INNOVATIONS IN e- AGRICULTURAL EXTENSION TECHNOLOGY (e-AET): DIFFUSION AND ADOPTION OF INFORMATION KIOSKS AND MOBILE INITIATIVES AMONG THE FARMERS OF THIRUVANANTHAPURAM DISTRICT, KERALA

by

HINDUJA. N. A.

(2012 - 11 – 190)

THESIS

Submitted in partial fulfilment of the

requirements for the degree of

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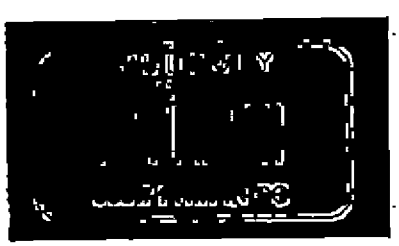

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2014

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I, hereby declare that this thesis entitled "**INNOVATIONS IN e-AGRICULTURAL EXTENSION TECHNOLOGY (e-AET): DIFFUSION AND ADOPTION OF INFORMATION KIOSKS AND MOBILE INITIATIVES AMONG THE FARMERS OF THIRUVANANTHAPURAM DISTRICT, KERALA**" 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.

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LIST OF ABBREVIATIONS

Notation or Abbreviation	Full form
Govt.	Government
%	Percentage
i.e.	That is
$	Dollar
@	At the rate of
CABI	Centre for Agriculture and Biosciences International
ALP	Alappuzha
cc	Cubic capacity
cm	Centimetre
et al.	And others
g	gram
ha	Hectare
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
KAU	Kerala Agricultural University
KCAET	Kelappaji College of Agricultural Engineering and Technology
Kg	Kilogram
KKD	Kozhikode
KLM	Kollam
KNR	Kannur
KSD	Kasargode
m	Metre
$Mg.SO_4$	Magnesium Sulphate
ml	Millilitre
MLP	Malappuram
MOP	Murate Of Potash

LIST OF ABBREVIATIONS CONTINUED

Notation or Abbreviation	Full form
NGO's	Non-Governmental Organisations
No.	Number
PKD	Palakkad
Rs.	Rupee
S. No.	Serial Number
SAU's	State Agricultural Universities
t	tonne

Introduction

1. INTRODUCTION

The greatest challenge of today is the improvement in the quality of human life particularly of the rural people through eradication of poverty, hunger and achieving overall rural balance. Agriculture being the pivotal sector of rural economy of India contributes to the 14 percent of Gross Domestic Product (GDP). In the recent past, the agricultural sector has registered a dismal 3.7 per cent growth rate and has been deteriorating despite the fact that it provides employment to more than half of the Indian work force. This is mainly on account of poor infrastructure, declining public investment including institutional credit, lack of minimum support prices, inadequate backward and forward integration, low value addition and low productivity which have increased the risk and uncertainty in agriculture in post globalisation and World Trade Organization regime.

The XII Five year Plan focuses on priorities such as resource-use efficiency and technology to ensure sustainability of natural resources, adaptation to climate change and improvements in Total Factor Productivity (TFP) in agriculture. Hence, the farmers as producers of food must have an enabling environment for access to know-how and do-how for realizing the full potential of modern agricultural technology and should be empowered in taking initiatives and decisions which will only help in shaping the future of farmer's economy. In the present scenario of Indian agriculture, the public extension cannot possibly provide additional qualified manpower to adequately address the complex demand of the farmers by reaching the millions of farmers.

The information and communication support during past fifty years has been mainly through conventional methods. The extension personnel of the department of agriculture disseminated the technologies and messages to the farmers through various extension methods. But these approaches have not been able to reach majority of the farmers spread across the country. The diversity of agro-ecological situation adds to this challenge further. Farmer's needs are much more diversified

and the knowledge required to address them is beyond the capacity of the grass root level extension functionaries.

The emerging shift in government strategy towards knowledge–intensive services has created a climate more conducive to addressing enterprises, domestic infrastructure, education and the use of Information and Communication Technology to meet the developmental needs. The growth and spread of new Information and Communication Technology in rural India in recent years provide a viable alternative to overcome the physical barriers of face to face inter–personal communication.

Societies and governments must explore the possibilities of Information and Communication Technology (ICT) to agricultural development through effective rural to rural and urban to urban linkages. A pluralistic system needs to be envisioned with many players for promoting effective use of ICT for the benefit of farmers including government, corporate, private, non-government organisation and other farmer's organizations in various forms.

India is passing through a tremendous challenging time as far as ICT is concerned. It is positioned in a typical situation, such as; one of the highest populations, more than 18 languages and scores of dialects, one of the largest pools of number of skilled and educated work force, destination of one of the highest number of social entrepreneurs, second biggest software exporter globally, highest number of ICT projects implementation across the country, 45 per cent of the world ICT projects implemented in India, the highest number of Information Kiosks implemented across rural sectors and proposal of Rural info Kiosk-one each for the 600,000 villages-courtesy government (Manzar, 2004). In this context, quick dissemination of technological information from agricultural research system to the farmers in the field and reporting of farmers feed back to the research system is one of the critical inputs in dissemination of agricultural technology.

The ICT has a lead and edge over other technologies. It provides the flexibility in providing information on various modes of farming practices including all crops, specific commodities and enterprises real time price information and all other information related to technological advances and tracking global competitiveness. It helps to disseminate the knowledge derived from the huge network of education and research institutions.

1.1. IMPORTANCE OF THE STUDY

Today farming is seen as an enterprise wherein farmers need a variety of information for various aspects in this competitive agriculture to secure their livelihood. They need information viewing agriculture as a business, about the systems and sub-systems including administration, initiatives of other farmers, market information, best farming practices and other related information affecting the agricultural production system.

The role of agricultural information is more crucial in India where the economy is mostly dependent on agriculture. This has created the need for timely and generic information. With the passing era, communication has become so fast and reliable that one can take well-informed and timely decisions. These Information and Communication Technologies (ICT's) possess vast potential to promote agriculture and rural development through speedy transfer of technology to farming community.

Worldwide ICT's are gaining prominence in achieving the goals of sustainable development by reducing time and space barriers. Considering the fact that majority of the Indian population lives in rural areas and majority of rural mass are unaware of latest farm technologies for sustainable agriculture development, the efforts made by Central and State Governments and NGOs are not enough to reach rural masses.

The need of the hour is the use of modern and quick communication channels like ICTs to disseminate and create awareness about latest farm technologies among rural mass. There are umpteen ways in which ICTs can be useful to small and marginal farmers in India. In order to extend the benefits of ICTs to the disorganized and disadvantaged farming sector, one of the road maps to achieve them are access of ICTs to villagers through Information Kiosks and Mobile telephony.

1.2. SCOPE OF THE STUDY

The findings of the study will be helpful to policy makers, governmental and non- governmental agencies, development professionals and other agencies which are working for the agricultural development through use of information and communication technology. The study can contribute to the existing body of research on the integration of information and communication technology for agricultural development. The findings of this maiden study may serve as a guide for future researchers who may examine ICT in similar contexts.

The farmer's information needs, information and communication technology's utility in meeting their needs, their awareness about information and communication technology, their perception and attitude towards Information Kiosks and Mobile initiatives, constraints and solutions as perceived by them while accessing these information and communication technology will be of immense utility for the projects which are going to be initiated in the future.

The study will reveal the extent of utility of ICT projects by the farmers and will focus on the factors affecting the use of ICTs. In specific, the findings of the study will help planners and policy makers to apply appropriate strategy and specific actions while formulating ICT projects so as to achieve greater participation of farmers in utilizing information technology in rural areas. The constraints expressed by the stakeholders would help in strengthening the ICT initiatives.

1.3. PRACTICAL UTILITY OF THE STUDY

Agriculture forms the main stay of Indian economy and contributes a major share in the Gross Domestic Product (GDP) of the country. The application of Information and Communication Technology (ICT) and utilization of resources in a proper manner would help in achieving higher levels of agricultural production and productivity. The Government of India and Kerala have given importance for developing information touch screen Kiosks and Mobile messages to provide information whenever required enabling farming community to take appropriate decisions in their farming practices there by acting as a decision support system.

The Kiosk software is totally touch screen driven (no physical keyboard) with large icons displaying limited but focused data supported by graphics and animations. Local language is used though the system has multi-lingual capability and has very simple and clear navigational paths. It displays only the essential information from a basketful of variety information that farmers need and can be directly accessed by the farmers because it is available in their local language.

The cellular technology (Mobile phone) is becoming popular day by day with companies up with low price handsets and nearly one fourth of the country's population possesses a Mobile phone even in the rural areas. Keeping in view the scenario, messaging agricultural information through computers to the end users on Mobile phone is a means which will go a long way for the farmers to receive timely information. Understanding the importance of Mobile in day today life of the large majority of population which is inclusive of farming community, the Government of Kerala has given very much importance to the use of these Mobile initiatives in a productive manner for the benefit of the farming community.

The one crore project jointly implemented by the State Department of Agriculture and Kerala Agricultural University in the year 2012-2013 shows the significance of such initiatives for making mobile use more meaningful and productive in nature. Every Tuesday and Friday, messaging of agricultural

information for the benefit of farmers is done by the message pushers directly to the mobile phones of the farmers and field level workers. Hence, it is imperative to study the diffusion and adoption of the Mobile initiatives in Kerala as a means to help farmers with need based timely information that will further help to enhance the utility of these agro information support initiatives.

Besides this, the study will also help to identify the information needs of farmers, that will enable the research system to identify and bridge the information gap in the technologies diffused for the benefits of its users and ultimately for the betterment of the farming community. Further, the constraints identified from the farmers in accessing information through the technologies, that may include system constraints, social constraints, organisational constraints and the like will throw light on the interventions needed from the part of planners, policy makers, government and the designers of the Kiosks and Mobile initiatives, which would be a good background information for further streamlining the use of ICT in Agriculture. Viewed from these perspectives, the present study has immense practical utility.

1.4. OBJECTIVES OF THE STUDY

The present study was contemplated with the following objectives.

The objective of the study is to analyse the utility of the information support provided to farmers through the information kiosks and mobile initiatives in Kerala with a view to suggest measures for enhancing the utility of these agro information support initiatives. Constraints and solutions as perceived by the farmers while using information kiosks and mobile messages will also be studied which would enable in developing strategies to scale up its uses.

1.5. LIMITATIONS OF THE STUDY

The researcher faced all limitations due to single investigator. One of the obvious limitation is the resources and time available at the disposal of student

researcher. The study was conducted on two ICT projects serving the farmers in Kerala state. Since the study was completely based on perception and expressed opinion of the respondents, it may not be free from personal bias and prejudices. Care was taken to avoid this. Despite the limitations, much effort was put to make the study as objective and systematic as possible.

Review of literature

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 thorough review of literature is of paramount importance to any research endeavour. It helps to acquire general background in the field and to find out the available information which is related to the objectives of proposed research. It assists in not only delineation of problem areas but also provides a basis for theoretical frame work and for interpretation of the findings.

The main objective of this chapter is to review the crisp and supportive previous researches based on objective set forth for the study and to develop and establish the theoretical framework for the study based on ideas, concepts gathered from the review of existing literature of both theoretical and empirical nature. Literature available related to certain variables of the study was scanty. However an attempt has been made in this chapter to present a brief review of available literature related to the relevant variables selected which have meaningful relation to the objectives of the study. For better clarity and convenience, this chapter is organized under the following headings.

2.1 Concept of Innovations.
2.2 Concept of e-agriculture extension technologies
2.3 Information Kiosk and Mobile initiatives in agriculture
2.4 Variables and their review

2.1. CONCEPT OF INNOVATIONS

Innovation is a process through which a nation creates and transforms new knowledge and technologies into useful products, services and processes for

national and global products leading to both value creation for stakeholders and higher standards of living (Lundvall, 1992).

A new technology (or innovation) is defined as "an idea, practice or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003).

Vedakumari (2005) reported that rapid innovations in tele-communications, semi-conductors, microprocessors, fibre optics and microelectronics are the engines of growth for development of countries across the world. These innovations are being referred as Information and Communication Technologies (ICTs).

Hall (2010) noted that innovation focuses on understanding the ways in which the process of research is used rather than only on how research products are transferred and adopted. He added that there is a diversity of ways of organizing innovation appropriate to different market, social, technological, institutional and policy niches.

2.2. CONCEPT OF e-AGRICULTURE EXTENSION TECHNOLOGIES

Jones (1997) explained that e- agriculture extension technologies (Cyber extension) would save time, money, effort and it will also remove a number of steps altogether from the traditional extension process. It can provide more in-depth analysis, detailed information and it appeals to the curious extension worker and analytical farmer. He also opined that Information and Communication Technologies (ICTs) has many potential applications in agricultural extension and its use is an important pillar of agriculture extension and in the current scenario of a rapidly changing world, it has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming.

FAO (1998) pointed out that Information and Communication Technologies (ICTs) have the potential to support the improvement of currently inadequate extension and education services and ensure the farmers have access to reliable information about agricultural technologies and market.

Balit (1998) explained that with new Information and Communication Technologies (ICTs), rural communities can acquire the capacity to improve their living conditions and become motivated through training and dialogue with others to a level where they make decisions for their own development.

Sharma (2000) indicated that Cyber extension means using the power of online networks, computer communication and digital interactive multimedia to facilitate dissemination of agricultural technology.

Gosh (2001) stated that the application of Information and Communication Technologies (ICTs) to agriculture and rural development are emerging everywhere.

Robert (2001) explained that the extension services with the Information Technology (IT) effect, affect each part of agricultural sequence like relative advantage, compatibility, complexity, trial ability and observability.

Kadiam *et al.,* (2012) defined e-Extension as extension over cyber space. e-Extension includes effective use of Information and communication technology, national and international information networks, internet, expert systems, multimedia learning systems and computer based training systems to improve information access to farmers, extension workers, research scientists and extension managers. Cyber extension means using the power of online networks, computer networks and digital interactive multimedia to facilitate dissemination of agricultural technology.

2.3. INFORMATION KIOSKS AND MOBILE INITIATIVES IN AGRICULTURE

2.3.1. Dhristee

Drishtee is a revenue-generating platform for rural networking and marketing services that enable e -governance, education, and health services. Drishtee is

currently in the process of installing low cost, self-sustaining, and community owned rural intranet projects in several targeted districts. Services are provided through Drishtee in a village (or a group of villages). A local villager owns a Kiosk after having it financed through a government-sponsored loan. Kiosk owners can then pay for their loans with their earnings and become an entrepreneurial role model for the younger generation. With a goal of 45,000 kiosk owners by 2003, the employment generated has the potential of seeding a new Information Technology (IT) -literate generation.

2.3.2. ITC's e- Choupal

Agri Business Division, one of India's largest exporters of agricultural commodities, has conceived e-Choupal as a more efficient supply chain aimed at delivering value to its customers around the world on a sustainable basis. Village internet kiosks managed by farmers called sanchalaks enable the agricultural community to access ready information in their local language on the weather and market prices, disseminate knowledge on scientific farm practices & risk management, facilitate the sale of farm inputs (now with embedded knowledge) and purchase farm produce from the farmers' doorsteps (decision making is now information-based).

Real-time information and customised knowledge provided by 'e-Choupal' enhance the ability of farmers to take decisions and align their farm output with market demand and secure quality and productivity. While the farmers benefit through enhanced farm productivity and higher farm gate prices, ITC benefits from the lower net cost of procurement (despite offering better prices to the farmer) having eliminated costs in the supply chain that do not add value. Launched in June 2000, 'e-Choupal', has already become the largest initiative among all Internetbased interventions in rural India. 'e-Choupal' services today reach out to over 4 million farmers growing a range of crops - soyabean, coffee, wheat, rice, pulses, shrimp - in over 40,000 villages through 6500 kiosks across ten states (Madhya Pradesh,

Haryana, Uttarakhand, Karnataka, Andhra Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Kerela and Tamil Nadu).

2.3.3. Dairy Information System Kiosk (DISK)

The DISK project was conceived with two components. An application running at the society level that could be provided Internet connectivity and a Dairy Portal, at the district level serving transactional and information needs of all members and staff in the district cooperative structure. The software used at the society level was developed to provide the Data analysis and decision support to help a rural milk collection society in improving its performance i.e. increasing milk collection, Data analysis to improve productivity and yield of milch cattle, Farmers with facilities to place orders for goods and services offered by different agencies in the co-operative sector and seek information on subjects of interest.

2.3.4. Rapid Deployment of Telecommunications Kiosks in India (RADTEK-I)

The RADTEK-I model calls for a basic self-supporting telecommunications Kiosk collocated either at a public facility or a small business operation. In some cases, it may be a standalone facility, with access to power or the ability to generate its own power. The RADTEK-I (the Telecom/ Internet kiosk) may contain two or three telephone sets and a limited number of desktop computers. The connection lines can be several 8 Kbps lines along with analog or digital voice lines.

2.3.5. Ekgaon

Ekgaon started its financial services in the year 2002. This provides mobile tools allowing farmers in rural India to access market price information, weather alerts, agricultural best practices, soil nutrient advice and crop management recommendations. Ekgaon partnered with four different agricultural focused organizations and reach roughly 11,000 farmers through the services, which offer information through SMS, IVR, out - bound call (OBC) and web – based information portals. It has recently partnered with the multi commodity Exchange

of India to take its services through its network of service points in six states of India.

2.3.6. KISSAN (Karshaka Information Systems Services and Networking) Kerala mobile based agri information system

Kerala is one of the states in the country where the mobile penetration is very high with a growth rate of 3.2%. KISSAN is an integrated, multi – modal delivery of agricultural information system, which provides several dynamic and useful information and advisory services for the farming community across Kerala. The project was officially launched on 1st November 2003 (Kerala day). KISSAN is one of the leading citizen centric e – governance projects of the department of Agriculture, Government of Kerala. The project was conceived, developed and managed by the Indian Institute of Information Technology and Management – Kerala for the Department of Agriculture, Govt. of Kerala. In this Project several mobile based services were introduced via SMS, voice and video based services to the farming community.

Agricultural services offered by KISSAN are the following services.

- Information on the availability of planting materials.
- SMS based weather information.
- SMS based information on the availability of livestock farmers.
- Soil information on mobile.
- SMS based two – way query answering system (Ask our experts through Mobile).
- SMS based scheme alert service.
- SMS based information on Krishideepam television program
- Access agri videos through mobile.
- Mobile voice based monthly crop management advice.
- KISSAN voice based information service.

2.3.7. Fisher friend programme

This mobile service is launched by Qualcomm and Tata tele services in partnership with the M. S. Swaminathan Research Found (MSSRF). This services provides information to fishermen through physical centres in fishing villages. The fisher friend programme relays the same information by mobile in order to solve the last mile problem for fishermen at sea. This initiative was launched on December 2007. Free handsets were supplied to the fishermen and text messages were being sent on Market prices, optimal fishing zone, rural yellow pages, Government schemes, Weather (Wave height, wind speed). Estimated range of service at sea is 5 nautical miles.

2.3.8. Reuters Market Light (RML)

Reuters Market Light (RML), a mobile phone based service, was started in Maharashtra state in western India on April 2007 and has signed up over 7, 500 farmers. RML helps farmers achieve better yields and secure better prices by allowing them to receive accurate weather forecasts and local price information direct to their mobile phones in their own language. Reuters Market Light introduced a small customer charge of rupees 60 per month. No of SMS totals to approximately 75 to 100 per month. RML helps farmers to enhance their crop yields and improve their productivity over a very wide range of produce including onion, cotton, soya bean, pulses, pomegranates and oranges.

RML has chosen to specialize in information collection and sending customized content for each of its subscribers; but in some regions, they have partnered with an operator (Idea cellular's Idea Krishi subscription plan). Some of the services are being offered for free by operators. When it is a paid service, it is generally via a time – based subscription model (one month, 3 month, 6 month or annual subscription). Pricing varies from service to service but generally ranges from INR 15-100 per month.

2.3.9. Nano Ganesh

" Nano Ganesh'' is a product which allows farmers to use mobile phones to remotely monitor and switch irrigation pumps used for watering crops in remote locations. This revolutionary electronic device is developed by Ossian Agro Automation, Pune, India and works in conjunction with Tata tele services phones. It is an application that lets farmers turn their pumps on and off using their mobile phones and is gaining popularity with over 5000 farmers using it since 2008.

The application requires a Tata Indicom mobile connection and phone. The modem is also available with a device called "Nano Ganesh Hanuman" that alerts the owner of attempts to steal the modem, cable or the pump. A farmer purchases the device for between $ 12 and $ 268, depending on the model. The device is then connected both to a mobile phone and the electric water pump. Once it's set up, the farmer just needs to call that phone and enter a code to get it started. If cell service is there it can be operated through remote.

2.3.10. IKSL (IFFCO's Kisan Sanchar Limited)

IKSL is a tri- lateral joint venture between the Indian farmers fertiliser cooperative Ltd. (IFFCO), the largest farmer' s cooperative in India and Airtel, the largest mobile network operator, along with Star Global Resources Limited, rural telephony experts. After a successful pilot, the service launched in 2008. Centre for Agriculture and Biosciences International (CABI) is a not – for - profit international organization that provides information and applies scientific expertise to solve problems in agriculture and the environment manages the content and quality assurance for the service. It provides voice – based agricultural information to empower rural farmers and reinforce the cooperatives through the mobile network.

IKSL distributes Airtel SIM cards branded 'Green SIM' to its IFFCO members and other farmers. The Green SIM functions as a normal SIM as well as providing the agricultural valued added services (Agri VAS). The user receives 5

one minute recorded voice messages free of charge each day on topics such as crop management, market rates, weather forecasts and government schemes covering both local and national agricultural topics. Green SIM users access an agri helpline where they can get answers from agri – experts to any farming question they care to raise. Today more than 1.5 million farmers use IKSL's mobile services. IKSL currently serves 18 states in India.

2.3.11. Nokia life tool (NLT)

Nokia Life is an SMS based, subscription information service designed for emerging markets which offers a wide range of information services covering healthcare, agriculture, education and entertainment. The service is currently available in Pakistan, India, Indonesia, China and Nigeria. As of April 2011, over 15 million people have experienced NLT services in these four countries.

Nokia Life Tools was preceded by a pilot project called Mera Nokia, in the state of Maharashtra in India in early 2009. After the successful pilot, a wider commercial deployment of the service under the name Nokia Life Tools began in India on June 2009. The first two supported devices were the Nokia 2323 Classic and Nokia 2330 Classic devices, English and the services in India supported 11 local languages. (Urdu, Hindi, Marathi, Gujarati, Tamil, Bengali, Telugu, Punjabi, Kannada, Malayalam, Assamese and Oriya).The service has later been expanded to Indonesia in November 2009, China in May 2010 and Nigeria in November 2010.The service has been created from the ground-up, having teams in local markets where they work with government organizations, NGOs, universities and reputed partners and content providers. The unit is headed by Jawahar Kanjilal, Global Head for Nokia Life Tools.

The agricultural part of the service consists of localized information including weather conditions, advice about crop cycles, general tips and techniques, as well as market prices for crops. Farmers in the pilot scheme said getting daily prices on their phones reduced their dependency on agents for basic information, enabling

them to negotiate with greater confidence. The educational tools provide simple English and general knowledge courses in local languages, as well as study modules on a variety of state and ICSE board topics, including history, geography, biology, physics and chemistry. In India, it also includes a service that allows students to retrieve their exam results through their NLT app.

The healthcare services offers pregnancy and childcare advice, men's health, and women's health in all countries. There is also a range of health topics like respiratory, heart, diabetes, hepatitis and digestive health which are specific to some countries. The entertainment suite offering varies regionally and includes among others cricket and football scores, news, wallpapers, astrology, and ringtones. The latest name was changed to "Nokia Life" and was announced at Mobile World Congress in Barcelona in February 2012.

2.3.12. m – Krishi

m - Krishi provides farmers with the benefits of Information and Communications Technology (ICT). It is developed by Tata Consultancy Services Ltd (TCS). It is an award-winning, patent-pending innovative platform that delivers services to rural communities. It connects farmers with a variety of stakeholders packaging multiple services through communication devices like mobile phones. It can also integrate wireless sensors and script technology with communication devices to provide an enhanced solution. m - KRISHI ensures significant business benefits to the stakeholders by enabling them to reach the farmers directly. It costs a farmer between rupees 40 and rupees 80 a month. m - KRISHI serves to achieve the following.

- Reach farmers individually to understand their needs.
- Enable farmers to receive important information about pesticides, fertilizers and soil and water conservation.
- Provide critical micro-climate, weather information in order to plan farming operations.

- Facilitate better production and cultivation practices.
- Improve access to markets, refining the associated economy.

2.3.13. Ovi life tools on Bharati Airtel's mobile service

On August 17, 2010 Nokia and Bharti Airtel, a leading global telecommunications company with operations in 18 countries across Asia and Africa, joined hands to launch Ovi Life Tools service targeted at providing Airtel' s mobile customers with access to relevant content on agriculture, education and entertainment. In India, Ovi life tools has a partnerships with Airtel, Idea, Reliance communications and Tata Docomo. Airtel mobile services customers can subscribe to Ovi Life tools starting at rupee 10 per pack. Agriculture services: includes personalized agriculture related information, weather updates, crop advisory and market prices. For instances, farmers can leverage Ovi Life tool's Agriculture services to get immediate personalized updates on areas such as best practices from experts, weather advisory and market prices and arrivals of crops from the nearest mandis.

This service is available on a range of Nokia handsets including the popular entry level devices and is available in 11 Indian languages including Hindi, Gujarati, Tamil, Telugu, Bengali, Oriya, Assamese, Marathi, Malayalam, Kannada and Punjabi in addition to English.

2.3.14. Mobile services by HANDYGO technologies

HANDYGO technologies a provider of value added services solutions and CABI have joined hands to provide mobile based agricultural solutions to rural India. Under the partnership, CABI will provide region specific data including agricultural content, advisory, etc., while HANDYGO will be providing technical solutions by bridging the gap between the NGO and the rural hinter lands. This service is available in 18 regional languages, 24/7, 35 days a year and provides

credible and authentic information making this service more attractive to the rural population.

2.3.15. Meteorological information by Ingen technologies

Offered by a Kanpur based company Ingen technologies, the service updates farmers on temperature, humidity and rainfall with additional parameters such as atmospheric pressure, solar radiation, wind speed and soil moisture. Many farmers in Punjab and West Bengal are receiving messages on their cell phones about weather information specific to towns and districts. For farmers, Ingen provides agro advisory services that include advice on sowing items, disease outbreaks and frost forecast through SMS.

2.3.16. Mandi on mobile

The Uttar Pradesh Agricultural Marketing Board (Mandi Parishad) has tied up with Bharat Sanchar Nigam Limited (BSNL) to start a voice-based scheme in which the farmer can dial and get to know the latest mandi rates of 108 commodities; Termed 'Mandi on mobile', the project would empower the farmers to dial a number 1255534 and ask for the rates of any vegetable, grain, pulse or fruit in any of the mandis all across the state by naming the product and the district of which he wants to know the rates. There are 108 items of ranging from grains, pulses, fruit and vegetables, daily rates of which, from any of their 247 mandis can be availed by dialling this number. It will also start distributing around 700 mobile phones each month to farmers of Uttar Pradesh. The distribution will continue till most of the farmers in all the 71 districts in the state have a phone to keep themselves updated on the current prices of different commodities before bringing their produce to the mandi.

2.3.17. Mandi bhav

This provides real time prices up dates from different commodity markets (mandis) based on the list of the states, markets and commodities. It provides

information in English, Hindi, Marathi, Guajarati, Punjabi, Malayalam, Tamil, Telugu, and Kannada. The mandi bhav application provides mandi rates from 3000 mandis across India covering more than 500 commodities. It eliminates the need of middle man in the transactions thus maximising gains for both sellers and buyers.

2.4. VARIABLES AND THEIR REVIEW

2.4.1. Age

Sreedaya (2000) reported a non-significant relationship of age with the extent of adoption of recommended practices among vegetable growers of both Intensive Vegetable Development Programme (IVDP) and Vegetable and fruit promotion council, Kerala.

Meera (2002) concluded that majority (51.66%) of the farmers belonged to middle age groups followed by young (37.50%) and old (10.83%) age groups.

Meera (2004) found that in Gyandoot project 90 percentage of the farmers belong to the middle aged.

Bondale *et al.* (2005) reported that most of the farmers approaching Kisan call centre were young (61.90%).

Kumar (2008) reported that majority of the farmers were middle aged (43.33%) followed by young (40.67%) and old age (16%).

Dhaka and Chayal (2010) found that majority (46.67%) of the respondents belonged to the middle aged group followed by young age (38.67%) and old age (14.67%).

Oladele (2011) found that majority of the farmers were between 51 and 60 years of age.

2.4.2. Education

Meera (2002) observed that majority (31.70%) of the farmers availing ICT facilities were educated up to middle school level, 24.20 per cent farmers educated up to primary school level, 8.30 per cent farmers were functionally literate, 6.70 per cent were educated up to college level and above.

Bonade *et al.* (2005) reported most of the farmers approaching Kisan Call Centre were young (61.90%), completed college education (59.52%).

Kumar (2008) found that majority (24.67%) of the farmers were educated up to high school level followed by primary school level (21.33%), middle school (9.33%) and 15.67 per cent were functional literates, Only 8.7 per cent are illiterates and 7.33 per cent had college education.

Okwu and Umoru (2009) have taken a sample size of 70 women farmers for the study but only data for 65 respondents have been analysed. The result reveals that 35.4 per cent of the respondents have had no formal education, 40 per cent primary/adult education, 18.5 per cent secondary education and 6.2 per cent tertiary education.

Rajula and Thiagarajan (2011) indicated that participants were mostly literate with high school to graduate level (73.55%).

2.4.3. Exposure to ICT

Kashem and Hossain (2000) reported that almost half (46%) of the television viewing farmers opined that television was an important source of agricultural information.

Muller (2000) revealed that one out of 25 United States farmers had access to the internet. Farmers were accessing various e-commerce sites dealing with transaction cost and market price.

Nie *et al.* (2001) observed that dominant group of the society has more access to latest communication technologies in any geographical area in particular.

Medium level utilization of mass media sources such as radio and television was observed by the majority of the respondents (Tripati, 2001).

Anandaraja (2002) stated that about four-fifth (82.80%) of the farmers had not utilized agricultural websites for the betterment of farming while remaining 17.20 per cent of the farmers utilized the agricultural websites.

Das (2002) reported that out of 1949 farmers, who visited Community Information Centres, 141 visited more than 10 times, 248 in between 6-10 times, 1057 in between 2-5 times and 503 only once. He also observed that 11 per cent of the farmers visited Community Information Centres a distance of more than 26 Km, 16 per cent in between 11- 25 Km, 22 per cent in between 6-10 Km and 41 per cent less than 5 Km. Further he emphasized that the increased number of information through Internet had certainly improved the knowledge level of users.

Navaratne (2003) reported that ICT can improve the access of the poor farmer to micro credit, government services, market information, production, storage and marketing of farm and non-farm products. Further ICT can also facilitate the generation and exchanges of community based information and stimulate the establishment of small and medium sized enterprises and expand their market base.

Chandrima (2004) has found that 5.71% of the farmers in Alappuzha district were using internet and other electronic media for getting agriculture related information.

Meera *et al.* (2004) found out that in the state government project, users mostly valued access to market information, land records and information on rural development programmes. In the cooperative project, question and answer services, accounting and farm management information were valued mostly by the farmers. The participating farmers valued various types of information on practices,

management of pests and diseases and rural development programmes. They also stated that some of the areas where ICT can play an important role are broad basing agricultural extension activities, developing farming system research and extension activities, location specific modules of research and extension promoting market extension, sustainable agricultural development and participatory research etc.

Vedakumari (2005) reported that one of the key components improving socioeconomic status of farmers in villages is to ensure that their products find right kind of markets and reach these markets in minimum time without a number of middleman involved in it. The reach of ICT in rural areas will provide unique opportunities to producers of rural products, agriculture, agro processing products, rural handicrafts etc. to have direct access to markets. Internet enables advertising of rural products produced even in the remotest villages to global markets. The agriculture extension worker can access latest information on farm technology and products and disseminate the same to villages. Examples of rural based e-commerce are emerging sporadically.

Akpabio (2007) revealed that 89 percent of respondents used computer between 0 and 5 hours a week and 7 per cent reported to use computer between 6 and 10 hours a week.

Ommani (2007) reported that 89% of the respondents used computers between 0-5 hours a week and 7 percent between 6-10 hours a week.

Sharma *et al.* (2008) revealed that nearly three fourth (74.50 per cent) of the respondents had medium level of awareness of communication sources and channels. Besides 15 per cent had high and 10.50 per cent had low level of awareness of communication sources and channels. Study further highlights that 81.25 per cent small, 73.52 per cent medium and 65.39 per cent large dairy farmers had low level of awareness of communication sources and channels. Thus it could be concluded from the results that majority of the dairy farmers had medium level of awareness. The reason that could be ascribed to this is that majority of the

respondents were educated. This would have helped them to be aware of existence of communication sources and channels. Study also revealed that the dairy farmers were mostly aware of personal localite sources (57.51%). These were followed by personal cosmopolite channels (53.89%). However impersonal cosmopolite channels (51.17%) were the least known channels of communication to the dairy farmers.

Kumar (2008) found that majority of the farmers are using ICT services once in a month (42.67%) followed by once in a fortnight (29.33%), never used (24.67%) and weekly twice (13.33%). No one used daily and twice a week.

Hassan (2008) observed that majority of the farmers (52.22%) had low level of exposure to ICT, 31.11 per cent had medium level of exposure to ICT and only 16.66 per cent of respondents had high level of exposure to ICT.

Halakatti *et al.* (2010) in Haveri district of Karnataka examined farmers' use of mass media, where TV was most used, followed by radio then print media.

2.4.4. Information dissemination

Frempong *et al.* (2006) revealed that 96.5% indicated that ICTs could facilitate the exchange of information among major stakeholders in the agricultural system.

2.4.5. Awareness

Anandaraja (2002) reported that more than two fifths of the computer owning farmers (44.5 per cent) was not aware of any single agricultural website. This was followed by one third of the respondents (34.4 per cent) who were aware up to two agricultural websites. About one tenth (13.1per cent) of the respondents were found with awareness of three to five agricultural websites. Only 8 percent of respondents were found with awareness of more than five agricultural websites.

Senthilkumar (2003) in his study reported that less than half (44.44%) of the respondents had a medium level of awareness on electronic databases followed by low level of awareness (33.33%) and only 22.22 per cent had a high level of awareness on electronic databases.

Rao and Reddy (2007) revealed that Rythumitra programme created awareness for all (100%) viewers on latest farm technologies. They further reported 77.50 per cent adopted the practices and rest of them (22.50%) could not utilize the practices.

Sharma *et al.* (2008) revealed that nearly three fourth (745%) of the respondents had medium level of awareness of communication sources and channels. Besides, fifteen per cent had high and 10.50 per cent had low level of awareness of communication sources and channels. Study further highlights that 81.25 percent of small, 73.52 per cent of medium and 65.39 per cent of large dairy farmers had medium level of awareness of communication channels. Besides 12.50 per cent of small, 20.59 percent of medium and 11.54 per cent of large dairy farmers had high level of awareness Likewise 6.25 per cent of small, 5. 89 per cent of medium and 23.07 per cent of large dairy farmers had low level of awareness of communication source channels.

Kumar (2008) found that majority (70%) are aware of e-Choupal by project staff and canvassing by Kiosk operator, twenty per cent through friends and ten per cent visited the Kiosk by themselves and acquired awareness.

2.4.6. Frequency of use of messages

Frequency of use of ICT services in the Gyandoot project, 52.5 per cent of the respondents was found to be using ICT services once in a month and 45 per cent once in a fortnight. Among the respondents of the Warna wired village project, the frequency of use is about 45 per cent within duration of fortnight and a month. At least five per cent of the farmers used the services only once. About

52.5 per cent of the farmers used the ICT services at least once a month, 40 per cent once a fortnight and 72.5 per cent used the same once a week at the *i* Kisan project villages (Meera, 2002).

2.4.7. Information needs of the farmers

Thysen (2000) informed that farmers want ICT application that supports the operation aspects of farming i.e., real-time decision support of internet connections, e-mail and applications by photos, videos and sound.

One area where ICT offer great potential is in increasing the flow of public good type information. Information can be defined as a public good when it is difficult to restrict, having 'low excludability', and when it keeps its value to individuals regardless of whether others also acquire it because it has 'low extractability'. In the context of agricultural extension, public good type information includes weather forecasts, basic information on soils and cropping techniques, market prices and food safety etc. all of which ought to be available without restrictions or restrictive institutional controls (Anonymous, 2001).

Meera (2002) found that majority of Gyandoot farmers (90%) perceived marketing information as most appropriate, followed by facilitation of land records/registration on line (82.5%), question and answer service (67.5%) and information on rural development programmes. Majority of the famers (70%) perceived package of practices of cultivating Soya bean and Wheat as appropriate followed by postharvest technology, agricultural news and information on crop insurance.

Meera (2002) found that majority (87.50%) of Warana Wired village project farmers perceived as most appropriate was question and answer service, followed by accounting and payment (75%), best package of practices (68%) and market information service (50%). Among information needs such as input prices and availability, early warning systems, information on rural development and general

agricultural news were found to be appropriate. Six information needs viz. crop insurance, farm business and management information, dairy marketing and milk production information, post-harvest technology information and provision of land records were considered as less appropriate by more than 40% per cent of farmers.

Meera (2002) reported more than 50 per cent of i-Kisan project farmers perceived information on disease/pest early warning system, information on rural development programmes, question and answer service, information on cropping system and planning and best agricultural practices were most appropriate. Among the other information needs such as weather forecasting, soil testing and soil sampling information, general agricultural news, facilitation of land records and market information were perceived as appropriate by more than 50 per cent farmers. Information on post-harvest technology, farm business and management, input prices and availability and crop insurance schemes were perceived as appropriate by more than 40 per cent farmers. Only one information need i.e., information relating to dairy and marketing of milk was perceived as less appropriate by 40 per cent farmers.

Meera (2002) found that majority (75%) of Warna Wired village project farmers perceived question and answer service as most appropriate, followed by accounting and payment (75%), best package of practices (68%) and market information service (50%). Among information needs such as input prices and availability, early warning systems, information on rural development and general agricultural news were found to be appropriate. Six information needs such as crop insurance, farm business and management information dairy marketing and milk production information, post-harvest technology information and provision of land records were considered less appropriate by more than 40 per cent of the farmers.

Meera (2002) found that majority of Gyandoot farmers (90%) perceived marketing information as most appropriate, followed by facilitation of land records/registration on line (82.5%), question and answer service (67.5%) and information on rural development programs. Majority of the farmers (70%)

perceived package of practices of cultivating Soya bean and Wheat as appropriate followed by post-harvest technology, agricultural news and information on crop insurance.

Chandrakandan *et al.* (2003) from their study conducted in Thondamthur block of Coimbatore district found that overall self-confidence and interest towards computer learning and use was high and had medium perception. Farmers possessed medium level of aptitude to learn using computers.

Kaini (2003) revealed that farmers require information on supply of inputs, new technology, early warning systems (Such as drought and pests), credit and market.

Mali *et al.* (2003) stated that the farmers expressed lack of awareness of internet (26.25%) and illiteracy about computer operation (22.5%) as the major problems.

Nutball (2004) reported that farmers are increasingly purchasing and using on farm computers to get decision support information and assist in meeting their tax and other reporting commitments while having purchased, the farmers clearly believe that the investments is justified.

Bondale *et al.* (2005) reported that farmers were more interested about availability and rates of seeds (57.14%), crop protection measures (47.61%), marketing of crop (37.51%), cultivation practices of vegetables, economics of the crop, government subsidy (33.3%) respectively followed by fertilizers and water management (23.8%).

Manhas *et al.* (2005) observed that in this era of globalization, Indian farmers need to be updated with latest information to compete for global marketing. The farmers who access this information have a better chance of succeeding than those who do not access the same.

Sreenath *et al.* (2006) observed that 80 per cent of the questions were related to pest and disease problems (sometimes it reached 100%), 20 per cent are related to information about locally suitable varieties, information of the seed selling officers, water scarcity issues etc.

Sunil (2006) reported that the most important and decision support need in banana cultivation is the one related to ways of reduction in cost of cultivation. The next important need was on management of various plant protection problems. And the main areas of need identified include the cultivation, plant protection, marketing and management.

