AGRICULTURAL INFORMATION SUPPORT SERVICE VIS-À-VIS KISAN CALL CENTRE: A PERFORMANCE AUDITING

by

SHELY MARY KOSHY

(2013- 21- 119)

THESIS

Submitted in partial fulfillment of the

requirement for the degree of

DOCTOR OF PHILOSOPHY IN AGRICULTURE

Faculty of Agriculture

Kerala Agricultural University

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

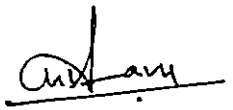
VELLAYANI, THIRUVANANTHAPURAM- 695 522

KERALA, INDIA

2016

DECLARATION

I, hereby declare that this thesis entitled **"AGRICULTURAL INFORMATION SUPPORT SERVICE VIS-À-VIS KISAN CALL CENTRE: A PERFORMANCE AUDITING"** 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.



Vellayani

Date: 18-04-2016

Shely Mary Koshy

(2013-21-119)

CERTIFICATE

Certified that this thesis entitled **"AGRICULTURAL INFORMATION SUPPORT SERVICE VIS-À-VIS KISAN CALL CENTRE: A PERFORMANCE AUDITING"** is a record of research work done independently by Ms. Shely Mary Koshy under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

Vellayani
Date: 18/7/16

Dr. N. Kishore Kumar
(Major Advisor, Advisory Committee)
Professor (Agricultural Extension)
College of Agriculture
Vellayani.

CERTIFICATE

We, the undersigned members of the advisory committee of Ms. Shely Mary Koshy, a candidate for the degree of Doctor of Science in Agriculture with major in Agricultural Extension, agree that the thesis entitled **"AGRICULTURAL INFORMATION SUPPORT SERVICE VIS-À-VIS KISAN CALL CENTRE: A PERFORMANCE AUDITING"** may be submitted by Ms. Shely Mary Koshy, in partial fulfillment of the requirement for the degree.

20/9/16

Dr. N. Kishore Kumar
(Chairman, Advisory Committee)
Professor
Department of Agricultural Extension
College of Agriculture, Vellayani.

20/9/2016

Dr. V. B. Padmanabhan
(Member, Advisory Committee)
Professor and Head
Department of Agricultural Extension
College of Agriculture, Vellayani.

20/9/2016

Dr. B. Seema
(Member, Advisory Committee)
Professor
Department of Agricultural Extension
College of Agriculture, Vellayani.

20/9/2016

Dr. Allan Thomas
(Member, Advisory Committee)
Assistant Professor (SS)
Department of Agricultural Extension
College of Agriculture, Vellayani.

20/09/16

Dr. Vijayaraghava Kumar
(Member, Advisory Committee)
Professor and Head
Department of Agricultural Statistics
College of Agriculture, Vellayani.

EXTERNAL EXAMINER

20/9/2016

Dr. D. M. Chandargi
Registrar
University of Agricultural Sciences
Raichur, Karnataka

Acknowledgement

I bow my head before God almighty whose grace had endowed me the inner strength and confidence and blessed me with a helping hand at each step during the work.

I place my profound sense of gratitude and indebtness to Dr. N. Kishore Kumar, Professor, Department of Agricultural Extension, College of Agriculture, Vellayani esteemed chairman of the advisory committee, for his expert guidance, constructive criticisms, enduring patience and immense help and constant encouragement throughout the course of the thesis preparation.

I am thankful to Dr. V. B. Padmanabhan, Professor and Head, Department of Agricultural Extension his generous help and co-operation rendered to me during the period of my study.

I avail this opportunity to express my deepest respect towards Dr. B. Seema, Professor and member of my advisory committee for her ever willing help, helpful suggestions and scrutiny of the manuscript during the course of my study.

I express my deepest respect towards Dr. Allan Thomas, Assistant Professor and member of my advisory committee for his constant support, encouragement, timely guidance, help and affectionate advice.

I gratefully acknowledge Dr. Vijayarahava Kumar, Professor and Head, Department of Agricultural Statistics member of my advisory committee for his guidance, stimulating suggestions and whole hearted co- operation during the statistical analysis and preparation of the thesis.

I express my sincere thanks to Agricultural Extension teaching staffs Dr. Dr. R. Prakash, Dr. S. Mothilal Nehru, Dr. A. Anil Kumar, Dr. A. K. Sherief, Dr. G. S. Sreedaya, my M. Sc. Guide Dr. A. Sakeer Husain for their friendly approach and constant encouragement rendered to me during the course of my study and research work.

I wish to place my deep sense of gratitude towards the Sharath, Ajay, Menaka Madam and Kusuma, the call centre agents of Kerala, Tamil Nadu and Karnataka KCC for their timely support in rendering all the data with regard to KCC.

I avail this opportunity to thank all the non- teaching members of the Department of Agricultural Extension consideration on me throughout my study.

My special thanks to Sangeetha Madam, Chinju chetan, Ravi Kishore for their valuable suggestions during my thesis work.

With deep sense of gratitude I wish to thank my entire juniors M. Sc. Extension Graduates of 2013, 2014 and 2015 batch in the Department of Agricultural Extension, Vellayani who have helped and supported me during the course of my study.

I am thankful to my grandparents and my relatives for their moral support in various stages in completing this course.

Words can't express my profound veneration and love to my dearest appa Mammen Sajoo, amma Susan George, sister Megha. My fiancé Jobin Mathew, papa K. K. Mathew, mummy Anie Mathew, sister Jemin Mathew. Words seem inadequate to express my love and gratititude to them for their unflinching support, love and care which enabled me to complete the work.

My thanks are also due to many others who have been helpful to me sometimes or other during the period of this research programme.

My time at College of Agriculture is definitely a memorable one the experiences and the opportunities I received will always be cherished and I am thankful to my teachers and friends for the good times that I had.

Above all, I bow before God Almighty for his eternal love and blessings showered upon me.

Shely Mary Koshy

CONTENTS

LIST OF TABLES

LIST OF TABLES CONTINUED

LIST OF TABLES CONTINUED

LIST OF FIGURES

LIST OF FIGURES CONTINUED

LIST OF FIGURES CONTINUED

LIST OF PLATES

LIST OF ABBREVIATIONS

AAS	- Agro Advisory Services
ATMA	- Agricultural Technology Management Agency
BPO	- Business Process Outsourcing
CIMMYT	- International Maize and Wheat Improvement Center
DAC	- Department of Agriculture and Cooperation
et al.	- And others
FAO	- Food and Agriculture Organization of the United Nations
GSM	- Global System for Mobile
IASB	- International Accounting Standards Board
ICT	- Information and Communication Technology
i. e.	- That is
IFFCO	- Indian Farmers Fertilizer Cooperative Limited
IVRS	- Interactive Voice Response Service
KAU	- Kerala Agricultural University
KCC	- Kisan Call Centres
KVK	- Krishi Vigyan Kendras
MAAS	- Multimedia Agricultural Advisory System
NGO	- Non Governmental Organisation
PC	- Personal Computer
RDRS	- Rangpur Dinajpur Rural Service
SMS	- Subject Matter Specialists
VFPCK	- Vegetable and Fruit Promotion Council Keralam

INTRODUCTION

1. INTRODUCTION

India homes 1.21 billion population where over 70 per cent of rural households depend on agriculture. A peep into the green revolution that took place back in 1960 has brought a huge demand for novel and innovative technologies and in this era it is almost impossible to prosper in agricultural productions by holding on to the traditional methods of farming. Over 40 million individuals in world is being pushed into poverty since 2010 due to the rising food prices (World Bank, 2011). The growing universal population, expected to hit 9 billion by 2050, has heightened the demand for food and placed pressure on already fragile resources. Feeding the population will require a 70 per cent increase in food production (FAO, 2009). Agricultural extension plays a decisive protagonist in encouraging agricultural productivity, increasing food security, improving rural livelihoods and promoting agriculture as a locomotive of economic growth.

Information and communication technologies (ICT) is bringing the world closer at an astonishingly faster rate, which brings people in the most remote places in earth to communicate with each other within seconds. ICT encompasses all those technologies that enable the handling of information and facilitate different forms of communication among human actors, between human beings and electronic system (Acharya *et al.*, 2013). Nowadays the use of ICT is increasing and it plays an important role in developing agriculture and also helps in socio economic development (Farooqi *et al.*, 2002). Information technology includes all the devices that are used for communicating information. With the advancement of information technology, the fourth factor of production is being regarded as information along with land, labour, capital (Purohit, 2009).

The population in India is increasing day by day. The wide gap between farmer and the extension agents restricts the extension system from reaching the farmers to provide extension service. Moreover, the farmers are geographically

widely scattered. This is more pronounced in a state like Kerala where people live in isolated homesteads. Due to this face to face dissemination of information would be costly. Another problem is that the extension agents find it difficult to reach the targeted audience. The need for field level extension personnel is estimated to be about 1.3 -1.5 million against the present availability of about 0.1 million personnel (Raj, 2015). It is here the role of ICT comes in to picture. ICTs, especially mobile phones can help to communicate to those who depend on the traditional communication sources. There are more than 43 mobile based extension services provided by public, private and in partnership of both private and public partnership. Some of these services are paid and some of the services are free of cost. One among the extension service that is free of cost and which is provided all over India is the Kisan Call Centre (KCC).

Kisan Call Centre was launched on 21st of January 2004 by the Department of Agriculture and Cooperation (DAC), Ministry of Agriculture and Farmers Welfare, Government of India to provide free extension services to the farming community by exploiting the tele-communication facility. The service can be availed by any farming community in their respective local language throughout the country through the toll free number 1800-180-1551. The Kisan Call Center, consists of three levels namely Level-I, where the calls from the farmers are directly connected. The calls in level one are handled by agricultural graduates in the local language who are in a position to answer the majority of the queries of the farmers. Level-II is the Subject Matter Specialists from KVK, Krishi Bhavan. When the queries cannot be solved by the Level I agents the calls are transferred to the Level II. Finally the Level-III which is occupied by the SMS from the nodal office. Those calls that are not solved by the Level I and II will be transferred to the Level III. The schematic representation of the Kisan Call Centre is provided in Fig. 1.

