking services required by farmers for agricultural and banking purposes, and constraints faced by them in availing such services are discussed in this chapter. The major findings and conclusion of the analysis will be presented in chapter V.

SUMMARY OF FINDINGS AND
CONCLUSION

CHAPTER 5

SUMMARY OF FINDINGS AND CONCLUSIONS

Emerging and fast growing innovations in information technology and globalization have changed the whole process of service providing organizations. Innovative information technology is the backbone of economic development of any country. Today mobile phone technology has rapidly expanded all over the world. Mobile phones which are normally in use to communicate with family and friends could be used for availing various agricultural and banking services nowadays. Phone could be good device to make strong relationship with all agriculture business stakeholders by communication, SMS, email thus benefiting farmers by timely market information to increase the income and decrease the poverty. Technology enhancement has also changed batch processing system of bank to real time processing system. Mobile banking is the result of recent telecommunication growth and innovation, which provide a new access point to the customer. Mobile banking is a kind of m-commerce in which bank customer interact with bank through mobile and enjoying all facilities and services provided by banks via mobile applications.

The study on ‘Adoption of mobile phone for agricultural and banking services by farmers’ has been undertaken with the objectives of assessing the extent of usage of mobile phone by farmers for their agricultural and banking services, to determine the factors promoting the adoption of mobile phone by farmers, to identify the agricultural and banking services required by farmers through mobile phone and to examine the constraints if any experienced by the farmers.

The study has been fundamentally based on primary data. The sample size of the study was 100 respondents; consisting of 25 each from four Panchayats of Puzhakkal block viz., Adat, Tholur, Kaimparambu and Avanur. Data were collected through pre-tested structured interview schedule. Simple percentages, indices such as awareness index, accessibility index, usage index, frequency of usage index, information need index, influential index, factor analysis and Kendall’s coefficient of concordance were employed to analyse the data.

5.1 Major findings

The major findings of the study are summarised and presented in the sequence given below.

5.1.1 Socio economic profile of the respondents

5.1.2 Pattern of usage of mobile phone by farmers

5.1.3 Farm related details of the farmer respondents

5.1.4 Banking related details of the farmer respondents

5.1.5 Extent of usage of mobile phone for agricultural and banking purposes

5.1.6 Factors promoting adoption of mobile phone by farmers for availing agricultural and banking services

5.1.7 Agricultural and banking services required by farmers through mobile phone

5.1.8 Constraints faced by farmers in availing agriculture and banking related Services

5.1.9 Suggestions for effective use of mobile phone for various agricultural and banking services

5.1.1 Socio economic profile of the respondents

- More than 50 per cent of the respondent farmers were marginal based on NABARD classification that is farmers with a landholding of below 1 hectare (2.5 acres).
- Indicators like age, gender, religion, marital status, educational qualification, economic status and occupational category were taken for analysis of socio – economic characteristics of the farmers.
- The most prominent age group among farmers was 45-55 years. This indicated that mainly middle aged respondents were into the field of agriculture and they make use of mobile phone for accessing agricultural and banking services.
- Gender-wise breakup of the respondents revealed that a large majority of them were male (70 per cent) and the rest of the respondents were female.

- Formal education is an important determinant of individuals understanding ability. Highest educational status was among marginal farmers i.e. six of them had graduation and above. Majority of the respondents (40 per cent) had completed their tenth standard
- 82 per cent of the respondent farmers belonged to APL category and the rest 18 per cent belonged to BPL category.
- Agricultural was the primary occupation for 76 per cent of the respondents followed by 14 per cent of the respondents were daily wage earners.

5.1.2 Pattern of usage of mobile phone by farmers

- All the respondents were having their own mobile phone and 54 per cent of them were using it for the past 4-6 years.
- The frequency of usage of mobile phone was same among all the farmers. All the farmers used it daily.
- All the farmers make use of voice call service, internet, social apps and camera.
- Farmers were also aware about various applications in the mobile phone and SMS services.
- More than half of the respondents used their mobile phone for listening music and radio.
- Very few farmers had awareness about the Wi-Fi facility in their mobile phone.
- More than half of the respondents (58 per cent) spend less than 500 for 3 months and rest spend more than 500 for 3 months.
- Different data plans ranging from Rs. 143 to Rs 699 were common among the respondents and all preferred prepaid recharge.