Jain *et al.* (2008) assessed information and media needs of rural women regarding Animal Husbandry practices. Nine messages identified for the study were breeding, balanced feeding management of cattle shed, health care, preservation of green fodder, clean milk production, farm management, accounting, marketing and animal diseases and their management. It revealed that out of these messages i.e. clean milk production, balanced feeding, preservation of green fodder, breeding and animal diseases and their prevention had ranked I to V based on their weighted mean scores respectively. Thus these five messages were identified as most needed by rural women.

An analysis of the Indian NSSO 2003 survey showed that small and marginal farmers accessed less information and from fewer sources than medium and large scale farmers (Adhiguru *et al.* 2009).

Information needs can be classified according to the 'agricultural value chain' (de Silva and Ratnadiwakara 2008).

2.4.8. Attitude

Thurstone (1946) defined attitude as the degree of positive or negative affect associated with some psychological object. According to Thurstone, "psychological

object" means any symbol, phrase, slogan, idea, person and institution towards which people can differ with respect to positive or negative effect.

Meera *et al.* (2004) in his study found that 11 per cent of the farmer users were having some knowledge about computers which implied that in developing countries, farmers need not be computer literate to harness ICT in agricultural development.

Kumar (2008) reported that majority (60%) of the farmers in e-Sagu area had favourable attitude towards ICT based extension followed by more favourable attitude (28%) and less favourable (12%) attitude. In case of e-Choupal 6 per cent farmers had favourable attitude followed by more favourable attitude (20%) and less favourable (16%) attitude, whereas in VASAT 6 per cent had favourable attitude followed by less favourable (24%) and more favourable attitude (2%) towards ICT based extension.

2.4.9. Effectiveness

Bhuvaneswari (2002) conducted a study to find out the relative effectiveness of two treatments *viz.*, power point slide presentation aided with inbuilt voice followed by discussion forum (T_1) and power point slide presentation aided with oral explanation followed by discussion forum (T_2). She concluded that both the treatments were effective. But T_1 is considered superior to T_2 as it contributes to more knowledge gain among the respondents in computer based presentation on sugarcane technology.

Fernandaz (2002) revealed that two hours training per day for 5 days i.e. 1-0 hours to farmers in computer-use was superior the another treatment, duration of 1 hour per day for 5 days. It also be concluded that as the duration of training increased the difference between the men and the women respondents was not significant. Hence 10 hours was optimum duration to train the respondents to learn computers. She also found that there was a significant difference between the men

and women respondents regarding the knowledge gain. Hence the deciding factor in the knowledge gain of the respondents were duration and gender for training the farmers on computer-use

Meera (2002) revealed about 5 per cent of functionaries working in ICT projects showed moderate effectiveness and 18 per cent showed higher level of effectiveness.

Senthilkumar (2003) conducted a study to assess the effectiveness of three treatments *viz.*, use of IMCD, web page and computer conferencing towards knowledge gain for the subjects. The results of this study indicated that the mean knowledge gain with regard to IMCD was maximum with a score of 6.4 which indicated 20.00 per cent of gain in knowledge, this was closely followed by computer conferencing and web page which accounted for 30.20 per cent and 13.00 per cent respectively. He also observed that the variables namely family status and annual income were found to have positive and highly significant relationship with the effectiveness of cyber extension tools. The review traced the various extension methods and visual aids and audio with and without group discussion were influencing the knowledge gain of the participant farmers. With this in view, an attempt was made in this study to find out the effectiveness of computer-based Expert System against human experts in terms of knowledge gain with regard to plant protection aspects of rubber crop.

2.4.10. Advantages of Mobile SMS services

Ferris *et al.* (2006) revealed that use of mobile based market information technologies provide facilities for virtual activities resulting in higher prices to suppliers and the easier disposal of crops.

Swamy (2006) reported farmer call center "pariskaram" of government of Andhra Pradesh in answering farmer's queries on a toll free number 1100. Scientists at call centres answer queries through phone calls. The important

questions and answers given by scientists were displayed in Saptagiri channel and broadcasted the same through regional radio stations and published in popular agricultural journals facilitating to react enumerable farmers of Andhra Pradesh and beyond

Verclas (2009) inferred that the use of mobile telephones improved supply-chain management, enabling more efficient use of existing storage, packaging, transport and processing facilities, swifter un-blockage of disruptions in the supply chain, traceability, quality problem alleviation, reduced travel time and expense, overcome security problems and sometimes shortening of supply chains.

Molony (2009) stated that mobile phones in agricultural marketing systems improved monitoring and co-ordination of freight transport operations, including product collection and deliver and in overcoming problems of vehicle breakdown and swift spare parts replacement.

Labonne and Chase (2009) revealed that the intervention of mobile phone in dissemination of market information resulted in easier price communication, enabling greater price transparency and the reduction of price volatility and price trends as well as reduction in mean prices to consumers.

Duncombe and Boateng (2009) proved that use of mobile phones improved the capability to speed up trading transactions and payments.

Availability of effective ICT such as mobile telephony at the hands of the farmers can be postulated as a key driver for improving farm productivity by diminishing information search cost and increasing efficiency (Gerad, 2013).

2.4.11. Constraints faced by the farmers

Vijayalan (2001) identified that labour scarcity (100.00%), high cost of labour (90.00%), high risk involved (87.50%), lack of training (84.16%), inability to attend

extension programmes (81.66%) and high cost of inputs (81.66%) were the major constraints.

Mali *et al.* (2003) stated that the farmers expressed lack of awareness of internet (26.25%) and illiteracy about computer operation (22.5%) as the major problem.

Mungania (2003) revealed that e-Learning barriers are heterogeneous, encompassing seven types of barriers namely: (1) personal or dispositional, (2) learning style (3) instructional, (4) situational, (5) organisational, (6) content suitability, and (7) technological barriers.

Senthilkumar (2003) reported that the rural areas are having poor connectivity and also poor band widths.

Muilenburg and Berge (2005) determine eight barriers to online learning including administrative/instructor issues, social interactions, academic skills, technical skills, learner motivation, time and support for studies cost and access to the internet and technical problems.

Sunil (2006) found among the weakness of the information and decision support system, the most prominent in the order include the need of computers and accessories, the basic knowledge on computers to operate, need of regular power and internet connection and the requirement of skilled personnel to manage, assume significance.

A more recent study by Ali and Magalhaes (2008) divided the barriers in the adoption of e-Learning into two factors: organisational and technical issues. As for the technical barriers, the most commonly cited are system crashes, bandwidth and infrastructure upgrading, accessibility, usability, technical support and perceived difficulties in using such a system. The organisational barriers include lack of time available for training; cost versus value; lack of appropriate content related to specific needs; language barrier (as most of the content is delivered in English).

Singh *et al.* (2008) found that poor connectivity, lack of awareness in farmers and incomprehensible technical information provided through helpline services were perceived as constraints in effective co-line information dissemination to the farmers.

Kumar (2008) revealed that majority of farmers (72.66%) expressed lack of crop guidance from experts is a major problem followed by lack of required information from the centre (70%), appropriateness of information (62%), access to information centre (62%), capacity building of farmers in ICT extension mechanism (60%), inadequate ICT infrastructure (60.8%), location specific content (60%), timeliness of services (58.66%), connectivity (54.66%), appropriateness of information (54.66%), low efficiency of field functionaries (54.66%), IT illiteracy of farmers (54%), assured supply of electricity (50%), low orientation of field functionaries towards ICT extension (4%) and less favourable attitude of extension personnel (25.33%).

Dhaka and Chayal (2010) reported that insufficient regional specific information emerged as most prominent constraint and based on RBQ value (67.36) given highest priority. It is reported by the respondents that majority of knowledge centre uploaded information is in English language. More than half of the respondents expressed irregular internet connectivity as one of the major constraints and as per RBQ value (63.54) rated as second most prominent constraint.

2.4.12. Utility of messages

Information is said to be a resource that must be acquired and used for the improvement of agricultural production. The sharing of ideas and information forms a large part of extension agents' job. Having adequate well-presented information will improve the efficiency of rural development projects and programmes (Samuel, 2001).

Dairy Information Services Kiosks at collection centres describe best practices in animal care to enhance milk yield and quality and assists dairy cooperatives to effectively schedule and organize veterinary, artificial insemination, cattle feed and related services (Rama Rao, 2001).

Chauhan *et al.* (2002) found that in India we have developed sufficient technology and how it is important that the developed technology is to be communicated and transferred effectively and efficiently to the actual users in time so that they can use these developed techniques on their own farms for increasing their farm produce.

Kaungo (2002) reported that the poor families turned out to be major users of ICTs and women were also found to be participating as well in ICT initiatives.

Despite the additional cost and time associated with generating localized content, its access could be more relevant and useful to meet farmers' information needs (Cecchini and Scott 2003).

Sharma *et al.* (2003) found that more timely the information the greater is its news value. Communication of information has to be timely, if one wants the reader to make use of it. Information can be made best use of only if it is communicated at proper time. If an information however interesting or useful it may be, if given late will lose its utility. The very purpose of communication is then defeated.

According to KISSAN news report, the ICT innovative project in Kerala, received a total number of 1341 hits from Kiosks and the total number of queries answered so far is 1531. The most accepted page is on crop information and most accepted page is the market information (Anonymous, 2004).

Molony (2005) studied mobile phone use amongst the domestic tomato and potato traders in Tanzania with some follow-up interviews in subsequent years. The results of his study suggested that mobile phone played a major role between

isolated farmers and wholesalers, because of the social nature of trading linkages, were face to face contact is preferred to the remoteness of mobile phones.

Swaminathan (2006) opined that families need the right information at the right time and at the right place.

Jensen (2007) reported that Mobile phones have reduced price dispersion, and waste while increased fishermen's profits and consumer welfare in Kerala, India. In Kerala, Mobile phone services were run by the private sector companies to make profits. The fishermen were willing to pay for mobile phones because of the increased profits they received through the information exchange.

Kumar (2008) reported that the Kiosks place in e-Choupal centre contributed to the decision making of their farming activities. He also reported that forty four per cent of the farmers expressed medium level of satisfaction for the timeliness of services provided by the e-Choupal kiosks.

Nagalakshmi and Swamy (2008) reported that ICT will help in providing need based, timely, accurate and quality information at a faster rate.

Information must be relevant and meaningful to farmers in addition to being packaged and delivered in a way preferred by them (Diekmann *et al.* 2009).

Muto and Yamano (2009) observed that market participation of banana farmers from rural Uganda was induced by the increased coverage of Mobile phone.

The use of cellular or mobile phones is almost ubiquitous and has become an important mode for communicating content that is adapted to local use and which meets the needs of local agricultural communities and individuals. He also stated that as 3G coverage increases and with it mobile data availability, different opportunities are likely to arise for agricultural value added services and connected agriculture solution (Gerad, 2013).

2.4.13. Extent of Perception

Perception is the process of understanding sensation or attaching meaning based on experience to signs (Taneja, 1989).

Anandaraja (2002) detailed that nearly two-third of the viewers of IMCD (62.60%) have perceived all the 62 sub components *viz*., overall perception (8), message component (17) and technical components (37), of IMCD as 'highly satisfied' while more than two-fifth of the viewers (23.30%) expressed as 'satisfied' and for a minimal percentage of the viewers (14.10%) it was 'not satisfied'. Most of the respondents (95.00%) expressed that IMCD could be very much useful to teach illiterate farmers, to give complete information on a subject and to solve farmers problems.

Chandrakandan *et al.* (2003b) from their study conducted in Thondamthur block of Coimbatore district found that over all self-confidence and interest towards computer learning and use was high and had perception medium.

Senthilkumar (2003) assessed the respondent's perception about the information requirement through different cyber extension tools. The result of the study indicated that all the respondents required the technological information via web page and group mail and mobile phone followed by IMCD and computer conferencing. Whereas, they preferred to access the market information through web page followed by mobile phone and group mail. Majority of the respondents (80.00%) were 'satisfied' with the cyber extension tools used to deliver the agricultural information.

Vijai and Asokhan (2010) found that about three fourth of dairy farmers (75.50%) perceived that they could information in time through ICT.

Kavaskar and Santha (2011) found that majority of the respondents (65%) perceived all the components of IMCD as highly satisfied followed by nearly one fourth (23.30%) of the respondents expressed as satisfied while minimal percentage

of the viewers (11.25%) were not satisfied. Whereas about two third (61.25%) of the respondents were highly satisfied with the adequacy of the information provided through IMCD but still 10% of the respondents were not satisfied.

Oladele (2011) revealed that researchers (60.00%) had a more positive perception of the effect of ICT on information access than the extension agents (38.64%) or the farmers (25.11%). The effect is thus represented as: R>EA>F. The implication is that access to agricultural information through the use of ICT will continue to improve, since the perceptions are overtly positive among researches, extension agents and farmers.

Materials and Methods

3. MATERIALS AND METHODS

Research methodology is a way to systematically solve the research problems. It may be understood as a science of studying how research is done systematically. It explains various steps done that are adopted by a researcher in studying his research problem, along with the logic behind them. It is necessary for the researcher to know not only the research methods and techniques but also the methodology.

- Kothari (1985)

This chapter describes the research techniques and methods followed in this study. The details have been dealt under the following headings.

3.1. Locale of the study
3.2. Selection of the respondents
3.3. Design of the study
3.4. Variables and their measurements
3.5. Tools and techniques of data collection
3.6. Statistical tools used.
3.7. Conceptual frame work of the study

3.1. LOCALE OF STUDY

3.1.1. Selection of the district

The study was conducted in the Thiruvananthapuram district of south Kerala region. Thiruvananthapuram district was purposively selected for the study as all the Information and Communication Technology (ICT) applications in Kerala state agriculture department are heralded and monitored by the IT (Information Technology) cell of the Directorate of Agriculture, Vikas Bhavan, Thiruvananthapuram and Indian Institute of Information Technology and Management Kerala (IIITMK) located at Technopark, Thiruvananthapuram. This

is the only district in Kerala which was having maximum number of Information Kiosks installed in the Krishi Bhavans and farmers registering for Mobile SMS arealso more in number as per the database available in IT (Information Technology) cell, Directorate of agriculture, Thiruvananthapuram and theproject, "Content development for Agri Kiosk and networking through Mobile SMS" which is initiated by Department of Agricultural Extension, Vellayani, Indian Institute of Information Technology and Management Kerala (IIITMK), Technopark, Thiruvananthapuram.

The Information Kiosks were run by the "Karshaka Information Systems Services And Networking Kerala (KISSAN KERALA)" project which was launched on 1st November, 2003 and also through the project "Content development for Agri Kiosk and networking through Mobile SMS" which was launched on March 2012 at panchayat level to enable the farmers to communicate with agricultural scientists and officials. Such Information Kiosks were installed at Krishi Bhavans of Thiruvananthapuram district namely Venganoor, Attipara, Kazhakootam, Managalapuram, Sreekariyan, Pothencode, Nedumangad, Karakulam, Kudappanakunnu, Vattiyoorkavu and Ulloor. Information Kiosks were also installed at world market, Nedumanagad market, State Agricultural Management and Training Institute (SAMETI) and at IT (Information Technology) cell, Directorate of agriculture, Thiruvananthapuram.

3.1.2. Selection of panchayats

From the twelve block panchayats present in Thiruvananthapuram district, five block panchayats were selected based on the maximum number of users of Information Kiosk facility and receivers of Mobile SMS based on the records available in the Krishi Bhavans and in the data base of IT (Information Technology)cell, Directorate of agriculture, Thiruvananthapuram. Vamanapuram, Athiyannoor, Vellanad, Nedumangad, Kazhakootam block panchayats are selected for the study. The study area map was shown in the figure 1. The maps of the block panchayats taken for the study are furnished in the appendices.

A.

B.

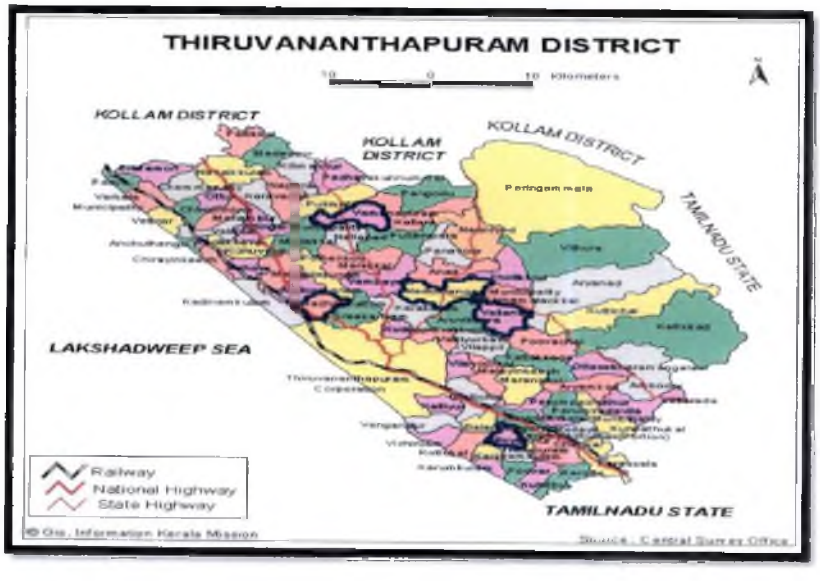


Figure 1. Map of the study area: (A) Map of India (B) Map of Thiruvananthapuram district

3.2. SELECTION OF RESPONDENTS

A list of user farmers of Information Kiosk and receivers of Mobile SMS were selected from the records of the block panchayat. From these lists the respondents were selected by random sampling method. Forty farmers were taken for users of Information Kiosk and sixty farmers were taken for users of Mobile SMS who formed the respondents of the study.

3.3. DESIGN OF THE STUDY

The research design gives the complete guidelines for data collection. The research design used here is ex-post-facto design. 'Ex-post-facto' research design is a systematic inquiry in which the scientist does not have direct control over the independent variables because their manifestations have already occurred or because they are inherently not manipulable (Kerlinger, 1983). This research design was resorted to in this study as there was no scope for manipulation of any variables under study.

3.4. OPERATIONALIZATION AND MEASUREMENT OF THE VARIABLES

A list of forty eight independent variables related to the study which are important for meeting the objectives of the study were collected after detailed review of literature and discussion with subject matter specialists. The lists of variables were then sent to 20 judges comprising Agricultural Extension scientists and Agricultural Economics scientists. They were asked to examine the variables critically and rate the relevancy of each variable on a three-point continuum ranging from most relevant, relevant and less relevant with weightages of three, two and one respectively. The final variables were selected based on the criterion of mean relevancy score, which was obtained by summing up the weightages obtained by variable and dividing it by the number of judges responded. Those variables garnering a score more than the mean score were selected for the study.

Eleven independent variables andfour dependent variables were selected for the study. The dependent variables were Utility of messages of Information Kiosk and Mobile SMS, Perception towards Information Kiosk and Mobile SMS. Variables and their empirical measurement is listed below in table 1.

Table 1: List of variables and their measurements

Variables	**Measurement and scoring procedures developed or adopted by**
Age of farmers utilising Information Kiosk and Mobile SMS	Actual chronological age and classification based on census report (2011)
Education of farmers using Information Kiosk and Mobile SMS	Sobha (2013)
Exposure to Information and Communication Technology(ICT) by farmers using Information Kiosk and Mobile SMS	Hassan (2008) with some modifications
Information dissemination ways by the farmers utilising information Kiosk and Mobile SMS	Kumar (2008) with some modifications
Awareness of farmers towards Information Kiosk and Mobile SMS.	Hassan (2008) with some modifications
Frequency of use of messages by the farmers using Information Kiosk and Mobile SMS	Hassan (2008) with some modifications

Table 1 continued

Information needs assessment of the farmers using Information Kiosk and Mobile SMS	Kumar (2008)
Attitude towards Information Kiosk and Mobile SMS	Kumar (2008) with some modifications
Effectiveness index of Information Kiosk and Mobile SMS	Varghese (2012) with some modifications
Utility of Information Kiosk messages	Procedure followed by Hassan (2008) with modifications
Utility of Mobile SMS	Procedure followed by Hassan (2008) with modifications
Extent of Perception towards Information Kiosk by farmers	Procedure followed by Balasubramani (2004) with modifications
Extent of Perception towards Mobile SMS by farmers	Procedure followed by Balasubramani (2010) with modifications
Advantages of Mobile SMS	Hassan (2008) with some modifications
Constraints faced by the farmers while using Information Kiosk and Mobile SMS	Varghese (2012) with some modifications

3.4.1. Independent variables and their empirical measurement

3.4.1.1. Age

Age was operationally defined as the number of years completed by the respondent at the time of investigation. This was measured as the total number of

years completed by the farmer at the time of interview and was classified based on census report, 2011 classification method. The scoring procedure is represented in table 2.

Table 2. Age wise distribution of respondents

Age category	Years	Score
Young	Less than 35	1
Middle aged	35-55	2
Aged	Greater than 55	3

3.4.1.2. Educational status

Educational status was operationally defined as the extent of formal education achieved by the respondent. Trivedi (1963) had developed the original scale for measuring the educational status. In this study, educational status was measured by using the scoring pattern adopted by Sreedaya (2000) and followed by Sobha (2013). The scoring procedure is represented in table 3.

Table 3. Education wise distribution of respondents

S. No.	Category	Score
1.	Illiterate	1
2.	Can read and write	2
3.	Primary school	3
4.	Middle school	4
5.	High school	5
6.	College	6
7.	Professional Degree	7

3.4.1.3. Exposure to ICT (Information Communication and Technology)

Exposure to ICT (Information Communication and Technology) was operationally defined as the extent to which the respondent was exposed to internet and Information Communication and Technology (ICT) for developing his/her knowledge and skills for the benefit of his/her profession.

The scale adopted by Hassan (2008) with some modifications was used in this study. Summation of the score of all items gave the score of the respondents on exposure to information and communication technology. The scoring procedure is represented in table 4.

Table 4. Exposure to ICT wise distribution of respondents

S. No	Exposure to ICT	Score
1	Daily	6
2	Greater than two times per week	5
3	Two times per week	4
4	Once in a week	3
5	Once in a fortnight	2
6	Once in a month	1
7	Never	0

3.4.1.4. Information dissemination

It is operationalised as the sharing of messages by the respondent among his fellow members or groups and also the most used means of information dissemination or followed pattern of information dissemination for communication the information support provided through Information Kiosk and Mobile SMS.

The method used by Hassan (2008) with some modifications was used for the study. The scoring procedure is represented in table 5. Summation of the

score of all items gave the score of the respondents on use of information dissemination sources.

Table 5. Mode of information dissemination wise distribution of respondents

S. No	Mode of dissemination	Score
1	Online/Email	5
2	By adopting the content in the field	4
3	Telephone/mobile	3
4	Letters	2
5	By word of mouth	1
6	Do not share	0

3.4.1.5. Awareness of the farmers about Information Kiosk and Mobile SMS

It is operationalised as the awareness acquired by farmers by different sources about Information Kiosk and Mobile SMS. The procedure used by Kumar (2008) is used with necessary modifications for measuring this variable.

The scoring procedure for this variable for Information Kiosk using farmers is represented in table 6 and for Mobile SMS using farmers in table 7. Summation of the score of all items gave the score of the respondents.

Table 6. Awareness source wise distribution of respondents using Information Kiosk

S. No	Source of awareness	Score
1	You visited yourself	1
2	Through friend/relative	2
3	Canvassing through Kiosk operator/Project staff	3
4	Through newspaper	4
5	Through extension personnel	5
6	Others	6

Table 7. Awareness source wise distribution of respondents using Mobile SMS

S. No	Source of awareness	Score
1.	Through friend/relative	1
2.	Canvassing through Kiosk operator/Project staff	2
3.	Through newspaper	3
4.	Through extension personnel	4
5.	Others	5

3.4.1.5. Frequency of use of messages by the farmers using Information Kiosk and Mobile SMS

It is operationalised as the number of times farmers have utilized the messages received by them in the field conditions so far.

The procedure used by Hassan (2008) with some modifications was used for measuring this variable. The scoring procedure is represented in table 8.

Table 8. Frequency of use of messages wise distribution of respondents

S. No	Frequency of use of messages	Score
1	Never	0
2	Only once	1
3	2-3 times	3
4	4-5 times	4
5	6-10 times	5
6	More than ten times	6
7	Regularly	7

3.4.1.6. Assessment of information needs of the farmers

Information needs of the farmers is operationalised as the desire of the farmers to obtain or locate information to satisfy his conscious or unconscious need.

The scale developed by Kumar (2008) was used for the study. There are four levels of appropriateness felt by the farmers. Scoring procedure is represented in table 9. Summation of the score of all items gave the score of the respondents on information needs assessment. Information needs index was developed by using the formula.

$$\text{Information need index} = \frac{\text{Individual subject's score}}{\text{Total score}} \times 100$$

Table 9. Appropriateness wise scoring for information service needs

S. No	Category	Score
1.	Most needed	4
2.	Needed	3
3.	Less needed	2
4.	Not needed	1

3.4.1.8. Attitude of the farmers

Attitude is an organized predisposition to think, feel, perceive and behave towards a cognitive object. Thurstone (1946) defined attitude as the degree of positive or negative affect associated with some psychological object.

According to Thurstone, "psychological object" means any symbol, phrase, slogan, idea, person and institution towards which people can differ with respect to positive or negative effect.

Attitude in this study was operationalized as the degree of positive or negative feeling of farmers towards the Information Kiosk and Mobile SMS.

For measuring the Attitude of farmers towards Information Kiosk, the attitude scale developed by Kumar (2008) was adopted with necessary modifications. The scale consists of twelve statements of which the six are negative and six are positive. The items were rated over a five point continuum which ranged from strongly agree to strongly disagree.

Summation of the score of all items gave the score of the respondents on attitude of farmers towards Information Kiosk.

Attitude of farmers towards Mobile SMS was measured using the attitude scale developed by Kumar (2008) was adopted with necessary modifications. The scale consists of ten statements of which the six are negative and four are positive. The items were rated over a five point continuum which ranged from strongly agree to strongly disagree.

Summation of the score of all items gave the score of the respondents on attitude of farmers towards Mobile SMS.

The following scoring procedure was followed for measuring the attitude towards Information Kiosk and Mobile SMS and is represented in table 10.

Table 10. Attitude wise scoring for statements of attitude scales of Information Kiosk and Mobile SMS

Responses	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
Positive statements	5	4	3	2	1
Negative statements	1	2	3	4	5

3.4.1.9. Effectiveness index

Effectiveness index of Information Kiosk and Mobile SMS is developed taking into consideration the conversational ability, quick availability, ability to exploit a considerable amount of knowledge, reliability, scalability, preservation and improvement of knowledge.

It is operationalised as the degree to which Information Kiosk and Mobile SMS are successful in achieving the objectives and producing the desired result.

Scale used by Varghese (2012) with some modifications was used. These items were administered to the subjects in a five point continuum namely most satisfied, more satisfied, satisfied, least satisfied and not satisfied.

The scoring is represented in table 11.Summation of the score of all items gave the score of each respondent.

Table 11. Appropriateness wise scoring for Effectiveness Index statements

S. No	Category	Score
1.	Most satisfied	5
2.	More satisfied	4
3.	Satisfied	3
4	Least satisfied	2
5.	Not satisfied	1

Based on the scores the effectiveness index of Information Kiosk and Mobile SMS for each respondent was calculated using the formula.

$$\text{Effectiveness Index (EI)} = \frac{\text{Individual subject's score}}{\text{Total score}} \times 100$$

The Statements used for measuring the Effectiveness Index of Information Kiosk are given table 12 and for Mobile SMS are given in table 13.

Table 12. Effectiveness Index of Information Kiosk measuring statements

Statements	Most S	More S	S	LS	US
Scalability					
Reliability					
Knowledge gain					
Availability of messages for further reference					
Conversational ability					
Motivation to learn					
Readability of the message					
Completeness of subjective matter					
Information storage					
Interesting to use					
Simple to operate					
Quick availability,					
Attractiveness					
Motivate to adopt the messages in farm					
Photo clarity					
Information provided					
Orderliness of subject matter provided					
Ability to exploit considerable amount of knowledge.					

*Most S - Most satisfied, More S - Most Satisfied, S - Satisfied, LS - Least satisfied, US - Unsatisfied

Table 13. Effectiveness Index of Mobile SMS measuring statements

Items	Most satisfied	More satisfied	Satisfied	Least satisfied	Unsatisfied
Scalability					
Reliability					
Knowledge gain					
Motivation to learn					
Completeness of subjective matter					
Motivate to adopt the messages in farm					
Readability of the message					
Information provided					
Ability to exploit considerable amount of knowledge.					

3.4.1.10. Advantages of Mobile SMS

Advantages of mobile SMS as perceived by the farmers were studied using the procedure adopted by Hassan (2008) with some modifications. Statements used for assessing the advantages of Mobile SMS were given in the table 14. Each advantage was given a score 1. Summation of the score of all advantages gave the score of the respondents.

Table 14. Perception of respondent's wise distribution of Mobile SMS advantages

S. No	Particulars	Tick
1.	Gives personalized and timely information	
2.	One stop shop information source	
3.	Saves time and money in interacting	
4.	Has all information the farmer wants.	
5.	Supports marketing	

3.4.1.11. Constraints faced by the farmers

It is operationalised as the problems faced by the respondents while accessing and utilizing the Information Kiosk and Mobile SMS. The procedure used by Varghese (2012) with some modifications was used. Each constraint was given a score 1.

Summation of the score of all constraints gave the score of the respondents. Statements used for measuring the constraints faced while accessing the services of Mobile SMS and Information Kiosk are represented in table 15 and table 16 respectively.

Table 15. Statements for measuring constraints faced by respondents of Mobile SMS

S. No	Category	Tick
1.	Content problems	
2.	Illiteracy	
3.	Incompleteness of subject matter	
4.	Negative mentality in accepting new things	
5.	Not compatible with the culture	
6.	Other constraints	

Table 16. Statements for measuring constraints faced by respondents of Information Kiosk

S. No	Category	Tick
1.	Not compatible with the culture	
2.	Not available at all times	
3.	Negative mentality in accepting new things	
4.	Illiteracy	
5.	Lack of infrastructure facilities	
6.	Content problems	
7.	Unavailability of learning materials	
8.	Lack of training programmes	
9.	Lack of awareness about ICT tools	
10.	Other constraints	

3.4.1.11. Suggestions of the farmers

The suggestions given by the farmers were noted down for further improvement of delivery of services through Information Kiosk and Mobile SMS.

3.4.2. Dependent variables and their measurement

Kerlinger (1973) referred the dependent variable as the presumed result of variation in the independent variable or in other words, the dependent variable 'Y', is the presumed effect which varies concomitantly with changes or variation in the independent variable 'X'.

In accordance with the objectives of the study, two dependent variables of the study are Utility of messages of Mobile SMS and Information Kiosk and Perception of the messages of Mobile SMS and Information Kiosk.

3.4.2.1. Utility of messages of the Information Kiosk and Utility of messages of Mobile SMS

It is operationalized as the extent of utility observed by the messages given through Information Kiosk and Mobile SMS as perceived by the farmers.

The method used by Hassan (2008) was used for measuring this variable with some modifications. It is measured in terms of characteristics messages of an ICT. They are timeliness, reliability, relevancy, retrievability, adequacy, format clarity, practicability, simplicity.

Scoring pattern followed is represented in table 17. Summation of the score of all items gave the score of the respondents.

Table 17. Appropriateness wise scoring for attributes of messages of Information Kiosk and Mobile SMS

S. No	Category	Score
1.	All information	4
2.	Most information	3
3.	Some information	2
4.	No information	1

Statements used for the measurement of Utility of Information Kiosk and Mobile SMS is represented in 18.

Based on the scores the Utility Index was calculated using the formula.

$$\text{Utility Index (UI)} = \frac{\text{Individual subject's score}}{\text{Total score}} \times 100$$

Table 18. Statements for measuring Utility of messages of Mobile and Information Kiosk

Characteristics of information	All information	Most information	Some information	No information
Timeliness				
Reliability				
Relevancy				
Retrievability				
Adequacy				
Format clarity				
Practicability				
Simplicity				

3.4.2.2. Perception of the farmers towards Information Kiosk and Mobile SMS

Perception is the process of understanding sensation or attaching meaning based on experience to signs (Taneja, 1989). Perception in this case was operationalized as the farmer's opinion towards the features of the messages that they were exposed to through Information Kiosk and Mobile SMS.

To measure the perception level of subjects about the Information Kiosk method used by Balasubramani (2004) with some modifications and for the Mobile SMS, method used by Balasubramani (2010) with necessary modifications were used. In case of Mobile SMS, eight statements were positive and second and sixth statements were negative. These items were administered to the respondents in a three point continuum namely, most satisfied, satisfied and not satisfied.

Scoring pattern is represented in table 19 and the statements used for measuring the Perception towards Information Kiosk, Mobile SMS are given in table 20 and table 21 respectively.Summation of the score of all items gave the score of each respondent.

Table 19: Appropriateness wise scoring for perception towards Information Kiosk and Mobile SMS

Category	Score
Most satisfied	3
Satisfied	2
Not Satisfied	1

Based on the scores the Perception Index was calculated using the formula.

$$\text{Perception Index (PI)} = \frac{\text{Individual subject's score}}{\text{Total score}} \times 100$$

Table 20. Statements used for obtaining Perception towards Information Kiosk

S. No.	Category	MS	S	NS
I	**Content attributes of Information Kiosk**			
1.	Diagnostic path is sequential and logic			
2.	Diagnostic path leads to correct conclusion			
3.	Answers are based on field reality			
4.	Photographs helps for confirmation of disease, pest			
5.	Adequacy of photographs			
6.	Photo clarity			
7.	Adequacy of message			
8.	Clarity of message			
9.	Words and sentences are simple			

Table 20 continued

S. No.	Category	MS	S	NS
10.	Practical utility of message			
11.	Favours good interaction			
12.	Motivate to learn			
II.	**Display attributes of Information Kiosk**			
1.	Appearance and layout			
2.	Background colour			
3.	Size of the letter			
4.	Style of the letter			
5.	Colour of the letter			
III	**Physical attributes of Information Kiosk**			
1.	Easily portable			
2.	Ease in use and functionality			
IV	**Functional attributes of Information Kiosk**			
1.	As management tool			
2.	As decision support system			
3.	As extension tool			
4.	As training education tool			
5.	As diagnostic tool			

*MS - Most Satisfied, S - Satisfied, NS - Not Satisfied

Table 21. Statements used for obtaining Perception towards Mobile SMS

S. No.	Perception Statement	SA	UD	SD
1.	Easy to learn			
2.	Too expensive			
3.	Absolutely essential			
4.	Swift/ rapid information transfer			

Table 21 continued

S. No.	Perception Statement	SA	UD	SD
5.	Age no bar			
6.	Exclusive for literate groups			
7.	Plethora of information transfer			
8.	Used in contingencies			
9.	Used in emergencies			
10.	Portable			

*SA – Strongly Agree, UD – Undecided, SD – Strongly Disagree

3.5. TOOLS AND TECHNIQUES OF DATA COLLECTION

Taking into consideration the scope and objectives of the study a comprehensive interview schedule was prepared. A pilot study was conducted in Alappuzha and Kollam districts to pre-test the interview schedule so as to test and verify the applicability, understanding ability of the content of the interview schedule. The pre testing of interview schedule was done with 60 respondents selected from the non-sample area. Based on the response, the interview schedule was perfected by incorporating the relevant and deleting the irrelevant items to meet the objective of the study before its final administration. Precautions were taken to ensure that items were concise, unambiguous, comprehensive and complete.

The data regarding the profile of the participant farmers, advantages of Mobile SMS, information needs, awareness, attitude, perception, utility, effectiveness, constraints and suggestions about Information Kiosk and Mobile SMS were collected from the respondents with the help of a well-structured interview schedule. The interview schedule is furnished in Appendices.

Plate1. Extension personnels and farmer's interface with Agri Information Kiosk

3.6. STATISTICAL TOOLS USED

The data collected from the respondents were scored, tabulated and analyzed at College of Agriculture, Vellayani. Appropriate parametric and non-parametric tools were used to analyse the data and draw relevant inferences. Simple random sampling is the basic sampling technique where we select a group of subjects (a sample) for study from a larger group (a population). Each individual is chosen entirely by chance and each member of population has equal chance for being included in the sample. Every possible sample of a given size has the same chance of selection i.e., each member of the population is equally likely to be chosen at any stage in the sampling process. The following statistical tools were used.

3.6.1. Percentage analysis

Percentage analysis was used in descriptive analysis for making simple comparisons. It explains the distribution of respondents. For calculating percentages, the frequency of the particular cell was multiplied by 100 and divided by total number of respondents. Percentage was correlated to two decimal places.

3.6.2. Quartiles

Quartile deviation was used to categorize the respondents. It is based on the lower quartile Q_1 and the upper quartile Q_3. For a normally distributed data, the first quartile (Q_1) also called lower quartile, is equal to the data at the 25^{th} percentile of the data. The third quartile (Q_3) also called the upper quartile is equal to the data at the 75^{th} percentile of the data. It is a measure of dispersion. Quartile deviation uses the difference of first and third quartile as a measure of the dispersion. The observations obtained below first quartile Q_1 are taken to be low category, observations from first quartile Q_1 to third quartile Q_3 as medium category and above third quartile Q_3 for higher category for categorizing the respondents.

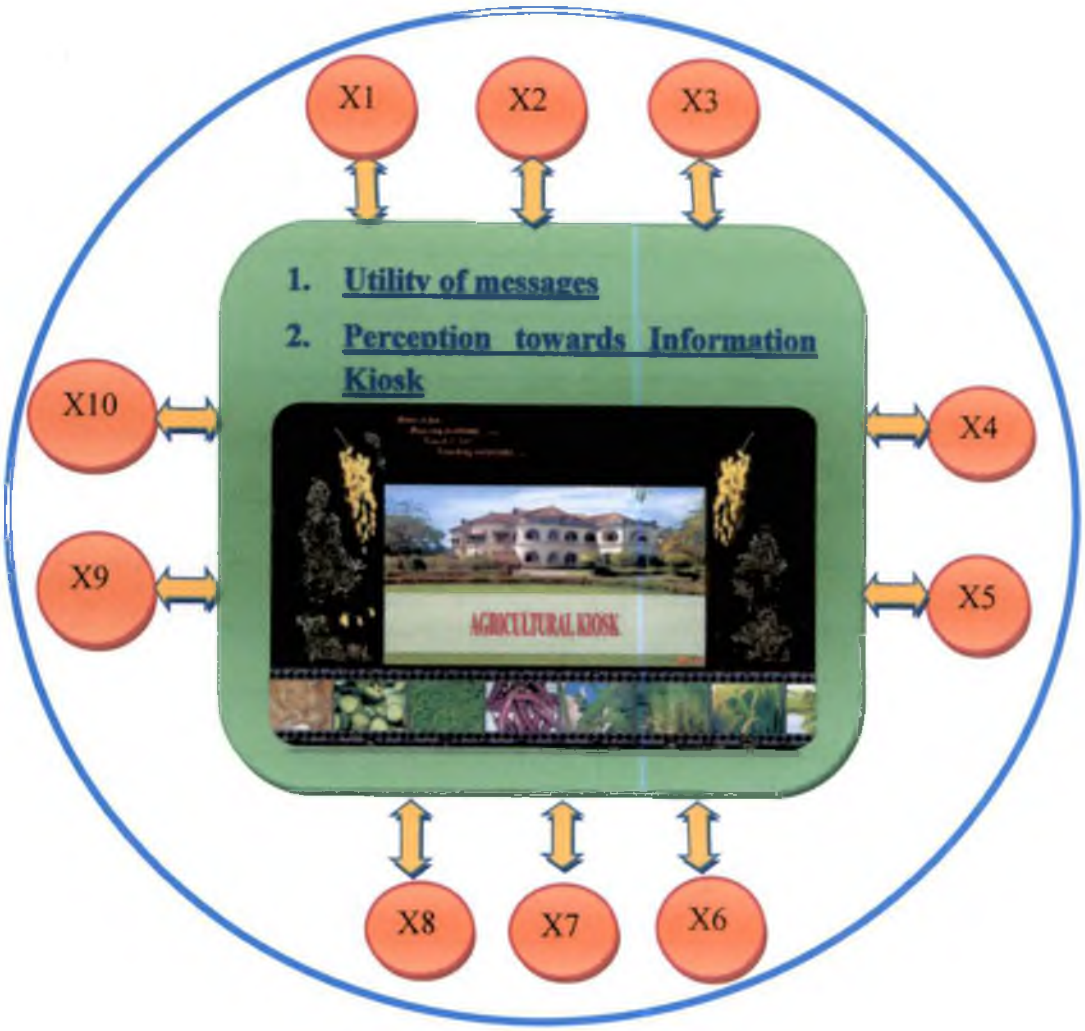
3.6.3. Correlation Analysis

Simple correlation analysis was done to explain the relationship of different characteristics of the farmers with the Utility of messages of Information Kiosk and Utility of messages of Mobile SMS and Perception about Information Kiosk and Mobile SMS. Correlation coefficient is a measure of the relationship between two variables. The correlation coefficient was worked out to measure the degree of relationship between the dependent variables 'Y' and the independent variables 'X'.