The Kisan Call Centre for Kerala was functioning at Thrissur till 2010. It was only in 2011 the centre was shifted to Bangalore jointly for Kerala, Karnataka and

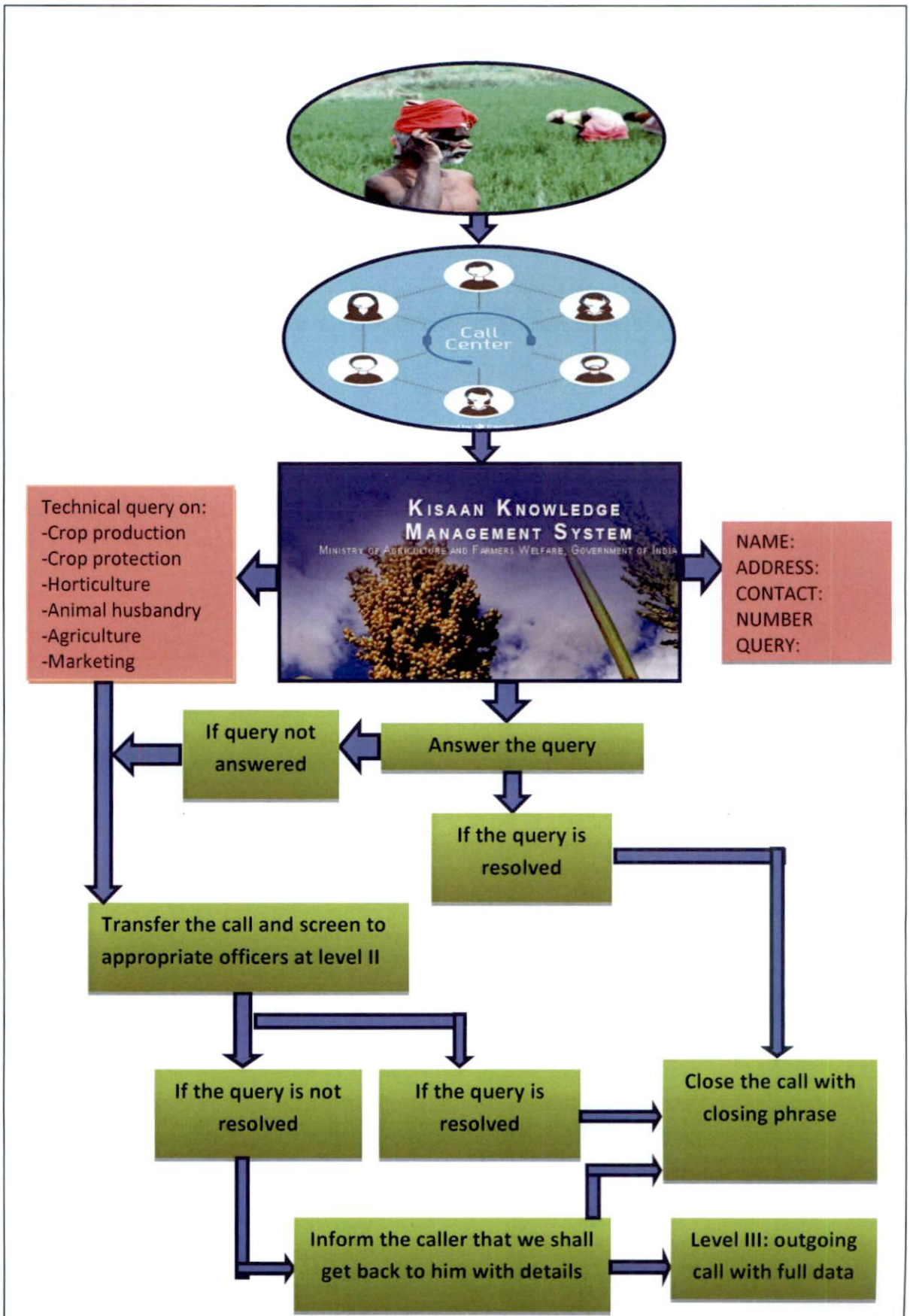


Figure 1.Pictorial representation on the working of Kisan Call Centre

(Saravanan and Suchiradipta, 2014)

Lakshadweep reason being the minimum calls received from the state. So far, no studies have been conducted with regard to KCC in Kerala. Hence, the study was taken so as to throw light on the performance/ lacunae in the performance of KCC with the reasons thereof, which would help the administrators to make necessary policy interventions for stream lining the Kisan Call Center.

1.1. OBJECTIVES OF THE STUDY

The study was undertaken with the following objectives:-

1. To conduct a performance audit of Kisan Call Centre aimed at suggesting performance improvement of agricultural advisory services.

2. To delineate, categorize and document the constraints and solutions in imparting agricultural advisory service through Kisan Call Centre, and

3. To develop an efficiency index that can be used for further analysis of Kisan Call Centre.

1.2. SCOPE AND IMPORTANCE OF THE STUDY

The aim of KCC in India is to provide information to the farming community through a toll free number, 1551. The main objective of KCC service, funded by the Central Government, which started functioning from 21-01-2004 was to address the need of the farming community, by making use of increased tele-density and Information Technology, taking professional help and making information available to farmers at their doorstep, putting the farmers directly in contact with agricultural experts from 6 am to 10 pm on all days and making authentic field data available for agricultural policy decisions by the authorities. Therefore there is a need to evaluate the performance of the service of KCC in order to understand how far the service could reach and create an impact in the farming community

The study aims to find out the awareness of farmers on Kisan Call Centre and its services and the utilization and satisfaction derived out of the KCC, attitude of farmers toward KCC which would provide sufficient background information to stream line the KCC for improved effectiveness.

The constraints and suggestions elicited from the intended users, the information providers and Agricultural Officers would also enrich the study to throw light on the performance/lacunae in the performance of KCC with the reasons thereof, which would help the administrators to make necessary policy interventions for streamlining the KCC and making appropriate structural and functional modifications for effective performance of Kisan Call Centre.

The efficiency index and performance auditing done in the research would also be helpful to the authorities in strengthening the working of KCC as well as to provide unconditional services to the farming community.

1.3. LIMITATIONS OF THE STUDY

The present study was undertaken as part of the Doctoral degree programme of the researcher. The study required the information from farmer who had utilized the call centre. Though the call center comes under the Ministry of Agriculture and Farmers Welfare it is run by the private agency IFFCO. Hence, the researcher found it difficult to collect information regarding the working of KCC from the agency as well as to collect information from the farmers. The farmers who utilized the services where first contacted through telephone and later questionnaires were sent to them. Majority of the time the calls could not be connected due to busy lines and the changes in the mobile numbers of the callers. The researcher also found it difficult to collect the mailed questionnaire in spite of reminding the respondents regularly.

1.4. ORGANIZATION OF THE THESIS

The study is reported under five chapters. The first chapter deals with the introduction that highlights the objective, scope and limitations of the study. A systematic review of literature relevant to the study is presented in the second chapter. The third chapter describes the methodology adopted which includes the locale of the study, selection of respondents, data selection and statistical tools used. The fourth chapter is devoted to results and discussions and the fifth chapter summarizes the major findings of the study and conclusions drawn from the analysis. The references, appendices and abstract to the thesis are given at the end.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

A literature review is an evaluative report of studies found in the literature related to the selected area. It goes beyond the search for information and includes the identification and articulation of relationships between the literature and your field of research (Boote and Beile, 2005)

A review of literature is required for having a strong base for the systematic inquiry of the study. It helps to delineate the problem areas and also prove a basis for the theoretical frame work and for interpretation of the findings.

Therefore, the review of literature was done to derive a conceptual base for the study. The collected literature is presented in the following sub heads:

2.1. Information and Communication Technology

2.2. Agricultural Advisory Services

2.3 Agricultural Information Support Services

2.4 Performance auditing

2.5 Efficiency

2.6 Attitude towards ICT

2.7 Kisan Call Centre- empirical studies

2.8 Variables and their review

2.1. INFORMATION AND COMMUNICATION TECHNOLOGY

Murali (1993) evolved a database on telephone based totally interactive voice response system (Audiotex), which incorporates facts concerning the farmers, the agronomic situations of the sector, individual area observations, recommendation, model constants and the weather data. The person enters the field observations using a touch tone telephone and pre -recorded message were used to manual the consumer during the facts access and for advising control measures.

Pessanelli (1993) speculated that technology will permit gaining knowledge of to take place in reality anywhere.

According to Zijp (1994) ICT has many capacity applications in agricultural extension. It is able to bring new statistics services to rural areas where farmers, as users, can have tons extra manage than earlier than over present day statistics channels.

Lenk and Traunmuller (1996) opined that improvement in IT consisting of electronic record, group ware for computer guide paintings, internet etc. result in innovative administrative records system, which enhances coverage formula, sell participation, enhance carrier nice, make planning greater effective and will become a method of empowering citizens.

According to Richardson (1996). The Applications of IT in support of agricultural and rural development fall into five main areas they are:

- economic development of agricultural producers;
- community development;
- research and education;
- small and medium enterprises development; and

• media networks

According to Jones (1997) agricultural extension is an important mechanism for transfer of knowledge and advice as an input for modern farming. The need is of a shift of focus from delivery of technology to delivery of knowledge and information.

Heeks (1999) asked: "Can statistics and communication technology (ICTs) assist to relieve poverty in low-profits nations?" His study attempts to answer that query and provides a theoretical framework for empirical studies in this place. He shows that ICTs play a position particularly as communications technology in place of as statistics processing or manufacturing technologies. Among his priorities for the development agenda are: the poor want know-how to get entry to, examine and apply present records and need sources for movement greater than they want get entry to to new records; the negative want get entry to to new, domestically-contextualized information extra than access to present data from an alien context; the information needs of the terrible can be met via extra informal statistics systems than by way of formal ICT-primarily based systems; the poor will acquire the fullest benefits of ICTs simplest once they understand and manipulate both the technology and its associated know-how.

Avgerou (2000) considers IT as one of the most significant forces of rejuvenation in the context of developing countries. In the global information society, the diffusion of various indicators of IT is a characteristic of development.

Chowdhury (2000) writes that ICTs embody applied sciences that can process unique forms of knowledge (voice, video, audio, textual content and data) and facilitate one-of-a-kind varieties of communications among human dealers, amongst humans and know-how techniques, and among knowledge programs.

Grudzinski and Panasiewicz (2000) opined that rapid progress in electronics, telecommunication, PC multimedia and web transmission and presentation of

knowledge, one of kind varieties of understanding applied sciences and their software in planning, selling and production are useful to achieve the purpose.

Michiel and Crowder (2001) outlined ICTs s a range of digital applied sciences which when converged in new configuration are bendy adaptable, enabling and ready of remodeling businesses and redefining social members of the family.

According to Anderson and Baskin (2002) stated that ICTs are electronic applied sciences used for accessing, processing, gathering, manipulating and presenting or communicating know-how. It encompasses software, hardware, and even the connectivity.

Ingale (2002) stated that in India and some South-East Asian nations such as Laos the national NGO sector, personal, public-exclusive and public personal-group partnerships are rising as main vendors of understanding through ICT enabled initiatives.

According to Owhotu (2009) ICT is a term used to explain the instruments and the tactics to entry, retrieve, store, organize, manipulate, produce, present and trade understanding by means of electronic and other automatic method.

According to Roman and Colle (2003), expertise and conversation applied sciences (ICTs) are not quite in regards to the pc, the web and phone lines. They're about understanding and conversation. This makes the issue of content an extraordinarily important precedence as we try to use new technologies for community development and alleviation of poverty.