5.1.3 Farm related details of the farmer respondents

- All the farmer respondents were making use of traditional farming techniques. Along with traditional farming 67 per cent of them were adopting innovative farming techniques like use of hybrid seeds, technologically advanced equipments, fertilisers and pesticides in their field for better yield.
- It was seen that 46 per cent of the farmers had less than 10 years of experience in farming followed by 28 per cent of them with 20-30 years of experience in farming.
- All the farmers were having cultivation of paddy. In case of marginal farmers, majority of them (55 per cent) had undertaken paddy cultivation below 2 acres and 20 per cent of the respondents had paddy cultivation above 4 acres.
- Among vegetables, cultivation of brinjal was the highest which constituted about 68 per cent of total farmers out of which 66 per cent of the farmers were marginal.
- The other vegetables cultivated by the farmers were bitter guard (58 per cent), tomato (51 per cent), chinese potato (42 per cent), tapioca (38 per cent) and cowpea (18 per cent).
- Large scale cultivation of banana i.e. above 200 plants was undertaken by 17 per cent of the farmers.
- Cost of cultivation of majority of farmers ranged from Rs. 500000 to Rs. 100000.
- 54 per cent of the respondents were earning a net income of less than Rs. 50000 per year. Out of 54 per cent of respondents 86 per cent of them were marginal farmers.
- The different sources through which farmers procured different inputs were classified as krishibhavan, KAU, private nurseries, cooperative banks and from fellow farmers. Among these Krishibhavan was the first choice of all the respondent farmers irrespective of the category to which they belong to.

- Next preferred source of purchase of inputs for 84 per cent of farmers were from their fellow farmers followed by KAU. Cooperative societies was least preferred by the respondent farmers.
- Cultivation of paddy of was common among all the respondent farmers and all of them preferred SUPPLYCO for the marketing of their produce as it ensured reasonable and stable price.
- Direct sale of mainly vegetables were preferred by 92 per cent of the farmers.
- More than half of the farmers (60 per cent) preferred wholesalers in case of sale of banana and coconut and 52 per cent of the farmers go for retailers.
- Only 20 per cent of the respondent farmers availed credit from commercial banks for agricultural purposes.

5.1.4 Banking related details of the farmer respondents

- All the respondent farmers were having their own bank account.
- While looking into the type of bank in which the respondents had their account showed that 57 per cent of them had their account in public sector banks.
- Banking industry provides both modes of transactions to its customers i.e. offline and online banking. Only 40 percent of the respondent farmers were using online mode for various banking transactions.
- Majority of the farmers (60 per cent) were having 10- 20 years of customership.
- The frequency with which customers transacted their business with the bank varied from customer to customer. All the respondents had their transactions done occasionally.

5.1.5 Extent of usage of mobile phone for agricultural and banking purposes

- In case of extent of usage of mobile phone for availing agricultural services by farmers it was found that all the farmers make use of mobile phone for calling their fellow farmers, followed by making calls to experts for various information and advisory services
- Usage of social media apps especially WhatAapp groups, Facebook pages and Youtube videos related to agriculture was common among the respondents.
- A very low usage of mobile phone was found among the farmers in the case of browsing various agriculture related sites.
- In case of extent of usage of mobile phone for availing banking services by farmers, all the farmers commonly used their mobile phone for receiving transactional notification through SMS.
- Usage of banking related apps and also payment related apps was seen only among 40 per cent of the respondents.
- Browsing webs related to banking was having the lowest index.
- The major apps used by farmers related to agriculture were KVK mobile app, e-Vipani, Karshika vivara Sanketham, and Krishi Malayalam.
- Farmers had active participation in various agriculture related WhatsApp groups formed under their respective Krishibhavan, fellow farmers etc.
- Major banking and payment apps used by farmers in their mobile phone were Fed Mobile, YONO SBI, KGB-mPay, Google pay, Phonepe and KSEB app.
- Various agricultural purposes for which farmers used mobile phone was analysed and it was found that all the respondents used it for accessing information related to farm operations, input supply, market price and market availability of their produce.