3.7. CONCEPTUAL FRAMEWORK OF THE STUDY

A conceptual model of the study has been framed based on the objectives set forth for the study, the concepts theoretically derived from the review of literature and factors influencing the Utility of messages of Information Kiosk, Utility of messages of Mobile SMS and Perception towards Information Kiosk, Perception towards Mobile SMS. The framework explains the relationship between the independent variables and the dependent variables namely Utility of messages and extent of Perception. The conceptual framework is given in figure 3(A) and figure 3 (B).

The findings of this study have been reported in the succeeding chapter with discussion.



X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X6- Frequency of use of messages

X7- Information needs

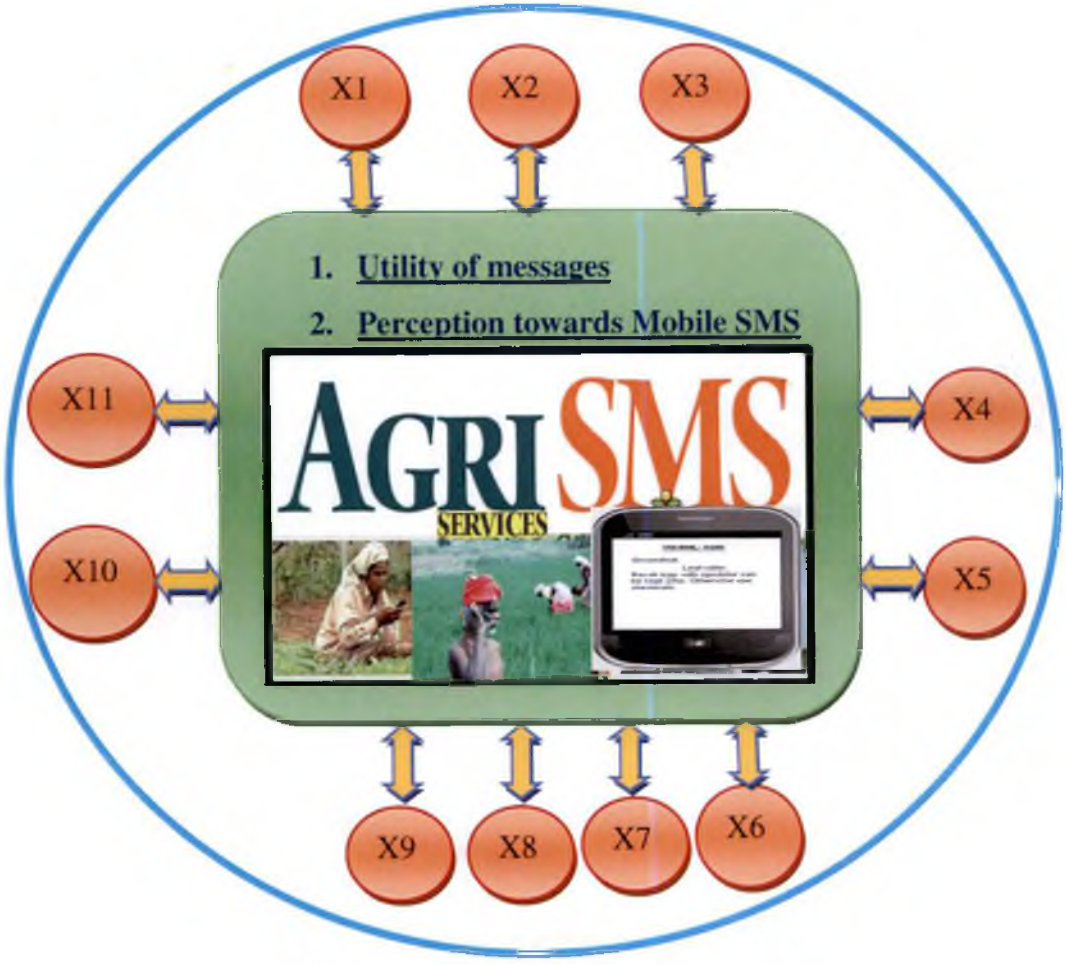
X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness Index of Information Kiosk

Figure 3. Conceptual framework of the study.

(A) Expected relationship between Utility of the messages of Information Kiosk and Perception towards Information Kiosk with independent variables



X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X11- Advantages of Mobile SMS

X6- Frequency of use of messages

X7- Information needs

X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness Index of Mobile SMS

Figure 3. Conceptual framework of the study.

(B) Expected relationship between Utility of the messages of Mobile SMS and Perception towards Mobile SMS with independent variables

Results and Discussion

4. RESULTS AND DISCUSSION

"The main body of a research report is results and discussion whose purpose is to provide sufficient information so as to arrive at valid conclusion and recommendations. Discussions help to interpret the result of the study in proper perspective and to relate them with other relevant studies, including the hypothesis - supported or non-supported".

- Ray and Mondal (1999)

The findings of the present investigation are presented in this chapter. The results are discussed and the inferences are drawn in the light of the objectives set forth simultaneously. These are presented under the following sub heads.

4.1 Profile characteristics of the respondents availing Information Kiosk and Mobile SMS services.

4.2 Awareness about Information Kiosk and Mobile SMS by the respondents.

4.3 Frequency of use of messages by respondents utilizing Information Kiosk and Mobile SMS services.

4.4 Attitude of the respondents about the Information Kiosk and Mobile SMS.

4.5 Assessment of information needs of the respondents availing services of Information Kiosk and Mobile SMS.

4.6 Effectiveness index of Information Kiosk and Mobile SMS services.

4.7 Classification of Mobile SMS with reference to crop, time and content.

4.8 Advantages of Mobile SMS as perceived by the respondents.

4.9 Constraints as perceived by the respondents while availing Information Kiosk and Mobile SMS services.

4.10 Utility of the information support through the Information Kiosks and Mobile SMS services as perceived by the respondents.

4.11 Extent of Perception of the respondents towards Information Kiosk and Mobile SMS.

4.12 Relationship between Utility of messages of Information Kiosk, extent of Perception towards Information Kiosk, Utility of messages of Mobile SMS and extent of Perception towards Mobile SMS with the independent variables.

4.13 Suggestions as perceived by the respondents.

4.14 Strategy for scaling up of uses of Information Kiosk and Mobile SMS.

4.1. PROFILE CHARACTERISTICS OF THE RESPONDENTS AVAILING THE SERVICES OF INFORMATION KIOSK AND MOBILE SMS

The first objective of the study is to know the profile characteristics of the farmers availing the services of Information Kiosk and Mobile SMS services which include personal and social profile characteristics.

This section presents the distribution of respondent farmers according to selected variables namely age, education, exposure to ICT (Information and Communication Technology) and information dissemination ways of farmers.

4.1.1. Age

The frequency distribution of respondents on the variable age is reported in table 22. Among the beneficiaries of Information Kiosk 12.5 percent were young, 32 per cent were middle aged and 7.5 per cent were old age groups.

Among the beneficiaries of Mobile SMS 13.33 percent were young, 48.33 per cent were middle aged and 38.33 per cent were old age groups. Majority (61%) of the respondents were middle to old aged. This is line with the findings of Hassan (2008) and Rahul (2013). This is represented in figure 4.

Table 22: Distribution of respondents based on age

Age category (in years)	Information Kiosk (Sample size=40)	Mobile SMS (Sample size=40)
Young (<35)	5(12.5)	8(13.33)
Middle (35-55)	32(80)	29(48.33)
Old (>55)	3(7.5)	23(38.33)

*Figures in parenthesis indicate percentages

4.1.2. Education

The frequency distribution of respondents on the variable education is given in table 23. Among the respondents availing services from Information Kiosk, 40 percent pursued high school education followed by collegiate education (30%), middle school and professional degree education (12.5%) and primary school (5%).

In case of Mobile SMS using respondents, majority were educated up to collegiate level (45%) followed by high school (26.66%), professional degree level (13.33 %), middle school (11.66%), primary school (3.33%) and none of the respondents in both the categories were observed under illiterate and can read and write category.

The higher level of education among the respondents was attributed to the well-developed educational system prevailing in the state as well as the high level of literacy owned by the people in the study area which was in conformity to the studies conducted by Thomas (2004) and Rahul (2013). This is represented in figure 5.

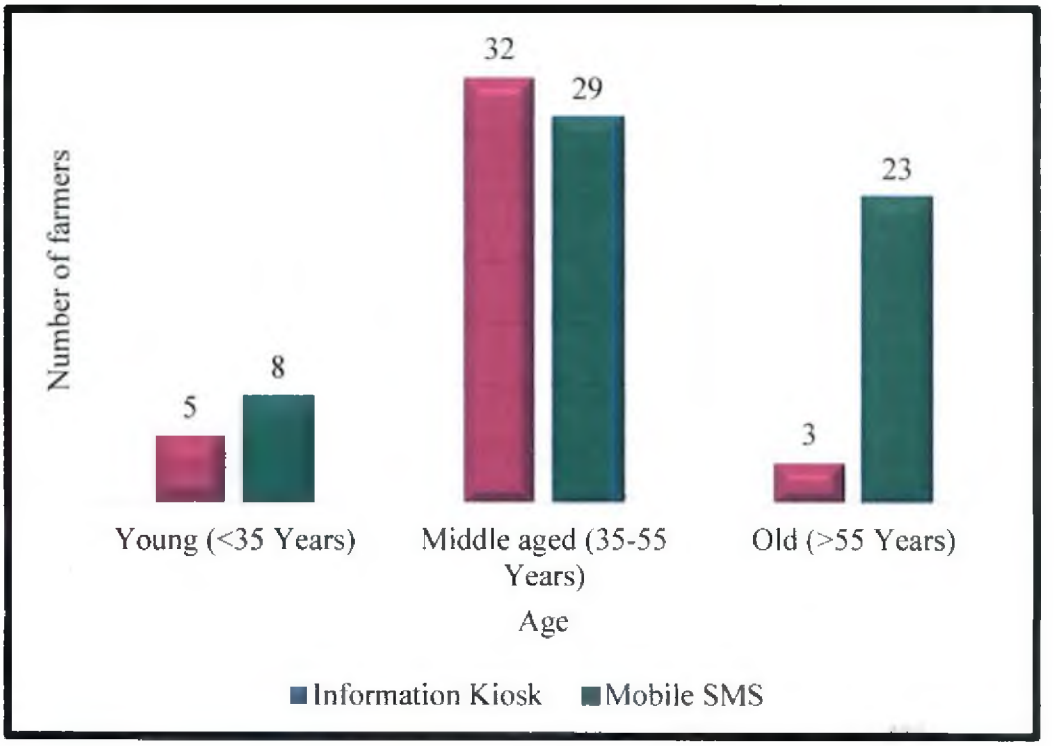


Figure 4. Distribution of respondents based on age

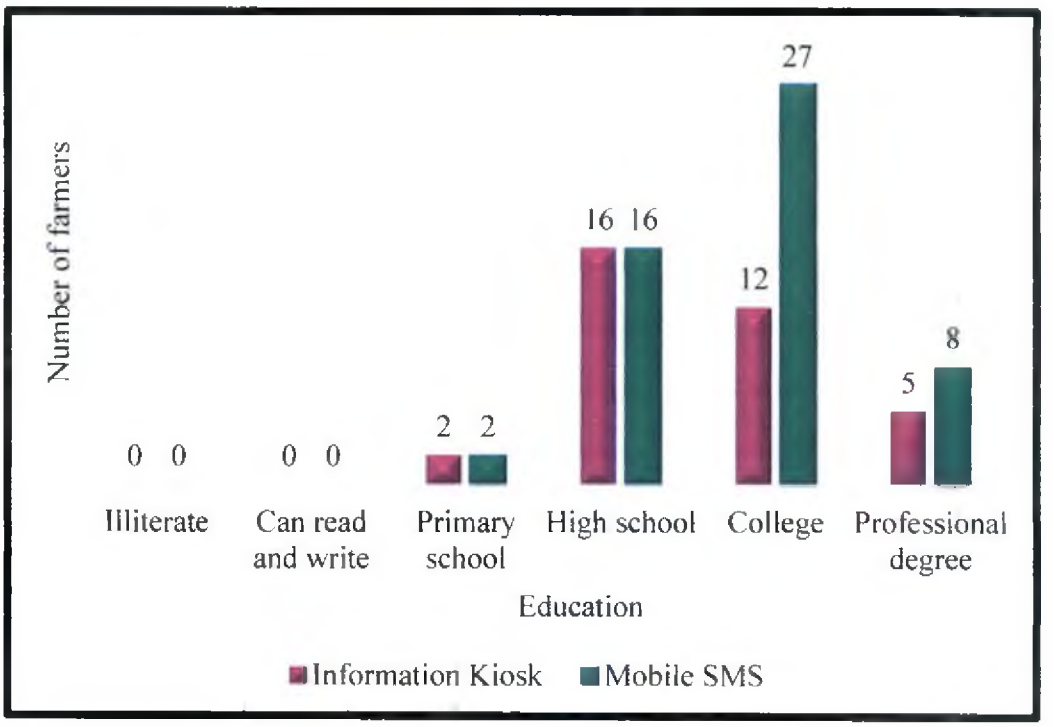


Figure 5. Distribution of respondents based on education

Table 23: Distribution of respondents based on education

S. No	Category	Information Kiosk (Sample size =40)		Mobile SMS (Sample size =60)	
		No.	Percentage	No.	Percentage
1.	Illiterate	--	--	--	--
2.	Can read and write	-	--	--	--
3.	Primary school	2	5	2	3.33
4.	Middle school	5	12.5	7	11.66
5.	High school	16	40	16	26.66
6.	College	12	30	27	45
7.	Professional degree	5	12.5	8	13.33

4.1.3. Exposure to Information and Communication Technology (ICT)

The frequency distribution of respondents on the variable exposure to Information and Communication Technology (ICT) is given in table 24. Majority of the farmers using Information Kiosk had medium exposure to ICT tools (67.5%) followed by high exposure to ICT tools (25%) and less exposure to ICT tools (2.5%).

In case of Mobile SMS receiving farmers, majority of them had medium exposure to ICT tools (51.66%) followed by both high exposure to ICT tools (25%) and less exposure to ICT tools (23.33%) based on quartiles. The farmers with scores less than quartile$_1$ are categorized to be having low exposure to ICT, between quartile $_1$ and quartile $_3$ as medium exposure to ICT and above quartile $_3$ as having high exposure to ICT.

This is because majority of the farmers being small and marginal, had less possession of ICT tools. They were unable to access ICT tools due to lack of awareness and pressing livelihood needs. Also may be due to working timings of the centre does not suit the timings of the farmer. This is represented in figure 6.

Table 24: Distribution of respondents based on exposure to ICT

S. No	Exposure to ICT	Information Kiosk (Sample size=40)		Mobile SMS (Sample size=60)	
		No.	%	No.	%
1	Low	3	7.5	14	23.33
2	Medium	27	67.5	31	51.66
3	High	10	25	15	25
	$Quartile_1$	24		28	
	$Quartile_2$	30		30	
	$Quartile_3$	34.25		39.25	
	Range	22-42		22-42	

The frequency distribution of ICT tools by the farmers using Information Kiosk is reported in table 25. Majority of the farmers (97.5%) availing services of Information Kiosk utilized both Mobile Phone and Television daily followed by Telephone (72.5%), Radio (70%), other ICT tools (42.5%) and both Computer and Internet (20%). Telephone was utilized by majority of the farmers (15%), Internet and Radio both were utilized equally by most of the farmers (12.5%) followed by Computer (10%) and all the three, other ICT tools, Mobile Phone and Television were utilized by least no of farmers (2.5%) for greater than two times a week. Majority of the farmers utilized Computer (17.5%) followed by Internet (15%), Radio (7.5%) and Telephone (7.5%) two times a week.

Few farmers utilized Computer (10%) followed by Internet (7.5%) once in a week and 2.5 per cent of the farmers utilized Radio and other ICT tools once in a fort night. Few farmers utilized Computer (12.5%), followed by Internet (7.5%) and other ICT tools (2.5%) once in a month. Majority of the farmers' utilization is nil for other ICT tools (50%) followed by Internet (37.5%), Computer (30%) and both Telephone (7.5%) and Radio (7.5%). This is represented in figure 7.

Table 25: Distribution of ICT tools according to the frequency of use by respondents using Information Kiosk (Sample size=40)

Category	Computer	Internet	Telephone	Mobile phone	T. V.	Radio	Other
Daily	8 (20)	8 (20)	29 (72.5)	39 (97.5)	39 (97.5)	28 (70)	17 (42.5)
Greater than Two times per week	4 (10)	5 (12.5)	6 (15)	1 (2.5)	1 (2.5)	5 (12.5)	1 (2.5)
Two times per week	7 (17.5)	6 (15)	2 (5)	--	--	3(7.5)	--
Once in a week	4 (10)	3 (7.5)	--	--	--	--	--
Once in a fortnight	--	--	--	--	--	1 (2.5)	1(2.5)
Once in a Month	5 (12.5)	3 (7.5)	--	--	--	--	1 (2.5)
Never	12 (30)	15 (37.5)	3 (7.5)	--	--	3 (7.5)	20 (50)

*Figures in parenthesis indicates percentage of the farmers.

The frequency distribution of ICT tools by the farmers using Mobile SMS is reported in table 26. Majority of the farmers utilized Television daily (98.44%) followed by Mobile Phone (93%), other ICT tools (85%), Telephone (76.66%), Radio (73.33%), Computer (36.66%) and Internet (23%).

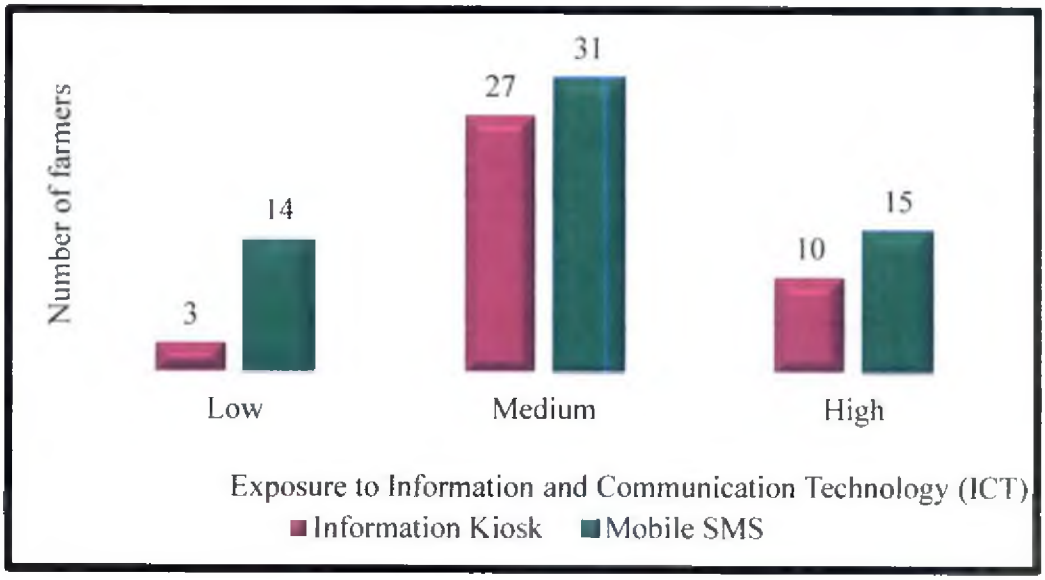


Figure 6.Distribution of respondents based on exposure to Information and Communication Technology (ICT)

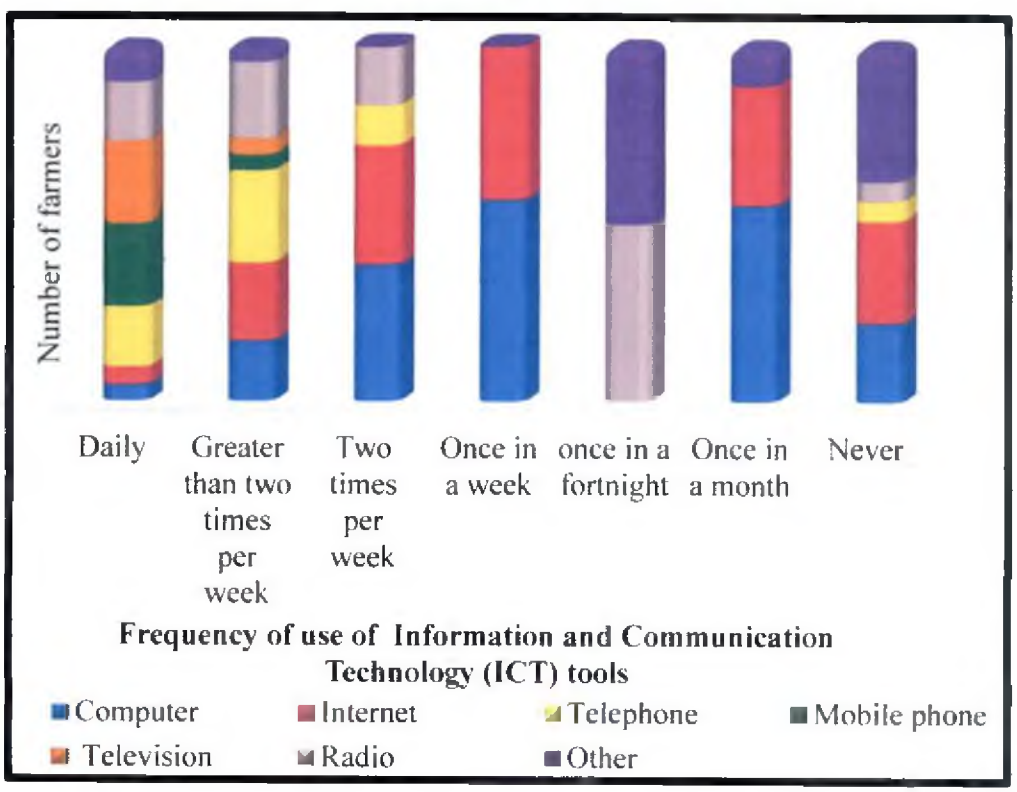


Figure 7.Distribution of ICT tools based on frequency of use by respondents of Information Kiosk

Computer was utilized by majority of the farmers (10%) followed by Radio (8.33%), both Internet and Telephone (6.66%), other ICT tools (5%), Mobile Phone (3.33%) and Television (1.66%) greater than two times a week.

Only Internet (21.6%), Mobile Phone (3.33%) and Radio (1.66%) was used by the farmers two times a week. The ICT tools which are used once in a week in the order of majority of the usage by the farmers are both Computer and Radio (8.33%), Telephone (3.33%), both Internet and other ICT tools (1.66%).

Few farmers utilized Computer (3.33%), followed by Internet (1.66%) once in a fortnight. Only Internet (6.66%) and Computer (3.33%) were used once in month by the farmers.

Majority of the farmers' utilization is nil for Internet (55%), followed by Computer (38%), Telephone (13.33%) and both Radio (8.33%) and other ICT tools (8.33%). This is represented in figure 8.

A cursory glance through the pooled data given in table 24 and table 25 combined depicts that Television was used by 98 per cent of the farmers and Mobile phone was used by 95 % of the respondents daily.

All the three ICT tools Computer, Telephone and Radio (10%) were used higher than other ICT tools greater than two times a week by farmers.

Internet was used by 19 per cent of the farmers two times a week and Computer was used by few farmers (9 %) once in a week. Computer (48%) and Internet (45 %) was not utilised by majority of the farmers.

This is due to the fact more than $3/4^{th}$ of the farmers had possessed Television sets followed by Mobile Phones. Few members owned land phones and very meagre percentage possessed Radio sets and Computers.

Table 26: Distribution of ICT tools according to the frequency of use by respondents using Mobile SMS (Sample size=60)

Category	Computer	Internet	Telephone	Mobile phone	T. V.	Radio	Other
Daily	22 (36.66)	14 (23)	46 (76.66)	56 (93)	59 (98.44)	44 (73.33)	51 (85)
Greater than Two times per week	6 (10)	4 (6.66)	4 (6.66)	2 (3.33)	1 (1.66)	5 (8.33)	3 (5)
Two times per week	--	13 (21.6)	--	2(3.33)	--	1 (1.66)	--
Once in a week	5 (8.33)	1 (1.66)	2 (3.33)	--	--	5 (8.33)	1 (1.66)
Once in fortnight	2 (3.33)	1 (1.66)	--	--	--	--	--
Once in a Month	2 (3.33)	4 (6.66)	--	--	--	--	--
Never	23 (38)	33 (55)	8 (13.33)	--	--	5 (8.33)	5(8.33)

*Figures in parenthesis indicates percentage of the farmers

This is also in line with the findings of the Halakatti *et al.* (2010) where majority of the respondents' utilised television for getting farm related information.

4.1.4. Information dissemination

The frequency distribution of utilisation of information dissemination ways by the farmers using Information Kiosk and Mobile SMS is given in table 27. It

indicates that majority of the farmers utilizing Information Kiosk services disseminated messages by word of mouth (72.5%) followed by Mobile/Telephone (62.5%), by adopting messages in field (57.5%), by e-mail (7.5%) and letters (2.5%).

Majority of the farmers receiving Mobile SMS disseminated information through both Mobile/Telephone and adopting in field (98%) followed by word of mouth (88%), letters (48%) and e-mail (21.66%).

This is attributed to high level of communication between farmers at field and farmer's meeting places, neighbourhoods for various purposes and contacts through Telephone and Mobile phone for various purposes. It indicates very high exchange of information among the farmers. This is represented in figure 9.

Table 27: The frequency distribution of Information dissemination ways by the respondents using Information Kiosk and Mobile SMS

S. No	Category	Information Kiosk (Sample size =40)		Mobile SMS (Sample size=60)	
		No.	Percentage	No.	Percentage
1	By word of mouth	29	72.5	53	88.33
2	Mobile/ telephone	25	62.5	59	98
3	By adopting in field	23	57.5	59	98
4	By e-mail	3	7.5	13	21.66
5	Letters	1	2.5	29	48

4.2. AWARENESS ABOUT INFORMATION KIOSK AND MOBILE SMS BY THE RESPONDENTS

Awareness source of Information Kiosk and Mobile SMS as perceived by the respondents were studied. The frequency distribution of awareness source of farmers availing Information Kiosk services is presented in table 28.

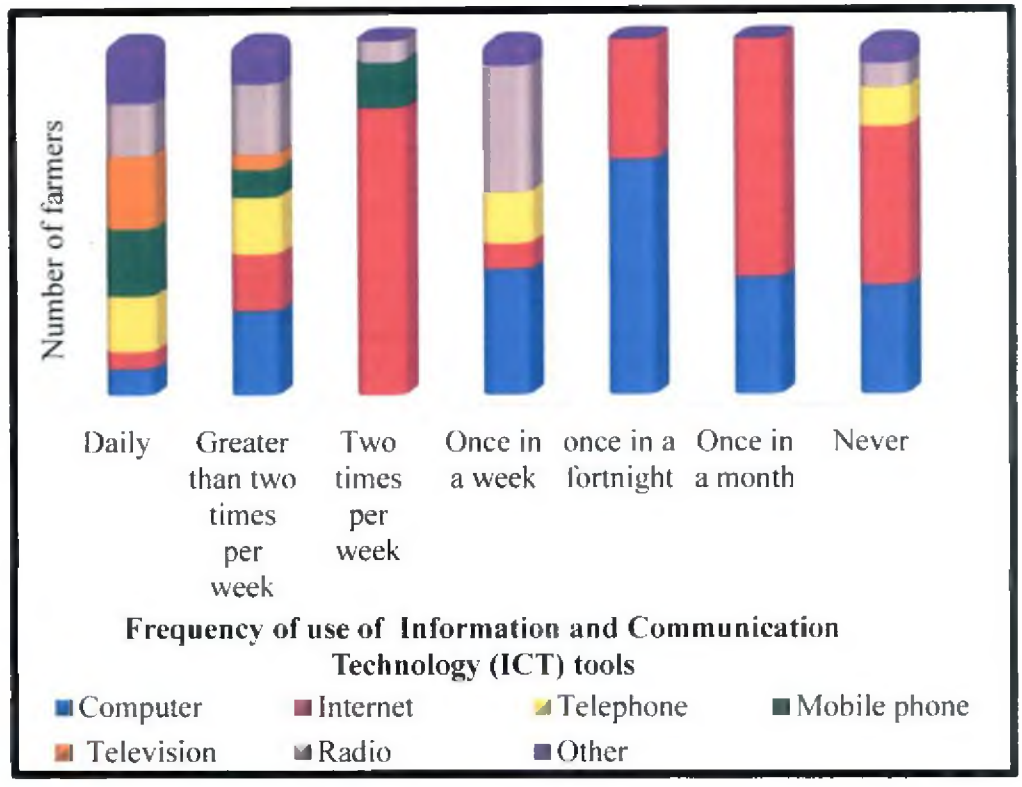


Figure 8. Distribution of ICT tools based on frequency of use by respondents of Mobile SMS

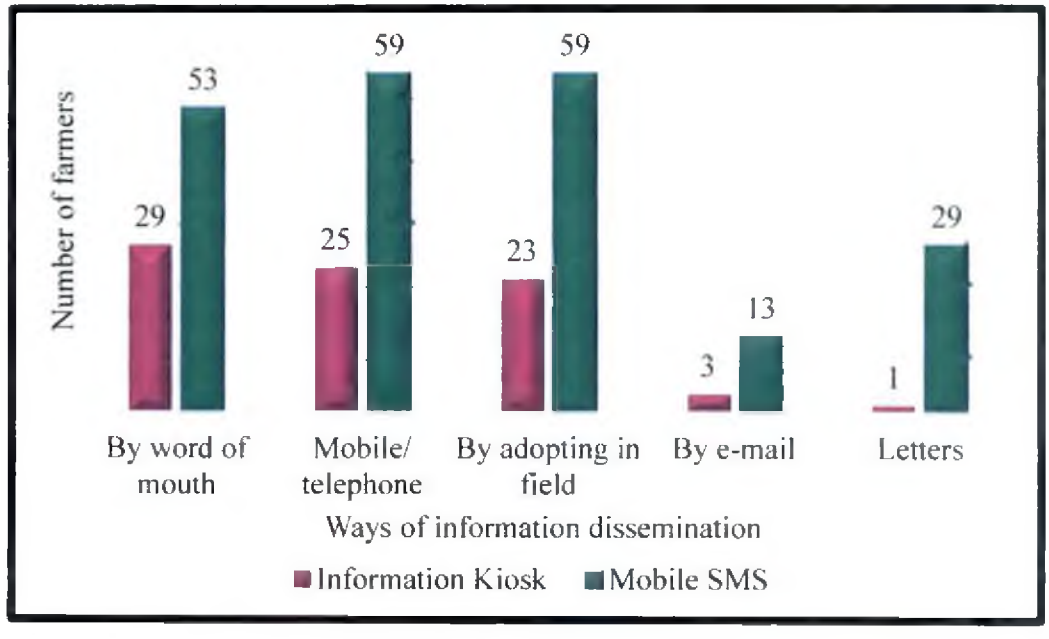


Figure 9. Distribution of respondents based on ways of information dissemination

It indicates that majority of the farmers (35%) became aware of Information Kiosk through with Krishi Bhavans and markets where Information Kiosks were placed, followed by canvassing through project staff (30%), newspaper (15%), contact with extension personnel (12.5%) and friend/relative (7.5%). This is represented in figure 10.

Table 28: Frequency distribution of awareness source of respondents availing Information Kiosk services

S. No	Awareness source (Sample size=40)	Number	Percentage	Rank
1	You visited yourself	14	35	I
2	Canvassing through project staff	12	30	II
3	Newspaper	6	15	III
4	Through extension personnel	5	12.5	IV
5	Friend/relative	3	7.5	V

The frequency distribution of awareness source of farmers availing Mobile SMS services is reported in table 29. In case of farmers receiving Mobile SMS majority of them became aware through extension personnel (95%) followed by friend/relative (11.66%), newspaper (10%), Canvassing through project staff (6.66%) and others (3.33 %). This is represented in figure 11.

Table 29: Frequency distribution of awareness source of respondents availing Mobile SMS services

S. No	Awareness source (Sample size=60	Number	Percentage	Rank
1	Through extension personnel	57	95	I
2	Friend/relative	7	11.66	II
3	Newspaper	6	10	III
4	Canvassing through project staff	4	6.66	IV
5	Other	2	3.33	V

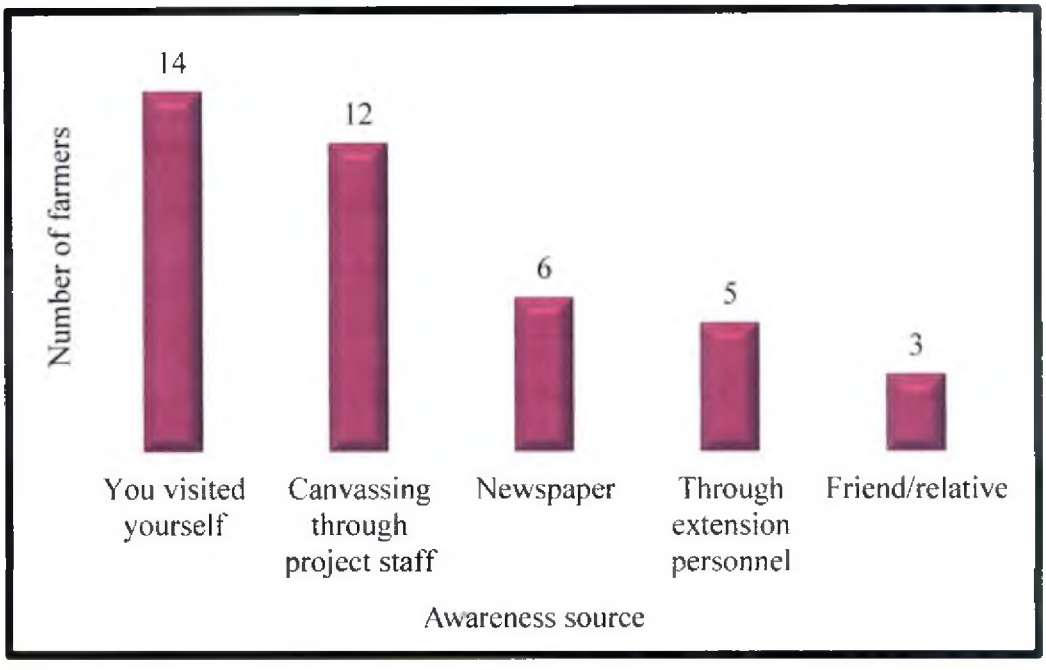


Figure 10. Distribution of respondents based on awareness source about Information Kiosk

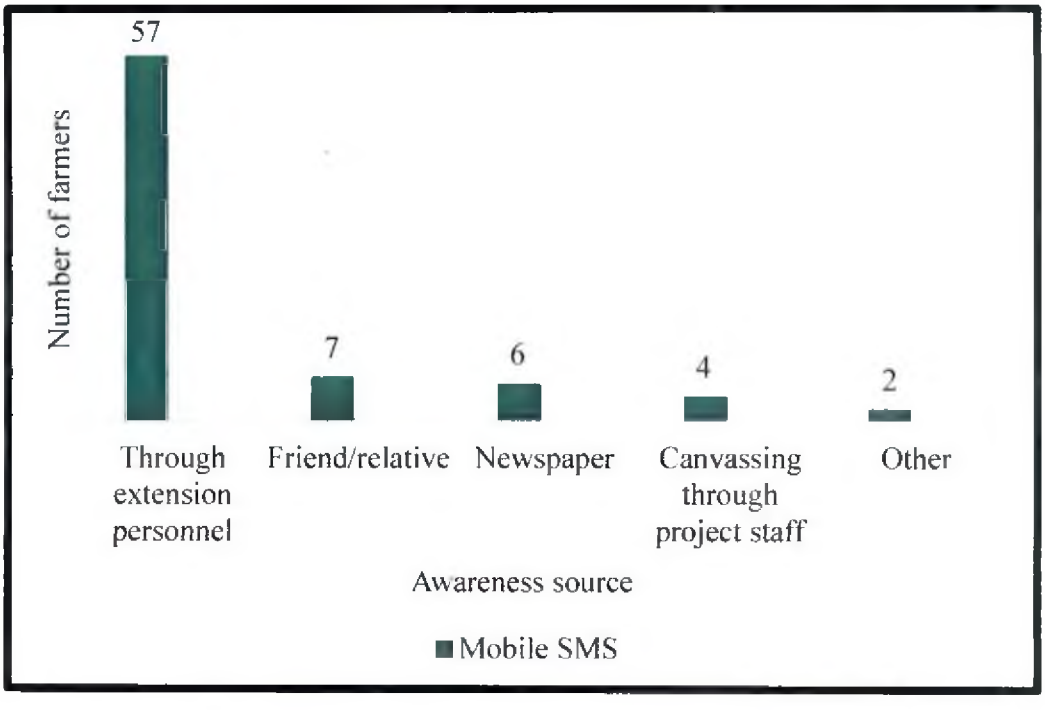


Figure 11. Distribution of respondents based on awareness source about Mobile SMS

This is because majority of the farmers were frequently contacting Krishi Bhavans for getting agricultural information. As the Information Kiosks were installed at Krishi Bhavans and markets most of the farmers have themselves visited it and became aware of it. Training programmes conducted by project investigators and staff contributed to awareness about Information Kiosk to the farmers. Newspapers, extension personnel, friends/ relatives also contributed to the awareness of the farmers about the Information Kiosk.

Majority of the farmers became aware of the Mobile SMS through extension personnel because farmers regularly visit scientist and agricultural officers for information and with their communication only farmers enrol their name for availing Mobile SMS services.

4.3. FREQUENCY OF USE OF MESSAGES BY RESPONDENTS UTILIZING INFORMATION KIOSK AND MOBILE SMS SERVICES

Frequency of utilization of the messages of Information Kiosk and Mobile SMS by the farmers are tabulated and are presented in table 30 and table 31 respectively and frequency of utilization of the messages of Information Kiosk and Mobile SMS is represented in figure 12 and figure 13 respectively.

Majority of the farmers utilized the messages of Information Kiosk for 4-5 times (35%) followed by more than ten times and 6-10 times (20%), followed by 2-3 times (15%) and both only once (5%) and regularly (5%).

In case of farmers receiving Mobile SMS majority of the farmers utilized the messages for only once (40%), regularly (20%), 2-3 times (15%), 4-5 times (10%), more than ten times (8.33%) and 6-10 times (6.66%).

Majority of the farmers utilised messages only for 4-5 times because farmers could not locate the Information Kiosk. Timings at the centre may not be suited to the working timings of the farmer. Sometimes Information Kiosk was not functioning owing to infrastructure problems like supply of electricity etc. In case

of Mobile SMS majority of the farmers utilised only once since the SMS are pushed in English language which may not be understandable to the farmers and also content was not specific to the crops grown by the farmer and location.