Akudolu (2004) is of the opinion that ICT contraptions and programmes can facilitate and enrich the nice of educating and studying in humanities lecture rooms within the areas of listening, speech work, studying and writing.

Chauhan and Thakor (2004) reported that the initial response of the rural people, particularly farmers has been very encouraging; many organizations are trying to institute internet connectivity to make best use to satellite based communication technology.

According to Meera *et al.* (2004) ICT would assist extension workers to gather, store, retrieve and disseminate a extensive array of information required by small producers such as information on best practices, new technology, better prices of inputs and outputs, better storage facilities, improved transportation links, collective negotiations with buyers, information on weather.

Jensen (2007) demonstrated that the ICT assisted fishers along the coastline in Kerala, India learn about prices at different locations and decide where to trade their products cost-effectively.

Mohan and Singh (2007) stated that the brand new ICT digital contraptions such as desktops, email, internet, multimedia, video conferencing, cell telephones etc. which have the competencies of providing large amount of central knowledge to rural populace in well-timed and complete and cost amazing method.

Lawal (2008) opined that there shall be speedy exchange of agricultural information between the extension sellers and farmers if ICT components are integrated in supply of agricultural know-how to farmers in Nigeria.

Singh *et al.* (2008) draws attention as digital development is the new approach, which can be characterized as the augmentation over the internet, signifies "Utilizing the force of on-line systems, PC, interchanges and computerized intuitive sight and sound to encourage spread of farming innovation.

According to Chauhan (2010) among the various means of information communication, satellite based communication through internet are very efficient,

accurate, quick and cheaper in the field for spreading the information from research system to farmers.

According to Nayak *et al.* (2010) ICTs can assume a critical part in battling rustic and urban destitution and encouraging feasible advancement through making data rich social orders and supporting occupations. On the off chance that ICTs are suitably sent and understand the differential needs of urban and rustic individuals, they can turn out to be effective devices of financial, social and political strengthening.

Lucky and Achebe (2012) remarks that in dissemination of agriculture extension information, the advent of technology and technological devices, the medium of information storage, retrieval and dissemination has prominently lead to the utilization of computers and facilities of internet in accessing information other than the conventional method.

2.2. AGRICULTURAL ADVISORY SERVICES

Kalim (2005) reported that orientation of modernizing of extension should focus on the importance of extension in bringing positive behavioral change among farmers for sustainable rural and agricultural development.

Orhan *et al.* (2011) in their exploration recommended that, notwithstanding expanding viability of open expansion, steps must be taken to build the adequacy of agriculturists' associations and the private area in the field of augmentation.

Fereshteh and Ali (2012) remarks that the sustainability of advisory offerings in public sector and society depend upon holistic help and steering of professionals, associations and increasing institutional relation between public and exclusive sector. Also permanent employment of consultant raises their enthusiastic in doing their duties.

Khobragade *et al.* (2013) acknowledged that Agro Advisory Services (AAS) presents normal, timely and safely pre-knowledge of distinctive climate and climate stipulations of exceptional plants. Agro Advisory Services (AAS) worthy to farmers for broaden interest, skills, adoption and impact of climate changes on agricultural practices.

2.3. AGRICULTURAL INFORMATION SUPPORT SERVICES

Robert (2001) explained that the extension services with the expertise science (IT) outcomes, affect each and every part of agricultural sequences like relative competencies, compatibility, complexity, trialability and observability.

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

Akpabio *et al.* (2007) reported that ICT makes it possible for those who work inside the agricultural development sector to play complimentary roles of retrieving and conveying key know-how to farmers, as a substitute than fitting replaced.

Demiryurek (2008) points out that the dearth of expertise aid from the institutional sources resulted in the progress of personal understanding sources to exchange knowledge and diffuse technological know-how among the many farmers themselves.

Kadiam *et al.* (2012) outlined e-extension entails the powerful use of ICT, national and global information networks, internet, knowledgeable programs, multimedia finding out methods and PC based coaching methods to fortify information access to farmers, extension workers, research scientist and extension networks and digital interactive multimedia to facilitate dissemination of agricultural technological know-how.

Yelapure and Kulkarni (2012) explains that that expert system is most strong process that simulates human talents from an informed in detailed domain for support human to make decision at a stage of or bigger than human proficient. Expert system process helps the growers in making economically potential and environmentally robust resolution involving crop management.

Moghaddam and Khatoon-Abadi (2013) stated that digital learning platforms widen the approachability of information amongst disadvantaged groups of societies.

Muthiah *et al.* (2013) developed a multimedia agricultural advisory system (MAAS) which shows farmer can rise a query using their mobile phone to an agricultural expert. When a farmer calls, a call centre like interface with personalized information pops up at the expert's end who views the farmer's dashboard and analyses the state and request based advice is delivered to the farmer.

Namisiko and Aballo (2013) reports that e-agriculture presents the rich knowledge of supplementing common supply of offerings and channels of communication in ways that extend the agriculture institution's capability to meet the needs of its farmers. Benefits incorporate more advantageous access to expertise and assets, empowerment of farmers to make advised agricultural choices, streamlined organizational strategies and transactions, and extended exceptional, worth, and agricultural productivity satisfaction.

Vignare (2013) said that the m-Farmer initiative funded via USAID in India and some African nations shows that queries from cell device customers are connected to a call and fed right into a database, and an employee or extension agent answers to provide an informed response.

Bharud *et al.* (2015) reported that the Central Institute for Cotton Research functioning under the Indian Council of Agricultural Research has been accomplishing a novel extension mechanism called "e-Kapas network" for effective

knowledge transmission among Indian cotton growers. e – Kapas" essentially refers to the utilization of electronic devices - mobile phones for delivering cotton technologies to farmers, extension workers and other development workers engaged in cotton sector.

2.4. PERFORMANCE AUDITING

Smith *et al.* (1972) said that performance auditing leads attention to the policies and internal processes which are normally swathed, directed and forced by organization

Khan (1988) reported that performance auditing is an assessment of the events of an organization to see if the assets are being managed with due regard for economy, efficiency and effectiveness and accountability necessities are being met judiciously.

Leeuw (1996) points out that audit efficiency and effectiveness of an organization is important where financial audit is powerless to tell the broad story.

Talbot (1999) has inscribed that performance measurement is the relationship between the organizational activities and the results the organization wants to accomplish also how the result will come out in the end.

Dittenhofer (2001) points that performance auditing provides evidence to a government organization, program, activity or function by contributing the accountability that help provide an independent assessment of their performance, assisting them progress public accountability.

According to Shlomo and Idit (2007), auditing is very important, especially extent of effectiveness, as this is an indicator of the elected representatives' work. This depicts whether the representatives have acted in a political and bureaucratic way in the auditing process.

Verbeeten (2008) claims, that performance management shows whether the public organization have set up goals to achieve and also evaluates the performance of the actions that are made to reach the goals that were set up from the beginning

Fryer *et al.* (2009) explains that performance measurement sees whether an organization has achieved its goals and missions. It is also a technique to do an assessment of the aspects and indicators.

Ling (2009) points that performance audit understands what difference a service, regulation or other activity makes, at what cost and who bears the costs and receives the benefits. Hence it is the contribution made to achieving desirable outcomes and minimizing undesirable costs and consequences.

According to Tilleman and Bogt (2010), performance budgeting implies that an independent body may conduct an investigation in order to make an assessment of the organization. Later findings are then used to draw up an auditing report, that can be utilized by parties internal or external to the organization.

Funkhouser (2011) points to anecdotal evidence of performance improvements resulting from audits and questions the achieved value of performance audits where he debates amenability and trivial elements are most often the object of scrutiny

Furubo (2011) describes legislative auditing as an evaluative activity that produces assessments regarding performance or evidence about performance, of such a dependable degree and with such a independence from investigatory and reporting constraints, that they can be used in the dominion of accountability.

Popa (2011) reported that performance auditing is a means trace out the weaknesses of the analyzed process and to discover the ways to increase the expected performance levels.

Van Looke and Put (2011) highlights three factors that contribute to an increased impact of performance auditing (1) media pressure, pressure from interest groups, pressure from parliament; (2) relationship auditor/ auditee during the audit, the audit report, follow-up of recommendations; (3) willingness from the audited organization, ongoing reform in the audited entity, chance events.

2.5. EFFICIENCY OF UTILITIES

Feinberg *et al.* (2000) points out that if call center agents are haughty or does not understand much on the customer complaints, the company might face a great loss from losing customers.

Efficiency measures link between inputs and outputs or how efficaciously the inputs have been transformed into outputs (Low, 2000)

According to IASB (2008) understandability, will increase when information is classified, characterized, and presented clearly and in brief. Understandability is the quality of information that enables users to comprehend their meaning.

Gopalakrishnan (2012) reports that challenge for any organisation is to maximize the full capabilities, expertise and capabilities of its employees in the most effective and efficient manner, whilst still crafting a working environment where the employees work life-balance is attained.

According to Pinprayong and Siengthai (2012) there is a difference between business efficiency and organizational efficiency. Business efficiency reveals the performance of input and output ratio, while organizational efficiency reflects the improvement of internal processes of the organization, such as organizational structure, culture and community

Šakalytė (2013) reported that excellent organizational efficiency could enhance entities performance in terms of management, productivity, quality and profitability.

According to Saghier and Nathan (2013) the concept of quality refers to the matching between what customers expect and what they experience. They said that reliability on a service is about the accuracy and timeliness in the service provided.

2.6. ATTITUDE TOWARDS ICT

Oppenheim (2001) said that an attitude is a state of readiness, a tendency to respond in a certain manner when confronted with certain stimuli.

Elsey and Sirichoti (2003) revealed that farmers may change their attitudes or behaviours toward the use of ICT tool if they realized the advantages derived from the usage.

Karnka (2006) said that computer sets linked to the Internet for a specific farmer group, revealed that most participants had positive attitudes toward the usage of ICT for supporting their learning activities.

Solano and Shiro (2008) in his research has proved that rural community have positive attitude towards ICT and they welcome any ICT project to be constructed in their areas.

Dhaka and Chayal (2010) observed that education was positively associated with frequent use of information services. The landholding was not related at all with the occurrence of using ICT services, showing that all farmers, irrespective of their landholding size, were using them. It was also observed that exposure of farmers to mass media was found favorable for using ICT by farmers. The respondent's level of innovativeness also significantly and positively influenced the use of ICT services by farmers.

Kumar and Sankarakumar (2012) reported that farmers in Ramapuram District of Tamil Nadu felt that ICT application in Agriculture has created a need based rather than money based information, ICT application in Agriculture is a cheap source of information to the farmers and ICT application in Agriculture has made farmers into knowledgeable.

Shankaraiah and Swamy (2012) reported that favourable attitude towards MMS network was found among forty percentage of farmers. Further, revealed that education, farm size, material possession, economic motivation, innovative proneness, cosmopoliteness, extension participation, mass media participation and achievement motivation had positive and significant relationship with attitude of farmers.