- Farmers made least use of their mobile phone for knowing weather and climate updates.
- In case of various banking purposes for which farmers make use of mobile, it was evident that all the farmers make use of their mobile phone for getting notification of their account transactions.
- Only 12 per cent of the respondents used their mobile phone for accessing information related to General/ Life insurance services.

5.1.6 Factors promoting adoption of mobile phone by farmers for availing agricultural and banking services

- Factor analysis was employed to identify various factors that promoted the adoption of mobile phone by farmers for various agricultural and banking services.
- The various factors derived from factor analysis in case of adoption of mobile phone for availing agricultural services were accessibility, adequacy, user friendly, availability and awareness.
- Among the factors, availability got the highest index. Availability of mobile phone at lower rates and availability of farmer specific information influenced farmers to use mobile phone for availing agricultural related services.
- The various factors derived from factor analysis in case of adoption of mobile phone for availing banking services were accessibility, adequacy, user friendly, availability, affordability and awareness.
- Awareness of latest updates regarding respondents banking activities highly promoted the adoption of mobile phone by farmers.

5.1.7 Agricultural and banking services required by farmers through mobile phone

- In case of various general agricultural needs, highest index was found in the case of Package of practices. Package of practices of various crops included all the information related to cultivation.

- The next required information need of the respondent farmers was related to post harvest techniques of crops.
- Information related to agricultural insurance was least needed one among all the respondent farmers.
- Regarding agricultural marketing needs, the highest index on market trend indicated that majority of farmers highly needed information related to prevailing market price of commodities and comparative prices in the nearby markets.
- Among the various banking related services, the most required service was to know the account balance where and when the respondent needs it.
- The least needed service as stated by the respondents through mobile phone was information related to various insurance schemes.

5.1.8 Constraints faced by farmers in availing agriculture and banking related services

- Farmers encountered numerous constraints in using mobile phone for availing agricultural services. Among the confronted constraints, lack of training ranked first.
- Most of the farmers stated that they lack skills in operating mobile phone hence if they are given enough training on using of various applications of agriculture that was available in mobile phone would encourage their usage.
- Among the various constraints faced by farmers in availing banking services through mobile phone, fear of security issues was having the first rank which means all the respondents were reluctant to use mobile phone for banking services because of security issues.

5.1.9 Suggestions for effective use of mobile phone for various agricultural and banking services

From the analysis of the study “Adoption of mobile phone for agricultural and banking services by farmers” it is understood that even though all the farmers have

accessibility to all the agricultural and banking services available through mobile phone, their extent of awareness and usage of these services is limited. Hence certain suggestions for improving the effective and efficient use of mobile phone in imparting agricultural and banking services to farmers which have been deduced from the study are discussed in the subsequent paragraphs.

While analysing the extent of usage the extent of usage of mobile phone by farmers for various agricultural and banking services, it is found that almost all the respondent farmers are having full or partial awareness related to agricultural and banking related apps, social media, website related to agriculture, voice call service to experts, SMS based service etc but their usage level is found to be less. The major reason stated by the farmers for their less usage in case agricultural purposes was lack of training that is they are not expertise in using various apps related to agriculture. They don't know how to download various apps in their mobile phone and the agencies which provides the source of information. Farmers who are actively using various agricultural apps pointed that information provided in some of the apps are not updated for a long time that is accurate and relevant information are not included in some agriculture related applications. In case of usage of mobile phone by farmers for availing banking services, it is observed that most of them are reluctant to use various banking or payment apps because of fear of unsecure transactions such as fraud. Only 40 per cent of the farmers are using online banking services. Rest of the farmers opined that even though they are aware of various banking apps, they have little knowledge of how to use phones for mobile banking.