Table 30: Distribution of respondents based on frequency of use of messages of Information Kiosk

S. No	Frequency of use of messages (Sample size=40)	Number	Percentage	Rank
1	4-5 times	14	35	I
2	More than ten times	8	20	II
3	6-10 times	8	20	II
4	2-3 times	6	15	III
5	Only once	2	5	IV
6	Regularly	2	5	V
7	Never	--	--	--

Table 31: Distribution of respondents based on frequency of use of Mobile SMS

S. No	Frequency of use of messages (Sample size=60)	Number	Percentage	Rank
1	Only once	24	40	I
2	Regularly	12	20	II
3	2-3 times	9	15	III
4	4-5 times	6	10	IV
5	More than ten times	5	8.33	V
6	6-10 times	4	6.66	VI
7	Never	--	--	--

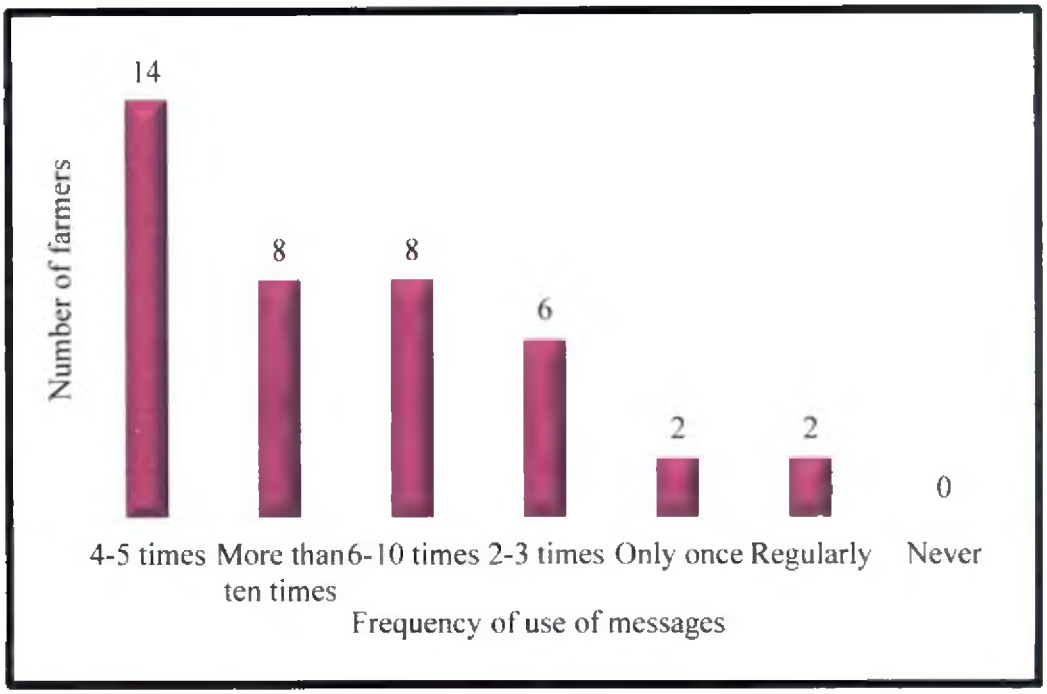


Figure 12. Distribution of respondents based on frequency of use of messages of Information Kiosk

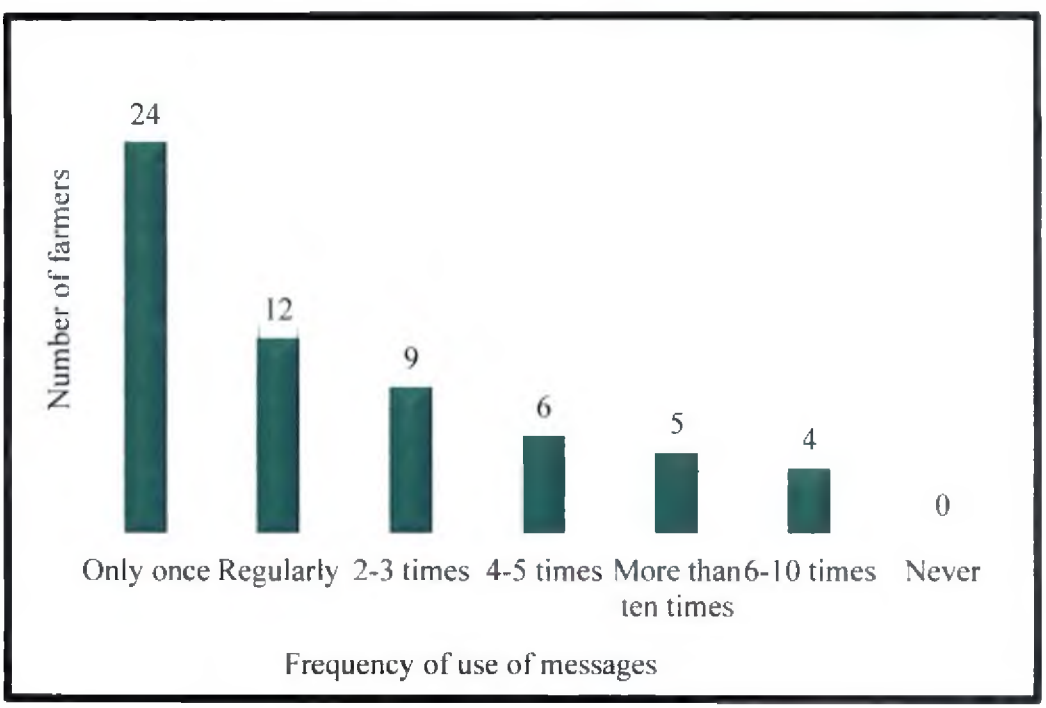


Figure 13. Distribution of respondents based on frequency of use of Mobile SMS

4.4. ATTITUDE OF FARMERS TOWARDS INFORMATION KIOSK AND MOBILE SMS

Attitude of farmers towards Information Kiosk and Mobile SMS was measured with the help of attitude scale as detailed in chapter III. The respondents are categorized into less favourable attitude, favourable attitude and more favourable attitude based on quartiles. Farmers with attitude scores less than $quartile_1$ are categorized to be having less favourable attitude, farmers with attitude scores between $quartile_1$ and $quartile_2$ as possessing favourable attitude and farmers with attitude scores more than $quartile_3$ as having highly favourable attitude.

The frequency distribution of farmers according to their attitude about Information Kiosk and Mobile SMS is presented in table 32. Majority of the farmers (52.5%) had favourable attitude towards Information Kiosk followed by more favourable attitude (25%) and less favourable attitude (22.5%). Majority of the farmers (51.66%) had favourable attitude towards Mobile SMS followed by more favourable attitude (25%) and less favourable attitude (23.33%). This is in line with the findings of Kumar (2008). This is represented in figure 14.

Table 32: Distribution of farmers according to their attitude towards Information Kiosk and Mobile SMS

S. No	Attitude	Information Kiosk (Sample size=40)		Mobile SMS (Sample size=60)	
		No.	%	No.	%
1	Less favourable	9	22.5	14	23.33
2	Favourable	21	52.5	31	51.66
3	More favourable	10	25	15	25
	$Quartile_1$	44.75		40	
	$Quartile_2$	48		42	
	$Quartile_3$	50.25		49.25	
	Range	36-54		30-50	

4.5. ASSESSMENT OF INFORMATION NEEDS OF THE FARMERS

The important link between the whole chain of Information Technology (IT) networks and their applications is for the ultimate benefit of the farmers. To achieve sustainability and success of ICT (Information and Communication Technology) projects for agricultural development, we must begin with the real needs of the farmers. In this back drop, understanding farmers and their information needs attain significant role. In this research investigation, an attempt was made to study the information needs of farmers.

The frequency distribution of farmers based on information needs utilising Information Kiosk and receiving Mobile SMS is reported in table 33. It is clear from the table 33, that majority of the farmers utilizing Information Kiosk had medium level of information needs (50%) followed by both high information needs (25%) and less information needs (25%). In case of Mobile SMS using farmers, majority of them had medium level of information needs (58.3%) followed by both high information needs (23.3%) and less information needs (18.33%) based on quartiles. This is represented in figure 15.

Table 33: Distribution of farmers based on information needs utilising Information Kiosk and receiving Mobile SMS

S. No	Extent of information needs	Information Kiosk (Sample size=40)		Mobile SMS (Sample size=60)	
		No.	%	No.	%
1	Low	10	25	11	18.33
2	Medium	20	50	35	58.33
3	High	10	25	14	23.33
	$Quartile_1$	44.3		63.77	
	$Quartile_2$	49.9		72.27	
	$Quartile_3$	70.4		79.71	
	Range	40-82.9		41.45-88.22	

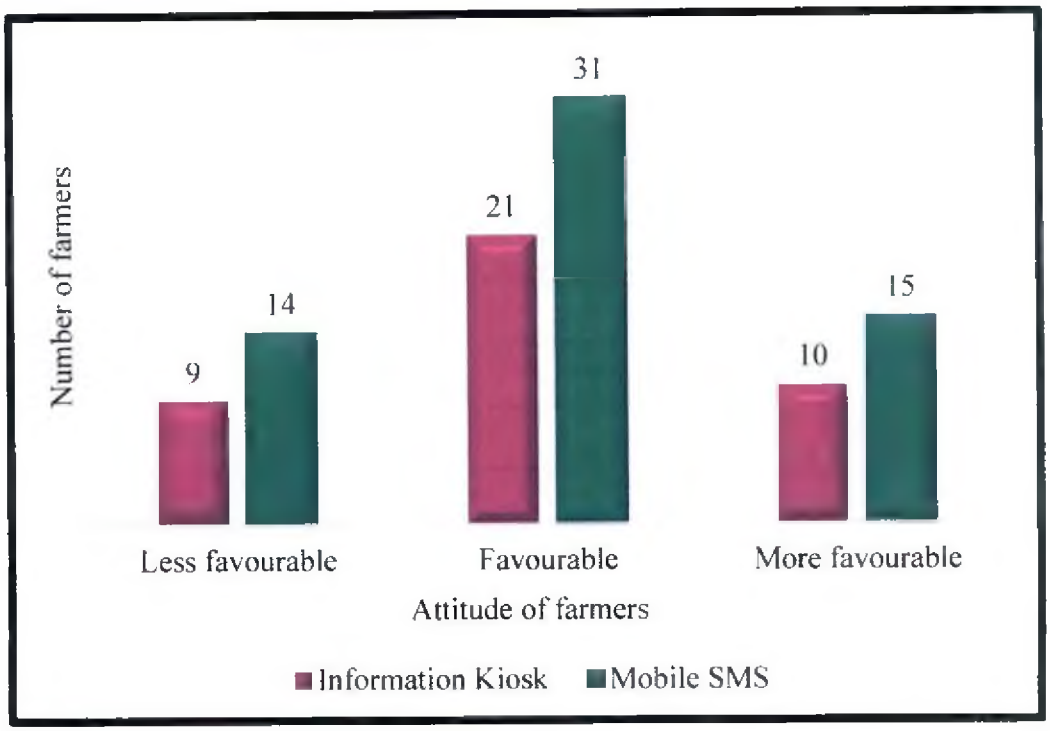


Figure 14. Distribution of respondents based on attitude

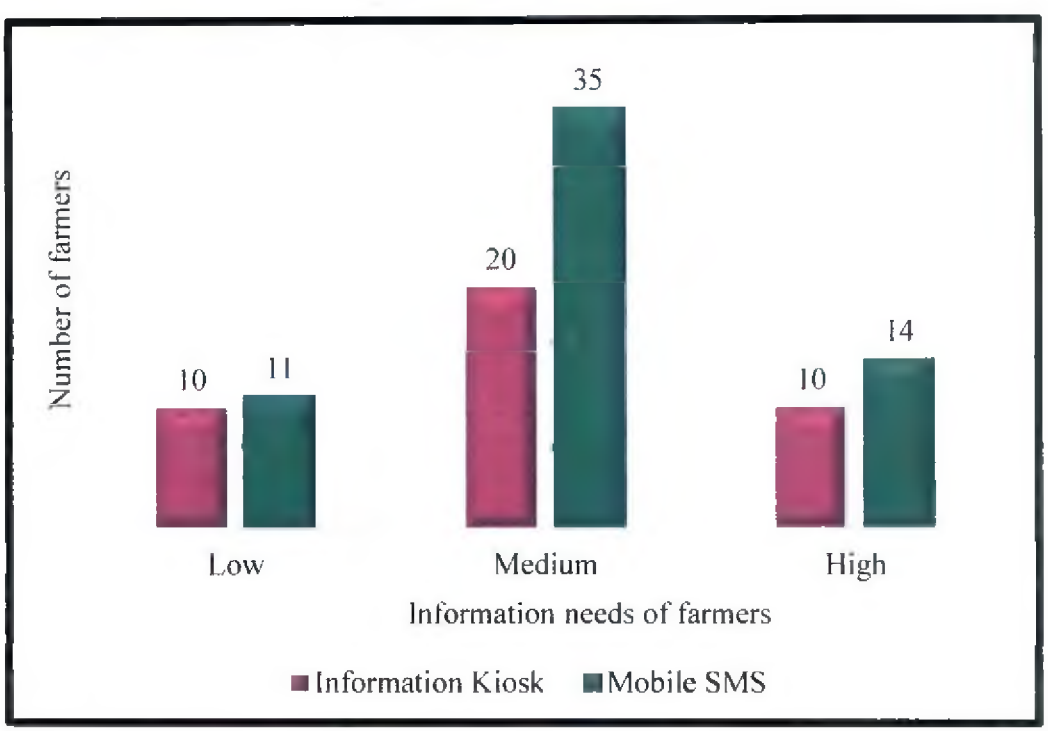


Figure 15. Distribution of respondents based on information needs

The information needs of the farmers availing Information Kiosk services were studied to assess their information needs. The various areas of information services were categorized as most needed, needed, less needed and needed based on their felt importance by the farmers.

4.5.1. Information Kiosk beneficiaries

The frequency distribution of information needs as perceived by the farmers utilizing Information Kiosk is presented in table 34. A cursory glance into the table 34 reveals that out of twenty eight information needs listed, seven were perceived most needed, fourteen were perceived as needed, six were perceived as less needed and only two were perceived as not needed by the farmers. Input prices and availability need service was perceived as most needed and needed equally by majority of the farmers.

The information needs in rank order of their importance in terms of most need intensity are detailed below. It is represented in figure 16.

- ***Market information and price trends and advises from scientists on crop management***

These were the first most important information service 72.5 percentage of farmers perceived as most needed. This information provides an opportunity to choose a market on the basis of prevailing price and sell their produce in their chosen market and earn more returns on their investment.

Scientist's advices provide an opportunity to farmers to equip with latest techniques, new varieties and advices to their problems etc. from a group of experts pertaining to crop husbandry. This is in conformity with the results of Kumar (2008).

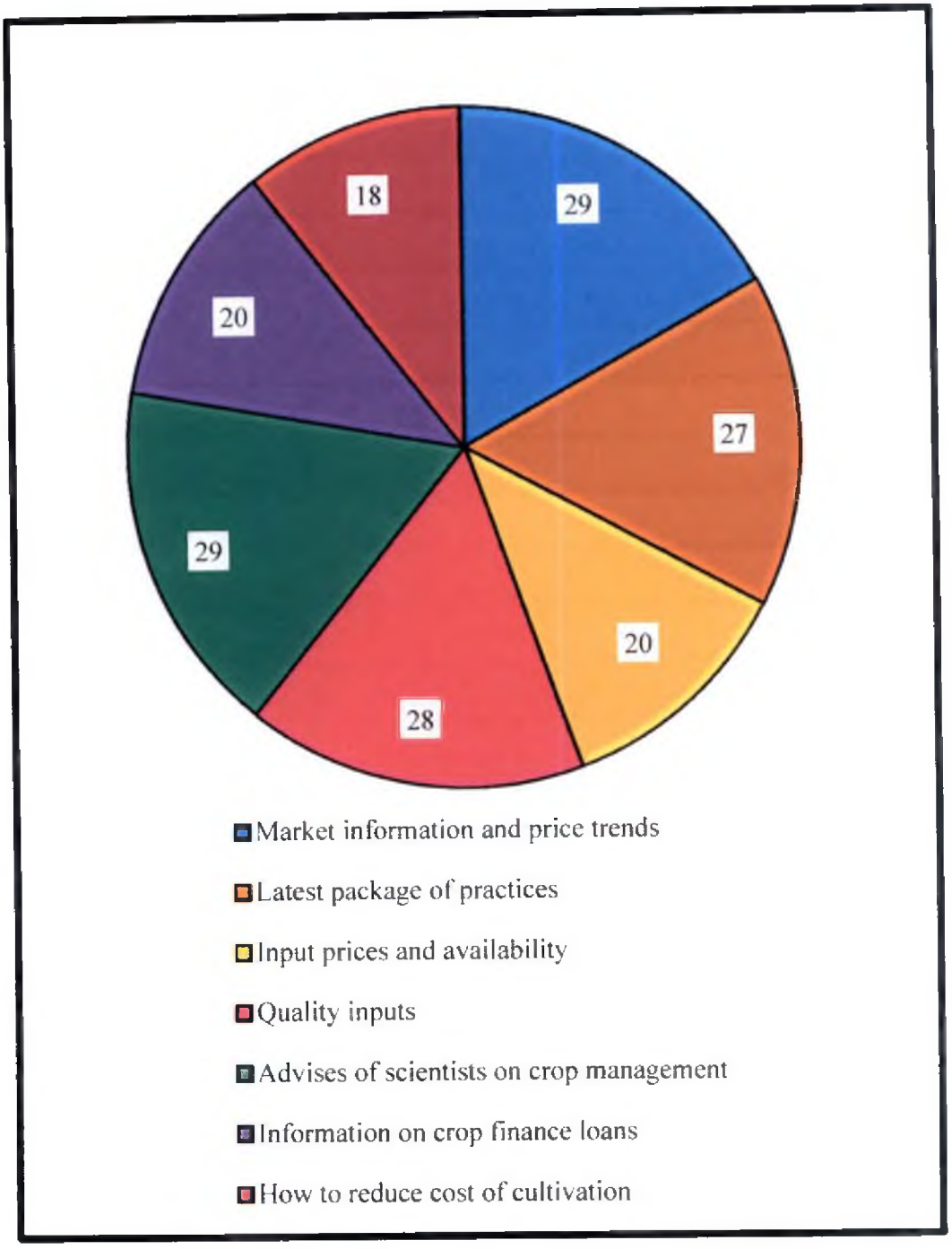


Figure 16. Frequency distribution of most needed information services as perceived by majority number of Information Kiosk respondents

- ***Quality inputs***

These were the second most important information service seventy percentage of farmers perceived as most needed. This information provides an opportunity to enhance the productivity and quality of the produce which increases the demand for the product, nutritive value, shelf-life and also meets export standards.

- ***Latest package of practices***

These were the third most important information service 67.5 percentage of farmers perceived as most needed. This information provides the farmers with the easier and newest technology and makes them updated with the benefits of the current practices of cultivation. It helps the farmers to carry out timely operations, management practices which leads to increased productivity. This is in conformity with the results of Kumar (2008).

- ***Input prices and availability and information on crop finance loans***

These were the fourth most important information services as perceived by 50 percentage of the farmers. This may be because of high cosmopoliteness and high access to information sources such as pesticides, fertilizer outlets etc., by the farmers.

Most of the farmers are not availing crop loans owing to prevailing unawareness about all kinds of institutional sources of credit. This restricted them to get all kinds of loans for agricultural development. Credit at the right time enables the farmer to go for cultivation of the crops at the right time and reduces availing of finance from non-institutional sources which might lead to distress sales. Hence, information about crop loans provided by different banks are felt as most important needed service for the farmers.

- ***How to reduce cost of cultivation***

These were the fifth most important information services as perceived by 45 percentage of the farmers. As this may be because of increased cost of cultivation during these years which incur more investment on same unit of land without an additional returns. This is in conformity with the results of Kumar (2008).

The following information services are felt as needed by the farmers. This is represented in figure 17.

- ***Disease/pest early warning system and management***

This was the first needed information area as perceived by majority of the farmers (57.5%). It can be inferred that crops grown in this district are more prone to the diseases, frequent attack of pests and diseases demands this information. This will help in better management and reduce the input expenditure. It will help in taking precautionary measures and avoids huge losses.

- ***Crop insurance and Government policies regarding agriculture***

This was the second felt needed information service needed by the farmers (55%). The detailed information about crop insurance schemes, the nature of damage and nature of compensation, premium to be paid etc., were felt needed information by the farmers.

Farmers are interested in knowing about the government policies because with this information they will be getting assistance from the government authorities and can avail subsidies and benefits provided by the government.

- ***Integrated Nutrient management and water management***

Integrated Nutrient management (52.5%) and water management (52.5%) are the third needed information service by the farmers. This might be because

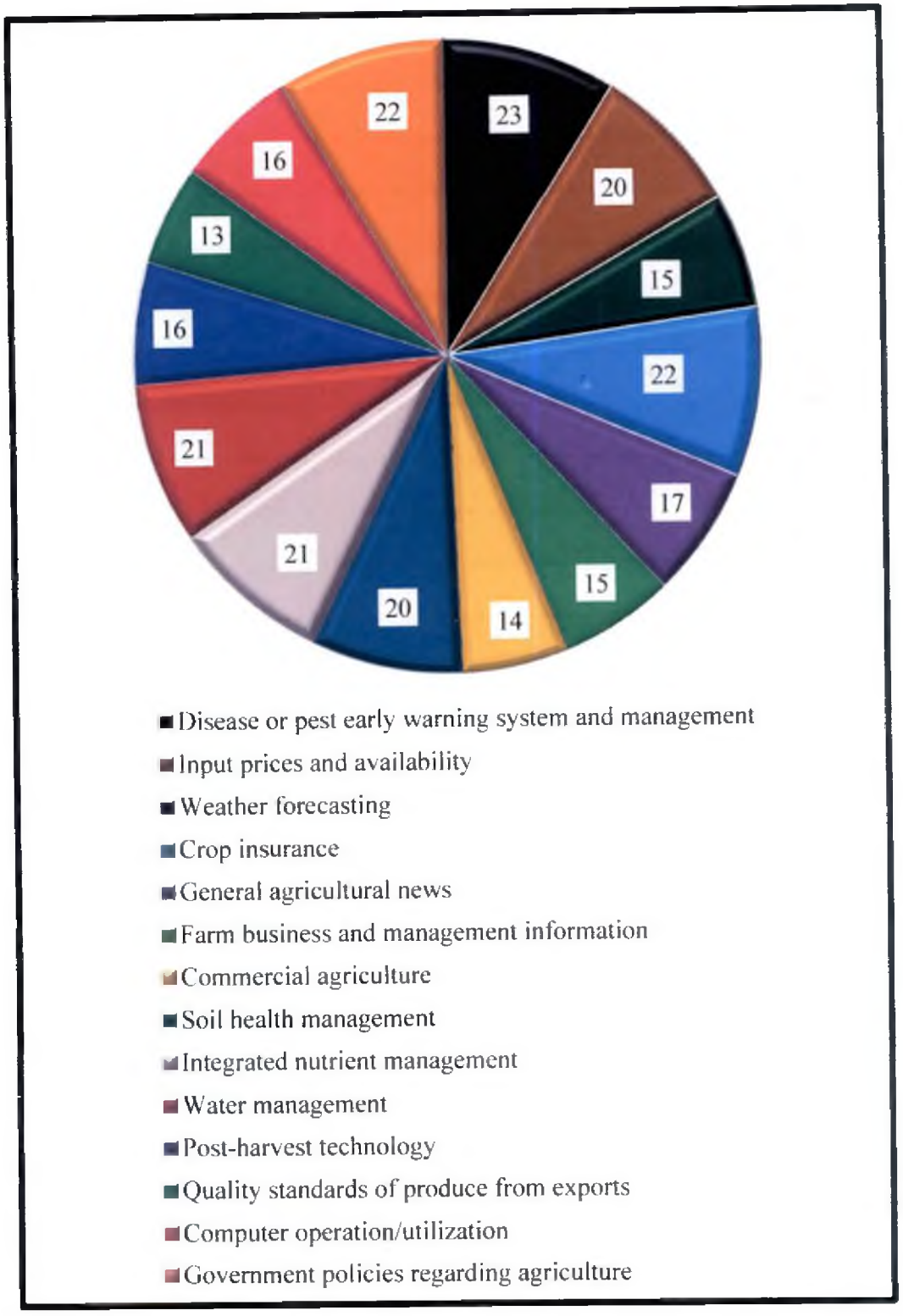


Figure 17. Frequency distribution of needed information services as perceived by majority number of Information Kiosk respondents

increased area under nutrient depletion, indiscriminate use of fertilizers, pesticides, unbalanced fertilizer application and stagnated yields of the crops.

Information services on water management would help in increasing water use efficiency resulting in increased productivity.

- ***Soil health management and input prices and availability***

Soil health management (50%) and input prices and availability (50%) are the fourth needed information service by the farmers. This might be because increased area under nutrient depletion, indiscriminate use of fertilizers, pesticides, unbalanced fertilizer application and stagnated yields of the crops.

Knowledge about the appropriate cost effective inputs and the information regarding their availability will increase the access of the various quality inputs to the farmers and leads to higher net returns.

- ***General agricultural news***

This is the fifth needed information service by the farmers (42.5%) which provides basic knowledge of operating and functioning of agriculture department, its services and prices of various crops in different markets.

- ***Computer operation/ utilization and post- harvest technology***

They are the sixth needed information service by the farmers (40%). Computer operation will help the farmers in getting necessary information from websites about availability of inputs, prices etc.

Knowledge about post- harvest technology will help in better storage of produce, maintaining quality, increase in shelf life and getting favourable price for the produce.

- ***Weather forecasting and farm business and management information***

They are seventh needed information service by the farmers (37.5%). Agriculture is dependent on weather conditions, hence it is apt to know the weather forecasting to take up any precautionary activity.

As the governments are promoting agriculture as an entrepreneurial activity for increased returns, farmers are motivated to know about the farm business and management information.

- ***Commercial agriculture***

It is the eighth needed information service by the farmers by thirty five per cent of the farmers. Vegetables have high commercial value. Increased knowledge in seed production activities for these crops will further enhance their horizons in agricultural aspects. They are interested in knowing about the high income generating crops.

- ***Quality standards of export produce***

It is the ninth needed information service by the farmers (32.5%). Knowledge about this information area will help farmers in exporting their produce to higher demand areas thereby getting more income.

The following information services are felt as less needed by the farmers. This is represented in figure 18.

- ***Success stories of farmers***

Fifty per cent of the farmers considered Success stories of farmers as first less needed information service. This might be because farmers are not interested in knowing the success stories due to their perception that succeeded farmers' conditions are different and their ventures or practices cannot be replicated in their conditions.

- ***Facilitation of land records***

This was considered as second less needed by the majority of the farmers (52.5%). This might be because all the respondents are possessing land records with passbooks issued by concerned authorities. This is in line with the findings of Kumar (2008).

- ***Water conservation through drip and sprinkler irrigation system***

Fifty per cent of the farmers considered water conservation through drip and sprinkler irrigation system as third less needed information service. This might be because availability of sufficient quantity of irrigation for the crop production and well- built water supplying sources.

- ***Information on rural development programmes and value addition to produce***

Information on rural development programmes (47.5%) and value addition to produce (47.5%) are considered are fourth less needed information service by the farmers. Socio economic conditions are good and may be most of the farmers perceive that they do not need to know about the rural development programmes. Majority of the farmers are small and marginal farmers. Farmers might not be aware of value addition alternatives and so were not seeking any information and value addition alternatives.

- ***Dry land crops and practices***

Dry land crops and practices (40%) are considered less needed information service by majority of the farmers. This is due to the fact that availability of sufficient amount of water through the tanks and bore wells which are a major source for irrigation in this district and many farmers are possessing irrigation facility, this was not felt as their need.

The following information services are felt as not needed by the farmers. This is represented in figure 19.

- ***Dairy and poultry management and market infrastructure like ware houses and cold storages***

Dairy and poultry management (42.5%) and market infrastructure like ware houses and cold storages (50%) are considered not needed by majority of the farmers. This may be due to most of the farmers were not possessing cattle and poultry farm as an allied occupation. As most of the farmers are only small and marginal and they are not aware of storing the produce in warehouses. In case of vegetable and fruit cultivating farmers, the products are marketed immediately through the intervention of VFPCK (Vegetable and Fruit Promotion Council Keralam) and also in village outlets every day.

Table 34: Frequency distribution of information needs service by the farmers utilizing Information Kiosk

Information needs	Most needed	Needed	Less needed	Not needed
Market information and price trends	**29 (72.5)**	11(27.5)	--	--
Latest package of practices	**27(67.5)**	13(32.5)	--	--
Pest early warning system and management	12(30)	**23(57.5)**	5(12.5)	--
Input prices and availability	**20(50)**	**20(50)**	--	--
Weather forecasting	14(35)	**15(37.5)**	11(27.5)	--
Information on rural development programmes	10(25)	8(20)	**19(47.5)**	3(7.5)
Crop insurance	7(17.5)	**22(55)**	11(27.5)	--
General agricultural news	12(30)	**17(42.5)**	11(27.5)	--
Facilitation of land records	2(5)	10(25)	**21(52.5)**	7(17.5)
Quality inputs	**28(70)**	8(20)	3(7.5)	1(2.5)

Table 34 continued

Information needs	Most needed	Needed	Less needed	Not needed
Farm business and management information	4(10)	**15(37.5)**	11(27.5)	10(25)
Commercial agriculture	12(30)	**14(35)**	11(27.5)	3(7.5)
Soil health management	12(30)	**20(50)**	7(17.5)	1(2.5)
Integrated nutrient management	14(35)	**21(52.5)**	5(12.5)	--
Water management	12(30)	**21(52.5)**	7(17.5)	--
Water conservation through drip and sprinklers	5(12.5)	9(22.5)	**20(50)**	6(15)
Post-harvest technology	4(10)	**16(40)**	14(35)	6(15)
Dry land crops and practices	3(7.5)	9(22.5)	**16(40)**	12(30)
Quality standards of produce from exports	5(12.5)	**13(32.5)**	12(30)	10(25)
Computer operation/utilization	6(15)	**16(40)**	15(37.5)	3(7.5)
Dairy and poultry management information	9(22.5)	6(15)	8(20)	**17(42.5)**
Market infrastructure like warehouses and cold storages	4(10)	4(10)	12(30)	**20(50)**
Advises of scientists on crop management	**29(72.5)**	7(17.5)	2(5)	2(5)
Information on crop finance loans	**20(50)**	15(37.5)	5(12.5)	--
Success stories of farmers	9(22.5)	6(15)	**22(55)**	3(7.5)
Value addition to produce	8(20)	8(20)	**19(47.5)**	5(12.5)
How to reduce cost of cultivation	**18(45)**	16(40)	6(15)	--
Government policies regarding agriculture	8(20)	**22(55)**	9(22.5)	1(2.5)

*Figures in parenthesis indicate percentages

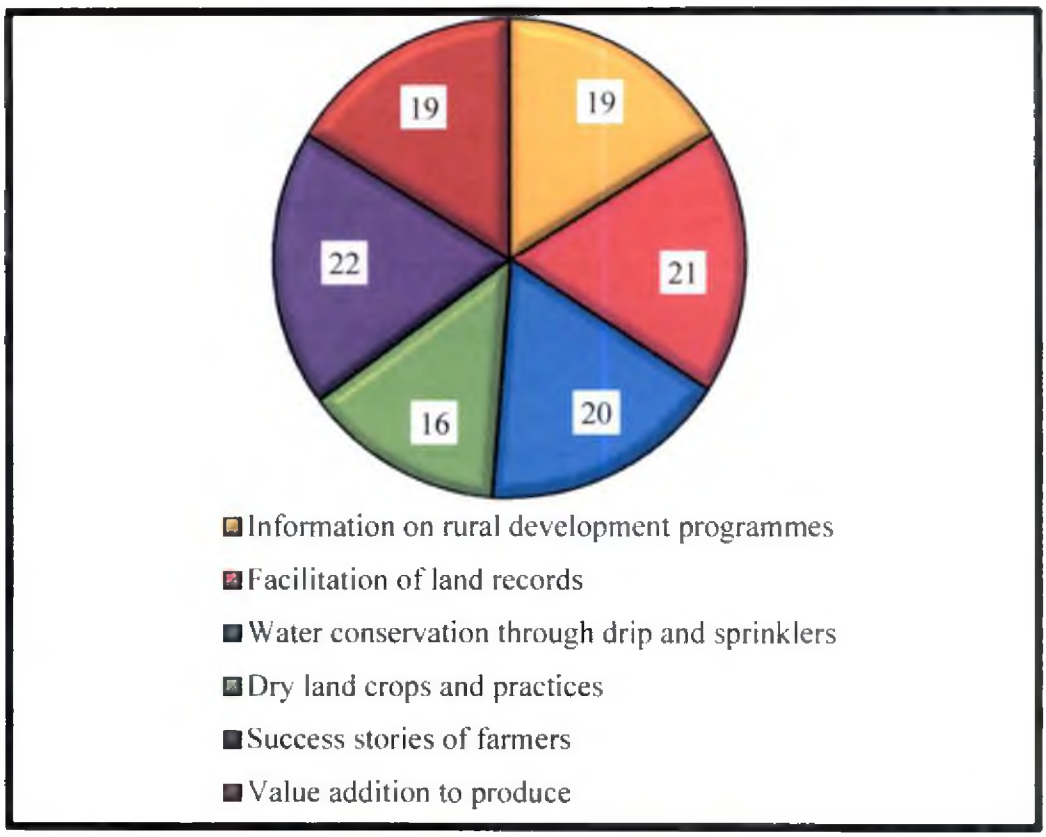


Figure 18. Frequency distribution of less needed information services as perceived by majority number of Information Kiosk respondents

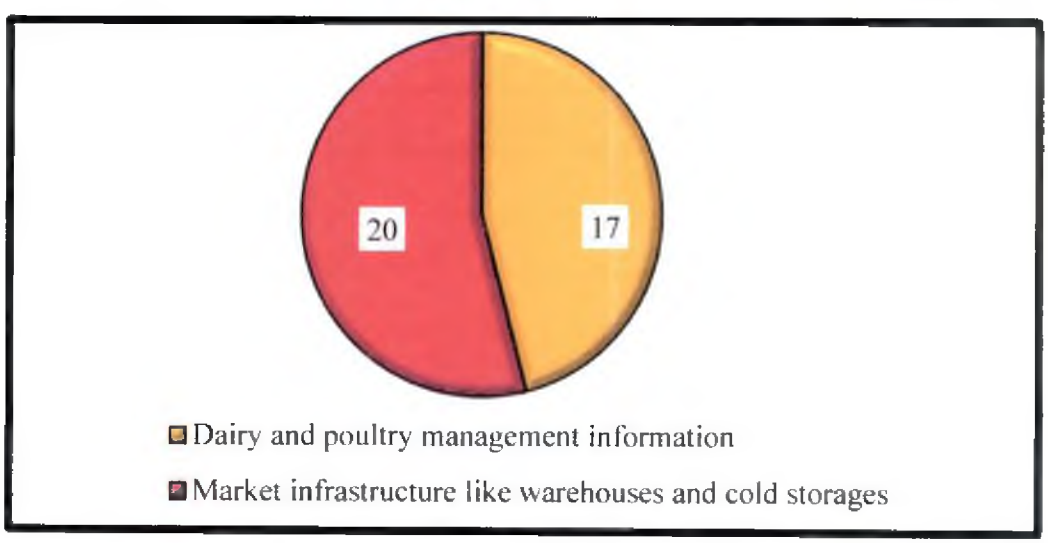


Figure 19. Frequency distribution of not needed information services as perceived by majority number of Information Kiosk respondents

4.5.2. Mobile SMS beneficiaries

The frequency distribution of information needs as perceived by the farmers utilizing Mobile SMS is presented in table 35. Of the twenty eight information needs listed, twenty two were perceived as most needed, five were perceived as needed, one was perceived as less needed by the farmers.

For farmers who are utilizing Mobile SMS services the most needed information services in the order of ranking were as follows. This is represented in figure 20.

- ***Advises of scientists on crop management and quality inputs***

Advises of scientists on crop management and quality inputs were opined as first most needed information service by the majority of the farmers (91.66%). Scientist's advices provide an opportunity to farmers to equip with latest techniques, new varieties and advices to their problems etc. from a group of experts pertaining to crop husbandry. This is in conformity with the results of Kumar (2008). Quality inputs information provides an opportunity to enhance the productivity and quality of the produce which increases the demand for the product, nutritive value, shelf-life and also meets export standards.

- ***Weather forecasting, integrated nutrient management and soil health management***

Weather forecasting, integrated nutrient management and soil health management were the second most needed information service by the farmers (90%). Agriculture is dependent on weather conditions, it is apt to know the weather forecasting to take up any precautionary activity.

Integrated nutrient management and soil health management information helps in replenishing the soil nutrients and increases soil fertility, soil microorganisms and maintains ecological balance. This might be caused because,

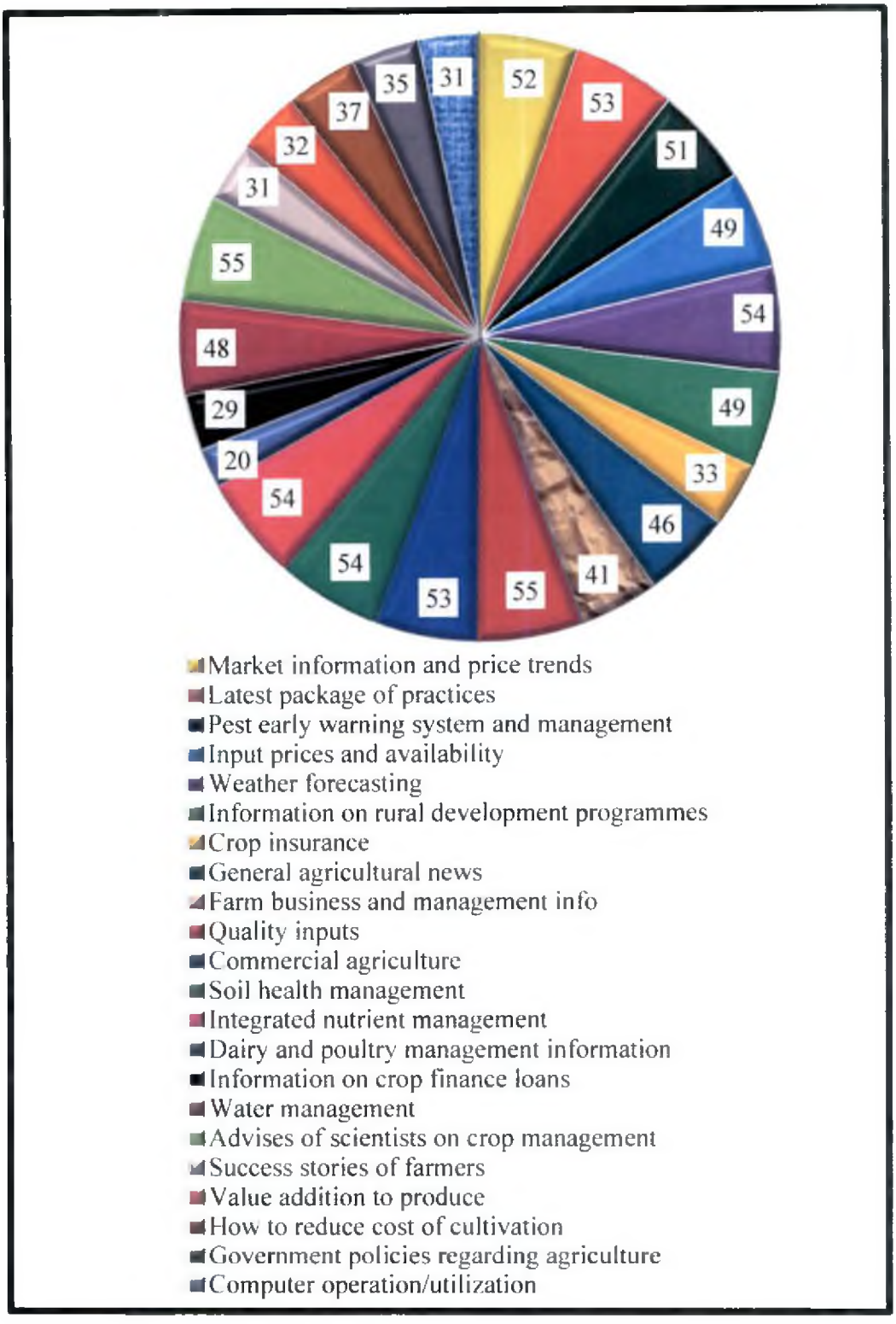


Figure 20. Frequency distribution of most needed information services as perceived by majority number of Mobile SMS respondents

there is increased area under nutrient depletion due to indiscriminate use of fertilizers, pesticides and unbalanced fertilizer application resulting in stagnated yields of the crops.