Raghuprasad *et al.* (2012) assessed the attitude of farmers towards utilization of ICT tools in farm communication and found that among 120 farmers selected for the study, more than two-fifth (40.83 per cent) of the farmers were found to have a positive favorable attitude towards ICT tools followed by 31.67 per cent had least favorable and 27.50 per cent had most favorable attitude.

According to Ram *et al.* (2014), seventy four per cent of the farmers had moderately favorable attitude towards the use of Kisan Call Centre followed by 16.00 per cent and 10.00 per cent had less favorable and highly favorable attitude towards the use of Kisan Call Centre.

Ahmed *et al.* (2012) in a study on Customers' attitude towards agro based benefits provided by the telecommunication operators in Bangladesh reported that 30 per cent customers were dissatisfied and highly dissatisfied customers with the service was found to be 12 per cent, 27 per cent of customers were satisfied and 10 per cent highly satisfied respondent. 21 per cent respondent had neutral attitude.

Kabir (2015) reported that farmers in Bangladesh had highly favorable attitude (58.9 per cent) towards the Information and Communication Technology. The age of the respondents, level of education, farming experience, farmers' perception on their information need and farmers' knowledge were found to be the potential factors of enhancing their attitude towards ICTs.

Syiem and Raj (2015) found out that farmers with higher degree of cosmopoliteness, social participation and favourable attitude of ICTs had higher degree of usage of ICTs.

Vosough *et al.* (2015) reported that households' attitudes towards ICT, compatibility and contact with agricultural extension agent are significant determinants for ICT adoption.

2.7. KISAN CALL CENTRE- EMPIRICAL STUDIES

Arya (2004) reported that, one year after its launch, KCCs brilliant and highly ambitious concept taken from Delhi Business Process Outsourcing (BPO) firm, to address the problems of the farmers, has failed to fulfill the hope it generated. He also reported that KCC did little apart from offering the very same services that traditional extension system offered. It had been offering theoretical and impractical answers to the farmers. He further stated that the job had been outsourced to bring professionalism but that had not happened. The biggest handicap of the KCCs was that they relied heavily on the knowledge of level-1 executive, who may not be an agriculture graduate. With little practical knowledge, the level-I call centre executives tries to settle the problems at his end. He appreciated the concept but questioned its popularity in the rural masses.

In majority of cases the reply was theoretical and has little practical solution to the farmer's problem. Further, he found that

1. The call centre agents were answering based on the information available to them through government sources, internet and data base.

2. KCC had provided a platform for the farmers and scientist to learn from each other

He observed a steady decline in the number of calls received by KCC. He reported that the number of calls reached its peak during March and since it's declined constantly. He also reported that the onset of Kharif season, the spectral of drought and other factors failed to enthuse farmers to call KCC.

Durga (2004) reported that the Hyderabad KCC received 3770 total calls during the period of January to June, 2005.

Lavanya *et al.* (2009) in her evaluation study of KCC in Tamil Nadu reported that there was 23.3 per cent awareness among the farmers about KCC. Agriculture magazine was the main source through which 29.79 per cent of the users were aware of the centre. Almost 99.62 per cent of the calls were made by males. More than three- fourths of the users of KCC had not adopted the instructions given by officers and majority of the users were not satisfied with the overall services of KCC.

Ram *et al.* (2014) in their study revealed 74 per cent of the farmers had moderately favorable attitude towards the use of Kisan Call Centre followed by 16.00 per cent and 10.00 per cent had less favorable and highly favorable attitude towards the use of Kisan Call Centre

Slathia *et al.* (2011) reported that seventy six per cent of the farmers had no knowledge of the centres as well as the toll free number. Twenty four per cent of the respondents, farm youth had high level of awareness whereas farmwomen dawdled behind in terms of the awareness regarding Kisan Call Centres.

2.8. VARIABLES AND THEIR REVIEW

2.8.1. Age

Bondale *et al.* (2005) reported that most of the farmers approaching Kisan Call Centre were young (61.90 per cent).

Dhaka and Chayal (2010) found that majority (46.67 per cent) of the respondents who utilized ICT services for agriculture belonged to the middle aged group followed by 38.67 per cent in the young age category and old age (14.67 per cent).

Kumari *et al.* (2014) reported forty nine percent of the farmers who used radio as an educational media to transfer agricultural information belonged to middle age category.

Rashid *et al.* (2015) reported that among the women beneficiaries of RDRS, nearly two third of the respondents (66.07 per cent) were young aged, while 30.36 per cent were middle and only 3.57 per cent were old

2.8.2. Gender

Asiedu-Darko (2014) reported that gender has no significant effect on the adoption of agricultural technologies.

Etwire *et al.* (2013) pointed out that gender is one of the causes influencing farmers' adoption of a climate related strategies introduced by research institutions. Targeting females, increasing access to agricultural extension services and generating more attentiveness about variations in temperatures are important in promoting the adoption of climate related technologies.

2.8.3. Education

Meera (2002) observed that majority (31.70 per cent) of 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.

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

Rajula and Thiagarajan (2011) indicated that participants who used interactive multimedia instruction in agriculture were mostly literate with high school to graduate level (73.55 per cent)

Muhammad *et al.* (2015) reported that 68.3 per cent of the farmers who utilized farm information from union information and service centers in Bangladesh had Higher secondary level of education.

2.8.4. Occupation

Chauhan (2010) reported that sixty percent of the internet facility expecting farmers of Anand district in Gujarat belonged to the small category of farmers with mixed farming as main occupation

Okoedo-Okojie and Omoregbee (2012) in a study in Edo State, Nigeria revealed that majority of the farmers (59.07 per cent) who utilized GSM for agricultural information were full time farmers.

Ajijola *et al.* (2015) in a study on socio economic effect on the use of Information and Communication Technology among rural farming households revealed that 92.03 per cent of the respondent's major occupation was farming.

2.8.5. Annual Income

CIMMYT (1993) reported that wealthier farmers may be the first to try a new technology, especially if it involves purchased input. Many farmers who do not adopt may complain of a lack of cash or credit as the principal factor limiting their adoption.

Ankuya and Ashwar (2014) reported that annual income of the poultry farmer had positive significant relationship with extent of adoption of poultry practices.

Paonam and Ram (2015) reported that annual average income was an important factors which have contributed to the knowledge gained by the poultry farmers.

2.8.6. Extension Agency Contact

Sangeetha (2008) revealed that 83.64 per cent of the PF beneficiaries had medium to high level of extension agency contact followed by low level of extension agency contact with 16.36 per cent.

Rakesh (2010) reported medium level of extension agency contact (58 per cent) was followed by 28.70 per cent with high level of extension agency contact among farmers practicing precision farming.

Nyaga (2012) reported that 47 per cent of the farmers had not received any extension service through ICT tools.

Hanjabam (2013) pointed out that the precision farmers had medium level of extension agency contact (76.67 per cent) followed by high level extension agency contact (15 per cent).

2.8.7. Innovativeness

According to Sasankan (2004) Forty nine percentage of the farmers had medium level innovativeness.

According to Kilelu *et al.* (2013), innovation happens through the joint exchanges among farmers, researchers, extension officers, service providers, and others, who are influenced by diverse interests, values, norms, technologies, markets, institutions, and infrastructural resources.

Tirfe (2014) showed that confident perspective in the direction of agriculture, engagement in creation of higher-quality seed, extension services provided through DAs, gurus from ISSD, study institutions, and Woreda degree agricultural agencies have foremost constructive outcomes to enhance the innovativeness of farmers. Then again mass-media exposure, whole knowledge in ordinary farming, scantiness and rate of inputs are negatively associated with innovativeness of farmers. On the other hand, participation in ability constructing activities (eg. Trainings, visits to demonstration websites, experience sharing visits, workshops), participation in nonfarm events, stage of formal education, financial position and access to credit haven't any large effect on innovation

2.8.8. Internet Use

According to Chauhan (2010), majority farmers utterly or to a precise degree felt that although internet is expensive affair for the farmers however it's the simplest mean to gather data on market costs of agricultural merchandise. 82.00 per cent of the farmers were wish their youngsters to create positive use of internet at constant time 81.00 per cent of them had opinion that farmers ought to build use of internet. quite seventy per cent of the farmers opined that net is that the made supply and quickest approach of exchanging data in short time.

Chauhan and Chauhan (2011) reported that 71 per cent of the farmers understood that internet is a rich source to collect worldwide information on agriculture and its allied fields, while 72 per cent supported to the statement that 'Internet is fastest way to exchange information in shortest time. The present cost involved in this technology, it was not easy for the farmers to have this facility individually at his home, and thus, 65 per cent of the farmers completely or to a certain degree felt that internet was pricy affair for the farmers. Internet was the paramount mean to collect information on market prizes of agricultural products but as it was being new system for our farmers, mix judgment was observed for this aspect and it was observed that 41 per cent of the farmers realized its use for agricultural marketing while 35 per cent partly realized it and nearly one fourth (24 per cent) of them did not realize this feature of internet.

Adamides *et al.* (2013) reported that 60.6 per cent of the Cypriot farmers used the personal computer and 54.2 per cent used the Internet. A higher percentage 68.4 per cent of the producers stated that they use the Internet either on their own or through others (children, spouse, friend, et cetera) for business purposes. The study suggests that farmers use the Internet to access agricultural related information, mainly about machinery and low cost inputs (67.3 per cent), and for reading electronic newspapers and magazines (44.4 per cent). The overpowering majority of the farmers, regardless of using the Internet or not, believe that the Internet is a useful information source (95 per cent) and from those who use it (23.4 per cent) state that they are "very satisfied" by its usage in the farm. They believe that the Internet can help them upturn their productivity (51.7 per cent), improve the superiority of their products (60.6 per cent) and reduce the production costs (73.8 per cent), while 38.4 per cent of the respondents believe that it can help them become innovative.

2.8.9. Information Source Utilization

Meitei and Devi (2009) revealed that in rural Manipur, the farmers needed a variety of information related to farm inputs. The desired medium was radio, followed by television and newspapers.

According to Devi and Verma (2011), the mass media are quick economical but lack crucial elements of empathy and feedback which are apparent in face to face situation.

Neethi *et al.* (2014) revealed that informal sources followed by formal source and mass media were ranked in the order of utilization of information sources by the farmers of Mahabubnagar District.

Hanglem *et al.* (2015) that farmers with comparatively high education are able to utilize different communication sources for retrieving information about farming. In order to come in concrete conclusion about an agricultural predicament, the respondents seek help from extension agencies. Because of their frequent interface, respondents aware of usage communication tools and consequently, by the vision of the advantages on communication in agricultural farming, farmers with scientific orientation utilized different communication tools.

Ronald *et al.* (2015) revealed that greater proportion (93 per cent) of the respondents preferred television as their source of agricultural information.