Policy makers need to recognize the potential of mobile services as a tool for development in reaching previously socially and geographically isolated people. Perform a thorough problem analysis during the creation phase of mobile services, by paying attention to, among other factors, the target users, stakeholders and the general context. The reliability of the content of mobile service should at all times be ensured. It is important to include all stakeholders in the iterative process of shaping the content. For example, a representative sample of the target users together with government and research institutes can validate content to ensure its reliability. Major players such as telecom operators, internet providers, agricultural department, banks

and non-governmental organisation are expected to encourage adoption of technologies and platforms that can provide accessible, affordable, open, authentic and safe agricultural and banking services to the farmers. Government and other stakeholders should also work together to build awareness regarding various agricultural and banking services to farmers and provide them with practical trainings on how to use mobile phone for availing these services. In addition in order to enhance trust in mobile banking services, stakeholders need to make sure that farmers are protected as much as possible against cyber security vulnerabilities and threats.

Conclusion

Information and Communication Technology tools are an effective way to disseminate agricultural and banking services. Among the ICT tools, mobile phone nowadays is gaining popularity among farmers but still there is gap available among business, customers and farmers. There is need of enhancement of different projects on mobile phone technologies where farmers could get easy access to various agricultural and banking services. The government and other related departments should also plan to provide farmers with timely information regarding agricultural production and marketing and also take initiative to provide necessary trainings to enhance their skill in using mobile phone for availing agricultural and banking services.

**ADOPTION OF MOBILE PHONE FOR AGRICULTURAL AND BANKING
SERVICES BY FARMERS**

By

**ANU ROY
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ABSTRACT OF THE THESIS

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Kerala Agricultural University**



**DEPARTMENT OF BANKING & FINANCE MANAGEMENT
COLLEGE OF CO-OPERATION, BANKING & MANAGEMENT
VELLANIKKARA, THRISSUR-680656**

KERALA, INDIA

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ABSTRACT

Agriculture continues to be the most important sector of the Indian economy which provides the main source of food, income and employment to the rural and poor urban population. According to the annual report of Department of Agriculture, Co-operation and Farmers' welfare, 60.4 per cent of the population is engaged in agricultural and allied activities and contributes about 16.5 per cent to the country's gross value added for the year 2019-20. At present farmers need technology, investment, better quality inputs, real time information and most of all the latest know-how for sustaining commercial and cost effective sustainable agriculture. A major shift in the methodology of delivering knowledge to the farm has taken place. Various ICT tools like radio, television, mobile phone, newspaper etc have the advantage of reaching a wide audience at a very low cost.

Nowadays soft resources like knowledge and skills are as important as hard resources like inputs in the field of agriculture. Information asymmetry is considered as one of the major limitation in the growth of agricultural productivity in India. Recent introduction of mobile-enabled information services and rapid growth of mobile telephony as compared to fixed line telephony provide a means to overcome existing information asymmetry. At least partially, it also helps to bridge gap between the availability and delivery of agricultural inputs and agricultural infrastructure. With the rising use of mobile phone in the country, mobile banking (also known as M-Banking) has also got a great potential for enabling financial services to the unbanked and under banked, particularly in rural areas.

The study entitled "Adoption of mobile phone for agricultural and banking services by farmers" has been undertaken with the main objective of assessing the extent of usage of mobile phone by farmers for their agricultural and banking services, to determine the factors promoting the adoption of mobile phone by farmers, to identify the agricultural and banking services required by farmers through mobile phone and to examine the constraints if any experienced by the farmers. The study was conducted in four panchayats namely, Adat, Tholur, Kaiparamb and Avanoor in the Puzhakkal block of Thrissur district. A sample of 25 farmers using mobile phone

for agricultural and banking purposes from each of the four panchayats was selected constituting a total of 100 farmers. Data collection from the selected farmers was done with the help of primary data. Data were analysed with the help of different statistical tools such as simple percentages, indices, factor analysis and Kendall's coefficient of concordance.