- ***Commercial agriculture and latest package of practices***

Commercial agriculture and latest package of practices (88.33%) were the third most needed information service by the farmers. Vegetables have high commercial value. Increased knowledge in seed production activities for these crops will further enhance their horizons in agricultural aspects. Farmers are interested in knowing about the high income generating crops.

Latest package of practices information provides the farmers with the easier and newest technology and makes them updated with the benefits of the current practices of cultivation. It helps the farmers to carry out timely operations, management practices which leads to increased productivity. This is in conformity with the results of Kumar (2008).

- ***Market information and price trends***

Market information and price trends (86.66%) were the fourth most needed information service by the farmers. This information provides an opportunity to choose a market on the basis of prevailing price and sell their produce in their chosen market and earn more returns on their investment.

- ***Disease or pest early warning system and management***

Disease or pest early warning system and management (85%) was the fifth most needed information service by the farmers. It can be inferred that crops grown in this district are more prone to the diseases, frequent attack of pests and diseases demands this information. This will help in better management and reduce the input expenditure. It will help in taking precautionary measures and avoids huge losses.

- ***Information on rural development programmes and input prices and availability***

Information on rural development programmes and input prices and availability were felt as sixth most needed information source by 81.66 % of the farmers. This might be because most of the farmers were not aware of the rural development programmes implemented in the district.

Knowledge about the appropriate cost effective inputs and the information regarding their availability will increase the access of the various quality inputs to the farmers and leads to higher net returns.

- ***Water management***

Water management was considered as most needed information source by 80% of the farmers. Farmers who are interested in hi-tech farming and using of micro irrigation methods felt the need for knowledge regarding water management. Water management will increase water use efficiency resulting in increased productivity.

- ***General agricultural news***

General agricultural news was the eight needed information service by the farmers (76.66%). This provides knowledge about operating and functioning of agriculture department, its services and prices of various crops in different markets.

- ***Farm business and management information***

Farm business and management information (68.33%) was the ninth most needed information service by the farmers. As the governments are promoting agriculture as an entrepreneurial activity for increased returns, farmers are motivated to know about the farm business and management information.

- ***How to reduce cost of cultivation***

This was the tenth most needed information service by the farmers (61.66%). This may be because of increased cost of cultivation during these years which incur more investment on same unit of land without an additional returns. This is in conformity with the results of Kumar (2008).

- ***Government policies regarding agriculture***

Government policies regarding agriculture is the eleventh most needed information service by the farmers (58.33%). Farmers are interested in knowing about the government policies because with this information they will be getting assistance from the government authorities and can avail subsidies and benefits provided by the government.

- ***Crop insurance***

The detailed information about crop insurance schemes, the nature of damage and nature of compensation, premium to be paid etc., were felt most needed information service by fifty five per cent of the farmers.

- ***Value addition to produce***

This was considered as most needed information service by 53.33 per cent of farmers. Value addition to produce fetches more price. Several Self Help Groups (SHGs) are being operated in the district marketing many value added products. Hence this information was felt as most needed.

- ***Computer operation /utilization and success stories of farmers***

Computer operation /utilization and success stories of farmers were considered as most needed by the farmers (51.66%). Computer operation will help the farmers in getting necessary information from websites about availability of

inputs, prices etc. Success stories of farmers motivate and provide principles and ideas for starting a farm business/ getting higher returns.

- ***Information on crop finance loans***

Information on crop finance loans was the fifteenth most needed information service by the farmers (48.33%). Most of the farmers are not availing crop loans owing to prevailing unawareness about all kinds of institutional sources of credit. This restricted them to get all kinds of loans for agricultural development. Hence it was perceived as most needed.

- ***Dairy and poultry management and marketing information***

Dairy and poultry management and marketing information was the sixteenth most needed information service by the farmers (33.33%). Farmers possessing cattle and poultry farms need information on various management and marketing aspects related to production, disease control, prices etc.

The information services are felt as needed by the farmers in order of ranking were. This is represented in figure 21.

- ***Quality standards of produce for exports***

Quality standards of produce for exports was the first needed information service by fifty per cent of the farmers. Knowledge about this information area will help farmers in exporting their produce to higher demand areas thereby getting more income.

- ***Facilitation of land records***

Facilitation of land records was the second needed information service by the farmers (48.33%). This might be because farmers want to ensure about the various details regarding land registration, pass books, concerned authorities and various programmes, schemes related to it.

- *Dry land crops and practices*

Forty five per cent of the farmers considered this as the third needed information service. Knowledge about dry land crops and practices helps the farmers cultivate crops in summer and in areas where sufficient irrigation is absent.

- ***Water conservation through drip and sprinklers and post-harvest technology***

Water conservation through drip and sprinklers and post-harvest technology was considered as fourth needed information service by the farmers (43.33%). Micro irrigation methods conserve water and they are very important in hi-tech and precision farming systems. Knowledge about the post- harvest technology will help in better storage of produce, maintaining quality, increase in shelf life and getting favourable price for the produce.

The following information services are felt as not needed by the farmers.

- ***Market infrastructure like warehouses and cold storages***

Market infrastructure like warehouses and cold storages (43.33%) was felt as not needed by majority of the farmers because most of the farmers are only small and marginal and they are not aware of storing the produce in warehouses. In case of vegetable and fruit cultivating farmers, the products are marketed immediately through the intervention of VFPCK (Vegetable and Fruit Promotion Council Keralam) and also in village outlets every day. This is represented in figure 21.

Table 35: Frequency distribution of information needs service by the farmers utilizing Mobile SMS

Information needs	Most needed	Needed	Less needed	Not needed
Market information and price trends	**52(86.66)**	8(13.33)	--	--
Latest package of practices	**53(88.33)**	5(8.33)	--	11(18.33)
Pest early warning system and management	**51(85)**	9(15)	--	--
Input prices and availability	**49(81.66)**	11(18.33)	--	--
Weather forecasting	**54(90)**	5(8.33)	1(1.66)	--
Information on rural development programmes	**49(81.66)**	9(15)	2(3.33)	--
Crop insurance	**33(55)**	25(41.66)	1(1.66)	1(1.66)
General agricultural news	**46(76.66)**	11(18.33)	1(1.66)	2(3.33)
Farm business and management info	**41(68.33)**	16(26.66)	1(1.66)	11(18.33)
Facilitation of land records	28(46.66)	**29(48.33)**	3(5)	--
Quality inputs	**55(91.66)**	4(6.66)	1(1.66)	--
Commercial agriculture	**53(88.33)**	6(10)	1(1.66)	--
Soil health management	**54(90)**	5(8.33)	1(1.66)	--
Integrated nutrient management	**54(90)**	5(8.33)	1(1.66)	--
Water conservation through drip and sprinklers	11(18.33)	**26(43.33)**	4(6.66)	19(3.16)
Post-harvest technology	11(18.33)	**26(43.33)**	4(6.66)	18(30)
Dry land crops and practices	4(6.66)	**27(45)**	5(8.33)	24(40)
Quality standards of produce from exports	6(10)	**30(50)**	14(23.33)	10(16.66)

Table 35 continued

Information needs	Most needed	Needed	Less needed	Not needed
Dairy and poultry management information	**20(33.33)**	18(30)	4(6.66)	18(30)
Information on crop finance loans	**29(48.33)**	27(45)	3(5)	1(1.66)
Market infrastructure like warehouses and cold storages	10(16.66)	16(26.66)	8(13.33)	**26(43.33)**
Water management	**48(80)**	11(18.33)	1(1.66)	--
Advises of scientists on crop management	**55(91.66)**	5(8.33)	--	--
Success stories of farmers	**31(51.66)**	26(43.33)	3(5)	--
Value addition to produce	**32(53.33)**	25(41.66)	1(1.66)	2(3.33)
How to reduce cost of cultivation	**37(61.66)**	21(35)	2(3.33)	--
Government policies regarding agriculture	**35(58.33)**	22(36.66)	3(5)	--
Computer operation/usage	**31(51.66)**	12(20)	4(6.66)	13(21.66)

*Figures in parenthesis indicate percentages

4.6. EFFECTIVENESS INDEX OF KIOSK AND MOBILE SMS

Effectiveness index of Information Kiosk and Mobile SMS was measured with the help of scale as detailed in chapter III. The respondents are categorized according to their perceived effectiveness towards Information Kiosk and Mobile SMS into low effectiveness, medium effectiveness and high effectiveness category.

It is clear from the table 36 that majority of the farmers reported medium effectiveness (50%) of the messages given by Information Kiosk followed by both high effectiveness (25%) and less effectiveness (25%) whereas for Mobile SMS

receiving farmers majority of them opined medium effectiveness (53.3%) of the messages followed by high effectiveness (25%) and less effectiveness (21.6%) based on quartiles. This is represented in figure 22.

The frequency distribution of farmers on the variable effectiveness for Information Kiosk and Mobile SMS is presented in table 36.

Table 36: Distribution of farmers according to their effectiveness towards Information Kiosk and Mobile SMS

S. No	Effectiveness	Information Kiosk (Sample size=40)		Mobile SMS (Sample size=60)	
		No.	%	No.	%
1.	Low effectiveness	10	25	13	21.6
2.	Medium effectiveness	20	50	32	53.3
3.	High effectiveness	10	25	15	25
	Quartile $_1$	62.8		52.08	
	Quartile $_2$	77		65.97	
	Quartile $_3$	82.1		84.20	
	Range	40.1-97.22		24.3-154.3	

This medium level of effectiveness of both initiatives is due to the fact that most of the effectiveness contributing characteristics are opined satisfied by the farmers.

Only few are categorized under more satisfied and most satisfied. However none of the characteristics was opined as least satisfied, not satisfied by the farmers and except reliability for mobile SMS was opined as least satisfied by majority of the farmers.

The following effectiveness items of Information Kiosk are considered as most satisfied by majority of the farmers. Availability of the messages for further

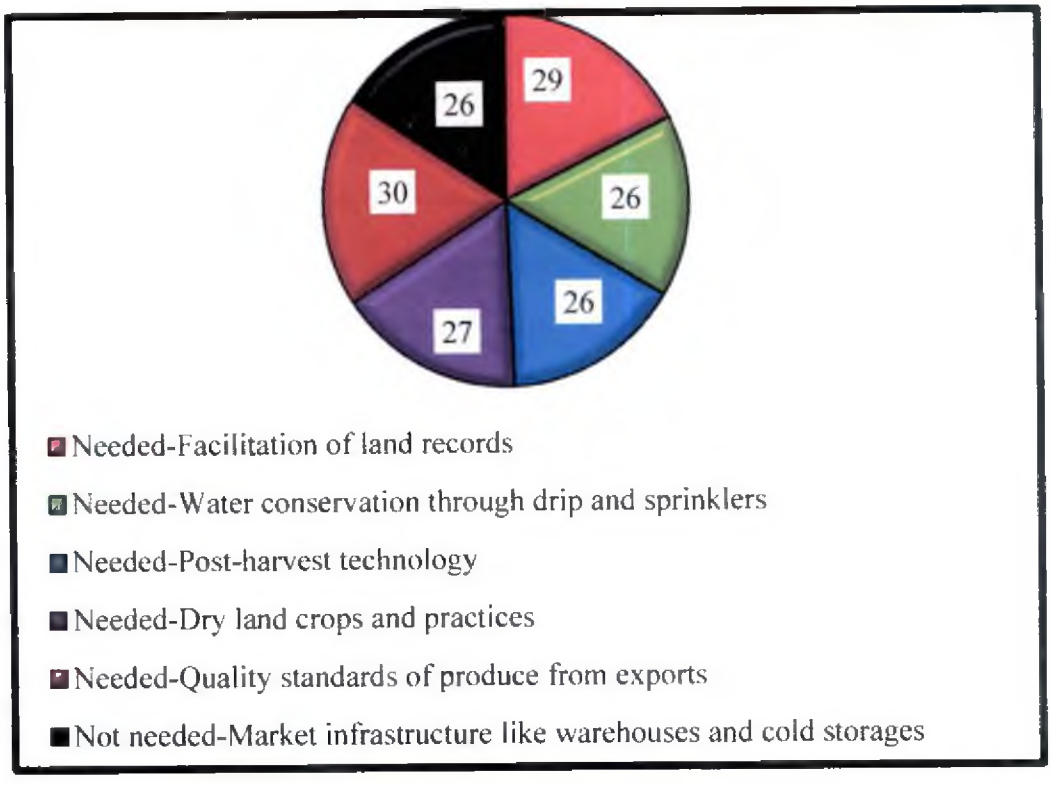


Figure 21. Frequency distribution of needed and not needed information services as perceived by majority number of Mobile SMS respondents

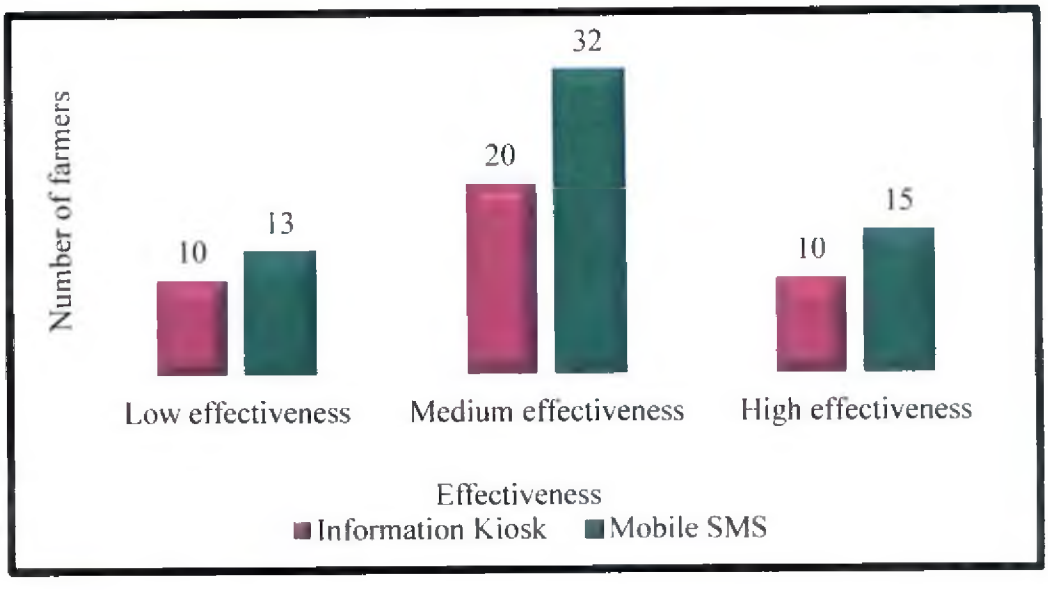


Figure 22. Distribution of respondents based on effectiveness of Information Kiosk and Mobile SMS

reference (37.5%), interesting to use (37.5%), simple to operate (47.5%), readability of the message (52.5%), Quick availability (47.5%), attractiveness (47.5%), motivate to adopt messages in farm (32.5%).

The following effectiveness items of Information Kiosk are considered as more satisfied by majority of the farmers. Conversational ability (47.5%), information storage (37.5%), motivation to adopt messages in farm (32.5%).

The following effectiveness items are considered of Information Kiosk as satisfied by majority of the farmers. Knowledge gain (77.5%), reliability (67.5%), scalability (50%), orderliness of subject matter provided (50%), ability to exploit considerable amount of knowledge (50%), completeness of subjective matter (50%), motivation to learn (47.5%), information provided (47.5%) and photo clarity (37.5%). None of the effectiveness item was opined as less satisfied and unsatisfied by majority of the farmers. The frequency distribution of items on the variable effectiveness for Information Kiosk is reported in table 37.

Table 37: Distribution of items according to their effectiveness for Information Kiosk according to farmers

Items	Most satisfied (%)	More satisfied (%)	Satisfied (%)	Least satisfied (%)	Unsatisfied (%)
Scalability	2.5	7.5	**50**	30	10
Reliability	2.5	20	**67.5**	7.5	--
Knowledge gain	5	17.5	**77.5**	--	--
Availability of messages for further reference	**37.5**	35	22.5	5	--
Photo clarity	5	25	**37.5**	25	7.5
Attractiveness	**47.5**	25	22.5	5	--
Quick availability	**47.5**	20	17.5	12.5	2.5

Table 37 continued

Items	Most satisfied (%)	More satisfied (%)	Satisfied (%)	Least satisfied (%)	Unsatisfied (%)
Conversational ability	17.5	**47.5**	7.5	7.5	20
Motivation to learn	12.5	35	**47.5**	2.5	2.5
Interesting to use	**37.5**	27.5	32.5	2.5	--
Completeness of subjective matter	10	35	**50**	5	--
Information storage	27.5	**37.5**	30	5	--
Simple to operate	**47.5**	27.5	22.5	2.5	--
Readability of the message	**52.5**	20	25	2.5	--
Motivate to adopt the messages in farm	**32.5**	**32.5**	27.5	7.5	--
Information provided	17.5	27.5	**47.5**	7.5	--
Orderliness of subject matter	17.5	27.5	**50**	--	5
Ability to exploit considerable amount of knowledge.	10	32.5	**50**	7.5	--

The following effectiveness items of Mobile SMS are considered as satisfied by majority of the farmers. Readability of the message (53.33%), reliability (51.66 %), knowledge gain (48.33%), ability to exploit considerable amount of knowledge

(41.66%), completeness of subjective matter (41.66%), motivation to learn (41.66%), motivation to adopt messages in farm (38.33%) and information provided (40%).

Voice clarity was considered as least satisfied by majority of the farmers (18.33%) using Mobile SMS. None of the effectiveness item was opined as most satisfied, more satisfied by majority of the farmers. The frequency distribution of items on the variable effectiveness for mobile SMS is presented in table 38.

Table 38: Distribution of items according to their effectiveness for Mobile SMS according to farmers

Items	Most satisfied (%)	More satisfied (%)	Satisfied (%)	Least satisfied (%)	Unsatisfied (%)
Voice clarity	10	20	5.66	**18.33**	--
Reliability	15	31.66	**51.66**	1.66	--
Knowledge gain	20	28.33	**48.33**	3.33	--
Motivation to learn	23.33	33.33	**41.66**	1.66	--
Completeness of subjective matter	10	21.66	**41.66**	1.66	--
Readability of the message	30	21.66	**53.33**	13.33	3.33
Motivate to adopt the messages in farm	23.33	35	**38.33**	3.33	--
Information provided	15	30	**40**	15	--
Ability to exploit considerable amount of knowledge	18.33	25	**41.66**	13.33	1.66

A cursory glance through the pooled data in both the categories depict that majority of the farmers opined satisfactory level of effectiveness for various

features of these ICT tools. In case of Information Kiosk, most of the farmers opined most satisfied and satisfied for greater number of effectiveness statements. Conversational ability and information storage were only perceived as more satisfied by majority of the farmers. For Mobile SMS, almost all the effectiveness items were observed to be satisfactory by the farmers. Voice clarity was opined by the farmers as only least satisfied due to speedy delivery of message.

None of the items on variable effectiveness were opined as unsatisfied by the farmers which indicates that these tools are effective in all aspects with some varying degree of effectiveness among the included components. Further improvement in more satisfied, satisfied, less satisfied categories increase the utility of the messages given through these ICT tools.

4.7. CLASSIFICATION OF MOBILE SMS WITH REFERENCE TO CROP, TIME AND CONTENT.

An attempt was made to classify the messages pushed to the farmers to identify which areas of information are more stressed in order to fill the information needs of the farmers. Classification of Mobile SMS were presented in table 39.

Majority of the Mobile SMS pushed were related to coconut crop (27.71%) followed by vegetables (18.07%), Banana (12.04%), Rice and plantation crops (8.43%), commercial crops (6.02%), tuber crops (3.6%), green manure crops (2.40%) and fruit crops (1.20%). This is represented in figure 23.

Majority of the Mobile SMS were pushed in Kharif season (56.6%) followed by Rabi season (33.7%) and other seasons (9.6%). This is represented in figure 24.

Content of the most of the Mobile SMS covered crop protection aspects (37.34%) followed by cultivation practices (30.12%), nutrient management and department services (16.84%), water management (8.43%), green manure crops (4.81%) and hi- tech farming (1.23%). This is represented in figure 25.

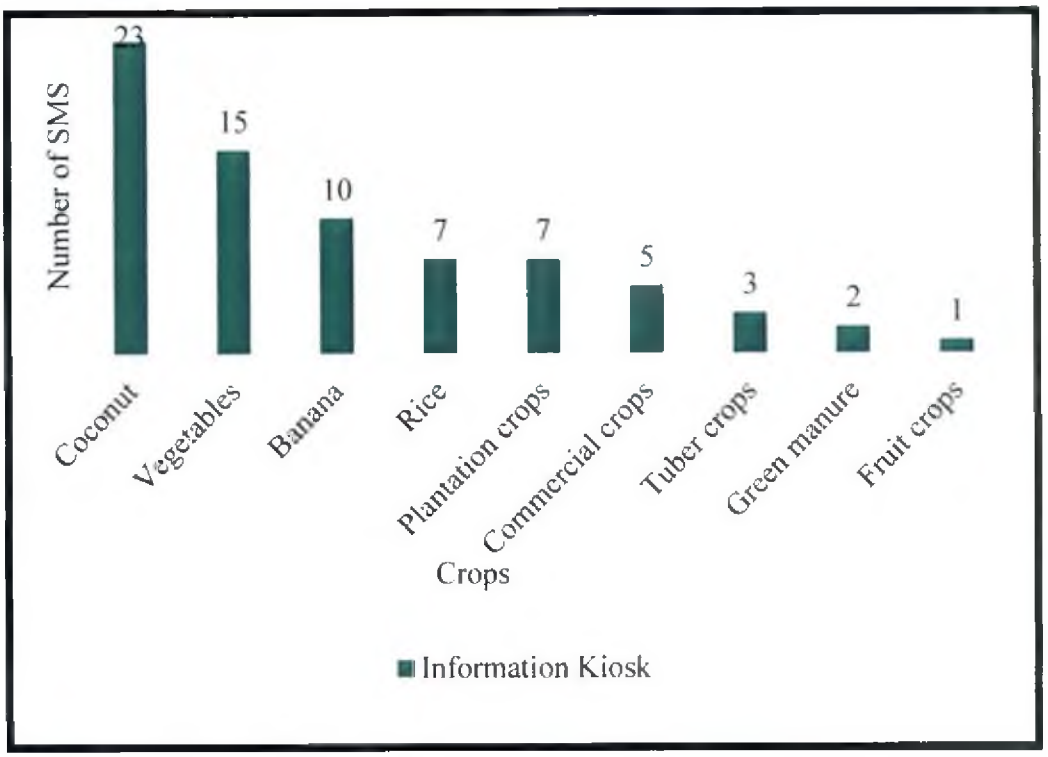


Figure 23. Distribution of Mobile SMS based on crops covered

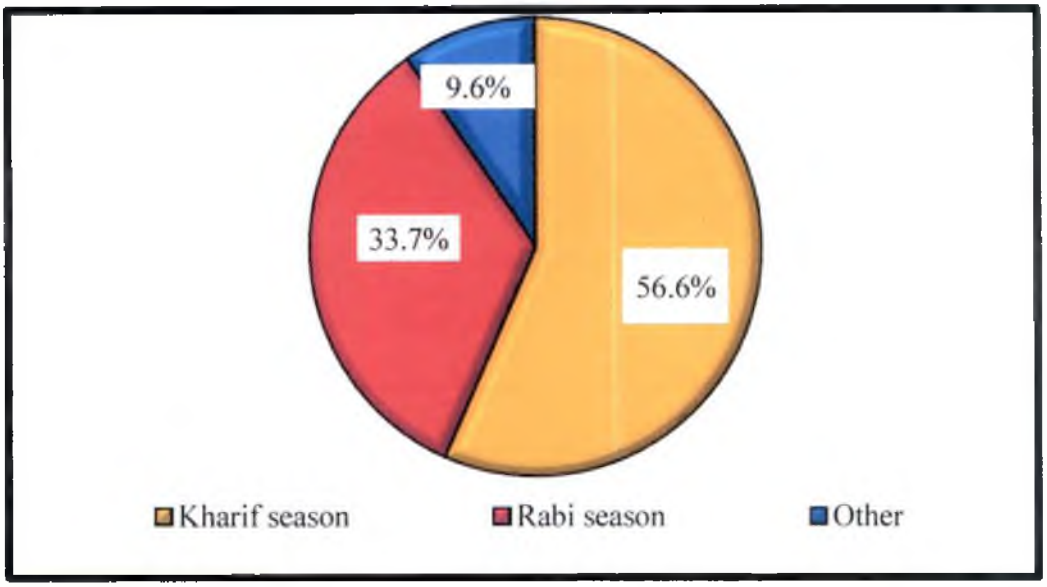


Figure 24. Distribution of Mobile SMS based on time

As coconut production and productivity is less, many messages were pushed related to its management practices. Vegetables and banana are the most cultivated crops in this district.

Rice, plantation crops like Rubber, Pepper, Cashew etc., commercial crops like ginger, onion etc., tuber crops like Tapioca etc., green manure crops like Daincha etc., green leafy vegetables and many fruit crops other than banana are the crops to be more concentrated for pushing of messages.

As in Kerala, farming mainly consists of homestead farming which is a mix of all crops in it as a component, hence information regarding all the crops have to be included and messages specific to the location and crops cultivated by the farmer have to be given for increasing the productivity and Utility of messages.

Table 39: Classification of Mobile SMS

S. No.	Category	Number of SMS received by farmers
	I. CROP	
1.	Coconut	23 (27.71)
2.	Vegetables	15 (18.07)
3.	Banana	10 (12.04)
4.	Rice	7 (8.43)
5.	Plantation crops	7(8.43)
6.	Commercial crops	5 (6.02)
7.	Tuber crops	3 (3.6)
8.	Green manure	2 (2.40)
9.	Fruit crops	1 (1.20)
	II. TIME	
1.	Kharif season	47 (56.6)
2.	Rabi season	28 (33.7)
3.	Other	8 (9.6)

Table 39 continued

S. No.	Category	Number of SMS received by farmers
	III. CONTENT	
1.	Crop protection	31 (37.34)
2.	Cultivation practices	25 (30.12)
3.	Nutrient management	14 (16.84)
4.	Department services	14 (16.84)
4.	Water management	7 (8.43)
5.	Green manure crops	4 (4.81)
6.	Hi-tech farming	1 (1.20)

*Figures in parenthesis indicate percentages

Along with cultivation aspects crop protection aspects play a significant role in determining the yield of the crop. Hence more messages are concentrated on crop protection aspects. Departmental services makes the farmer updated about the schemes and benefits provided to them. Adequate knowledge about nutrient management reduces the expenditure on input costs. Judicial use of fertilizers increases the soil fertility and also quality of the produce. A sufficient amount of irrigation is available to almost in all areas of the district comparatively less number of messages are focussed on this area of information. Water management, green manure crops, Hi- tech farming, marketing information, dairy and poultry management are the few other important information areas which has to be concentrated for pushing Mobile SMS.

4.8. ADVANTAGES OF MOBILE SMS

Advantages of mobile SMS as perceived by the farmers were studied. The table indicates that farmers ranked first "Has all information farmer wants" first (80%) followed by "Supports marketing" (65%), "Gives personalized and timely information" (63.33%), "Saves time and money" (58.33%) and "One stop information source" (50%). This is in line with findings of the Hassan (2008). This

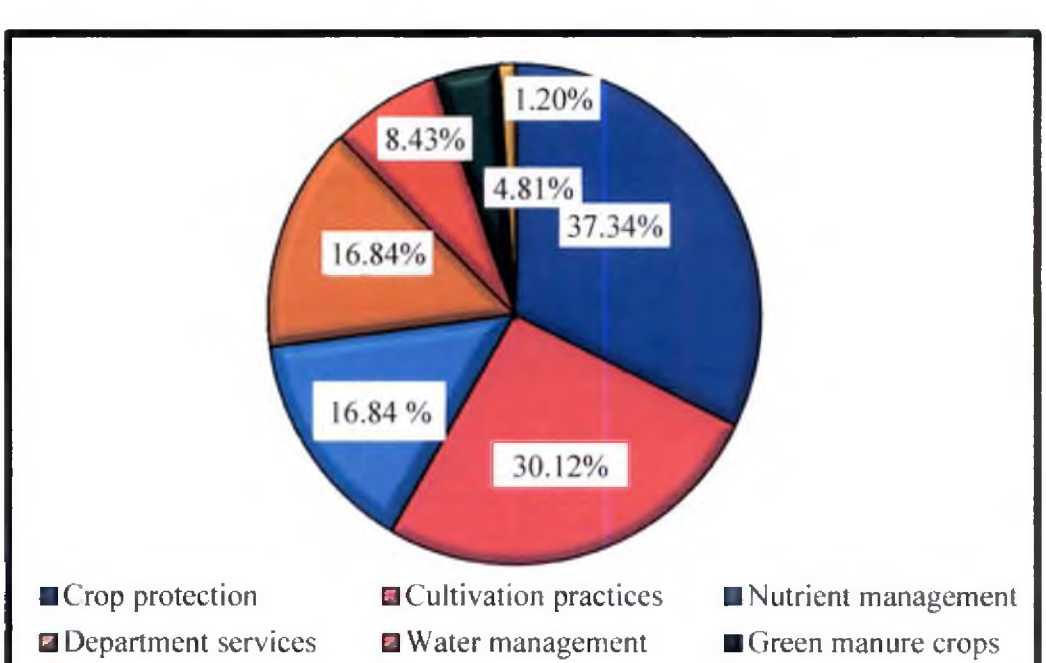


Figure 25. Distribution of Mobile SMS based on content covered

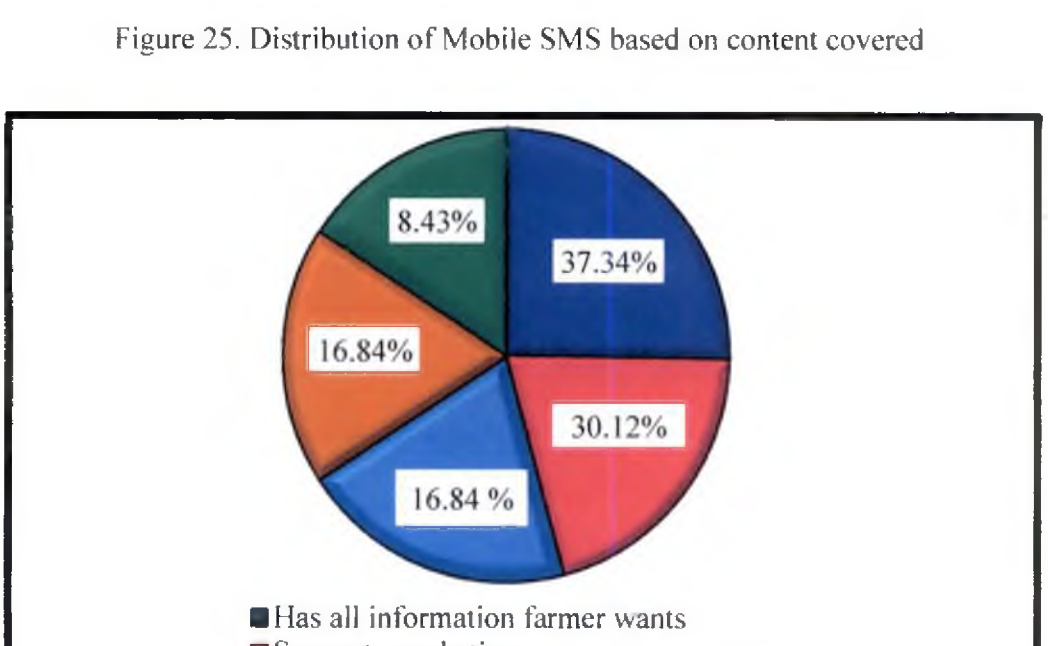


Figure 26: Distribution of advantages of Mobile SMS as perceived by majority of respondents

is represented in figure 26. The frequency distribution of items on the variable advantages for mobile SMS as perceived by the farmers is reported in table 40.

Table 40: Distribution of advantages according to the frequency as perceived by farmers using Mobile SMS

Advantages	No.	Percentage	Rank
Has all information farmer wants	48	80	I
Supports marketing	39	65	II
Gives personalized and timely information	38	63.33	III
Saves time and money	35	58.33	IV
One stop information source	30	50	V

*Figures in parenthesis indicate percentages

Majority of the farmers opined that most of the messages were possessing the adequate information required by them and also supported marketing. They opined that voice messages were very useful in understanding the content of the message and sending of agricultural messages through Mobile phone was a good initiative which saves time of the farmer which is consumed while approaching the extension professionals for advises.

4.9. CONSTRAINTS AND SUGGESTIONS AS PERCEIVED BY THE RESPONDENTS.

Constraint analysis is becoming one of the important components of extension research. Without analysing the constraints, it is impossible to refine the transfer of technology mechanism for effective dissemination of innovative technologies. Hence constraint analysis was taken up as one of the objectives of this study to analyse the constraints encountered by the respondents while using the Information Kiosk and Mobile SMS. The frequency distribution of constraints by the farmers utilizing Information Kiosk is reported in table 41. Lack of awareness about ICT tools constraint was ranked first by most of the farmers (85%) followed

by illiteracy (82.5%), unavailability at all times (80%), lack of infrastructure and content problems (72.5%), Lack of training programmes (60%), Unavailability of learning materials (50%), and least ranked was both negative mentality in accepting new things (40%) and in compatibility with the culture (40%).

The frequency distribution of constraints by the farmers utilizing Mobile SMS is reported in table 42. Content problems constraint was ranked first by most of the farmers (93.33%) followed by illiteracy (83.33%), incompleteness of subject matter (46.66%), negative mentality in accepting new things (45%) and least ranked was both in compatibility with the culture (1.66%) and other constraints (1.66%). Constraints face by the farmers while Mobile SMS and Information Kiosk are represented in figure 27 and figure 28 respectively.

Table 41: Distribution of constraints according to the frequency as encountered by farmers while using Information Kiosk (Sample size=40)

S. No	Constraint	Number	Rank
1	Lack of awareness about ICT tools	34 (85)	I
2	Illiteracy	33 (82.5)	II
3	Not available at all times	32 (80)	III
4	Lack of infrastructure	29 (72.5)	IV
5	Content problems	29 (72.5)	IV
6	Lack of training programmes	24 (60)	V
7	Unavailability of learning materials	20 (50)	VI
8	Negative mentality in accepting new things	16 (40)	VII
9	Not compatible with the culture	16 (40)	VII
10	Other constraints	--	--

*Figures in parenthesis indicate percentages

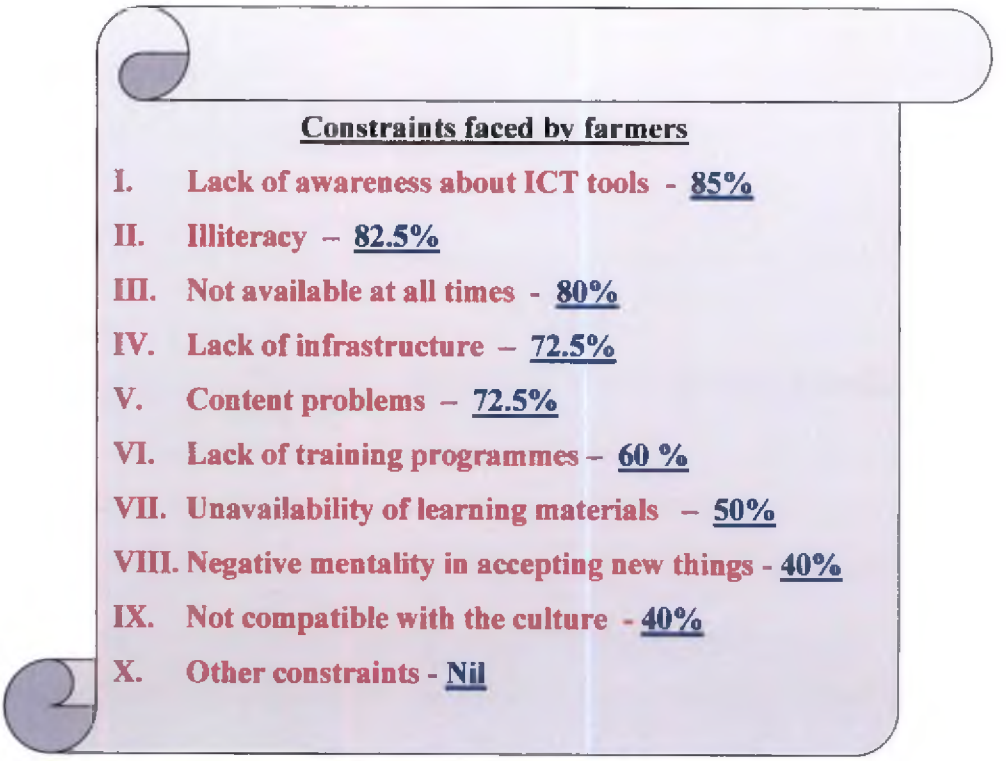


Figure 27. Distribution of constraints as perceived by the farmers utilising Information Kiosk

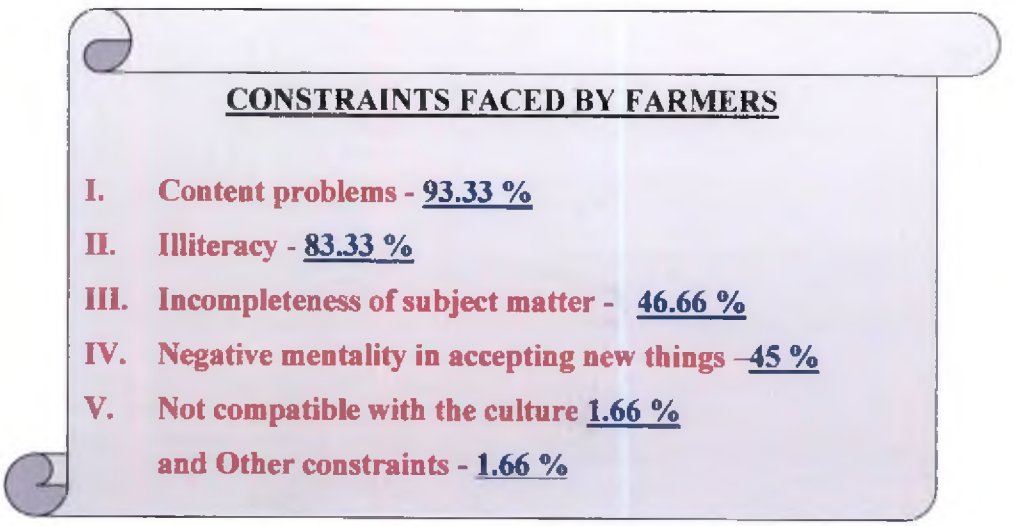


Figure 28. Distribution of constraints as perceived by the farmers utilising Mobile SMS

Table 42: Distribution of constraints according to the frequency as encountered by farmers while using mobile SMS (Sample size= 60)

S. No	Constraint	Number	Rank
1	Content problems	56 (93.33)	I
2	Illiteracy	50 (83.33)	II
3	Incompleteness of subject matter	28 (46.66)	III
4	Negative mentality in accepting new things	27 (45)	IV
5	Not compatible with the culture	1 (1.66)	V
6	Other constraints	1 (1.66)	V

*Figures in parenthesis indicate percentages

4.10. UTILITY OF THE INFORMATION SUPPORT PROVIDED TO RESPONDENTS THROUGH THE INFORMATION KIOSKS AND MOBILE SMS.

The invention of computers and subsequent development of Information Technology (IT) is one of the most significant achievements of the 20th century. The role of IT as an instrument for progress and development has been widely acknowledged and is expected to bring in major social and economic benefits for the man kind and accelerate the process of development.

Information and Communication Technology has connected the world globally and is now changing our life style and social consciousness dynamically. None of the walks of life have been untouched by the IT sector. This powerful tool has been instrumental in improving the performance of ever sector wherever it is used.

There is a growing appreciation of the role of IT in enhancing the productivity and improving the utilization and performance of livelihood technologies such as agriculture, education, health and medical services etc. The challenge is to identify the areas where IT can be used to improve the performance of services and technologies and build cost effective IT based extension systems that improve the

accessibility of communication technology to the rural population but also to improve the relevance to local development.