According to Sakib *et al.* (2015), almost three fourths of the respondents (74 per cent) belonged to high category in case of mass media utilization. On the other hand majority of the respondents (90 per cent) had fallen medium to high category regarding group contact. The percentage of the respondents who desired medium to low employment of personal cosmopolite sources was 94.5. Most of the respondents (73.6 per cent) fall medium to high category about preference to use of personal locate information sources. Among all information sources mass media ranked first

on the basis of index score followed by group contact, personal locate and personal cosmopolite.

2.8.10. 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. Three to five agricultural websites was known byone tenth (13.1 per cent) of the respondents. Only 8 per cent of the respondents were found with awareness of more than five agricultural websites.

Rebecca (2012) revealed that majority (86.7 per cent) of the respondents were quite aware of extension services and activities in the study area.

Ajala *et al.* (2013) reported that medium level of awareness on improved technologies were found among 46 per cent of cassava farmers, while 33 per cent had high level of awareness.

Sundar and Ramakrishnana (2013) revealed that 40 per cent of respondents were both aware and subscribed crop insurance and 27 per cent aware but not subscribed and remaining respondents were not aware about crop insurance schemes.

Islam *et al.* (2014) reported that majority of the rural women (56 percent) had medium awareness on agricultural extension activities, while high and low awareness was found among 43 per cent one per cent of the respondents.

2.8.11. Utilization of ICT Tools

Agwu *et al.* (2008) revealed that 56.7 per cent of the farmers had low knowledge about ICT, 59 per cent were not aware of the ICT tools and restricted access towards ICT tools was found among 67 per cent of farmers.

Armstrong and Gandhi (2012) revealed that factors hindering the utilization of the ICT service included the failure to visit farmers, wrong broadcasting time, non-promotion of the training and service of farmers.

Sobalaje and Adigun (2013) reported that the farmers using ICT had an average age of 35 years with secondary education. The most preferred ICT tools by farmers were television, radio and mobile phone. The major constraints faced in the use of ICT were the lack of infrastructural facilities.

Savithramma *et al.* (2014) revealed that 72.50 per cent of the farmers had utilized the service only once in four month, 18.30 per cent of the farmers had utilized call centre 2-3 times and only 9.20 per cent of the farmers had made more than three calls to the call centre.

2.8.12. Information Needs

Sammadar (2006) reported that the context-specific facts could have higher impacts on the adoption of technologies and enhance farm production for marginal and small agricultural landholders.

Saravan *et al.* (2008) carried the learning on information pattern and information necessity of the tribal farmers in Arunachal Pradesh indicate that most of the farmers need information on various topics such as pest management, disease management.

Tologbonse *et al.* (2008) carried the study of information need of rice growers community in Niger state disclosed that majority of farmers (89.9 per cent) need information about the crop production

Meitei and Devi (2009) conducted the study of farmer's community in Manipur (India) to understand the information need of the rural farmer's community

in Manipur state. This study shows that majority of farmers did not access to information for their activities.

According to Bachhav (2012), majority of the farmers need information on seed availability (74.29 per cent), crop production (70.86 per cent) and insecticide availability (62.29 per cent) followed by fertilizer availability (64.58 per cent). Others areas that were mentioned by farmers include water management (34.28 per cent), weather information (23.43 per cent) and agricultural equipment (17.72 per cent). He also reported that majority of the farmer's depend on on their colleague for obtaining the information while second important channel of information is the newspaper 62.29 per cent followed by Government office 57.15 per cent.

Babu *et al.* (2011) carried the study on farmers' information needs and how they search for information in Tamil Nadu and found that the major constraints to access information by the farmers is poor availability, poor reliability, lack of awareness of information sources available among farmers and untimely provision of information.

Factors that influence use of information by farmers include their personal characteristics like age (Carter and Batte, 1993), education (Waller *et al.*, 1992), experience in farming (Schnitkey *et al.*, 1992); business characteristic like market orientation of farming (Ngathou *et al.*, 2002), farm size (Solano and Shiro, 2008; Alvarez and Nuthall, 2006; Llewellyn, 2007), type of farm enterprise (Carter and Batte, 1993), liability level (Tucker and Napier, 2002), proprietorship of farm.

2.8.13. Digital Divide

Chen and Wellman (2004) studied Internet use in eight countries: United Kingdom, United States, Germany, Italy, China, Japan, Korea and Mexico. Across these eight nations, socioeconomic status, gender, life stage, and geographic location significantly influenced people's use and access of the internet. The study reveals that

internet users are more likely to be better-off and highly educated than non-users and, that men are more likely than women both to access and to use the Internet regularly.

According to Malhan (2009) the key to effectively building assortment within the digital era is additionally coaching to library professionals as a result of it they learn the way to create best use of technology, the latter can mechanically become involved in their work culture. They will thus conjointly facilitate to bridge the digital divide by coaching the information users

Shah (2009) reported that, access to broadband internet services is substantially low in rural areas and deprived urban neighbourhoods of many developing countries than in the metropolitan urban.

Panda *et al.* (2013) reported that the phase "Digital Divide" is being mentioned to the gap that exists in most Countries between those with ready access to information and communication technology and the information that they offer access to and those deprived of such access skills.

According to Gautam (2014) Digital Divide" has been applied to the gap that exists in most countries between those with ready access to the tools of information and communication technology and the knowledge that they provide access to and those without such access skills.

2.8.14. Peer Group Contact

Swaminathan and Balan (2013) pointed out that answers to questions like what to produce, when to produce, how much quantity to produce, where and when to sell, at what price and in what form to sell their produce. This is market intelligence which could get better accomplished by the approach of group dynamics.

Obinna and Agu – Aguiyi (2014) revealed that fellow – farmers were the most preferred channels of dissemination of cassava based technologies because of their high regards and confidence on their indigenous knowledge practices.

2.8.15. Constraints in Using ICT

Cecchini (2003) The availability of content in local languages and the use of graphic and voice interfaces can make e- governance application more accessible to poor people, illiteracy and low levels of education are powerful obstacles to the use of computers and other ICT tools.

Mittal and Mehar (2013) poor extension facility, inappropriate availability of quality inputs (seed, pesticides and fertilizers), poor access to electricity and irrigation facility, shortage of labour, poor or no access to soil and water testing facility.

Derso *et al.* (2014) High cost of infrastructure, less extension support, inaccessibility towards agricultural information and unavailability on time were the major constraints that faced majority of both users and nonusers of ICT while using ICTS in agricultural extension.

Sireesha *et al.* (2014) the major constraints felt in using ICT tools were inadequate precisely competent personnel in using the ICTs, problems of maintenance of ICT tools, disruptions in Internet connectivity, inadequate budget allocation for ICT tools, lack of up gradation of ICT equipment and problem of viruses and junk mails.

METHODOLOGY

3. METHODOLOGY

This chapter deals with the description of the methods and procedures adopted in conducting the present research study. It is furnished in this chapter under the following subheadings.

3.1. Locale of the study

3.2. Selection of the respondents

3.3. Design of the study

3.4. Variables and their measurement

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 THE STUDY

The government of Kerala was one of the first in India to develop a policy designed to promote and accelerate the diffusion and use of ICTs within the region (Government of India, 2008). The spread of ICT services in agriculture has also been increasing. The service of Kisan Call Centre is available throughout the country and is also being offered in Kerala as well. Therefore the service can be availed by farmers throughout the state. The Kerala State is divided geographically into North Kerala, Central Kerala (Kochi region), South Kerala (Travancore region) (GOK, 2016). Therefore for studying the awareness of farmers regarding Kisan Call Centre, farmers were selected from the three zones. Trivandrum district, Idukki district and Kottayam District were selected representing the South Zone. Ernakulam District, Thrissur District and Palghat District were selected representing the Central Zone and Kasargode District, Wyanad District and Malappuram District was selected for

representing the North Zone of Kerala. Kerala state was the locale of study. The study area map is shown in figure 2.

3.2. SELECTION OF THE RESPONDENTS

The respondents in this study were the beneficiaries of Kisan Call Centre as well as the farmers from different zones of Kerala. A total of 300 farmers were selected for the study. There were two categories of respondents, 150 farmers for studying the awareness on Kisan Call Centre and 150 farmers for studying the utilization of Kisan Call Centre. Figure 3 shows the pictorial representation of selection of respondents. For studying the awareness of farmers on KCC, the respondents were selected from the three zones of Kerala that is 50 farmers each was selected using simple random sampling from the South Zone (Trivandrum district, Idukki district and Kottayam District), Central Zone (Thrissur District and Palghat District) and Northern Zone (Kasargode District, Wyanad District and Malappuram District) of Kerala. For studying the utilization of KCC by farmers, 150 farmers who had utilized the service during the year 2015 were selected using purposive sampling method from the data base of Kisan Call Centre.

3.3 DESIGN OF THE STUDY

The research design gives the complete guidelines for data collection. Kerlinger (1973) defined "Research design is the plan, structure and strategy of investigation so as to obtain answers to research questions and to control variance". The research design enables the researcher to answer research questions validly, objectively and accurately.

In the present study the research design used was ex- post facto research design. In Ex-post facto research design the scientist does not have direct control over the independent variables as they have already occurred and they cannot be manipulated. The researcher draws inference regarding the relationship between