The major findings of the study were that marginal farmers between the age group of 45-55 years were the major users of mobile phone for various agricultural and banking purposes. Gender-wise breakup of the respondents revealed that a large majority of them were male (70 per cent) and the rest of the respondents were female. Agricultural was the primary occupation for 76 per cent of the respondents followed by 14 per cent of the respondents were daily wage earners. The main crops cultivated by the farmers in the study area were paddy, banana and vegetables. All the respondent farmers were having their own bank account but only 40 per cent of them were using mobile banking services. In case of extent of usage of mobile phone for availing agricultural services by farmers it was found that all the farmers make use of mobile phone for calling their fellow farmers, followed by making calls to experts for various information and advisory services. Usage of social media apps especially WhatsApp groups, Facebook pages and YouTube videos related to agriculture was also common among the respondents. In case of extent of usage of mobile phone for availing banking services by farmers, all the farmers commonly make use of mobile phone for receiving transactional notification through SMS. Usage of banking related apps and also payment related apps was seen only among 40 per cent of the respondents. The major agricultural apps used by farmers were KVK mobile app, eVipani, Karshika vivara Sanketham, and Krishi Malayalam. Farmers have active participation in various whatsapp groups formed under their respective Krishibhavan, among fellow farmers etc. Major banking and payment apps used by farmers in their mobile phone were Fed Mobile, YONO SBI, KGB-mPay, Google pay, Phonepe and KSEB app. All the respondents make use of their mobile phone for accessing information related to farm operations, input supply, market price and market availability of their produce. In case of various banking purposes for which farmers

make use of mobile, it was evident that all the farmers make use of their mobile phone for getting notification of their account transactions.

Factor analysis was employed to identify various factors that promoted the adoption of mobile phone by farmers for various agricultural and banking services. The various factors derived from factor analysis in case of adoption of mobile phone for availing agricultural services were accessibility, adequacy, user friendly, availability and awareness. Among the factors, availability has got the highest index. Availability of mobile phone at lower rates and farmer specific information through mobile phone influenced farmers to use mobile phone for availing agricultural related services. The various factors derived from factor analysis in case of adoption of mobile phone for availing banking services were accessibility, adequacy, user friendly, availability, affordability and awareness. Among the factors, awareness has got the highest index. Awareness of latest and timely updates regarding respondents banking activities highly promoted the adoption of mobile phone by farmers.

The various agricultural and banking services required by farmers through mobile phone was analysed and ranked. In case of various general agricultural services, highest index was found in the case of Package of practices. Package of practices of various crops includes all the information related to cultivation. Regarding agricultural marketing needs, the highest index on market trend indicated that majority of farmers highly needed information related to prevailing market price of commodities and comparative prices in the nearby markets. Among the various banking related services, the most required service was to know the account balance when and where the respondent needs it. Numerous constraints were encountered by the farmers in using mobile phone for availing agricultural and banking services. Among the confronted constraints in availing agricultural services through mobile phone, lack of training was ranked first as most of the farmers stated that they lack skills in operating various applications in mobile phone and in case of constraints faced by farmers in availing banking services through mobile phone, fear of security issues was ranked first.

From the study it can be concluded that if the huge reach of mobile phone is harnessed in agricultural extension, can change the face of agriculture altogether in a developing country like India, by using it as a medium to disseminate agricultural information in multimodal form. If such information is available when the farmers need it, not only does it reduce transaction costs, but also improve the returns of the farmers from their produce. Timing of precise information is central to minimizing wastage and therefore increasing efficiency. Mobile banking can also bring significant changes in the provision of financial services among the farmers. When compared with traditional banking channels, mobile banking which is considered as a major component of branchless banking can result in high level of convenience among farmers.

Policy makers need to recognize the potential of mobile services as a tool for development in reaching previously socially and geographically isolated people. They also need to perform a thorough problem analysis during the creation phase of mobile services, by paying attention to, among other factors, the target users, stakeholders and the general context. The reliability of the content of mobile service should at all times be ensured. It is important to include all stakeholders in the iterative process of shaping the content. For example, a representative sample of the target users together with government and research institutes can validate content to ensure its reliability. Major players such as telecom operators, internet providers, agricultural department, banks and non-governmental organisation are expected to encourage adoption of technologies and platforms that can provide accessible, affordable, open, authentic and safe agricultural and banking services to the farmers. Government and other stakeholders should also work together to build awareness regarding various agricultural and banking services to farmers and provide them with practical trainings on how to use mobile phone for availing these services. In addition in order to enhance trust in mobile banking services, stakeholders need to make sure that farmers are protected as much as possible against cyber security vulnerabilities and threats.