The traditional agriculture is transforming into it hi-tech agriculture. The need for updated (latest) information is essential for increased agricultural production and productivity, eventually giving a lucrative yield and income to the farming community. Indian agriculture is facing multitude of problems to maximize the productivity. Due to several reasons, the majority of the farming community are not getting upper bound yield despite successful research on new agricultural practices. One of the reasons is that appropriate and timely advice about farming is not reaching the farmers.

Several ICT based interventions in agriculture and allied fields taken up across the globe were found to be successful. The applications such as multi-data base technology, decision technology systems, web enabled applications, agriculture portals, knowledge based expert systems, Geographic Information Systems and remote sensing technology, e governance, e-commerce, multimedia application, data warehousing, Video conferencing etc., are now widely used for transfer of technology especially in agriculture.

Several studies were also conducted on the utility of information and communication technology in the field of agriculture. In the present investigation two ICT initiatives were considered which were serving to the farming community in Kerala state. First one is Information Kiosk which is initiated through two projects in Kerala. Karshaka Information Systems And Services Networking Kerala (KISSAN Kerala) project which is jointly coordinated by Indian Institute of Information Technology Management-Kerala (IIITMK), State Department of Agriculture and Kerala Agricultural University and a collaborative project of Department of Agricultural Extension, Vellayani and Indian Institute of Information Technology Management-Kerala (IIITMK), Techno Park, Trivandrum which is funded by State Planning Board and Government of Kerala.

Second one is Mobile SMS services which is a collaborative project of Department of Agriculture, Vellayani and IIITMK, Techno Park, Trivandrum which is funded by State Planning Board and Government of Kerala. Every Tuesdays and Fridays Text messages in English and voice messages in Malayalam related to various agriculture related information which includes packages of practices, departmental services etc., are being sent to the farmers

Utilization of the messages given through information kiosk and mobile SMS by the farmers is measured in terms of timeliness, reliability, relevancy, retrievability, adequacy, format clarity, practicability, simplicity.

The frequency distribution of farmers on the variable Utility for Information Kiosk and Mobile SMS is presented in table 43. Majority of the farmers reported medium Utility (52.5%) of the messages given by Information Kiosk followed by high Utility (25%) and less Utility (22.5%) whereas for Mobile SMS receiving farmers majority of them reported medium Utility (50%) of the messages followed by both high Utility (25%) and less Utility (25%) based on quartiles. This is represented in figure 29.

Table 43: Distribution of famers based on extent of Utility of messages

S. No	Utility of the message	Information Kiosk (Sample size=40)	Mobile SMS (Sample size=60)
1	Low	9 (22.5)	15 (25)
2	Medium	21 (52.5)	30 (50)
3	High	10 (25)	15 (25)
	$Quartile_1$	195.3	166
	$Quartile_2$	208.3	201.8
	$Quartile_3$	237.6	237.6
	Range	117.1-312.5	65-312.5

*Figures in parenthesis indicate percentages

The Utility of the messages were medium in both the cases because majority of the farmers were unable to locate and access the Information Kiosk. The content provided was not specific to the location and crops grown by the farmers. Few times farmers faced inconvenience due to shortage of power supply which lead to non-functioning of the Information Kiosk. Mobile SMS were pushed in English language which was a major constraint in understanding the content of the message.

The frequency distribution of attributes/ characteristics of messages contributing to the variable Utility as perceived by the farmers utilizing Information Kiosk is reported in table 44. From the table 44, it indicates that majority of the farmers opined that all the information disseminated through Information Kiosk possessed characteristics namely retrievability (52.5%) and simplicity (42.5%) and remaining characteristics such as timeliness (40%), reliability (47.5%), relevancy (55%), adequacy (55%), format clarity (35%), practicability (47.5%) were satisfied by most of the information given. This is represented in figure 30.

Table 44: Distribution of attributes/characteristics of messages contributing to the variable Utility of Information Kiosk

Utility of the message	All information	Most information	Some information	No information
Timeliness	13 (32.5)	16 **(40)**	11 (27.5)	--
Reliability	16 (40)	19 **(47.5)**	5 (12.5)	--
Relevancy	6 (15)	22 **(55)**	10 (25)	2 (5)
Retrievability	21 **(52.5)**	15 (37.5)	4 (10)	--
Adequacy	10 (25)	22 **(55)**	8 (20)	--
Format clarity	10 (25)	14 **(35)**	13 (32.5)	3 (7.5)
Practicability	7 (17.5)	19 **(47.5)**	14 (35)	--
Simplicity	17 **(42.5)**	12 (30)	11 (27.5)	--

*Figures in parenthesis indicates percentages

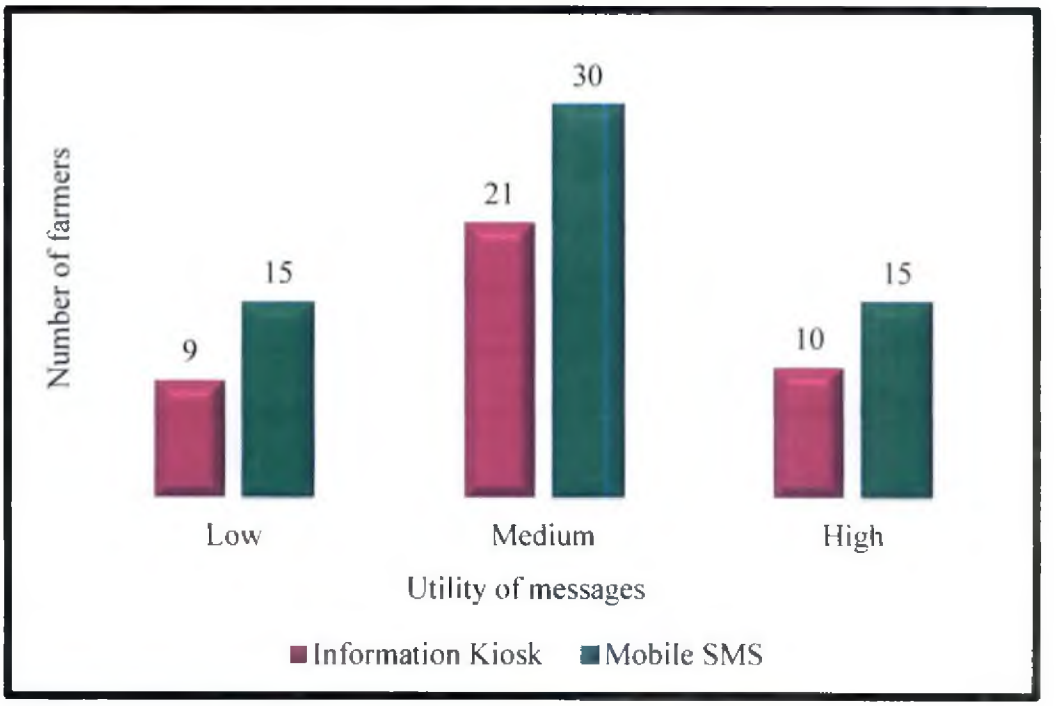


Figure 29. Distribution of respondents based on Utility of messages

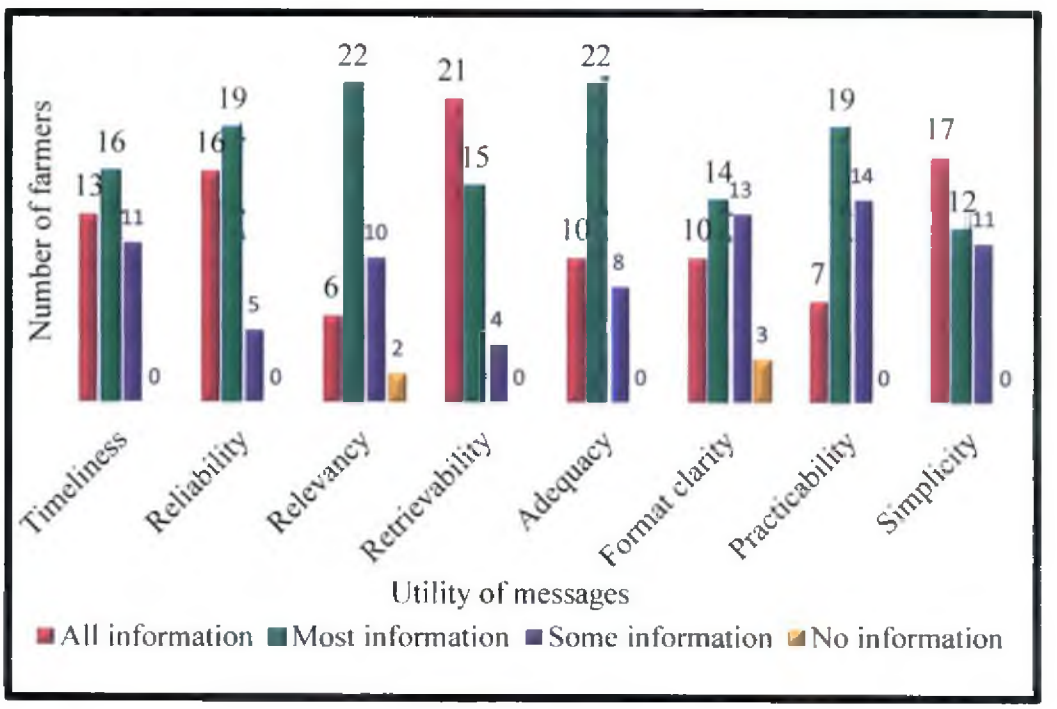


Figure 30. Distribution of characteristics contributing to variable Utility of messages of Information Kiosk

Thus it can be inferred that locating the information present in the Information Kiosk and again retrieving it whenever required was easy. The content provided was in simple language and clear, displaying the information in legible format enabling every farmer understand the information without any ambiguity.

Information given in the Information Kiosk was not updated with market information, organic practices, inclusion of more crops like flowers, plantation, commercial crops etc., and new pesticides. This also had an impact on practicability and adequacy attribute of the content and decreased these characteristics to all information provided in the Information Kiosk.

The farmers now need and prefer information about new generation pesticides for commercial crops and organic practices for food crops to increase the returns and provision of market information will give the knowledge about current prices. This lead to decrease in timeliness attribute for all information.

Many farmers other than innovative farmers rely upon the information communicated mainly through inter personal sources and extension personnel rather than mass media and ICT. Hence the reliability was opined for only some information by majority of the farmers.

The crops given in the Information Kiosk and the practices are presented in a generalized manner. Hence, farmers perceived that it has less personalized and localized content which decreased the relevancy to all information.

The photographs of the pests displayed in the Information Kiosk were perceived to be possessing less clarity by the farmers. They also opined that the page looked clumsy with more number of photographs incorporated into a single page. This reduced the format clarity characteristic of Information Kiosk.

Above all, the farmers opined the online connectivity and printer facility to be attached to the Information Kiosk which would help in getting the market prices and hard copy of information which can be used as a reference whenever needed

saving a lot of time spent in consulting the concerned specialists for required information.

From the table 44, it can be concluded that most of the information disseminated through the Information Kiosk was useful and including the above feature suggested would increase Information Kiosk utility to the farmers.

The frequency distribution of characteristics of messages contributing to the variable Utility of Mobile SMS is presented in table 45. It indicates that majority of the farmers opined that all the characteristics of the information timeliness (58.33%), practicability (56.66%), retrievability (53.33%), simplicity (53.33%), relevancy (51.66%), reliability (48.66%) and adequacy (43.33%) were satisfied by most of the information except format clarity (41.66%) which was opined to be possesses by some information only. This is represented in figure 31.

Table 45: Distribution of attributes/characteristics of messages contributing to the variable Utility of Mobile SMS

Utility of the message	All information	Most information	Some information	No information
Timeliness	15 (25)	**35 (58.33)**	10(16.66)	--
Reliability	18(30)	**28 (46.66)**	14 (23.33)	--
Relevancy	13 (21.66)	**31 (51.66)**	16 (26.66)	--
Retrievability	14 (23.33)	**32 (53.33)**	12 (20)	2 (3.33)
Adequacy	14 (23.33)	**26 (43.33)**	18 (30)	2 (3.33)
Format clarity	7 (11.66)	24 (40)	**25 (41.66)**	4 (6.66)
Practicability	11 (18.33)	**34 (56.66)**	14 (23.33)	1 (1.66)
Simplicity	10 (16.66)	**32 (53.33)**	17 (28.33)	1 (1.66)

*Figures in parenthesis indicates percentages

Thus it can inferred the table 45 that messages of the Mobile were possessing almost all the characteristics for the most of its information. This is because SMS

were pushed to all farmers with generalized information. They are not specific to crops grown by the farmer few times. This decreased the message relevancy.

Crop package of practices were sent based on the crops cultivated in a particular season but more specificity to the time of the various practices for a particular crop were not observed and also market prices were not disseminated. This reduced the timeliness and also practicability characteristics for the message.

As opined for Information Kiosk utilizing farmers, in case of Mobile SMS using farmers also many of them other than innovative farmers relied upon the information communicated mainly through inter personal sources and extension personnel rather than mass media and ICT. Hence the reliability was opined for only some information by majority of the farmers.

Retrievability of a Mobile SMS is always observed. The internal memory of the handset determines the retrievability. Hence the messages stored in the inbox of a farmer are always available to farmers for further reference. As voice messages could not be accommodated in the internal memory of some handsets, this decreased retrievability characteristic for all the information.

Mobile SMS is a tool which contains 300 characters per message. Hence most of the messages pushed were in few sentences. Due to that reason, farmers opined that the messages were lacking sufficient explanation to conquer the ambiguity of the content. This also had an effect on the simplicity of the message. Message consisted of simple words but not sufficient information to understand and clarify the content.

Many of the times messages received by the farmers were displayed in unpleasant manner with incomplete messages and with different symbols which are not readable. This is due to the lacking compatibility between the software used for pushing of the messages and handsets of the farmer. Hence format clarity was observed only for some information by the majority of the farmers.

Thus by including the more crops, practices dissemination at right time for the crops, provision of market information and content of the messages, the Utility of the messages can be improved.

4.11. EXTENT OF PERCEPTION OF THE FARMERS ABOUT INFORMATION KIOSK AND MOBILE SMS.

It is clear from the table 46 that majority of the farmers reported medium perception (55%) of the messages given by Information Kiosk followed by low perception (25%) and high perception (20%) whereas for Mobile SMS receiving farmers majority of them reported medium perception (58.33%) of the messages followed by low perception (40%) and high perception (18.33%) based on quartiles.

The frequency distribution of farmers for the variable perception on Information Kiosk and Mobile SMS as perceived by the farmers is reported in table 46 and is represented in figure 32.

Table 46: Distribution of farmers according to their perception towards Information Kiosk and Mobile SMS

S. No	Extent of perception	Information Kiosk (Sample size=40)		Mobile SMS (Sample size=60)	
		No.	%	No.	%
1	Low	10	25	14	40
2	Medium	22	55	35	58.33
3	High	8	20	11	18.33
	$Quartile_1$	20.33		150	
	$Quartile_2$	269.6		200	
	$Quartile_3$	319.4		233.3	
	Range	33.33-300		112.2-462.9	

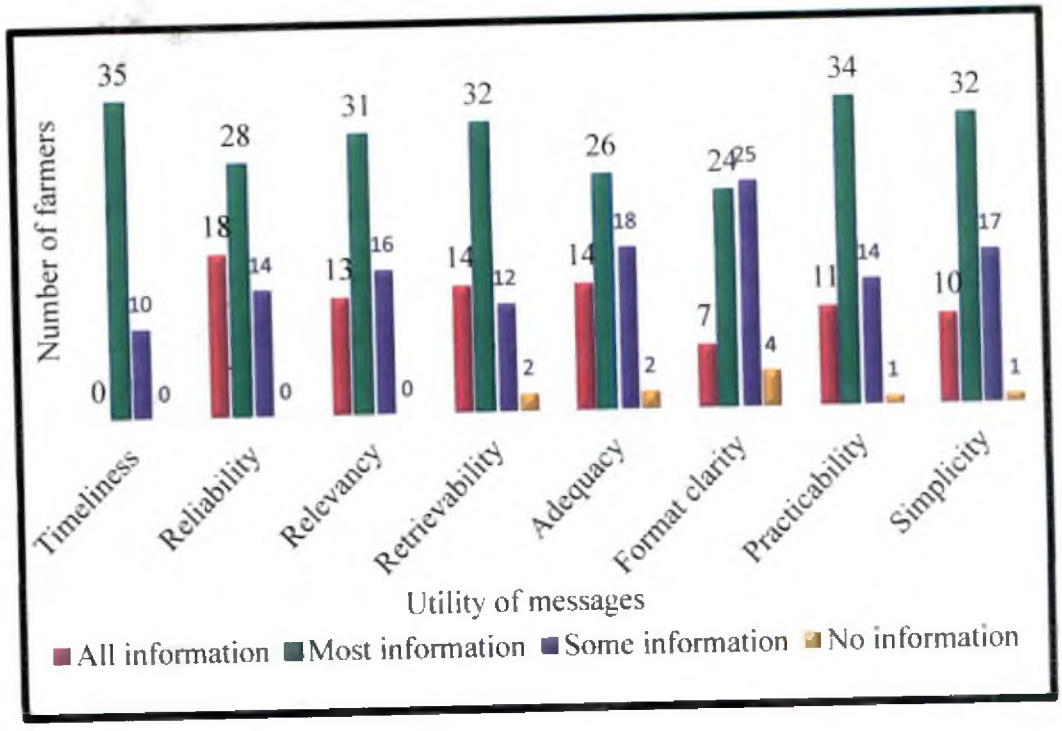


Figure 31. Distribution of characteristics contributing to variable Utility of Mobile SMS

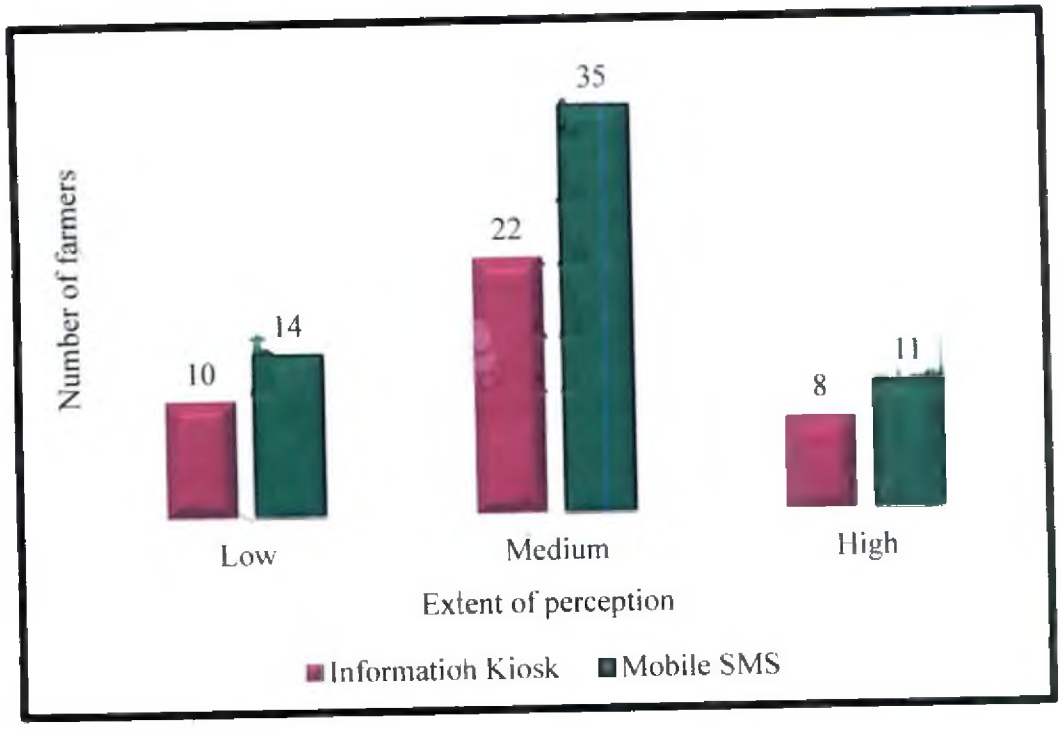


Figure 32. Distribution of respondents based on extent of Perception towards Information Kiosk and Mobile SMS

Majority of the farmers in both the cases opined medium level of perception. This is because majority of the components of the Information Kiosk such as physical layout and display, content of the information, function and attributes of the Mobile SMS were opined to be satisfied by the farmers. Very few opined as most satisfied.

The frequency distribution of statements contributing to the variable perception as perceived by the farmers utilizing Information Kiosk is presented in table 47. It indicates that majority of the farmers in both the cases opined features of the Information Kiosk to be satisfied except the colour of the letter which was observed to be most satisfied and function of the Information Kiosk as management tool was opined to be not satisfied.

From the table 47, it can be observed colour of the letter (52.5%) was opined to be most satisfied by majority of the farmers.

Most of the Perception statements such as adequacy of message (80%), practical utility of message (75%), as decision support system (72.5%), diagnostic path is sequential and logic (70%), diagnostic path leads to correct conclusion (70%), words and sentences are simple (70%), motivate to learn (67.5%), as extension tool (67.5%), ease in use and functionality (65%), as training education tool (65%), as diagnostic tool (65%), answers are based on field reality (60%), style of the letter (55%), clarity of message (55%), appearance and layout (55%), background colour (52.5%), easily portable (45%), favours good interaction (42.5%) and size of the letter (36%) are opined as satisfied by majority of the farmers.

Perception statements such as Information Kiosk as a management tool (67.5%), photo clarity (65%), photographs helps for confirmation of disease and pest (447.5%), adequacy of photographs (47.5%) and easily portable (45%) are opined as unsatisfied by majority of the farmers.

Table 47: Distribution of attributes/characteristics of messages contributing to the variable Perception of Information Kiosk

Perception Statement	Most satisfied	Satisfied	Not satisfied
Diagnostic path is sequential and logic	11 (27.5 %)	**28 (70 %)**	1 (2.5 %)
Diagnostic path leads to correct conclusion	12 (30 %)	**28 (70 %)**	--
Answers are based on field reality	11 (27.5%)	**24 (60 %)**	5 (12.5 %)
Adequacy of photographs	5 (12.5%)	16 (40 %)	**19 (47.5 %)**
Photographs helps for confirmation of disease and pest	5 (12.5%)	16 (40 %)	**19 (47.5 %)**
Photo clarity	2 (5 %)	12 (30 %)	**26 (65 %)**
Adequacy of message	5 (12.5%)	**32 (80 %)**	3 (7.5 %)
Clarity of message	6 (15 %)	**22 (55 %)**	12 (30 %)
Words and sentences are simple	8 (20 %)	**28 (70 %)**	4 (10 %)
Practical utility of message	5 (12.5 %)	**30 (75 %)**	5 (12.5%)
Favours good interaction	13 (32.5 %)	**17 (42.5 %)**	10 (25 %)
Motivate to learn	10 (25 %)	**27 (67.5 %)**	3 (7.5 %)
Appearance and layout	18 (45 %)	**22 (55 %)**	--
Background colour	16 (2.5 %)	**21 (52.5 %)**	3 (7.5 %)
Size of the letter	16 (2.5 %)	**24 (36 %)**	--
Style of the letter	18 (45 %)	**22 (55 %)**	--
Colour of the letter	**21 (52.5 %)**	19 (47.5 %)	--
Easily portable	4 (10 %)	**18 (45 %)**	**18(45 %)**
Ease in use and functionality	4 (10 %)	**26 (65 %)**	10 (25 %)
As management tool	1 (2.5%)	12 (30 %)	**27 (67.5 %)**
As decision support system	2 (5 %)	**29 (72.5 %)**	9 (22.5 %)

Table 47 continued

Perception Statement	Most satisfied	Satisfied	Not satisfied
As extension tool	3 (7.5 %)	**27 (67.5 %)**	10 (25 %)
As training education tool	1 (2.5 %)	**26 (65 %)**	13 (32.5 %)
As diagnostic tool	3 (7.5 %)	**26 (65 %)**	11 (27.5 %)

The frequency distribution of statements contributing to the variable perception as perceived by the farmers utilizing Mobile SMS is reported in table 48. From the table it indicates that majority of the farmers strongly agreed that the mobile SMS service had satisfied the features such as portable (80 %) absolutely essential (63.33%), easy to learn (61.6%), swift/rapid information transfer (53%), plethora of information transfer (51.6%). Equal majority of the farmers' opined age no bar (41.66%) as strongly agree and strongly disagree. Too expensive (46.66%) was equally observed to be undecided and strongly disagree by most of the respondents. Majority of the farmers opined exclusive for literate groups (38.3%) as undecided. Used in emergencies (43%) and used in contingencies (41.6%) were strongly disagreed by majority of the farmers.

Table 48: Distribution of attributes/characteristics of messages contributing to the variable Perception of Mobile SMS

Perception statement	Strongly agree	Undecided	Strongly disagree
Easy to learn	**37 (61.6%)**	7 (11.6 %)	16 (26.6 %)
Too expensive	4 (6.66 %)	**28 (46.66%)**	**28 (46.66 %)**
Absolutely essential	**38 (63.3%)**	12 (20%)	10(16.66 %)
Used in contingencies	12 (20%)	23 (38.3%)	**25 (41.6%)**
Used in emergencies	18 (30%)	16 (26.6 %)	**26 (43.3%)**
Age no bar	**25 (41.6 %)**	10 (16.66%)	**25 (41.6 %)**
Portable	**48 (80%)**	3 (5 %)	9 (15%)
Exclusive for literate groups	16 (26.6 %)	**23 (38.3%)**	21 (35%)

Table 48 continued

Perception statement	Strongly agree	Undecided	Strongly disagree
Plethora of information transfer	**31 (51.6 %)**	14 (23.3 %)	15 (25%)
Swift/ rapid information transfer	**32 (53.3 %)**	12 (20%)	16 (26.6 %)

From the data presented in table 48, it can be inferred that most of the Perception statements were opined to be satisfied by the farmers. Content was adequate and inclusion of more crops like flowers, plantation, vegetable and commercial crops, market prices would help in increasing the Perception of the utility of Information Kiosk to the farmers. Spelling mistakes of text provided in Malayalam language decreased the clarity of the message. Display attributes of the Information Kiosk were observed to be satisfied and inclusion of videos, more number of pages for each sub context will increase its appearance attributes.

Photographs provided were lacking clarity due to accommodation of more photographs in a single page leading to clumsy appearance. Inclusion of more information regarding the farm business and management aspects like availing of loans, schemes, success stories, economics of farm enterprise etc., will increase the usage of Information Kiosk as a management tool. Information Kiosk is a moderately large ICT tool which decreases its portability. Developing of apps of agricultural information Kiosk for Mobile can be a possible alternative.

Online connectivity and use of multimedia messages, provision of content in CD's, learning materials for user guidance will increase the Perception of the Information Kiosk.

From the table 48, it can be observed that most of the positive statements of Perception regarding Mobile SMS were strongly agreed by the farmers. Negative statements such as exclusive for literate groups and too expensive are perceived as

undecided and strongly disagreed by many farmers. As many farmers contact extension personnel, Department officials in case of emergency and contingencies, this statement was perceived to be strongly disagreed by most of the farmers. Majority of the farmers are middle aged group followed by old aged group. Hence equal per cent of the farmers opined strong agreement and strong disagreement for the statement age no bar.

There was a medium level of perception towards Mobile SMS service because this is a new initiative and by increase of awareness about its utility and necessity as a means of information aid will increase the Perception level of the farmers.

4.12. CORRELATION BETWEEN EXTENT OF PERCEPTION AND UTILITY OF MESSAGES WITH THE INDEPENDENT VARIABLES.

Correlation analysis was employed to assess the relationship of characteristics of respondents with the Utility of the messages of Information Kiosk, Mobile SMS and Perception towards Information Kiosk, Mobile SMS. The correlation coefficients were worked out and the significance was tested by comparing with the table values. The results are presented below.

4.12.1. Correlation between Utility of messages of Information Kiosk with the independent variables.

Utility of the messages of Information Kiosk is positively correlated with, frequency of use of messages, information needs, attitude of the farmers and effectiveness at 1 % significance level and education and awareness at 5% significance level. This is presented in table 49.

From the table 49, it can be inferred that increase in education level of the farmers increases the Utility of the messages through increased awareness as educated farmer has more awareness about ICT tools. As awareness increases, frequency of use of messages also increase which develops a positive attitude

towards Information Kiosk. Hence, the Utility of the messages also increases. Effectiveness of an ICT tool increases its Utility.

Table 49: Correlation between independent variables and Utility of messages of Information Kiosk

S. No	Independent variables	Utility of messages
1	Age	-0.185 NS
2	Education	0.346*
3	Exposure to ICT	0.091 NS
4	Information dissemination ways	0.042 NS
5	Awareness	0.358*
6	Frequency of use of messages	0.464**
7	Information needs	0.532**
8	Attitude of the farmers	0.430**
9	Constraints	0.131 NS
10	Effectiveness	0.734**

"*" Significant at 5% level, "**"Significant at 1% level, Not Significant "NS"

4.12.2. Correlation between Perceptions of farmers towards Information Kiosk with the independent variables.

Perception of the farmers about Information Kiosk is positively correlated with effectiveness at 1% significance level and awareness, information dissemination at 5% significance level. This is represented in table 50.

From the table 50, it can be observed that information dissemination ways provide information about the ICT tools and increase the awareness about various sources of information to the farmers. As awareness increase the Perception also increases. Effectiveness of an Information Kiosk meets the information

requirements of the farmers which in turn increases the Perception and also the Utility of the Information Kiosk.

Table 50: Correlation between independent variables and Perception of farmers towards Information Kiosk

S. No	Independent variables	Perception towards Information Kiosk
1	Age	-0.140 NS
2	Education	0.100 NS
3	Exposure to ICT	0.176 NS
4	Information dissemination ways	0.394*
5	Awareness	0.342*
6	Frequency of use of messages	0.150 NS
7	Information needs	0.022 NS
8	Attitude of the farmers	0.034 NS
9	Constraints	-0.160 NS
10	Effectiveness	0.421**

"*" Significant at 5% level, "**"Significant at 1% level, Not Significant "NS"

4.12.3. Correlation between independent variables and Utility of Mobile SMS

Utility of Mobile SMS is positively correlated with exposure to ICT, information dissemination ways, frequency of use of messages, information needs and advantages, effectiveness at 1% significance level. This is represented in table 51.

From the table 51, it can be inferred that increase in increases the knowledge about the agriculture information being given through SMS service and develops a positive attitude. Positive attitude increases the use of messages. Hence utility of the messages also increase. When information needs are met and they are positively

significant, effectiveness increases. And both information needs and effectiveness increase the utility of the Mobile SMS by the farmers.

Table 51: Correlation between independent variables and Utility of Mobile SMS

S. No	Independent variables	Utility of Mobile SMS
1	Age	-0.021 NS
2	Education	0.092 NS
3	Exposure to ICT	0.392**
4	Information dissemination ways	0.539**
5	Awareness	0.039 NS
6	Frequency of use of messages	0.693**
7	Information needs	0.333**
8	Attitude of the farmers	0.134 NS
9	Constraints	-0.020 NS
10	Effectiveness	0.500**
11	Advantages	0.319*

"*" Significant at 5% level, "**"Significant at 1% level, Not Significant "NS"

4.12.4. Correlation between independent variables and Perception of farmers towards Mobile SMS

Perception of farmers towards Mobile SMS is positively correlated with exposure to ICT, awareness and effectiveness at 1% significance level and information dissemination ways at 5% significance level. It is negatively correlated with constraints at 5% significance level. This is presented in table 52.

From the table 52, it can be inferred that exposure to ICT increases the knowledge about the Mobile SMS services and information dissemination ways, increase the credibility of the Mobile SMS which in turn increases the Perception about the Mobile SMS. More usage of the SMS will lead to better understanding

of the SMS services and increases the Perception. Effectiveness and advantages increase the Perception about the Mobile SMS. Constraints decrease the accessibility of the Mobile SMS service and decreases its Perception.

Table 52: Correlation between independent variables and Perception of farmers towards Mobile SMS

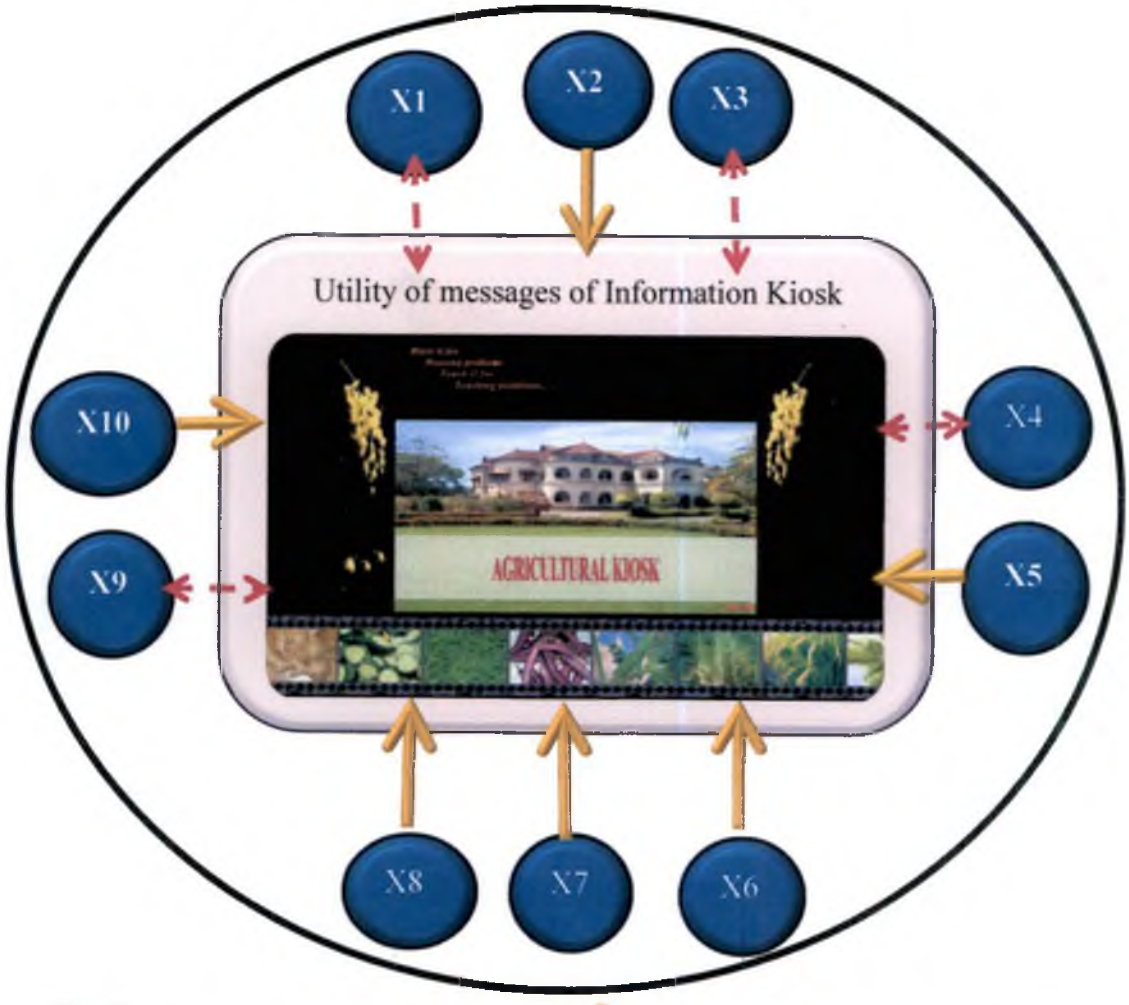
S. No	Independent variables	Perception towards Mobile SMS
1	Age	-0.145 NS
2	Education	0.147 NS
3	Exposure to ICT	0.326**
4	Information dissemination ways	0.411*
5	Awareness	0.680**
6	Frequency of use of messages	0.075 NS
7	Information needs	0.029 NS
8	Attitude of the farmers	0.086 NS
9	Constraints	-0.357*
10	Effectiveness	0.514**
11	Advantages	0.220 NS

"*" Significant at 5% level, "**"Significant at 1% level, Not Significant "NS"

Empirical relationship between various independent variables and the dependent variables of Information Kiosk and Mobile SMS is given in the figures 33, 34 and figure 35, 36.