Figure 2. Map of the study area

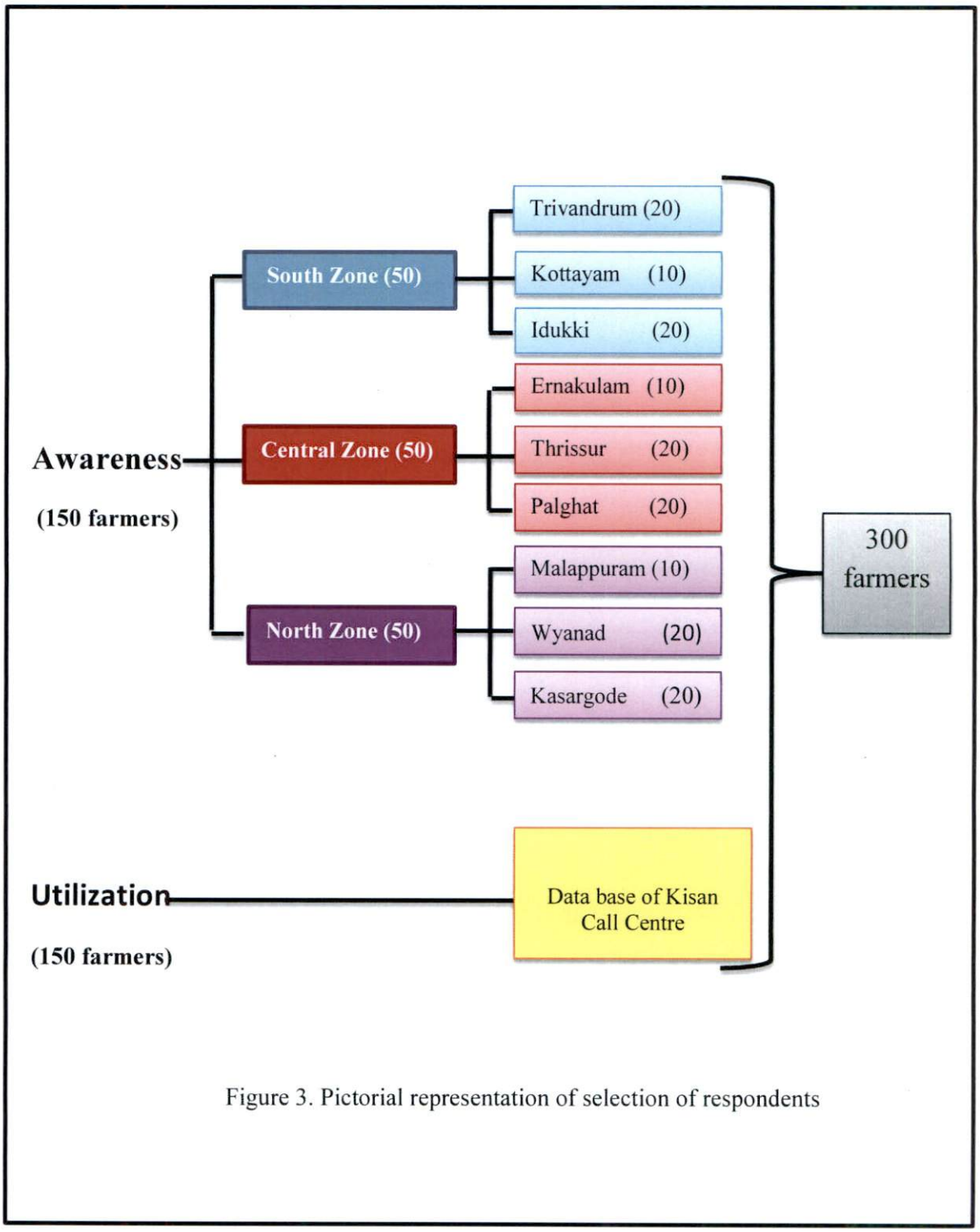


Figure 3. Pictorial representation of selection of respondents

variables on the basis of independent variables as they have already occurred. Therefore this research design was resorted in the study as there was no scope for manipulation of any variable under study.

3.4 OPERATIONALIZATION AND MEASUREMENT OF THE VARIABLES

A list of thirty five 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 the experts and observation made by the researcher. The lists of variables were then sent to 30 judges comprising of Agricultural Extension scientists and Agricultural Economic 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, least relevant 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 which gained a score of more than the mean score were selected for the study.

Finally seventeen independent variables and three dependent variables were selected for the study. The dependent variables were Performance of Kisan Call Centre, Efficiency of Kisan Call Centers and Attitude of farmers towards KCC. Variables and their empirical measurement are listed below in table 1.

Table 1: List of variables and their measurement

Variables	**Measurement and scoring procedures developed/ adopted**
Age of farmers utilizing KCC	Classification based on census report, 2011
Gender of farmers utilizing KCC	Actual sex of the farmers
Education of farmers using KCC	Actual educational qualification
Occupation of farmers utilizing KCC	Structured schedule
Annual income of the farmers utilizing KCC	Structured schedule
Extension agency contact of farmers utilizing KCC	Rahul(2013) with modification
Innovativeness of farmers utilizing KCC	Singh (1971)
Experience of internet use of farmers utilizing KCC	Structured schedule
Information source utilization by farmers utilizing KCC	Hanjabam (2013) with modifications
Awareness of farmers utilizing KCC	Structured Schedule
Adoption of advice	Structured Schedule
Utilization of KCC by the farmers	Structured Schedule
Constraints faced by farmers in utilizing KCC	Varghese (2011) with modifications
Digital divide among the respondents	Structured schedule
Information needs of farmers with regard to KCC	Ganesh (2008) with modification
Peer group contact of farmers using KCC	Structured schedule
Performance of KCC	Structured schedule
Efficiency of KCC	Structured schedule
Attitude of farmers	Structured schedule

3.4.1. Independent Variables and their Empirical Measurement

3.4.1.1. Age

Age refers to the number of calendar years completed by the respondent at the time of investigation. This variable was measured by asking the respondents the total number of years completed at the time of interview. Then the response was classified based on the census report, 2011. The scoring procedure is represented in table 2

Table 2. Age-wise distribution of respondents

Sl. No	Age category	Years	Score
1.	Young	≤35	1
2.	Middle aged	36-55	2
3.	Old	≥55	3

3.4.1.2. Educational Status

Educational status refers to the academic qualification possessed by the respondent. This was measured based on the actual educational qualification possessed by the farmer at the time of the interview. The scoring procedure is provided below in table 3.

Table 3. Education-wise distribution of respondents

Sl. No.	Educational Qualification	Score
1	Primary Education	1
2	High school education	2
3	Higher secondary education	3
4	Graduate level education	4

3.4.1.3. Gender

Gender is operationally defined as a set of learned expectations, behaviors, and attitudes about being a man or woman from our biologically determined traits. The scoring procedure is provided in table 4.

Table 4. Gender-wise distribution of respondents

Sl. No	Gender	Designate
1	Female	1
2	Male	2

3.4.1.4. Occupation of Farmers Utilizing KCC

Occupation is operationally defined as the actual bread winning time spent in a particular profession and was reckoned as primary and all other occupations in which the respondent were engaged at the time of interview. The scoring procedure is represented in table 5.

Table 5. Occupation-wise distribution of farmers

Sl. No	Occupation	Score
1	Farming as a sole occupation	1
2	Farming + Government	2
3	Farming + others	3

3.4.1.5. Annual Income of the Farmers Utilizing KCC

Annual income is operationally defined as the total income of the respondents from farming and other sources for a period of one year.

The response was obtained by asking the respondent the income he received during a year. Then the responses were categorized. The scoring procedure is represented in table 6.

Table 6. Annual income-wise distribution of farmers

Sl. No	Annual income	Categories
1	Upto Rs 25,000	1
2	Rs 25,000 to 50,000	2
3	Above Rs 50,000	3

3.4.1.6. Extension Agency Contact of Farmers Utilizing KCC

Extension agency contact is referred to as the degree to which the respondent utilizes contact with various extension agency/ methods for obtaining farming related information.

The scale used by Rahul (2013) with some modification was used for the study. These items were administered to the subjects in three point continuum namely often, sometimes, never with a score of three, two, and one. The scoring procedure is provided in Appendix II. The farmers were classified as high, medium and low categories by cumulative frequency of the scores obtained as indicated below. The range of measuring the information seeking behavior is 7-21.

3.4.1.7. Innovativeness of Farmers Using KCC

Innovativeness is operationally defined as the degree to which the respondent is relatively earlier in adopting new ideas.

The procedure used by Singh (1971) with some modification was adopted. The respondents were asked as to when they would like to adopt an improved practice in farming. The measurement of innovativeness was as follows:

Table 7. Scoring for innovativeness of farmers using KCC

Sl. No	Innovativeness	Score
1	As soon as it is brought to my knowledge	3
2	After I have seen other farmers try it successfully	2
3	I prefer to wait and take my own time	1

The classification procedure employed in innovativeness was the respondents who had a score of 1 belonged to the low group, respondents with score 2 belonged to medium and those with a score of 3 belonged to the high group.

3.4.1.8. Experience of Internet Use

Experience of Internet use is operationally defined as the number of years the respondent has been using the internet. The responses were gathered by asking the number of years he had been using the internet and later the response was categorized. The scoring procedure is presented in table 8.

Table 8. Scoring for experience of Internet use

Sl. No	Experience of internet use	Score
1.	0 years	1
2.	<3 years	2
3.	3-6 years	3
4.	>6 years	4

3.4.1.9. Information Source Utilization

Information source utilization is operationally defined as the relative frequency with which the farmer respondents receive agricultural information from various sources.

The method Hanjabam (2013) with some modification was used for the study. The scores for more frequency of use of the information sources utilization were ranging from 5 to 1 for most frequently, frequently, less frequently, occasionally and never in order of sequence. Based on the score obtained from the respondents they were classified into high, medium and low by using cumulative frequency method. The range of measuring the information source utilization was 9- 45.

3.4.1.10. Awareness of KCC

Awareness of KCC is operationally defined as the knowledge of farmers on the existence of Kisan Call Centre. To understand the awareness of farmers on KCC, 150 farmers were selected from the earlier mentioned districts and were asked whether they were aware of KCC, and if aware whether they have ever contacted the call centre. Percentage analysis was done to understand the awareness on KCC by farmers. The scoring procedure is presented in table 9.

Table 9. Scoring for awareness of KCC

1.Are you aware about KCC	Yes	1
	No	0
2. Have you ever contacted	Yes	1
	No	0

3.4.1.11. Utilization of KCC

Utilization of KCC is referred to as the frequency with which the respondents had utilized the services of KCC when there was a felt problem that needed to be solved in their farm immediately. For studying the utilization of KCC by the farmers, 150 respondents were selected from the data base of KCC. The utilization was measured by understanding temporal awareness of KCC (how long the farmers were aware of the KCC services), the source of awareness on KCC, number of times the farmers had utilized the service as well as by enquiring how they became aware about KCC. Percentage analysis was done to understand the utilization of KCC by the farmers. The scoring procedure is presented in table 10.

Table 10. Scoring for utilization of KCC

1. Temporal Awareness of KCC	<1 year	1
	1-2 year	2
	>2 years	3
2. Number of times utilized the service	<3 times	1
	3-6 times	2
	More than 6 times	3
4. How did you become aware of the KCC?	Friend/ relative	
	Radio	
	Television	
	Seminars	
	Agricultural officer	
	Extension personnel	
	Newspaper/Magazines	

3.4.1.12 Adoption of Advices

Adoption of advice is operationally defined as the degree to which farmers adopted the advice recommended by the call centre agent. The adoption was measured through a series of statements and has been provided in table 11.

Table 11. Scoring for adoption of advice

1.Adoption of advice	Did not adopt	0
	Discussed with neighbor	1
	Contacted extension worker for more details	2
	Partly adopted the practice	3
	Completely adopted the practice	4

3.4.1.13. Assessment of Information Needs of the Farmers

Information needs of farmers are referred to as specific information which the farmers need most from KCC to satisfy his conscious or unconscious need.