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ANNEXURE

KERALA AGRICULTURAL UNIVERSITY
College of Co-operation Banking and Management

INTERVIEW SCHEDULE FOR FARMERS

(For academic purpose only)

**Topic: Adoption of mobile phone for agricultural and banking services
by farmers**

Panchayat:

Ward & House No:

Socio Economic Profile

1. Name :
2. Mobile No. :
3. Age : Less than 35 yrs/ 35-45 yrs/ 45-55 yrs/ Above 55 yrs
4. Gender : Male/Female
5. Religion : Hindu/Muslim/Christian
6. Marital Status : Single/Married/Widowed/Separated
7. Educational Qualification : 8th Std/ SSLC/ Plus Two/ Technical/
Graduation and above
8. Economic Status : BPL/APL
9. Occupational : Pensioners/ Private Sector/
Self employed- Agriculture/ Self employed-others

Patten of usage of mobile phone by farmers

10. Duration of holding mobile phone (in years) : < 2 / 2-4 / 4-6/ >6
11. Frequency of usage of mobile phone: Daily/ Weekly/ Monthly

12. Are you familiar with the following functionalities in your mobile phone?

SL No.	Functionalities	Y/N
1	Voice call	
2	SMS text message	
3	Internet	
4	Wi-Fi	
5	Mobile applications	
6	Social media applications	
7	Multimedia players	
8	Radio	
9	Phone camera	

13. Recharging amount: Less than Rs. 500/ More than Rs. 500

14. Postpaid / Prepaid:

PART-A

Farming related details

15. Nature of farming: Traditional/ Innovative

16. Years of experience in farming (in years) : <10/ 10-20/ 20-30/ >30

17. Cropping pattern

Sl. No.	Crops	Area under cultivation

18. Cost of cultivation per annum (in Rs.) : <50000/ 50000-100000/ 100000-150000/
150000-200000/ <200000

19. Net income from agriculture per annum: <50000/ 50000-100000/ <100000

20. Source of input supply

Sl. No	Source of input supply	Yes/No
1	Private traders	
2	Krishibhavan	
3	KAU	
4	Govt. seed farms	
5	Government Nursery	
6	Private Nursery	
7	Cooperative banks	
8	Other farmers	
9	Others (Specify)	

21. Marketing of farm outputs

Sl. No.	Marketing Agency	Yes/No
1	VFPCK	
2	SUPPLYCO	
3	Wholesalers	
4	Retailers	
5	Direct sale	
6	Brokers/Commission agents	
7	Others (Specify)	

22. Sources of fund for agricultural operations:

Sl. No.	Source	Total Amount
1	Owned fund	
2	Commercial banks	
3	Cooperative banks	
4	RRBs	
5	Informal sources	
6	Others (Specify)	

Extent of usage of mobile phone for agricultural purposes

23. Awareness, Accessibility, Usage and Frequency of usage of mobile phone for obtaining agriculture related information and services.

(Note: Rate your responses by assigning marks ranging from 0-100 for the statements given below based on your level of awareness, accessibility, usage and frequency of usage of mobile phone)

<u>Awareness</u>	<u>Accessibility</u>	<u>Usage</u>	<u>Frequency of usage</u>
81-100 : Fully aware	81-100 :Always	81-100 :Very frequently	81-100 : Daily
61-80 : Partially aware	61-80 :Often	61- 80 :Frequently	61-80 : Weekly
41-60 : Moderately aware	41-60 :Sometimes	41-60 :Occasionally	41-60 : Fortnightly
21-40 : Very little awareness	21-40 :Seldom	21-40 :Rarely	21-40 : Monthly
0-20 : Unaware	0-20 :Never	0-20: Never	0-20 : Rarely

Sl. No	Agricultural Information and services	Awareness	Accessibility	Usage	Frequency of usage
1	Agriculture related Apps				
2	Social Media like facebook, whatsapp groups etc				
3	Browsing websites related to agriculture				
4	Call to experts for information and advisory services				
5	Call for input and marketing information and services				
6	Call to fellow farmers				
7	SMS based weather information				