4.13. SUGGESTIONS GIVEN BY THE FARMERS FOR THE IMPROVEMENT OF INFORMATION KIOSK AND MOBILE SMS SERVICES

The most important suggestions highlighted by the farmers was that the touch screen Kiosk should be placed at all Krishi Bhavans of Kerala for their easy accessibility. They opined that Information Kiosks when placed at Krishi Bhavans,



Non-Significant relationship **Positive significant relationship**

X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X6- Frequency of use of messages

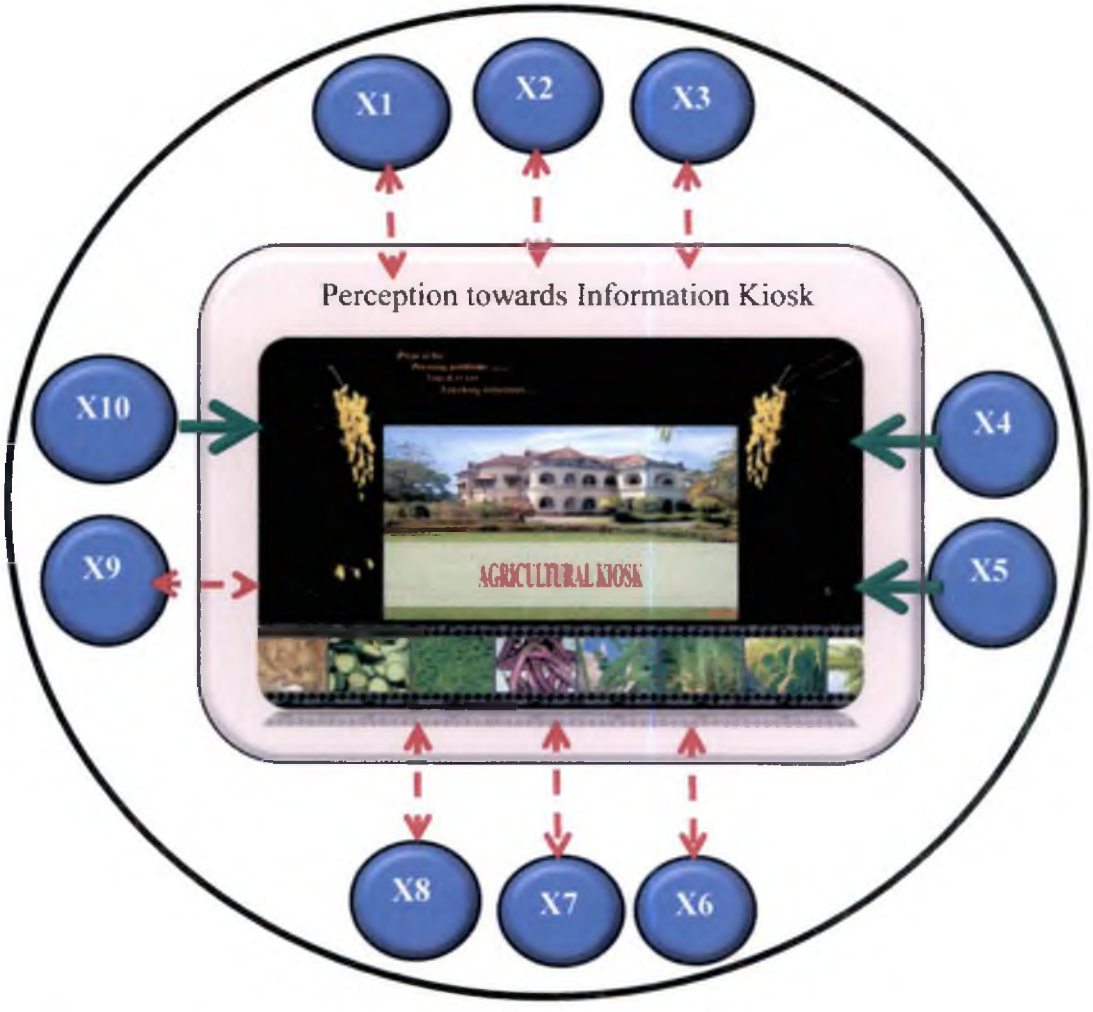
X7- Information needs

X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness of Information Kiosk

Figure 33. Empirical relationship between independent variables and the Utility of messages of Information Kiosk



Non-Significant relationship **Positive significant relationship**

X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X6- Frequency of use of messages

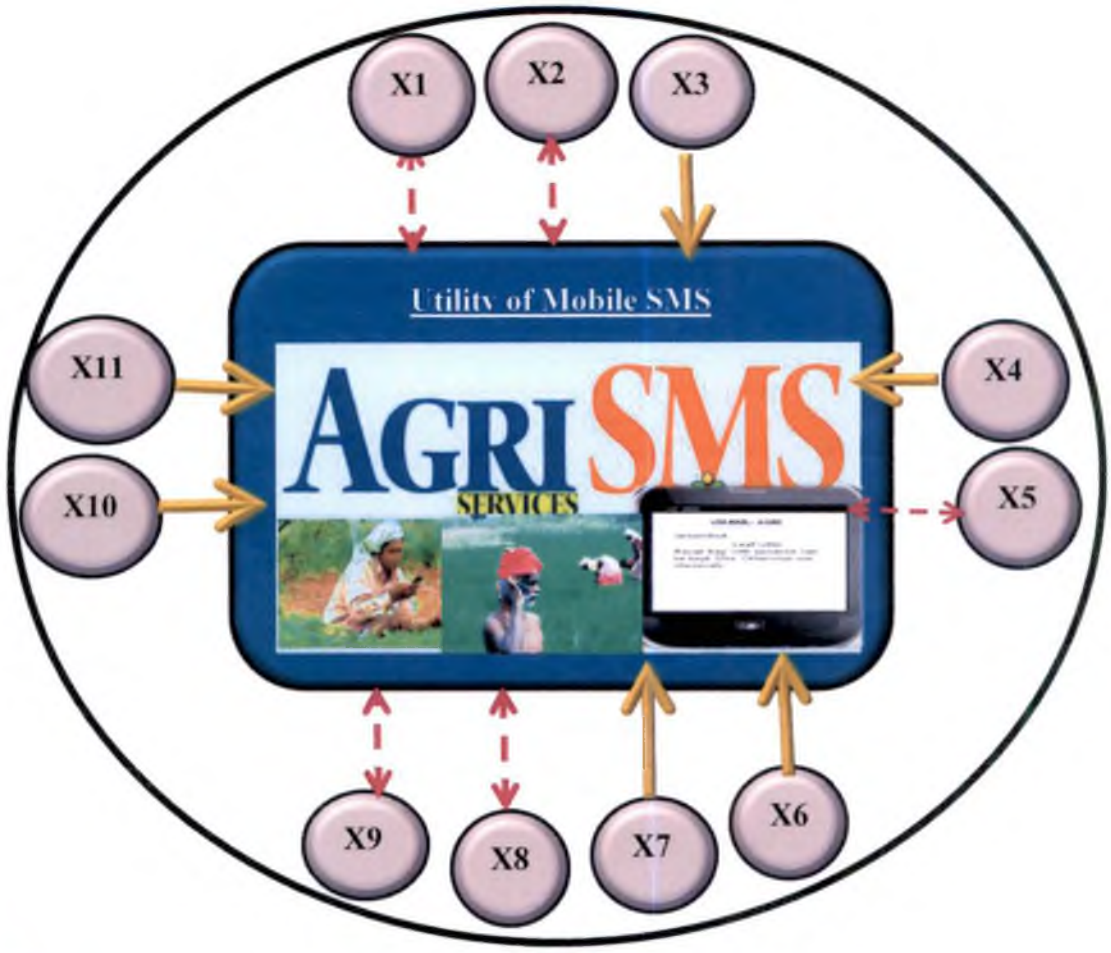
X7- Information needs

X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness of Information Kiosk

Figure 34. Empirical relationship between independent variables and the Perception of farmers towards Information Kiosk



Non-Significant relationship **Positive significant relationship**

X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X6- Frequency of use of messages

X7- Information needs

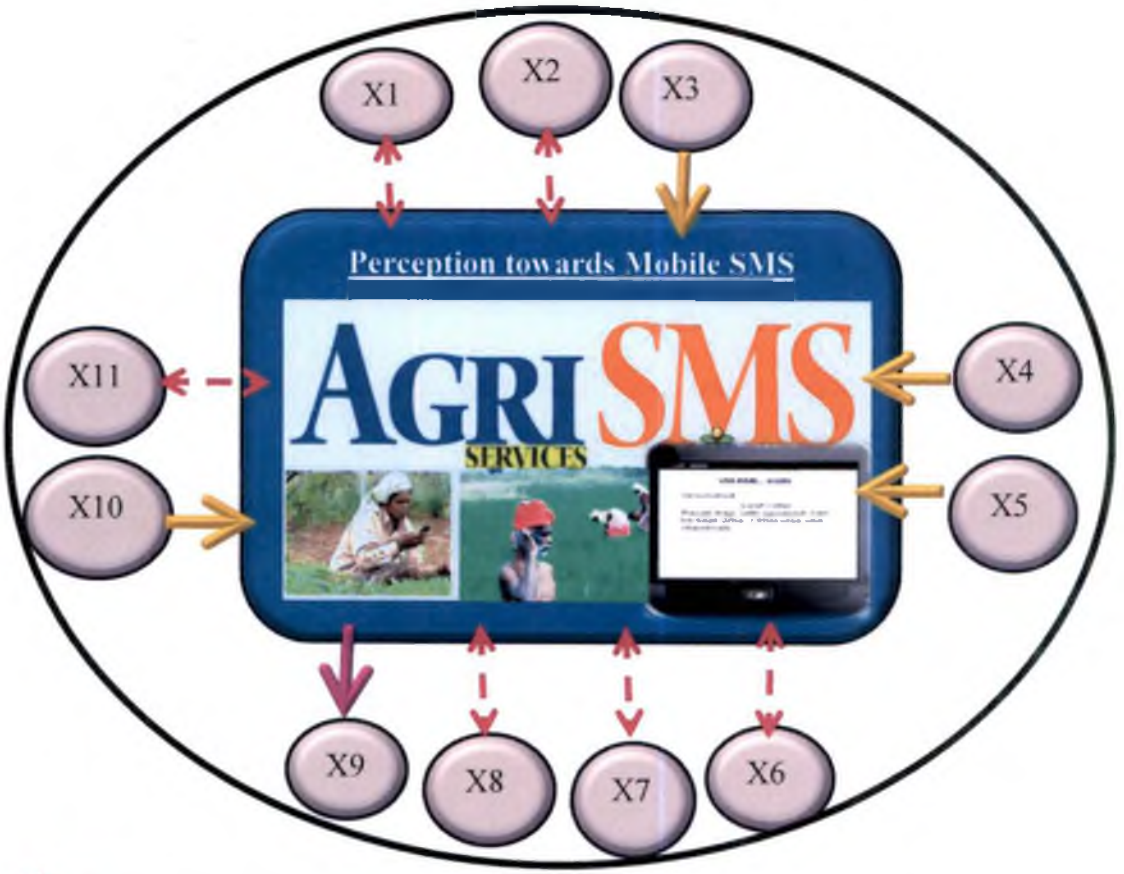
X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness of Mobile SMS

X 11- Advantages of Mobile SMS

Figure 35. Empirical relationship between independent variables and the Utility of Mobile SMS



Non-Significant relationship

Positive significant relationship **Negative significant relationship**

X1- Age

X2- Education

X3- Exposure to ICT

X4- Information dissemination

X5-Awareness

X6- Frequency of use of messages

X7- Information needs

X8- Attitude of the farmers

X9- Constraints

X10- Effectiveness of Mobile SMS

X 11- Advantages of Mobile SMS

Figure 36. Empirical relationship between independent variables and the Perception of farmers towards Mobile SMS

the farmers can easily identify and clarify the doubts with the help of agricultural officers or agricultural assistants. Also the concerned Agricultural officer can ensure the safety of the Information Kiosk and can also report to the concerned authority if the Kiosk is not functioning properly and rectify the defect as early as possible. It implies that farmers need ICT mediated technology advices through extension personnel. Other places suggested for placing of Information Kiosk were markets, bus terminals, Banks, ATM centres for their easy accessibility. Other suggestions were given below.

- Organic farming practices, Indigenous Technical Knowledge (ITK) should be included in information kiosk.
- Inclusion of topics Hi-Tech farming, precision farming.
- Inclusion of list of banned chemical in the Information Kiosk.
- Updating of Information Kiosk time to time.
- Make the contents available to the farmers in the form of CDs, e- books, and also in printed form.
- Online connectivity to the Information Kiosk and attaching printer facility.
- Improve picture clarity, increase number of photographs of pests and diseases.
- Increase the number of crops of vegetables, flowers, commercial and plantation crops and number of pests and diseases dealt under each crop.
- Decrease the number of photographs in one pane to avoid clumsy appearance.
- Information specific to area of placement of Information Kiosk should be included.
- Under each variety of crop yield per plant, market price of one unit of product, cost of fertilizers and pesticides, integrated pest management practices, local varieties along with new technology should be included.
- Malayalam text spellings to be corrected and touch screen device speed should be increased.
- Majority of the farmers opined that SMS received by them should be specific to the crop cultivated by the farmer and location.

- Some farmers cannot attend the voice messages in the morning as they are busy with their work. So voice messages should be delivered in the evening.
- Plant protection measures have to be given adequately.
- Messages should be repeated twice in a day.

4.14. STRATEGY FOR SCALING UP OF USES OF INFORMATION KIOSK AND MOBILE SMS.

The important link between the whole of ICT networks and their application is to ultimately benefit the stakeholders who are beneficiaries of these initiatives. In case of ICT initiatives aimed at agricultural development the main stakeholders are farmers. The overview of results of investigation indicate that majority of farmers are unaware of the ICT services being developed for them. Developing information services with farmers and understanding clientele and their information needs has been subsided by the technological enthusiasm that is prevailing. As a result, goals of these ICT initiatives had not reached expected level.

For the effective delivery of ICT based extension services, the following strategy is formulated based on the findings of the study as well as observation of existing conditions of the ICT projects. It is hoped that the implementation of the following strategy can help in effective delivery of ICT based extension services to the farming community. It is depicted in figure in 37.

- **Providing adequate infrastructure**

Placing of Information Kiosk at the locations which are frequently visited by the farmers help in increasing the accessibility and availability. Krishi Bhavans, panchayats, markets, ATM centres are the places where Information Kiosk security can be ensured and accessibility is increased. Providing online connectivity will help the farmers to get the current market information, availability of inputs, their costs etc. Attaching a printer facility will facilitate the farmers to get the required information in hard copy and keep it as a reference for further use.

- **Promotion of public private partnership**

Promotion of public private partnership in establishing Information Kiosks and SMS delivery services would help better outreach of services to the farming community. The private companies dealing with the manufacture and sale of agricultural inputs-seeds, fertilizers, insecticides and pesticides and those dealing with processing food and marketing can be reached by using ICTs. It also helps in demand driven extension services to the farming community. Effective PPP in utilizing ICT would help the extension system in reaching the unreached with need based, demand driven information and technologies.

- **Periodical monitoring and evaluation**

Monitoring and evaluation of the effect of provided information, decision-making process and economic returns accrued to the end users are required to rectify the pitfalls of the ICT projects. Effective monitoring and evaluation at all the levels improves the functioning of the extension system and enhances ICT utilization to provide personalized information and technologies

- **Orientation of human resources towards ICT extension**

Successful implementation of any program / project would depend on human resources. In case of ICT project, they are main driving force for achieving objectives of the project. They act as interface between ICT tools and farming community. By giving incentives to the grass root level extension workers and extension personnel by fixing targets, access to information services could be improved.

- **Network development among agricultural institutions**

Network development among agricultural institutions and Sharing of technologies and information among different ICT development initiatives would help in replicating success factors in one project to another, which finally

community in their decision-making. Networking always reduces the time gap, duplication of projects in the same area, increases the knowledge base and improves the decision making capacity. Collaboration of the different ICT projects will help in non-duplication of the efforts.

- **Content improvement**

Assessing the information needs of the farmers evolving of location specific and personalized information with feed-back and query system. Inclusion of more crops and practices, market information increases adequacy of the content provided and meets the requirements of the farmers. Periodical updating of content and including current practices and inputs increases the timeliness of the information. Clarifying the content from errors, spelling mistakes, increasing the speed of the Information Kiosk and picture clarity increases the format clarity. Providing content in local language for Mobile SMS and Information Kiosk increases the understand-ability and utility of these initiatives to the farmers

- **Conducting training programmes**

Developing IT skills efficiency of the extension personnel's through trainings would help in speedy and effective dissemination services to the farming community. Rural youth and experienced farmers need to trained on utilization operation of ICT tools. For this purpose, farmers groups, women self- help groups and other rural institutions should be targeted to build their capacities and create information revolution in the rural areas. Providing learning materials such as CDs, pamphlets, booklets etc., help the farmer in going through the material and clarifying the doubts by discussing with fellow farmers and it also helps in creating awareness among the fellow farmers.

- **Developing favourable attitude**

Agricultural scientists and extension service provides need to develop a positive disposition towards relevance and efficacy of information technology to improve their job performance, speed-up technology generation and also facilitate faster transfer of technology to farmers without any time lag distortion of information. Since these agricultural professionals are the e-leaders in the agricultural development, they need to be fully prepared and turned to future challenges. Any hesitation or reluctance among them towards ICTs may be removed immediately through proper training on computers as well as improving their development orientation, information sharing, problem solving skills, etc.

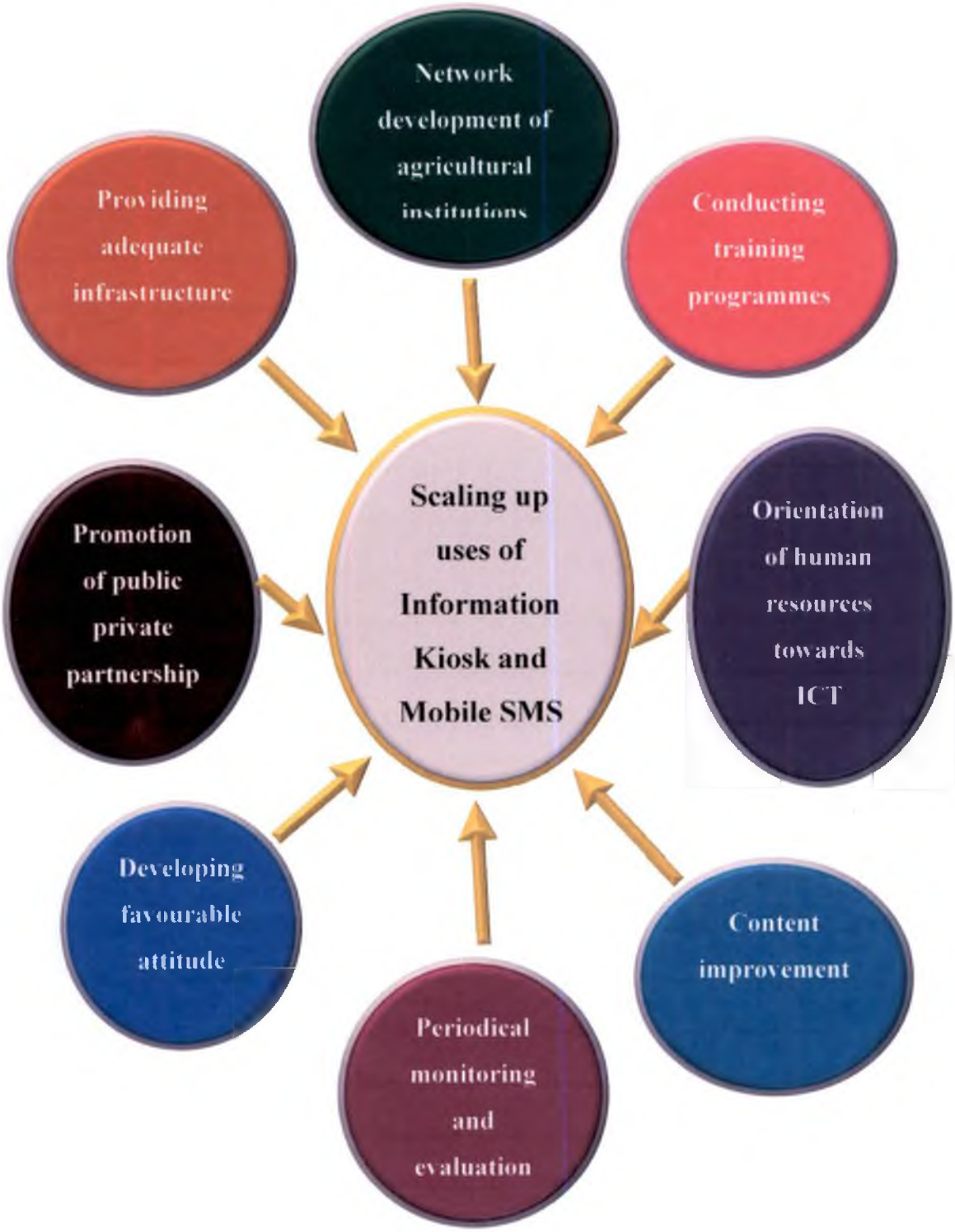


Figure 37. Strategy for scaling up uses of Information Kiosk and Mobile SMS services

Summary

5. SUMMARY

The enormous pressure to obtain higher productivity from a unit area of land in a sustainable way of production is a tough task and paves way for special effort to use key inputs in an innovative way and sound knowledge base to sustain agricultural productivity and profitability.

In this context quick dissemination of technological information from agricultural research system to the farmers in the field and reporting of farmers feed back to the research system is one of the critical inputs in dissemination of agricultural technology. The information and communication support during past fifty years has mainly been through conventional methods. The extension personnel of the department of agriculture disseminated the technologies and messages to the farmers through various extension methods. But these approaches have not been able to reach majority of the farmers spread across the country. The diversity of agro-ecological situation adds to this challenge further. Farmer's needs are much more diversified and the knowledge required to address them is beyond the capacity of the grass root level extension functionaries.

Information and Communication Technologies (ICTs) possess vast potential to promote agriculture and rural development through speedy transfer of technology to farming community. They are gaining prominence worldwide in achieving the goals of sustainable development by reducing time and space barriers. Considering the fact that majority of the Indian population lives in rural areas and majority of rural mass are unaware of latest farm technologies for sustainable agriculture development, the efforts made by central and state governments and non-government organisations are not enough to reach rural masses. The need of the hour is use of modern and quick communication channels like Information and Communication Technologies (ICTs) to disseminate and create awareness about latest farm technologies among rural mass.

There are umpteen ways in which ICTs can be useful to small and marginal farmers in India. In order to extend the benefits of ICTs to the disorganized and disadvantaged farming sector, one of the road maps to achieve them are access of ICTs to villagers through Information Kiosks and Mobile telephony. The present study attempts to analyse the utility of the information support provided to farmers through the Information Kiosks and Mobile initiatives in Kerala with a view to suggest measures for enhancing the utility of these agro information support initiatives. Constraints and solutions as perceived by the farmers while using Information Kiosks and Mobile messages will also be studied which would enable in developing strategies to scale up its uses. The study also aimed at developing Effectiveness Index of the Information Kiosk and Mobile SMS and assessing the information needs of the farmers.

Thiruvananthapuram district was purposively selected for the study because this is the only district in Kerala which was having maximum number of Information Kiosks installed in the Krishi Bhavans and also farmers registering for SMS is also in more number as per the project, "Content development for Agri Kiosk and networking through Mobile SMS" and database in IT cell, Directorate of agriculture. Accordingly, five block panchayats were selected namely Vamanapuram, Athiyannoor, Vellanad, Nedumangad and Kazhakootam. A list of user farmers of Information Kiosk and receivers of mobile SMS were selected from the records of the block panchayat. From these lists the respondents were selected by random sampling method. From the list of farmers 40 farmers taken for users of information kiosk and 60 farmers were taken for users of mobile SMS by random sampling formed the respondents of the study.

The design of the research is ex-post facto research. The independent variables are selected based on judges rating. Utility of messages of Information Kiosk and Mobile SMS, perception of the farmers towards Information Kiosk and Mobile SMS were the four dependent variables taken for the study. All the data was collected using a well-structured interview schedule and each respondent was personally interviewed by the investigator. The data was subjected to statistical analysis such as percentage analysis, quartiles and correlation.

5.1. SALIENT FINDINGS OF THE STUDY

1. In both the categories of Information Kiosk and Mobile SMS majority of the respondents fell under the middle age group i.e., 80 per cent and 48.33 per cent respectively fall under age between 35 and 55 years.
2. A higher percentage of respondents in the users of Information Kiosk had high school education (40 %). In the case of users of Mobile SMS majority of the respondents (45%) had collegiate education.
3. Majority of the respondents of Information Kiosk and Mobile SMS had medium level of exposure to Information and Communication Technology (ICT) 67.5 per cent and 51 per cent respectively.
4. Maximum number of respondents of Information Kiosk utilized Television (97.5%), Mobile phone (97.5%), Telephone (72.5%) and Radio (70%) every day and most of the respondents never used Computer (30%), Internet (37.5%) and other Information and Communication Technology (ICT) tools (50%).
5. Majority of the respondents utilized Television (98%), Mobile phone (93%), other ICT tools (85%), Telephone (76.66%) and Radio (73.33%) daily. Internet (55%) and Computer (55%) was not being utilized by many of the farmers.
6. Most of the farmers (72.5%) disseminated information received from the Information Kiosk through communication with other farmers at various occasions (word of mouth) and in case of farmers utilizing the Mobile SMS they disseminated the information through Mobile/Telephone (98%).
7. Most of the farmers utilizing Information Kiosk had become aware of it by visiting the Krishi Bhavan (35%) where the Information Kiosk is being installed and in case of Mobile SMS majority of the farmers became aware through extension personnel (95%)
8. Many farmers have utilized the Information Kiosk messages for 4-5 times and Mobile SMS for only once so far.
9. Farmers in both the categories had favourable attitude towards Information Kiosk (52.5%) and Mobile SMS (51.66%).

10. Farmers in both the categories had medium level of information service needs to be offered through Information Kiosk (50%) and Mobile SMS (58.33%).
11. Majority of the respondents of Information Kiosk opined market information and price trends and advises from scientists on crop management (72.5%), quality inputs (70%), latest package of practices (67.5%), input prices and availability and information on crop finance loans (50%) and how to reduce cost of cultivation (45%) as most needed information service areas.
12. Most of the respondents of Information Kiosk opined disease/pest early warning system and management (57.5%), crop insurance and government policies regarding agriculture (55%), integrated nutrient management and water management (52.5%), soil health management and input prices and availability (50%), general agricultural news (42.5%), computer operation and utilization and post- harvest technology (40%), weather forecasting and farm business and management information(37.5%), commercial agriculture (35%) and quality standards of export produce (32.5%) as needed information services areas.
13. Many respondents of Information Kiosk opined success stories of farmers (50%), facilitation of land records (52.5%), water conservation through drip and sprinkler irrigation system (50%), information on rural development programmes and value addition to produce (47.5%), dry land crops and practices (40%) as less needed information service areas and dairy and poultry management and market infrastructure like ware houses and cold storages as not needed information service areas.
14. Majority of respondents of Mobile SMS opined advises of scientists on crop management and quality inputs (91.66%), weather forecasting, integrated nutrient management and soil health management (90%), commercial agriculture and latest package of practices (88.33%), market information and price trends (86.66%), disease or pest early warning system and management (85%), information on rural development programmes and input prices and availability (81.66%), water management (80%), general agricultural news (76.66%), farm business and management information (68.33%), how to

reduce cost of cultivation (61.66%), government policies regarding agriculture (58.33%), crop insurance (55%), value addition to produce (53.33%), computer operation /utilization and success stories of farmers (51.66%) and information on crop finance loans (48.33%), dairy and poultry management and marketing information (33.33%) as most needed information service areas.

15. Most of the respondents of Mobile SMS opined quality standards of produce for exports (50%), facilitation of land records (48.33%), dry land crops and practices (45%), water conservation through drip and sprinklers and post-harvest technology (43.33%) as needed information service areas and market infrastructure like warehouses and cold storages as not needed information service areas.
16. Both the categories of respondents reported medium degree of effectiveness for Information Kiosk (50%) and Mobile SMS (53.33%).
17. Majority of the Mobile SMS pushed were related to coconut crop (27.71%) followed by vegetables (18.07%), Banana (12.04%), Rice and plantation crops (8.43%), commercial crops (6.02%), tuber crops (3.6%), green manure crops (2.40%) and fruit crops (1.20%).
18. Majority of the Mobile SMS were pushed in Kharif season (56.6%) followed by Rabi season (33.7%) and other seasons (9.6%).
19. Content of the most of the Mobile SMS covered crop protection aspects (37.34%) followed by cultivation practices (30.12%), nutrient management and department services (16.84%), water management (8.43%), green manure crops (4.81%) and hi- tech farming (1.23%).
20. Majority of the respondents (80%) perceived that Mobile SMS has an advantage of possessing all the information a farmer wants.
21. The major constraint in accessing Information Kiosk is lack of awareness about ICT tools (85%) and contents related problems are major constraint for Mobile SMS (93.33%)
22. Both the categories of respondents reported medium degree of Utility for messages of Information Kiosk (52.5%) and Mobile SMS (50%).

23. Both the categories of respondents reported medium degree of Perception towards Information Kiosk (55%) and Mobile SMS (58.33%).

24. Utility of the messages of Information Kiosk is positively correlated with, frequency of use of messages, information needs, attitude of the farmers and effectiveness at 1 % significance level and education and awareness at 5% significance level. As increase in education level of the farmers increases the utility of the messages through increased awareness as educated farmer has more awareness about ICT tools. As awareness increases, frequency of use of messages also increase which develops a positive attitude towards Information Kiosk. Hence, the utility of the messages also increases. Effectiveness of an ICT tool increases its utility.

25. Perception of the farmers about Information Kiosk is positively correlated with effectiveness at 1% significance level and awareness, information dissemination at 5% significance level. As information dissemination ways provide information about the ICT tools and increase the awareness about various sources of information to the farmers. As awareness increase the Perception also increases. Effectiveness of an Information Kiosk meets the information requirements of the farmers which in turn increases the Perception and also the Utility of the Information Kiosk.

26. Utility of Mobile SMS is positively correlated with exposure to ICT, information dissemination ways, frequency of use of messages, information needs and advantages, effectiveness at 1% significance level. As increase in increases the knowledge about the agriculture information being given through SMS service and develops a positive attitude. Positive attitude increases the use of messages. Hence utility of the messages also increase. When information needs are met and they are positively significant, effectiveness increases. And both information needs and effectiveness increase the utility of the Mobile SMS by the farmers.

27. Perception of farmers towards Mobile SMS is positively correlated with exposure to ICT, awareness and effectiveness at 1% significance level and information dissemination ways at 5% significance level. It is negatively

correlated with constraints at 5% significance level. Exposure to ICT increases the knowledge about the Mobile SMS services and information dissemination ways, increase the credibility of the Mobile SMS which in turn increases the Perception about the Mobile SMS. More usage of the SMS will lead to better understanding of the SMS services and increases the Perception. Effectiveness and advantages increase the Perception about the Mobile SMS. Constraints decrease the accessibility of the Mobile SMS service and decreases its Perception.

28. Providing adequate infrastructure, content improvement promotion of public private partnership, network development among agricultural institutions periodical monitoring and evaluation, conducting training programmes, developing favourable attitude and orientation of human resources towards ICT extension is the strategy to be followed to scale up the uses of these initiatives.

5.2. SUGGESTIONS FOR FURTHER RESEARCH

The results of the present study warrant the need for further investigations in other directions. The following suggestions are made for use of further researchers who undertake similar studies.

- The study was limited to Thiruvananthapuram district as this was the only district in Kerala which had maximum number of information kiosks installed in the Krishi Bhavans, markets etc., during the study period. This study will become a forerunner for the forthcoming researches in this area.
- The present study has been continued to few ICT projects. Similar studies may be taken in other ICT project areas in other areas for generalisation of results.
- The present study has considered few variables for analysing ICT initiatives Number of other variables, which are likely to affect the ICT usage in agriculture can be studied.

- The study was conducted according to ex-post-facto research design. Further studies can be conducted using exploratory research design and other research design.
- There is a need to study the process of incorporation of ICTs in various hierarchal levels of extension organizations.
- Evaluative and Impact studies on agricultural technology dissemination models may be undertaken in related and allied fields.
- There is a need to conduct action research by setting model ICT centres at village level by ICAR/SAUs/Department of Agriculture/NGOs.

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INNOVATIONS IN e- AGRICULTURAL EXTENSION TECHNOLOGY (e-AET): DIFFUSION AND ADOPTION OF INFORMATION KIOSKS AND MOBILE INITIATIVES AMONG THE FARMERS OF THIRUVANANTHAPURAM DISTRICT, KERALA

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ABSTRACT

The present study entitled, 'Innovations in e-Agricultural Extension Technology (e-AET): Diffusion and adoption of information kiosks and mobile SMS among farmers of Thiruvananthapuram district, Kerala' was carried out to analyse the utility of the information support provided to farmers through the Information Kiosks and Mobile initiatives in Kerala with forty user farmers for Information Kiosk and sixty user farmers for Mobile SMS from Thiruvananthapuram district.

The findings demonstrate that majority of the farmers in both the categories fell under middle age group and had favourable attitude towards these initiatives. Farmers utilizing Information Kiosk became aware through contact of Information Kiosk installed at Krishi Bhavan, markets, had more high school education and disseminated information through communication with fellow farmers. Farmers utilizing Mobile SMS became aware through extension personnel, had more collegiate education and disseminated information through Mobile/Telephone. Medium level of exposure to Information and Communication Technology (ICT), effectiveness, information needs, perception and utility of messages was observed for the information support given through both Information Kiosk and Mobile SMS. Most of the farmers utilized the Information Kiosk messages for 4-5 times and Mobile SMS only once. The major constraint in accessing Information Kiosk is lack of awareness and contents related problems is a major constraint for accessing Mobile SMS.

Utility of the messages of Information Kiosk is significantly positively correlated with education, frequency of use of messages, awareness source, information needs, attitude of the farmers, effectiveness. Perception towards Information Kiosk is positively correlated significantly with information dissemination ways, awareness source and effectiveness. Utility of messages mobile is significantly positively correlated with exposure to ICT, information dissemination ways, frequency of use of messages, information needs, advantages and effectiveness. Perception towards mobile SMS is significantly positively

correlated with exposure to ICT, awareness source, information dissemination ways, effectiveness and negatively correlated with constraints.

Providing adequate infrastructure, content improvement promotion of public private partnership, network development among agricultural institutions periodical monitoring and evaluation, conducting training programmes, developing favourable attitude and orientation of human resources towards ICT extension is the strategy to be followed to scale up the uses of these initiatives. Hence the study undoubtedly exhibited that quick dissemination of information from agricultural research system through Information Kiosks and Mobile SMS can be done and they constitute one of the critical inputs in technology transfer in present agricultural scenario.

സംഗ്രഹം

സാങ്കേതിക കാർഷിക വിജ്ഞാന വ്യാപനത്തിലെ പുതുമകൾ - കിയോസ്കും മൊബൈൽ സന്ദേശങ്ങളുടെ പ്രസരണവും സ്വീകരണവും കേരളത്തിലെ തിരുവനന്തപുരത്തെ കർഷകരുടെ ഇടയിൽ എന്നതിനെ കുറിച്ച് ഒരു പഠനം 2013-2014 കാലയളവിൽ 40 വിവരണാത്മക കിയോസ്കുപയോഗിക്കുന്ന കർഷകരിലും 60 മൊബൈൽ സന്ദേശം സ്വീകരിക്കുന്ന കർഷകരിൽ നടത്തുകയു ായി.

ഈ ക ുപിടിത്തങ്ങൾ സാധുകരിക്കുന്നത് ര ുവിഭാഗത്തിലും വരുന്ന കർഷകർ മധ്യവയസ്ക്കരും സന്ദേശങ്ങളോട് അനുകൂലരീതിയുള്ളവരുമാണ്. വിവരണാത്മക കിയോസ്ക് ഉപയോഗിക്കുന്ന കർഷകർ കിയോസ്കിനെക്കുറിച്ച് അറിഞ്ഞത് കൃഷിഭവനത്തിലും ചന്തകളിലും സ്ഥാപിച്ച കിയോസ്കു വഴിയും ഹൈസ്കൂൾ വിദ്യാഭ്യാസം നേടിയതും ക്രിയാത്മക അറിവുള്ള കർഷകരിൽ നിന്നുമാണ്. മൊബൈൽ സന്ദേശം ഉപയോഗിക്കുന്ന കർഷകർക്ക് ഇതിനെക്കുറിച്ച് അറിവ് ലഭിച്ചത് കോളേജ് വിദ്യാഭ്യസം ലഭിച്ച വിജ്ഞാന വ്യാപനത്തിലെ ഉദ്യോഗസ്ഥരിലുടെയും സഹപാഠികളിൽ നിന്നും മൊബൈൽ/ടെലിഫോണിൽ നിന്നുമാണ്. ഈ വിവരവിജ്ഞാപന സാങ്കേതിക വിദ്യയുടെ പ്രയോജനങ്ങൾ, സന്ദേശങ്ങളുടെ ഉപയോഗവും സ്വീകാര്യതയും ഇടത്തരം രീതിയാണ് ഉപയോഗപ്പെടുത്തുന്നത് എന്നാണ് നിരീക്ഷണങ്ങൾ വെളിപ്പെടുത്തുന്നത്. മിക്കവാറും വിവരണാത്മക കിയോസ്കുപയോഗിക്കുന്ന കർഷകർ 4-5 തവണയും മൊബൈൽ സന്ദേശം സ്വീകരിക്കുന്ന കർഷകർ ഒരു തവണയെങ്കിലും അവ പ്രയോജനപ്പെടുത്താറു ്. വിവരണാത്മക കിയോസ്കിന്റെ പ്രധാന പരിമിതി എന്നുപറയുന്നത് വിവരങ്ങളുടെ അവബോധമില്ലായ്മയും മൊബൈൽ സന്ദേശങ്ങളുടേത് ഉള്ളടക്കവുമായി ബന്ധപ്പെട്ട പ്രശ്നങ്ങളുമാണ്.

വിവരണാത്മക കിയോസ്കിലെ സന്ദേശങ്ങളുടെ ഉപയോഗം പൂർണ്ണമായും ബന്ധപ്പെട്ടിരിക്കുന്നത് വിദ്യാഭ്യാസത്തിനേയും സന്ദേശങ്ങളുടെ ആവൃത്തി, അറിവിന്റെ ഉത്ഭവം, വിവരത്തിന്റെ ആവശ്യകത, കർഷകന്റെ മനോഭാവം, പ്രയോജനം എന്നിവയെ ആശ്രയിച്ചാണ്. വിവരണാത്മക കിയോസ്കിന്റെ സ്വീകാര്യത പൂർണ്ണമായും ബന്ധപ്പെട്ടിരിക്കുന്നത് വിവരങ്ങളുടെ ശേഖരണരീതിയും അറിവിന്റെ ഉത്ഭവം, പ്രയോജനവും ബന്ധപ്പെടുത്തിയാണ്. മൊബൈൽ വഴിയുള്ള സന്ദേശങ്ങളുടെ ഉപയോഗം ബന്ധപ്പെട്ടിരിക്കുന്നത് വിവരവിജ്ഞാപന സാങ്കേതിക വിദ്യയുടെ ഉപകരണങ്ങളുടെ പ്രകാശനം, വിവരങ്ങളുടെ തരംതിരിച്ചിരിക്കുന്ന രീതി, സന്ദേശങ്ങളുടെ ഉപയോഗത്തിന്റെ ആവൃത്തി, വിവരങ്ങളുടെ ആവശ്യകത, ഗുണങ്ങൾ ഇവയാണ്.

കാർഷിക ഗവേഷണ സംവിധാനത്തിൽ അനുയോജ്യമായ അടിസ്ഥാന സൗകര്യങ്ങൾ നൽകുക, വിവരങ്ങൾ അഭിവൃദ്ധിപ്പെടുത്തുക, പൊതുസ്വകാര്യമേഖലയിൽ പ്രചാരം വർദ്ധിപ്പിക്കുക, കാർഷിക സ്ഥാപനങ്ങളിൽ ശൃംഖല വർദ്ധിപ്പിക്കുകയും ആനുകാലികമായി മേൽനോട്ടം വഹിക്കുകയും മൂല്യനിർണയം നൽകുകയും ചെയ്യുകയും പരിശീലനപരിപ്പാടികൾ സംഘടിപ്പിക്കുക, അനുകൂലമായ മനോഭാവം വളരത്തിയെടുക്കുക, തുടങ്ങിയ മാനുഷികവിഭവങ്ങളുടെ നവീകരണം വഴി ഉപയോഗപ്പെടുത്താം എന്നതാണ്. ഈ പഠനം സംശയമന്യേ കാണിക്കുന്നത് വിവരണാത്മക കിയോസ്ക്കിന്റേയും മൊബൈൽ സന്ദേശങ്ങളുടേയും ഏറ്റവും വിധിനിർണ്ണായകരമായ ഊർജ്ജം എന്ന് പറയുന്നത് കാർഷികപരമായ വിവരങ്ങൾ പെട്ടെന്ന് പ്രചരിപ്പിക്കുക എന്നതാണ്.

Appendix I

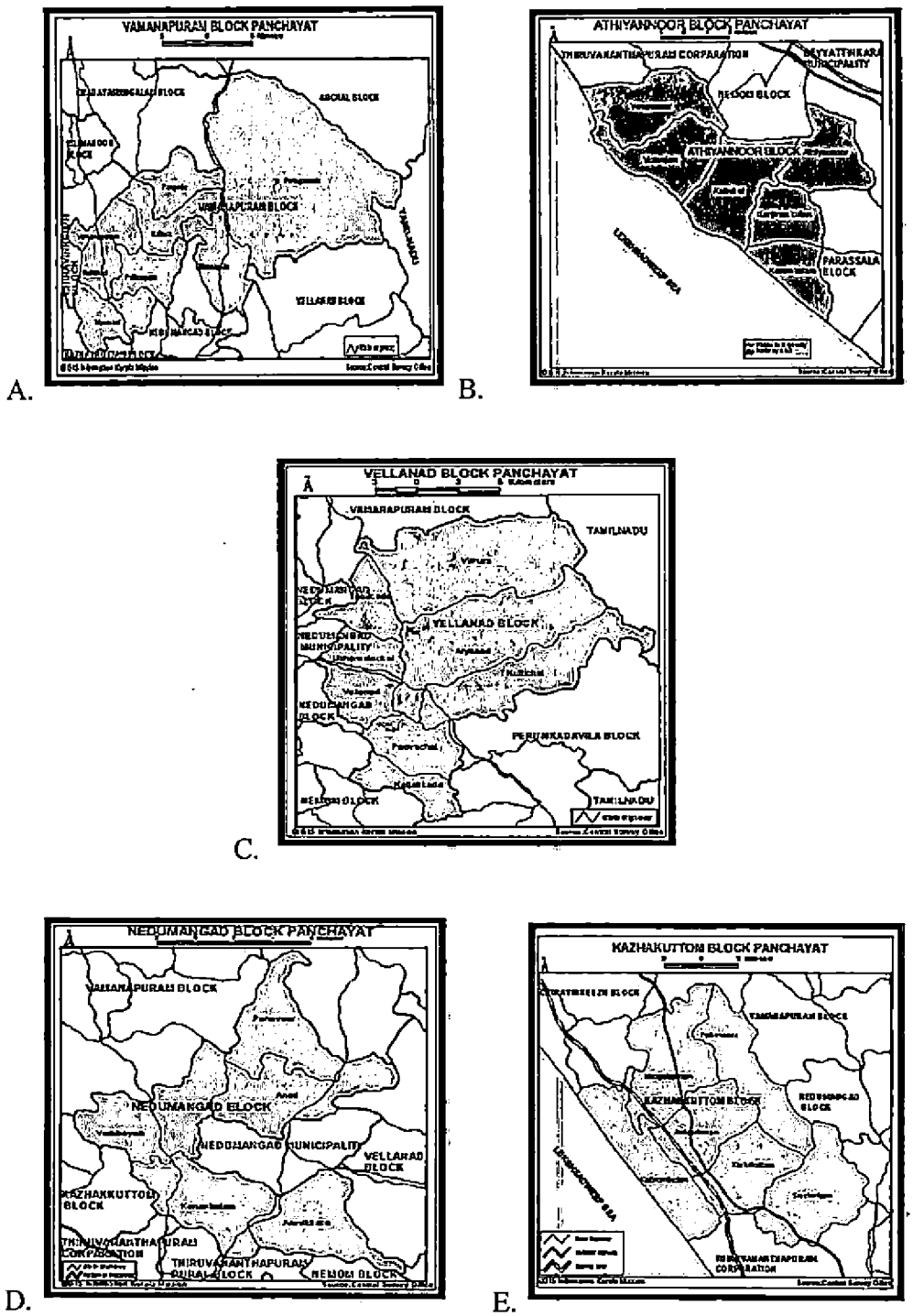

Figure 2. Map showing the block Panchayats taken for the study: (A) Map of Vamanapuram block Panchayat (B) Map of Athiyannor block Panchayat (C) Map of Velland block Panchayat (D) Map of Nedumangad block Panchayat (E) Map of Kazhakootam block Panchayat

Appendix II

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani, Thiruvananthapuram. 695 522

Department of Agricultural Extension

Prof. (Dr.) N. Kishore Kumar Date: 18/10/2013

Chairman of Advisory Committee

Sir/Madam,

Greetings.