The scale developed by Ganesh (2008) was used for the study. There are four levels of appropriateness felt by the farmers. Scoring procedure is presented in table 12. Summation of the score of all 28 items gave the score of the respondent on information needs assessment. Information need index was developed using the formula.

$$\textbf{Information need index} = \frac{\textbf{Total score obtained}}{\textbf{Maximum possible score}} \times 100$$

Table 12. Scoring for information needs

Sl. No	Category	Score
1	Most needed	3
2	Needed	2
3	Less needed	1
4	Least needed	0

3.4.1.14. Peer Group Contact

Peer group contact is operationally defined as the persuasion the farmers receive from his peer group in farming. Based on the scores obtained from the respondents they were classified into more frequently, frequently, less frequently, occasionally and rarely by using cumulative frequency method. The scoring procedure is provided in table 13.

Table 13. Scoring for peer group contact

Sl. No	Network Contact	Score
1.	Most frequently	5
2.	Frequently	4
3.	Less frequently	3
4.	Occasionally	2
5.	Rarely	1

3.4.1.15. Digital Divide

Digital divide is operationally defined as the inability of the farmers in accessing the ICT tools. The digital divide among the farmers was measured by identifying those ICT tools that were accessible for the farmers. The digital divide

was classified into available+ accessible, available + inaccessible, unavailable + accessible, Unavailable+ inaccessible by using the cumulative frequency method. The scoring procedure is provided in Appendix II.

3.4.1.16. Constraints in Utillizing Kisan Call Centre

Constraints faced in utilizing KCC are operationally defined as the difficulty faced by the respondents in using KCC for receiving various information. The procedure followed by Varghese (2012) with some modification was used. The constraints was rated in a three point continuum namely most relevant, relevant and least relevant with scores of 2, 1, 0. Ranking of the constraints faced in using KCC was done by calculating the total scores obtained.

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, three dependent variables of the study were Performance of KCC, Efficiency of KCC and Attitude of farmers towards KCC.

3.4.2.1. Performance of KCC

The performance of KCC is operationally defined as the degree to which the call centre is able to fulfill its goal oriented activities efficiently and effectively. The performance was measured by conducting performance auditing. Performance auditing was operationally defined as a set of methods aimed to evaluate efficiency and effectiveness of goal – oriented activities regarding the appropriate time period

and quality. The performance auditing was measured using SWOC analysis, Benchmarking, Outcome- oriented investigation.

3.4.2.1.1. SWOC Analysis

The Strength, Weakness, Opportunity and Challenges analysis was done after critically observing the performance of KCC as well as based on the observation of the call centre agents which was elicited through open ended questions. The SWOC analysis was aimed to find out the internal and external factors important in achieving the objective of the KCC. The strength and weakness were the internal factors influencing the call centre and the opportunities and challenges were the external factors affecting the call centre.

- **Strength**

Strength is the characteristics that are advantageous to the call centre over the other agro-advisory services.

- **Weakness**

Weakness are those characteristics that places the call centre at a disadvantage relative to other agro-advisory services

- **Opportunities**

Opportunities are the area where the call centre could excel in their service delivery

- **Challenges**

Challenges are those factors that could cause troubles in the working of Kisan Call Centre

3.4.2.1.2 Benchmarking

Benchmarking is operationally defined as a point of reference where the evaluation of KCC was made by comparing its performance with a standard measure. The standard measure was developed by International Finance Corporation (2010). That standard that would be suitable to measure the working of KCC was selected

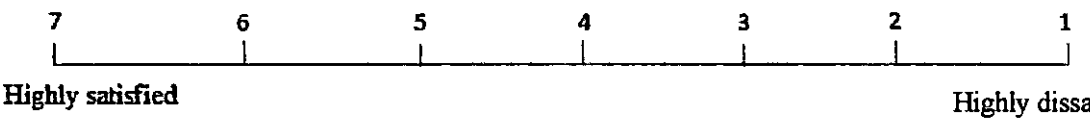
from the International Finance Corporation standards. The standards like service level, average speed to answer, abandonment rate, adherence to schedule, agent attrition, call wrap-up time, first call resolution and occupancy rate were selected for the benchmark study. The performance of KCC was measured with the help of the call centre agents and was compared with the standard. The standard that was used to measure the KCC performance is provided in table 14.

Table 14. Benchmarking standard used for measuring performance of KCC

Standards	Measure
Service Level The percentage of calls answered within a predefined time frame	80% of calls answered within 20 sec.
Average Speed to Answer The average time for calls to be answered. This includes the amount of time callers wait in a queue while the agent's phone rings, but not the time it takes for callers to navigate through the IVR	28 seconds
Abandonment Rate The number of callers that hang up before an agent answers.	5 - 8%.
Adherence to Schedule A call center agent's degree of compliance with their assigned schedule.	95%
Agent Attrition Measure of staff turnover annually	15%
Call Wrap-up Time Time an agent takes to complete all work associated with after the call has ended	6 min/call
First Call Resolution The percentage of all calls where the caller's issues were resolved on the first attempt, without the agent needing to escalate the call, transfer the call or call the customer back.	70-75%
Occupancy Rate The amount of time agents are on live calls as well as completing work associated with the calls (after call works).	60-80%

3.4.2.1.3. Outcome- Oriented Investigation

Outcome- oriented investigation was operationally defined as results or consequences of actions, aimed to achieve the final goals of the KCC. Outcome oriented investigation was measured by analyzing the satisfaction of the farmers who have utilized KCC. The satisfaction of farmers using KCC was operationally defined as how pleased the respondent were after utilizing the KCC service. It was measured on a seven point continuum as highly satisfied, moderately satisfied, slightly satisfied, neither satisfied nor dissatisfied, slightly dissatisfied, moderately dissatisfied, highly dissatisfied. The percentage analysis was done to measure the extent of satisfaction. The scoring procedure is as given below.



3.4.2.2. Efficiency of Kisan Call Centre

Efficiency was referred as the quality of being efficient. The efficiency of KCC was measured by developing an efficiency index. Eleven indices that reflected the efficiency of Kisan call centre were selected for the purpose and was send to 30 judges for judges rating. The judges were asked to examine the variables critically and rate the relevancy of each variable on a three point continuum ranging from most relevant, relevant, least relevant with weightages of three, two and one respectively. The final indices were selected based on the criterion of mean relevancy score, which was obtained by summing up the weightage, obtained by the indices and dividing it by the number of judges, responded. Those indices which gained a score of more than the mean score were selected for the study. Therefore 9 indices were selected and the farmers were asked to mark their responses on a five point continuum. The indices selected for measuring the efficiency is provided in Appendix II.

Based on the scores obtained the efficiency index of KCC for each respondents was measured using the formula

$$\textbf{Efficiency index (EI)} = \frac{\textbf{Individual subjects score}}{\textbf{Maximum score}} \times 100$$

3.4.2.3. Attitude of Farmers Towards KCC

Attitude of farmers towards KCC is operationally defined as the degree of positive and negative feeling of farmers towards Kisan Call Centre Services. An arbitrary attitude scale was developed and used for measuring the attitude of farmers towards KCC. The procedure followed in the construction of attitude scale is described in the pages that follow.

Collection of Items and Editing of Statements

Thirty five statements expressing the attitude of farmers towards KCC were first collected through review of literature and discussion with experts in the field of extension and was carefully edited using the criteria suggested by Edwards (1957). Finally thirty statements out of the thirty five statements were retained so as to include statements reflecting both favourable and unfavourable attitude towards KCC.

Scale Value

The thirty statements selected was resorted to a panel of 30 judges for judges rating and was requested mark their opinion on a five point continuum of equal appearing interval continuum from 'most favourable to 'least favourable'. Based on judgment, the scale value (S) of the distribution and the Q value for the statement were calculated with the help of the formula

$$S = L + \left[\frac{0.50 - \sum P_b}{P_w}\right] x\ 1$$

S= Scale Value

L= Lower level of continuum in which the median falls

ΣP_b = the cumulative proportion below interval in which the median falls

P_w = the proportion within an interval in which median falls

The inter-quartile range (Q = Q3 - Q1) for each statement was also found out and only those statements were selected whose median values were greater than Q value. Based on the scale value and the Q values, 23 statements were selected to constitute attitude scale towards Kisan call centre.

Administering the Scale

A pilot study was conducted in the Vellanad Panchayat of Trivandrum district among 20 non-respondent farmers. The final scale consisting of 23 statements, 15 positive and 8 negative statements was administered to them. Each statement was noted on a five point continuum as strongly agree, agree, undecided, disagree and strongly disagree with scores of 5,4,3,2,1 respectively for positive statements and the scoring was reversed in case of negative statements. The score obtained for each item was multiplied with the scale value and summed up to get the attitude score of farmer.

Validity of the Scale

According to Kerlinger (1973) content validity is the representativeness or sampling adequacy of the contents, the substance, the matter and topics of a measuring instrument.

To ensure the obtained test measured the variable it was supposed to measure the validity of the scale was to be assured. There are different types of validity and among them the most common one used is the content validity. In this study content validity was ensured. The statements that were gathered to form the scale was selected based on review of literature as well as after discussion with experts in the field of extension. Later the statements selected were also subjected to judges rating in order to be included in the scale developed.

Reliability of the Scale

A scale is said to be reliable when it produces the results with high degree of consistency when administered to the same respondents at different times. In this study the reliability of the scale was determined by split half method. The scale was administered to 20 respondents from a non-sample area and was asked to mark their response on a five point continuum strongly disagree, disagree, undecided, agree, strongly agree. The scale was divided into two halves based on odd- even numbers of the statement. The scores on the odd numbered items as well as the scores of the even numbered items of same respondents were correlated using the Pearson's product moment correlation coefficient. The coefficient of internal consistency was worked out using the formula:

$$\rho = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[(N\sum X^2) - (\sum X)^2][(N\sum Y^2) - (\sum Y)^2]}}$$

Where N= Number of respondents

X= Value of odd numbered items score

Y= Value of even numbered items score

The Roe value obtained was again correlated using Spearman Brown formula and thus obtained the reliability (r_t) of the original test. The formula used was

$$r_t = \frac{2\rho}{1+\rho}$$

The obtained r_t value was 0.9679, which indicated a high reliability of the scale.

Hence the scale was administered to the 150 respondents of the study in order to understand the attitude of the respondents towards KCC. The score for each statement was worked as mentioned in the pilot study in order to find out those statements to which the respondents agreed more to. Therefore the score of the statements ranged from 150-750.

3.4.3. Extent of Use of Kisan Call Centres for Agricultural Information by the Farmers in Tamil Nadu, Karnataka in Comparison with Kerala

The extent of use of KCC for agricultural information by the farmers in Tamil Nadu, Karnataka in comparison to Kerala was measured with the help of secondary data collected on average calls received, the major crops for which queries are received, the number of call centre agents working in the call centre.

3.4.4. Categorization of Calls Received by Kerala KCC

The categorization of calls coming to KCC was operationally defined as the categorization of calls received by the call centre on the basis of the month in which maximum calls are received, the queries for which calls are received , the crops for which major queries arise and the Districts from which major queries are received. The data was collected from the call centre agents using an open ended questionnaire.