24. Specify the apps you have in your mobile phone related to agriculture

Sl. No.	Apps related to Agriculture	Agency providing source of information	Type of information retrieved

25. Are you a member of WhatsApp groups related to agriculture? Yes/ No

Sl. No	Name of the WhatsApp group	Type of information retrieved

26. Purpose of using mobile phone for agricultural related services:

Sl. No	Information and advisory services	Yes/ No
1	Farming operations	
2	Input supply	
3	Crop management	
4	Pest management	
5	Market price of produce	
6	Market availability	
7	Crop insurance	
8	Weather	
9	Climate	
11	Others (Specify)	

Factors promoting adoption of mobile phone by farmers for availing agricultural information and services

27. Respondents should rate the responses based on their experiences for the statements given below by assigning marks ranging from 0-100

Response Code	Strongly Agree (SA)	Agree (A)	Moderately Agree (MA)	Disagree (D)	Strongly Disagree (SDA)
Marks/100	81-100	61-80	41-60	21-40	0-20

Sl. No	Statements	SA	A	MA	D	SDA
1	Simple and Easy to operate					
2	Up to date information					
3	Quick mode for accessing agricultural information					
4	Accessibility of information at any time					
5	Network quality and faster internet access					
6	Act as a single source of information					
7	Required information at finger tips					
8	Economical for low income groups					
9	Location specific information delivery					
10	Farmer specific information					
11	Effective handling of doubts and queries					
12	Communication in regional language					
13	Easy to handle					
14	Authentic and reliable					
15	Enhance better access to marketing channels					

Agricultural services required by farmers through mobile phone

28. Rate your responses by assigning marks ranging from 0-100 according to your need as:

Response Code	Highly Needed (HN)	Needed (N)	Moderately Needed (MN)	Less Needed (LN)	Not at all Needed (NN)
Marks/100	81-100	61-80	41-60	21-40	0-20

I. General agricultural services

Sl. No	Information and advisory services	HN	N	MN	LN	NN
1	Credit information					
2	Production information					
3	Package of Practices					
4	Agricultural insurance					
5	Government schemes					
6	Information on weather					
7	Information on Post Harvest Techniques					

II. Market related services

Sl. No	Information and other services	HN	MN	N	LN	N
1	Input supply					
2	Market profile					
3	Grades and standards					
4	Market research					
5	Market trend					
6	Better market links and distribution networks					
7	Export market					
8	Improved marketing practices					
9	Warehouse facilities					
10	Futures trading					

Constraints faced by farmers in availing agriculture related services through mobile phone

29. Rate your responses by assigning marks ranging from 0-100 based on the constraints faced while using mobile phone in availing agricultural related services

Response Code	Strongly Agree (SA)	Agree (A)	Moderately Agree (MA)	Disagree (D)	Strongly Disagree (SDA)
Marks/100	81-100	61-80	41-60	21-40	0-20

Sl. No.	Particulars	SA	A	MA	D	SD
1	Lack of skills and inability to use					
2	Illiteracy					
3	Lack of awareness					
4	Network failures					
5	Lack of interest					
6	High internet cost					
7	Fear of security issues					
8	Time constraints					
9	Lack of training					
10	Inadequate extension services					
11	Lack of confidence					
12	Lack of locally relevant information					
13	Impediments like age, knowledge, language, motivation					
14	Lack of skills and inability to use					

Suggestions, if any, to improve the use of mobile phone for agriculture services.....

PART-B

Banking related details

30. Type of bank: Public sector/ Public sector/ Cooperative bank/ RRBs

31. Type of account: SA/ CA/FD/RD

32. Specify the name of the bank:

33. Nature of banking transactions: Online/ Offline/ Both

34. Period of customership (in years): >10/ 10-20/ <20

35. Frequency of banking transactions: Daily/ Weekly/ Occasionally / Rarely/ Never

Extent of usage of mobile phone for banking purposes

36. Awareness, Accessibility, Usage and Frequency of usage of mobile phone for obtaining banking related information and services.