Sir/Madam,

Ms. Hinduja. N. A. (Ad. No. 2012-11-190), one of the M. Sc. Scholar, Department of Agricultural Extension, College of Agriculture, Vellayani is undertaking a research study entitled "Innovations in e-Agricultural Extension Technology (e-AET): Diffusion and adoption of information kiosks and mobile SMS among farmers in Thiruvananthapuram district, Kerala" as part of her PG research work.

After extensive review of the available literature and discussion with Extension scientists and other experts, variables supposed to have close association with the study have been identified.

Considering your vast experience and professional expertise you have been selected as a judge to rate the relevancy of the variables. I request you to kindly spare some of your valuable time for examining the questionnaire critically. Kindly return the list duly filled at the earliest.

Thanking you.

Yours sincerely,

(Dr. N. Kishore Kumar)

OBJECTIVES OF THE STUDY

In Kerala, farmers are getting voice messages in Malayalam language and text SMS in English ever Tuesday and Friday on agriculture and allied sectors related information. These services are offered through IITMK and Department of Agriculture, Kerala and Kerala Agricultural University.

Please rate the variables to be included in the study based on its relevancy as Most Relevant (MR), Relevant (R) and Least Relevant (LR) by ticking against each variable under the respective rating scale.

Variables	MR	R	LR
Age: Number of calendar years completed by the respondent at the time of investigation.			
Gender: It refers to the male and female farmers in the study area			
Education: It refers to highest academic qualification possessed by the farmer.			
Occupation: The main vocation and other additional vocations that the respondents were possessing at the time of interview.			
Annual income: It is defined as the total income a respondent derived from agriculture, allied and other occupation in a year.			
Land holding: It was operationalised as the number of standard acres possessed by the farmer at the time of enquiry.			

Variables	MR	R	LR
Productivity: It refers to the output per unit area cultivated.			
Farming experience: It is the number of completed years in farming.			
Extension agency contact: It is the degree to which the respondents meet the extension agents for agricultural information.			
Retrievability: It is operationalized as the extent to which the information provided in the Information Kiosk can be easily located and received by any user.			
Possession of ICT: It is the availability of facilitation and opportunities to the respondents for updating of information regarding farming activities.			
Accuracy: Any inaccurate information leads to faulty decisions, so accurate information is needed for successful decision making.			
Explicitness: It refers to the content of the SMS and Information Kiosk that does not need clarification.			
Cost effectiveness: It states that cost effectiveness of information is derived when its benefits outweighed its cost of gathering as perceived by the user.			
Adequacy: It is defined as information delivered covers all related aspects about a particular event or situation with respect to the Information Kiosk and SMS.			

Variables	MR	R	LR
Format clarity: It refers to the extent to which the information given in the Information Kiosk and SMS is in clear format which help the receiver to arrive at a decision.			
Non redundancy: It represents non duplication of information by the Information Kiosk and SMS. The same information is not stored or communicated using different reports.			
Interactiveness: It is operationalized as the extent to which the Information Kiosk system provides for interacting with the user.			
Information seeking behaviour: It is referred to as the sources or channels from which the respondents get technological information regarding agriculture and the related areas.			
Up to datedness: It refers to the currency of information delivered by the Information Kiosk and SMS.			
Effectiveness: It is defined as obtaining the right information to promote decision making to achieve the objectives.			
Information storing behaviour: The information storage refers to how the respondent received the message and how he stored the content in his local language			

Variables	MR	R	LR
Reliability: It is defined as information provided by Information Kiosk and SMS is free from errors and biases at acceptable degrees of confidence.			
Risk orientation: It is defined as the degree to which a farmer was oriented towards encountering risks and uncertainty in adopting any new ideas in farming.			
Economic motivation: It is defined as occupational in terms of profit maximisation and relative value the farmer places on monetary gains.			
Scientific orientation: It is defined as the degree to which a farmer was oriented towards the use of scientific methods in farming.			
Relevancy: It is defined as any information disseminated by Information Kiosk and SMS related to the information needs of a specific recipient for specific situation.			
Market orientation: is defined as organization wide generation of market intelligence pertaining to current and future customer needs, dissemination of intelligence across departments, and organization wide responsiveness to it.			
Level of aspiration: It is operationalized as the future level of achievements in famer's job in which he/she is expecting based on the knowledge about the level of past performance.			

Variables	MR	R	LR
Physical compatibility: It is the degree to which the technology is perceived as consistent with the infrastructural availability, past experience and needs of the respondent.			
Practicability: The dimension of practicability was measured whether the information provided in the Information Kiosk and SMS was adoptable in the real situation and feasible to the users.			
Information content: Information content was measured as the extent to which the information on the subject matter was covered in the Information Kiosk and Mobile SMS.			
Knowledge requirement: It meant the need of knowledge on improved practices and other information as realised by the respondent.			
Social acceptability: It is the degree to which a technology is considered useful, practical and feasible by majority by the members of the social system.			
Access to information sources: It was operationalized as the respondents access to information sources to get required information on agriculture and other related information.			
Skill requirement: It means that the skill farmer realises as his requirement to use the ICT for improving his /her work efficiency.			

Variables	MR	R	LR
Information dissemination behaviour: It refers to information exchange the respondent has within his community and among other communities and how he shared the message among the fellow members and or groups.			
Innovativeness: It is the degree to which an individual is relatively earlier in adopting new ideas.			
User education: It is defined as any effort or programme which will guide and instruct existing users, individually or collectively with the objective of facilitating the recognition of their own information needs, the formalization of their needs, the effective and efficient use of information services and assessment of these services.			
Mass media exposure (other than ICT services): It is the extent of exposure of respondent to mass media such as Radio, Television, Newspapers, Farm magazines on agriculture and others.			
Knowledge gain: Knowledge gain was the quantity of information gained by the respondent by interacting with the Information Kiosk and SMS.			
Flexibility- this is operationalized as the degree to which Information Kiosk is characterized by a ready capability to adopt to new alternative or changing requirements or conditions.			

Variables	MR	R	LR
Training received (on computers/ICT tools): Training received was operationally defined as an intensive learning activity for farmers by competent trainers to understand and practice computers/IT tools for accessing and to disseminate information on their own.			
Inventorisation: Extent of inventorisation of Information Kiosk in the field of agriculture.			
Frequency of use of ICT services: It was operationalised as the frequency of use of ICT services by the farmers.			
Attitude towards Information Kiosk and Mobile SMS: Type of attitude possessed by the respondents towards Information Kiosk and Mobile SMS.			
Awareness on Information Kiosk and Mobile SMS: Extent of awareness possessed by farmers on Information Kiosk and Mobile SMS.			
Availability: It is operationalized as information offered with reasonable proximity and appropriate hardware and software.			
Credibility: It meant the extent to which a communication source was preferred as trustworthy and important by receivers of the information			
Timeliness: It defines timeliness as the information provide when it is needed			

Variables	MR	R	LR
Simplicity: It is the degree to which the technology is simple to be adopted by the farmers.			
Computer literacy: It is the ability of the farmers to understand and use the computers to browse the internet for accessing IT services by himself			
Scalability: Evolving an Information Kiosk and to add, modify or delete content, outlay, visual presentation and content.			
Cosmopoliteness: It was operationalized as the frequency, purpose and duration of visit to nearby towns and villages by the respondent.			
Exposure to Information and Communication Technology: It refers to the extent to which the respondent was exposed to internet and Information Communication Technology (ICT) for developing his/her knowledge and skills for the benefit of his/ her profession.			
Rational orientation: Extent of rationality and scientific belief of a respondent in relation to the Information Kiosk information and SMS content.			
Any other suggestions:			

*ICT-Information and Communication Technology

*IT-Information Technology

Appendix III

APPENDIX III

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani, Thiruvananthapuram. 695 522

Department of Agricultural Extension

Innovations in e- Agricultural Extension Technology (e-AET): Diffusion and adoption of information kiosks and mobile initiatives among the farmers of Thiruvananthapuram district, Kerala.

INTERVIEW SCHEDULE

Part I (Information Kiosk services utilizing farmers)

Respondent No:

Name:

Block and Village:

Address and Contact No:

1. Age: .....Number of years
2. Education

S. No	Category	✓ Tick
1	Illiterate	
2	Can read and write	
3	Primary school	
4	Middle school	
5	High school	
6	college	
7	Professional degree	

3. Exposure to modern ICT facilities. (Please tick the appropriate one and indicate the frequency of use)

ICT	daily	>2 times per week	2 times per week	Once in a week	Once in a fortnight	Once in a month	Never
Computer							
Internet							
Telephone							
Mobile phone							
TV							
Radio							
Others							

4. How did you become aware of the Kiosk?

a) You visited yourself? ( )

b) Through friend/ relative ( )

c) Canvassing through Kiosk operator/ Project staff ( )

d) Through newspaper ( )

e) Extension personnel ( )

f) Others specify ( )

5. How many times in total you have visited the Kiosk so far?

a. Never ( )

b. Only once ( )

c. 2- 3 times ( )

d. 4- 5 times ( )

e. 6- 10 times ( )

f. More than ten times ( )

g. Regularly ( )

6. Attitude of farmers about the Information Kiosk. (Tick the appropriate one: SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree)

Statement	SA	A	UD	D	SD
Provide possible solution to the present agricultural situation					
Cannot meet location specific needs of farmers					
Farmers can access up to date information on various aspects					
Assist the farmers in planning and decision making aspects of agriculture.					
Kiosk based extension services transforms the lives of farmers.					
Could not show an impact on crop production					
Could not meet the farmers needs at the right time					
Provision of information would not help farmers in taking timely decisions					
Kiosk is a valuable ICT tool but it will never influence farmer's decision making.					
Cannot provide best package of practices of various crops to farmers					
Enable farmers to access an information they need at any time.					
Upgrades knowledge of the farmers in agricultural technologies.					

7. Where do you want to keep the Kiosk in your village so that it is easily accessible?

8. How do you disseminate the information received from the Kiosk?

a) Through email/ online using internet ( )

b) By adopting the content in field conditions. ( )

c) Mobile/ telephone ( )

d) Letters ( )

e) By word of mouth ( )

f) Do not share ( )

9. Suggestions for improvement of information Kiosk services

10. Please mention the utility of messages given by Information Kiosk

Characteristics of information	**All information**	**Most information**	**Some information**	**No information**
Timeliness				
Reliability				
Relevancy				
Retrievability				
Adequacy				
Format clarity				
practicability				
Simplicity				

11. Constraints experienced by farmers while using Information Kiosk

Category	Tick
Not compatible with the culture	
Not available at all times	
Negative mentality in accepting new things	
Illiteracy	
Lack of infrastructure facilities	
Content problems	
Unavailability of learning materials	
Lack of training programmes	
Lack of awareness about ICT tools	
Other constraints	

12. Perception of the farmers about Information Kiosk. (Please tick the appropriate one as MS- Most satisfied, S- Satisfied, NS- Not satisfied)

Perception Statement	MS	S	NS
Diagnostic path is sequential and logic			
Diagnostic path leads to correct conclusion			
Answers are based on field reality			
Photographs helps for confirmation of disease, pest.			
Adequacy of photographs			
Photo clarity			
Adequacy of message			
Clarity of message			
Words and sentences are simple			
Practical utility of message			
Favours good interaction			
Motivate to learn			

Perception Statement	MS	S	NS
Appearance and layout			
Background colour			
Size of the letter			
Style of the letter			
Colour of the letter			
Easily portable			
Ease in use and functionality			
As management tool			
As decision support system			
As extension tool			
As training education tool			
As diagnostic tool			

15. Assessment of the information needs. (Please tick the appropriate one: MN-Most Needed, N- Needed, LN- Less Needed and NN-Not Needed)

Statement	MN	N	LN	NN
Market information and price trends				
Latest package of practices				
Disease or pest early warning system and management				
Input prices and availability				
Weather forecasting				
Information on rural development programme				
Crop insurance				
General agricultural news				
Farm business and management info				
Facilitation of land records				
Quality inputs				
Market infrastructure like warehouses and cold storages				

Statement	MN	N	LN	NS
Soil health management				
Integrated Nutrient Management				
Water management				
Water conservation through drip and sprinklers				
Post-harvest technology				
Dry land crops and practices				
Quality standards of produce for exports				
Dairy and poultry management and marketing information				
Commercial agriculture				
Advises of scientists on crop management				
Information on crop finance loans				
Success stories of farmers				
Value addition to produce				
How to reduce cost of cultivation				
Govt. policies reg. agriculture				
Computer operation/utilization				

13. Effectiveness of Information Kiosk. (Please tick the appropriate one: Most S- Most satisfied, More S- More satisfied, S-Satisfied, LS- Least Satisfied, US-Unsatisfied)

Items	Most S	More S	S	LS	US
Scalability					
Reliability					
Knowledge gain					
Availability of messages for further reference					
Conversational ability					
Readability of the message					

Items	Most S	More S	S	LS	US
Motivation to learn					
Completeness of subjective matter					
Information storage					
Interesting to use					
Simple to operate					
Quick availability,					
Attractiveness					
Motivate to adopt the messages in farm					
Photo clarity					
Information provided					
Orderliness of subject matter provided					
Ability to exploit considerable amount of knowledge.					

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani, Thiruvananthapuram. 695 522

Department of Agricultural Extension

Innovations in e- Agricultural Extension Technology (e-AET): Diffusion and adoption of information kiosks and mobile initiatives among the farmers of Thiruvananthapuram district, Kerala.

INTERVIEW SCHEDULE

Part II (Mobile SMS services utilizing farmers)

Respondent No:

Name:

Block and Village:

Address and Contact No:

1. Age: .....Number of years
2. Education

S. No	Category	✓ Tick
1	Illiterate	
2	Can read and write	
3	Primary school	
4	Middle school	
5	High school	
6	college	
7	Professional degree	

3. Exposure to modern ICT facilities. (Please tick the appropriate one and indicate the frequency of use)

ICT	daily	>2 times per week	2 times per week	Once in a week	Once in a fortnight	once in a month	Never
Computer							
Internet							
Telephone							
Mobile phone							
TV							
Radio							
Others							

4. How did you become aware of the mobile SMS?

a. Through friend/ relative ( )

b. Canvassing through Project staff ( )

c. Extension personnel ( )

d. Through newspaper ( )

e. Others specify ( )

5. How many times in total you have utilized the mobile messages in field so far?

1. Never ( )
2. Only once ( )
3. 2- 3 times ( )
4. 4- 5 times ( )
5. 6- 10 times ( )
6. More than ten times ( )
7. Regularly ( )

6. How do you disseminate the information you receive from the Mobile SMS? Please specify the mechanism.

a. Through email/ online using internet ( )

b. By adopting the content in field conditions. ( )

c. Mobile/ telephone ( )

d. Letters ( )

e. By word of mouth ( )

f. Do not share ( )

7. Attitude of farmers about the mobile SMS. (Tick the appropriate one: SA-Strongly Agree, A-Agree, UD-Undecided, D-Disagree, SD-Strongly Disagree)

Statement	SA	A	UD	D	SD
Provide possible solution to the present agricultural situation					
Cannot meet location specific needs of farmers					
Assist the farmers in planning and decision making aspects of agriculture.					
Farmers can access up to date information on various aspects					
Information on government programmes and schemes would be made available					
Could not show an impact on crop production					
Could not meet the farmers needs at the right time					
Provision of information would not help farmers in taking timely decisions					
Mobile SMS is a valuable ICT tool but it will never influence farmer's decision making.					
Cannot provide best package of practices of various crops to farmers					

8. Suggestions for improvement of SMS delivery systems

9. Please mention the utility of messages of Mobile SMS

Characteristics of information	**All information**	**Most information**	**Some information**	**No information**
Timeliness				
Reliability				
Relevancy				
Retrievability				
Adequacy				
Format clarity				
Practicability				
simplicity				

10. Constraints experienced by farmers while using Mobile SMS

Category	✓ **Tick**
Not compatible with the culture	
Incompleteness of subject matter	
Negative mentality in accepting new things	
Illiteracy	
Content problems	
Other constraints	

11. Assessment of the information needs. (Please tick the appropriate one: MN-Most Needed, N- Needed, LN- Less Needed, NN-Not Needed)

Statement	MN	N	LN	NN
Market information and price trends				
Latest package of practices				
Disease or pest early warning system and management				
Input prices and availability				
Weather forecasting				
Information on rural development programme				
Crop insurance				
General agricultural news				
Farm business and management info				
Facilitation of land records				
Quality inputs				
Commercial agriculture				
Soil health management				
Integrated Nutrient Management				
Water management				
Water conservation through drip and sprinklers				
Post-harvest technology				
Dry land crops and practices				
Quality standards of produce for exports				
Dairy and poultry management and marketing information				
Value addition to produce				
Advises of scientists on crop management				
Information on crop finance loans				
Success stories of farmers				

Statement	MN	N	LN	NN
Market infrastructure like warehouses and cold storages				
How to reduce cost of cultivation				
Govt. policies reg. agriculture				
Computer operation/utilization				

12. Perception of the farmers about Mobile SMS. (Please tick)

Category	Strongly Agree	Undecided	Strongly Disagree
Easy to learn			
Too expensive			
Absolutely essential			
Swift/ rapid information transfer			
Age no bar			
Exclusive for literate groups			
Plethora of information transfer			
Used in contingencies			
Used in emergencies			
Portable			

13. Advantages of mobile SMS. Please give your response by giving a tick

S. No	Particulars	✓ Tick
1.	Gives personalized and timely information	
2.	One stop shop information source	
3.	Saves time and money in interacting	
4.	Has all information the farmer wants.	
5.	Supports marketing	

Any other advantages of mobile SMS

14. Effectiveness of Mobile SMS. (Please tick the appropriate one: Most S- Most satisfied, More S- More satisfied, S-Satisfied, LS- Least Satisfied, US-Unsatisfied)

Items	Most S	More S	S	LS	US
Voice clarity					
Reliability					
Knowledge gain					
Motivation to learn					
Completeness of subjective matter					
Readability of the message					
Motivate to adopt the messages in farm					
Information provided					
Ability to exploit considerable amount of knowledge					

Appendix IV

APPENDIX IV

LIST OF MOBILE SMS RECEIVED BY THE FARMERS

❖ 26 June 2012, 10.05 A. M.

Enhance productivity and profitability of farming by applying nutrients in right quantities. Test the soil before starting cultivation to know the nutrient status. Apply right quantities of lime, nitrogen, phosphorous and potash for each crop for better yield. Contact your Krishi Bhavan for details.

❖ 03 July 2012, 09.19 A. M.

Harvested Mangoes should be properly dried and packed in dry mango leaves to ensure uniform ripening. For controlling fruit fly maggot treat Mangoes in hot water at 55 degree centigrade for 15 minutes.

❖ 06 July 2012, 03.50 P. M.

In Palayakodam variety of banana apply 110 grams, 500 grams, 335 grams urea, rock phosphate and potash respectively per plant two months after planting. To control pseudo stem weevil in bananas mix 6 grams Sevin with mud and paint on the pseudo stem.

❖ 10 July 2012, 10.01 A. M.

In nendran banana apply 65 grams urea per plant just after the appearance of bunch. There is no need to apply other fertilizers during this time. Bury the weeds in the plant basins and ensure proper drainage.

❖ 13 July 2012, 10.08 A. M.

Spray garlic essence diluted in water to prevent attack of small, soft bodied insects attacking and damaging vegetables. Use pheromone traps to control fruit fly in cucurbits.

❖ 17 July 2012, 09.38 A. M.

Coconut: - Weather conditions are favourable for incidence of bud rot cut and remove the infected part and apply Bordeaux paste

❖ 20 July 2012, 09.42 A. M.

Banana: - High humidity may include sigatoka leaf spot disease. Cut and remove all the badly infected leaves in a single day and spray Propiconazole 1ml/ litre.

❖ 24 July 2012, 09.43, A. M.

Vegetables: To prevent the incidence of bacterial wilt in solanaceous crops, drench the soil with copper oxy chloride solution – 4 grams / litre of water. Ensure good drainage in vegetable fields to avoid fungal diseases.

❖ 27 July 2012, 09.46. A. M.

Agricultural market intelligence centre of KAU predicts that pepper prices may remain firm because of support from strong emerging domestic demand for next 2 months. Predicted price range of ungarbled black pepper for august 2012 is Rs. 410 to 425 per Kg and September 2012 is Rs. 415 to 35 per Kg.

❖ 31 July 2012, 09.32 A. M.

For coconut apply fertilizer and manures in circular basins at radius of 2 meters from the base of the palm and 10 cm deep, opened after the onset of South - West monsoon. For coconut apply $MgSO_4$ during August–September. For an adult palm 1.0 Kg dolomite or 10 Kg lime + 0.5 Kg $MgSO_4$ is required per annum. For coconut incorporate the green manure crops into soil during August-September and cover the basin with soil.

❖ 03 August 2012, 09.24 A. M.

Daincha the green manure crop can be raised seed rate is 20 – 25 Kg/ha. The green matter yields 10-20 tonnes/ ha. Quantity of Nitrogen is 75 – 80 Kg/ha. It can be incorporated at about 8 to 10 week after sowing.

❖ 07 August 2012, 09.41.A. M.

To control sigatoka leaf spot in banana, cut and burn all severely affected leaves. Spray 1 % Bordeaux mixture after the appearance of initial symptom 5 to 6 spraying at fortnightly intervals are to be given to crops according to severity of the disease.

❖ 10 August 2012, 09.23. A. M.

For cowpea plough the land thoroughly 2 – 3 times and remove weeds and stubbles. Make channels of 30 cm breadth and 15 cm depth at 2m apart to dream off excess rain water. For vegetables conduct weeding and ranking of the soil at the time of fertilizer application. Earthing up should be done during rain seasons.

❖ 14 August 2012, 09.21 A. M.

For coleus plough or dig the land to a depth of 15 – 20 cm and from 30 cm apart or raised beds of 60 – 90 cm width. Plant the coleus cuttings in the main field between July and October. A well-drained medium fertile soil is suitable for cultivation. Varieties like Nidhi, Sweedhara and Sulapha can be cultivated.

❖ 17 August 2012, 10.10 A. M.

Rice bacterial leaf streak @ in rice leaves, inter-venal lines join to form large dirty white patches. Spray fresh cow dung extract for managing the disease. Mix 20 grams cow dung in one litre of water and allow settling. Sieve and spray the rice with the supernatant (clear) solution to control bacterial leaf streak.

❖ 21 August 2012, 11.57 A. M.

Tapioca: For August – September planted tapioca apply half the close nitrogen. Full dose of phosphorous and half potash with first digging and weeding.

❖ 24 August 2012, 09.32 A. M.

Cassava leaf spot: Spots appear on either side of the leaves and the leaves become yellow, dry and may shed. To prevent this, plant stems with more spacing and resistant or tolerant varieties. To control cassava leaf spot, spray 0.2% Zineb or 1% Bordeaux mixture.

❖ 27 August 2012, 10.31 A. M.

Under the revised farmers pension scheme, small and marginal farmers who have attained 60 years of age and have cultivable land up to 2 ha are eligible for pension @ Rs. 400 per month. He/ she should have a minimum of 10 cents (own land/ lease) under cultivation continuously for the past ten years. These farmers who are already availing assistance from others welfare schemes are not eligible for the pension.

❖ 28 August 2012 09.27 A. M.

Sun hemp: Vigorous growing green manure crop which can be incorporated at ten weeks after sowing. It does not withstand water logging. The seed rate is 25-35 Kg/ha. Green matter yield is 15-20 t/ha. Quantity of nitrogen fixed by the crop is 75-80 Kg/ha.

❖ 31 August 2012, 09.52 A. M.

Deficiency of sulphur in cucurbitaceous vegetables results first in yellowing of younger leaves which spreads to older leaves also.

❖ 04 September 2012, 09.38 A. M.

Severe deficiency of sulphur in cucurbitaceous vegetables may result in the appearance of purplish colour on the leaves. Apply sulphur @ 20 Kg/ha for managing sulphur deficiency in cucurbitaceous vegetables.

❖ 11 September 2012, 11.26 A. M.

For coconut second dose of fertilizers @ 720 grams of urea, 1.5 Kg SSP and 1.5 Kg MOP and 500 grams of $MgSO_4$ can be applied in rain fed areas.

❖ 18 September 2012, 09.52 A. M.

Spray 1 % Bordeaux mixture as a prophylactic measure in the crown of coconut and especially on tender coconut leaves to prevent bud rot disease.

❖ 21 September 2012, 11.08 A. M.

Green manure or organic manure is as important as chemical fertilizers for coconut. Apply recommended dose of fertilizers 2 weeks after applying compost @ 25- 50 Kg per palm.

❖ 25 September 2012, 05.01.A. M.

Neem cake and sand mixture prepared in 1:1 ratio may be applied in coconut leaf axils for the control of rhinoceros beetle.

❖ 19 October 2012, 10.06 A. M.

To control kokkan disease in banana drench soil with Dimethoate @ 2 ml per litre at 20, 75 and 15 days after planting. Apply Dimethoate in leaf axils @ 2 ml per litre. Rogue out infected plants and use virus free planting materials.

❖ 23 October 2012, 10.06 A. M.

To control Yellow Mosaic Vein of bhendi cultivate resistant varieties like Arka anamika, Arka abhay and Varsha upahar. Rogue out and destroy affected plants. For controlling the vectors apply beneficial fungi Verticillium 2 grams per litre along with jaggery in the evening.

❖ 30 October 2012, 10.35 A. M.

To control fruit fly in cucurbits, in large gardens, apply Malathion 0.2% suspension containing sugar or jaggery at 10 grams /litre at fortnightly intervals at flowering and fruit initiation.

❖ 02 November 2012, 10.14 A. M.

To control rhizome weevil of banana cut and remove the outer layer of the rhizome, smear it with slurry of cow dung and ash and sun-dry before planting.

❖ 09 November 2012, 09.49 A. M.

To control leaf rot in coconut apply 2 ml Contaf in 300 ml of water at the base of spear leaf after clearing the affected portion.

❖ 16 November 2012, 09.33 A. M.

To prevent red pumpkin beetle in cucurbits apply quality neem cake @ 50 g/ pit and apply 3% neem oil emulsion. In severe cases spray Quinalphos 2 ml/ litre of water.

❖ 23 November 2012, 10.26 A. M.

Do mulching in coconut gardens with the close of monsoon season, mulching improves soil health and contribute to the yield.

❖ 27 November 2012, 10.07 A. M.

Amaranthus is a leafy vegetable rich in vitamin A. Available in red and green colours. Green amaranth is resistant to leaf spot.

❖ 04 December 2012, 09.35 A. M.

To prevent panama wilt in banana, dip the cleaned suckers of tolerant varieties of banana in 0.1% Carbendazim solution before planting.

❖ 07 December 2012, 09.31 A. M.

Avoid continuous planting of Banana in the same field. Adopt crop rotation to prevent the incidence of banana wilt.

❖ 11 December 2012, 11.03 A. M.

Do mulching in coconut gardens with the close of monsoon season, mulching improves soil health and contribute to the yield.

❖ 18 December 2012, 09.26 A. M.

Agricultural department started e-payments of subsidies directly to the bank account of farmers. Provide correct bank account number, IFSC code and mobile number to Krishi Bhavans. Keep your bank account active and register your mobile with banks for getting alerts.

❖ 21 December 2012, 09.31 A. M.

Rice farmers can register for climate linked crop insurance scheme. Premium is Rs. 160 /- per acre and last date of registration is 31st December 2012. Contact your Krishi Bhavans for details.

❖ 01 January 2013, 09.52. A. M.

In rice application of trichocards in the field @ 2cc/acre will effectively control stem and leaf borer Pheromone traps @ 8 no. s /acre and light traps helps in controlling stem borer.

❖ 04 January 2013, 10.45. A. M.

For 2 months old banana, add 60 grams urea, 250 grams Mussiriphos, 100 grams MOP per plant. For 3 months old banana, apply 60 grams urea and 100 grams MOP per plant. Grow pulses as intercrops for weed control.

❖ 08 January 2013, 10.03. A. M.

To control tea mosquito bug in cashew, apply Quinalphos 2ml/litre, if fungal attack is detected add 2 grams Mancozeb with above solution.

❖ 15 January 2013, 11.16. A. M.

In hi-tech farming, optimum use of resources result in 3- 10 times extra yield. Crops suited are capsicum, gherkin/salad cucumber, strawberry, lettuce, tomato and flowers. The products from hi-tech farming are uniform in size and of superior quality which ensure maximum income to the producer.

❖ 01 February 2013, 9.53 A. M.

Ordinary ginger varieties will be ready for harvest within 7-8 months. Harvest can be made after 6 months if the rhizomes are to be used for vegetable purpose. Ginger plants will give indication for harvest. Leaves and stem will turn yellow and start to dry. Remove dried leaves and stem from field before harvest. Use fork to pull out rhizomes without an injury or shock.

❖ 05 February 2013, 10.29. A. M.

Remove dirt, soil and roots from harvested Ginger rhizomes. Wash rhizomes well in water to remove the soil completely. Cleaned rhizomes are to be brought to the market during the very next days. Too much drying is not desirable. It can also be processed to dry ginger. The next planting season for ginger is April – May, keep the harvested rhizomes for seed purpose with proper care.

❖ 08 February 2013, 09.53.A. M.

Select bigger sized and disease free ginger rhizomes for seed purpose. Drench selected rhizomes in a bio chemical fungicide (0.25%) for 30 minutes, drain water and drain just to remove the moisture on surface. Keeping the treated rhizomes for seed purpose in a specially prepared ditches and covering them with soils is found to be the best adopted practice.

❖ 12 February 2013, 09.49. A. M.

Tomato can be cultivated up to the month of April. Sakthi and Mukthi are the two high yielding tomato varieties developed by KAU.

❖ 15 February 2013, 10.46. A. M.

Seethal and Swarnapoorna are the two varieties of high yielding salad cucumber suited for cultivation on Kerala.

❖ 27 February 2013, 09.6. A. M.

Micro irrigation methods like 'drip' and 'sprinkler' irrigation can be adopted by farmers for maximum water use efficiency. Contact nearest Krishi Bhavan or precision farming centre at KCAET Tavannur for more details. (No. 0494-268798)

❖ 01March 2013, 11.05. A. M.

In the sprinkler method of irrigation water is sprayed into air and allowed to fall on the ground surface somewhat resembling rainfall. The spray is developed by the flow of water under pressure through small orifices or nozzles.

❖ 05 March 2013, 09.21. A. M.

In Drip irrigation, irrigation water is pumped in to small pipes and emitted as drops near the root zone of crops in required quantities. Drip irrigation is the most efficient method among micro irrigation methods.

❖ 08 March 2013, 09.18. A. M.

The quantity of water to be applied to coconut palms can be increased in subsequent irrigations in case of coconut palms grown in soils having greater retention capacity. In soils with less water retention, increase the number of irrigation in coconut palms with lesser quantity of water. In case of drought affected areas, try to apply 350 litres of water per coconut palm per week.

❖ 12 March 2013, 10.30. A. M.

Irrigate mulched banana plants once in 3 – 4 days and others once in two days with 40 litres per plant.

❖ 15 March 2013, 03.58. P. M.

Apply neem seed extract (5%), tobacco decoction or neem oil – soap mixture (3%) against leaf sucking pests like white fly, bugs, mealy bugs etc., affecting banana during summer.

❖ 26 March 2013, 09.58. A. M.

Procurement of raw coconut will be done from farmers registered in respective Krishi Bhavans, at the rate of Rs. 16 per Kg of dehusked raw coconut in the districts of KLM, ALP, PKD, MLP, KKD, KNR and KSD on Tuesday and Thursday.

❖ 26 April 2013, 10.25. A. M.

For upland rice cultivation plough the fields after the first rain during the month. Apply 20 Kg organic fertilizer/compost/green manure as basal dose percent. Seed treatment with Pseudomonas (20 grams /litre) for 1Kg seed) will help to protect the plant from the diseases in the initial stages.

❖ 30 April 2013, 09.24. A. M.

For viruppu rice cultivation by broadcasting seed, plough the field and apply 140 Kg lime per acre. Apply 2 tonnes organic manure per acre as basal dose. For transplanting in fields, sow green manure plant seeds like Daincha and Sesbania @ 8 Kg/ acre after getting the first rain.

❖ 03 May 2013, 10.05. A. M.

For Coconut, open the basin and apply 1 Kg lime after summer showers. Take pita for planting seedling. Take beds for raising inter crops.

❖ 07 May 2013, 10.40. A. M.

To control leaf eating caterpillar in coconut, cut and burn the affected leaves during the beginning of the summer season. Release larval /pupal parasitoids. When infestation is severe, apply Malathion 0.1% or Quinalphos 0.05%.

❖ 10 May 2013, 09.29. A. M.

For coconut eriophid mite affected palms, spray neem based pesticides like Azadirachtin @ 4ml/litre in the crown of palms and in young bunches.

❖ 14 May 2013, 10.21. A. M.

To control stem bleeding in coconut chisel out completely the affected tissue. Apply Tridemorph @ 25ml in 25 litres of water as soil drenching once in four months.

❖ 17 May 2013, 11.09 A. M.

For arecanut apply half Kg lime per bed after the rain. For local varieties, Apply 100 grams urea, 100 grams rock phosphate, 120 grams potash. For high yielding varieties, fertilizers are applied @ 165:150:175 grams. For one year old seedlings, apply one third and for two year old, apply two third of above recommendations.

❖ 21 May 2013, 09.45 A. M.

Ginger and turmeric rhizomes can be planted this month. For Ginger, apply 1 Kg Rock phosphate, 200 grams MOP per cent. For turmeric, apply 600 grams Rock phosphate and 200 grams MOP as basal dose.

❖ 28 May 2013, 09.27 A. M.

Irrigate summer vegetables in kitchen gardens. For trailing cucurbitaceous vegetables apply 160-320 grams urea per cent. Apply fertilizers as top dressing after weeding. Apply cow dung slurry. After harvesting amaranthus apply 100 grams urea/litre of water.

❖ 25 June 2013, 01.48 P. M.

Grow bags containing 6 different vegetables having a total cost of Rs. 2000/- will be supplied for Rs. 500/- under Vegetable Development Programme. Public/ private institutions and schools will be given financial assistance for vegetable cultivation in an area not less than 50 cents, under Vegetable Development Programme. Contact your nearest Krishi Bhavan for various assistance to farmers under Vegetable Development Programme.

❖ 28 June 2013, 10.56 A. M.

Subsidy @ Rs. 4500/- per hectare will be given for rice cultivation (group farming) under the scheme, Sustainable development of Rice. Financial assistance up to Rs. 7500/ha will be given for promoting cultivation of high yielding varieties of rice under upland cultivation.

❖ 02 July 2013, 10.15 A. M.

Financial assistance up to Rs. 7500/ha will be given for promoting cultivation of high yielding varieties of rice under upland cultivation.

❖ 05 July 2013, 09.37 A. M.

Productive coconut palms can be insured at premium rates of Rs. 1. 06/- per palm (15 year old) or Rs. 1. 45/- per palm (16-60 year old) for assured sum of Rs. 600/- and Rs. 1150/- respectively.

❖ 08 July 2013, 12.34 P. M.

Applications for the award (state and district level) to extension personnel's should be submitted immediately. For more details please contact the PAO of districts.

❖ 09 July 2013, 09.46 A. M.

New wilt resistant tomato varieties -'Vellayani Vijay' and 'Arka Saamrat' were released by KAU. For seedlings contact, 0484-2317752, 9497276684.

❖ 12 July 2013, 09.29 A. M.

Coconut seedlings may be planted during rainy season. Seedlings having 9-12 months growth having 6-12 leaves are ideal. Quality coconut seedlings are available for sale at the selected farms of the Department of Agriculture and KAU.

❖ 17 July 2013, 09.48 A. M.

All farmers have to register in their Krishi Bhavans under the "farmer registration scheme" in order to avail benefits from Agriculture Department. Last date is extended up to 31/07/2013.

❖ 23 August 2013, 01.56 P. M.

To control the Bud rot disease of coconut cut, remove all affected tissues of the crown and apply Bordeaux paste. Also destroy the removed parts by burning. To prevent the spread of bud rot disease of coconut spray 1% Bordeaux mixture on spindle leaves and crown of disease affected as well as neighbouring coconut palms.

❖ 27 august 2013, 10.23 A. M.

For controlling the foot rot/ quick wilt disease of pepper remove affected leaves towards the ground level and give foliar spray with 1% Bordeaux mixture.

❖ 30 August 2013, 03.23 P. M.

Fungicides refer to those chemicals used for the control of various diseases causing fungi. Bordeaux mixture (1%) is the most commonly used fungicide against the fungal diseases, bud rot of coconut, foot rot of pepper and rot in

cardamom plants. Ensure to add a sticker while applying Bordeaux mixture during rainy season. The cheapest and most effective sticker is the rosin washing - soda mixture.

❖ 03 September 2013, 0S5.05 P. M.

Rotting of fruits during South West monsoon and subsequent falling of infected leaves in large numbers in rubber is known as abnormal leaf fall. Spraying of 1% Bordeaux mixture once in three months @ 1200 to 1400 litre/ acre is recommended to prevent abnormal leaf fall in rubber trees.

❖ 06 September 2013, 02.48 P. M.

Farmers can register their name, mobile number and name of crops cultivated in the nearest Krishi Bhavans to receive voice calls and SMS messages related to agriculture.

❖ 10 September 2013, 10.00 P. M.

Dig / plough inter spaces in coconut gardens is advisable during the month of August – September to get more yields. In sandy soils heaping of soil in the interspaces is recommended.

❖ 13 September 2013, 04.19 P. M.

The mutual association between the plant roots and the fungi is known as mycorrhizas, literally fungus root. Mycorrizal fungi helps plants acquire nutrients in many ways.

❖ 20 September 2013, 12.00 P.M.

Testing of soil is essential for getting more yields and reduce cost of nutrients and labour for its application. Contact Krishi Bhavan for more details.

❖ 18 October 2013, 02.09 P. M.

Plough the coconut gardens before the North East monsoon for better percolation of water. Take ditches for harvesting rain water and soil in coconut gardens located in sloppy lands.

❖ 22 October 2013, 12.20 P. M.

Plant tapioca before North east monsoon. Select sets from disease free plants to prevent the Tapioca Mosaic disease. H–165, Sreevijaya, Co–3, Co-4 are tapioca varieties resistant to this disease.

❖ 25 October 2013, 10.14 A. M.

Spray Ekalux @ 2ml/l to control pollu beetle in pepper gardens. Panniyur - 8 is new variety of pepper released by the Pepper Research Station, Panniyur is resistant to foot rot disease and drought.

❖ 29 October 2013, 12.22 P. M.

Dig out the ginger plants affected with rhizome rot and drench the beds with 1 % Bordeaux mixture.

❖ 01 November 2013, 12.23 P. M.

Tea mosquito bug appears with the emergence of new flushes and panicle in cashew. Spray Ekalux @ 2 ml/l during October. Also spray Dythane @ 3 grams /litre for the combined attack of fungus and tea mosquito bug.