(Note: Rate your responses by assigning marks ranging from 0-100 for the statements given below based on your level of awareness, accessibility, usage and frequency of usage of mobile phone)

<u>Awareness</u>	<u>Accessibility</u>	<u>Usage</u>	<u>Frequency of usage</u>
81-100 : Fully aware	81-100 :Always	81-100 :Very frequently	81-100 : Daily
61-80 : Partially aware	61-80 :Often	61- 80 :Frequently	61-80 : Weekly
41-60 : Moderately aware	41-60 :Sometimes	41-60 :Occasionally	41-60 : Fortnightly
21-40 : Very little awareness	21-40 :Seldom	21-40 :Rarely	21-40 : Monthly
0-20 : Unaware	0-20 :Never	0-20: Never	0-20 : Rarely

Sl. No	Banking related Information and services	Awareness	Accessibility	Usage	Frequency of usage
1	Banking related Apps				
2	Payment Apps				
3	Web browsing				
4	Call to banks' customer care centres				
5	Mini statements of last five account transactions through missed call				
6	Transaction notification				
7	Mini statement of last five account transactions through SMS				

37. Specify the apps you have in your phone related to banking:

Sl. No.	Apps related to banks	Type of Information retrieved

38. Purpose of using mobile phone for banking related services:

Sl. No	Banking services	Yes/ No	Source
1	Checking account balance		
2	Inter account fund transfer		
3	Transaction notification from banks through SMS		
4	Mobile recharging		
5	Online purchases		
6	Payment of various utility bills		
7	Information related to General/Life Insurance		
8	Credit related information		
9	Others (if any, specify)		

Factors promoting the adoption of mobile phone by farmers for availing banking related information and services

39. Respondents should rate the responses based on their experience for the statements given below by assigning marks ranging from 0-100

Response Code	Strongly Agree (SA)	Agree (A)	Moderately Agree (MA)	Disagree (D)	Strongly Disagree (SDA)
Marks/100	81-100	61-80	41-60	21-40	0-20

Sl. No	Statements	SA	A	MA	D	SDA
1	Easy to operate					
2	Up to date information on various banking aspects					
3	Quick accomplishment of banking tasks					
4	Faster internet access and network quality					
5	Required services at fingertips					
6	Cost effective accessibility anywhere anytime					
7	Economical for low income groups					
8	Reduces transaction cost					
9	Easy tracking of banking activities					
10	Promotes cashless transaction					
11	Effective handling of complaints and queries					
12	24 hours free customer care services					
13	Communication in regional language					
14	Safe and secure					
15	Authentic and reliable information					

Banking services required by farmers through mobile phone

40. Rate your responses by assigning marks ranging from 0-100 according to your need as:

Response Code	Highly Needed (HN)	Needed (N)	Moderately Needed (MN)	Less Needed (LN)	Not at all Needed (NN)
Marks/100	81-100	61-80	41-60	21-40	0-20

1. Banking related services

Sl. No.	Services	HN	N	MN	LN	NN
1	Account details					
2	Balance enquiry					
3	Interest rates					
4	Charges imposed on banking services					
5	Credit related queries					
6	Account related queries					
7	Various insurance schemes					

Constraints faced by farmers in availing banking related services through mobile phone

41. Rate your responses by assigning marks ranging from 0-100 based on the constraints faced while using mobile phone in availing banking related information

Response Code	Strongly Agree (SA)	Agree (A)	Moderately Agree (MA)	Disagree (D)	Strongly Disagree (SDA)
Marks/100	81-100	61-80	41-60	21-40	0-20

Sl. No.	Particulars	SA	A	MA	D	SD
1	Mobile banking would make feel frustrated					
2	Network failures					
3	Limited scope for personal advice on banking transactions					
4	Lack of knowledge					
5	Not easy to use –Lack of training					
6	Non availability of all banking services					
7	Fear of security issues					
8	Encourage impulsive purchases					
9	Mobile phone could be stolen					
10	Fraudulent apps					
11	Low confidence in usage					
12	Delay in services					
13	Difficulty in understanding technical terms related to banking					
14	Language barrier					
15	Mobile banking would make feel frustrated					

Suggestions, if any, to improve the use of mobile phone for banking services.....