3.4.5. Constraints Faced in Using KCC

3.4.5.1. Constraints faced by the Farmers in Using KCC.

The constraint faced by the farmers in using KCC is operationally defined as the difficulty faced by the farmers in receiving various information through KCC. The procedure followed by Varghese (2011) with some modification was used. The constraints was rated in a three point continuum namely most relevant, relevant and least relevant with scores of 3, 2, 1. The farmers were classified to high, medium and low categories by cumulative frequency scores. The score range of constraints faced was 9-27.

3.4.5.2. Constraints Faced by the Information Providers of KCC.

Constraints faced by the information providers of KCC are operationally defined as the difficulty faced by information providers in imparting agricultural services to the farmers. The list of constraints elicited from the information providers was collected using an open ended question.

3.4.5.3. Constraints Faced by the Farmers as Perceived by the Agricultural Officers.

Constraints faced by the farmers as perceived by the Agricultural Officers are operationally defined as the difficulties the farmers face according to Agricultural Officers in using KCC services. The constraints faced according to Agricultural Officers were collected from the Agricultural Officers using an open ended question.

3.4.6. Suggestions for Improving the Services of KCC.

Suggestions for improving the services of KCC were operationally defined as those recommendations given by farmers, information providers and Agricultural Officers in improving the services offered by the KCC. The suggestions in improving

the KCC services were elicited from the farmers, call centre agents and Agricultural Officers using an open ended question.

3.5. TOOLS AND TECHNIQUES OF DATA COLLECTION

Taking into consideration the scope and objective of the study a comprehensive interview schedule was prepared. A pilot study was conducted in Trivandrum district to pre- test the interview schedule so as to test and verify the applicability, understandability of the content of the interview schedule. The pre testing of the interview schedule was done with 40 respondents selected from the non- sample area. Based on the response, the interview schedule was modified 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 the items were concise, unambiguous, comprehensive and complete.

The primary data required for the study were collected from the respondents with the help of a well-structured interview schedule. The interview schedule is furnished in the Appendix II.

3.6. STATISTICAL TOOLS USED FOR DATA COLLECTION

The data collected from the respondents were scored, tabulated and analyzed at College of Agriculture, Vellayani. Appropriate tools were used to analyze the data and draw relevant inferences. The following statistical tools were used.

i. Mean
ii. Standard deviation
iii. Percentage analysis
iv. Cumulative frequency
v. Correlation analysis
vi. Path analysis

3.6.1. Mean

The arithmetic mean scores for all the variables were worked out to make suitable comparisons wherever necessary.

3.6.2. Standard Deviation

Standard deviation is considered as the most useful index of variability. The standard deviation was worked out to understand the variability, or spread, of a distribution group of scores. The respondents in the study were classified into low, medium and high category using mean and standard deviation.

3.6.3. Percentage Analysis

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

3.6.4. Correlation Analysis

Simple correlation analysis was done to explain the relationship of different characteristics of the farmers with the efficiency of KCC and attitude of respondents towards KCC. Correlation coefficient was worked out to measure the degree of relationship between the dependent variables 'Y' and the independent variables 'X'.

3.6.5. Path Analysis

Path analysis originally developed by Wright (1921), is an extension of regression model. The path analysis has two types of effects. The first is the direct effect and the second is the indirect effect. When the independent variables have a direct influence on the dependent variable, then it is said to be the direct effect. When an independent variable has an effect on the dependent variable, through the other independent variable, then it is said to be an indirect effect. To see the total indirect effect of the independent variables, indirect effect has been added. In general we assume that the independent variables will completely determine the dependent variable and if there are any other effect remains that will be calculated by making

use of the residual effect. If the calculated residual effect is very close to zero, it is an indication that the path analysis describes the system well.

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 efficiency of KCC and attitude of respondents towards KCC. The framework explains the relationship between the independent variables and the dependent variables namely 'Efficiency of Kisan Call Centre' and the 'Attitude towards Kisan Call Centre'. The conceptual framework is given in figure 4.

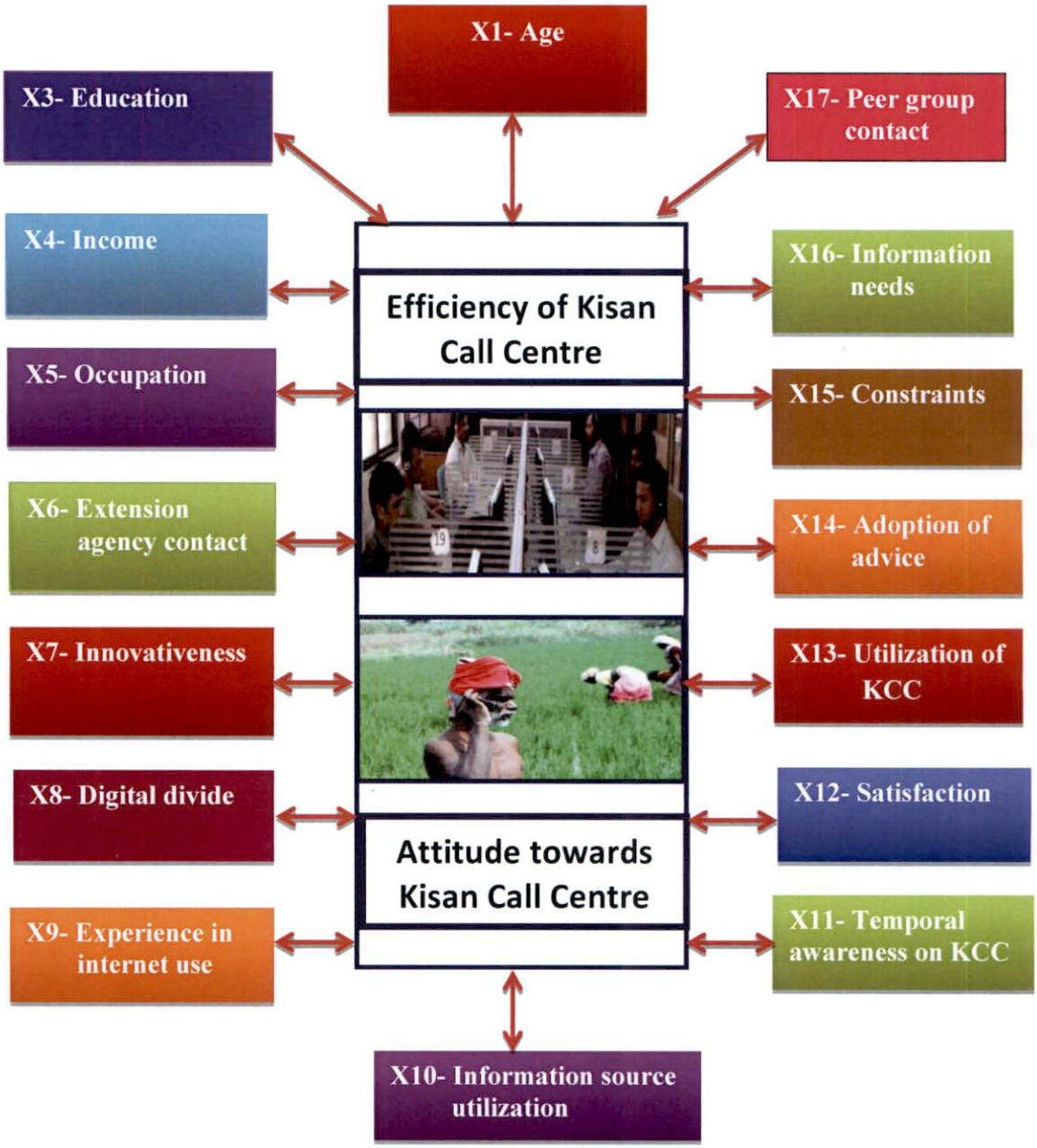


Figure 4. Conceptual frame work of the study.

Expected relationship between efficiency of KCC and attitude towards KCC with independent variables

RESULTS AND DISCUSSIONS

4. RESULTS AND DISCUSSIONS

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

4.1. Profile characteristics of the farmers

4.2. Awareness of KCC

4.3. Utilization of KCC

4.4. Adoption of the advice from KCC

4.5. Assessment of information needs of the farmers

4.6. Peer group contact

4.7. Performance auditing of KCC

4.8. Efficiency of Kisan Call Centre

4.9. Attitude of respondents towards KCC

4.10. Extent of use of Kisan Call Centres for agricultural information by the farmers in Tamil Nadu, Karnataka in comparison to Kerala

4.11. Digital divide

4.12. Categorization of calls received by Kerala KCC

4.13. Correlation between efficiency index and attitude of respondents on Kisan Call Centre with the independent variables

4.14. Direct and indirect effect of independent variables on dependent variables

4.15. Constraints faced by the farmers, call centre agents and Agricultural officers in using KCC

4.16. Suggestions of farmers, call centre agents and Agricultural officers in using KCC

4.1. PROFILE CHARACTERISTICS OF THE FARMERS

This section presents the profile characteristics of respondents who utilized KCC. A clear understanding of the socio- economic and psychological characteristics of the respondents would enable the investigator to interpret the data. For this purpose variables such as age, gender, education, occupation, annual income, extension agency contact, innovativeness, experience in internet use, information source utilization, and availability of ICT tools were selected and included in the study.

4.1.1. Age

It can be observed from table 15 that majority of the farmers (52 per cent) belonged to the middle age group, 29 per cent belonged to the old age category and 19 per cent of farmers were young (figure 5).

Table 15. Distribution of respondents based on age

Sl. No.	Category	Frequency (n=150)	Percentage
1.	Young (≤ 35 years)	28	19
2.	Middle aged (36-55 years)	78	52
3.	Old (≥55 years)	44	29

The utilization of KCC by the respondents below the age of 35 years was found to be less when compared to the respondents above 35 years of age. This might be because of the dependence of the young farmers on the facilities like agricultural sites and advisory platforms available on internet. However, the results were in conformity with Ganesan *et al.* (2013) who reported that 46.72 per cent of the respondents who utilized multimedia agricultural advisory system were middle aged 32.72 per cent old and 20.52 per cent young.

4.1.2. Gender

The frequency distribution of respondents on the variable gender is given in table 16. Among the respondents availing the service of KCC 73 per cent of respondents were male and only 27 per cent female (figure 6).

Table 16. Distribution of respondents based on gender

Sl. No.	Category	Frequency (n=150)	Percentage
1.	Male	110	73
2.	Female	40	27

4.1.3. Educational Status

The table 17 on educational status reveals that the respondents who utilized the KCC service were literate. Forty nine per cent of the farmers were graduates and 39 per cent of the farmers had high school level education. This showed that the farmers who have utilized the service were educationally forward. It is also depicted in figure 7.

Table 17. Distribution of respondents based on educational status.

Sl. No.	Category	Frequency (n=150)	Percentage
1.	Primary	4	3
2.	High school	58	39
3.	Higher secondary	14	10
4.	Graduate	73	49

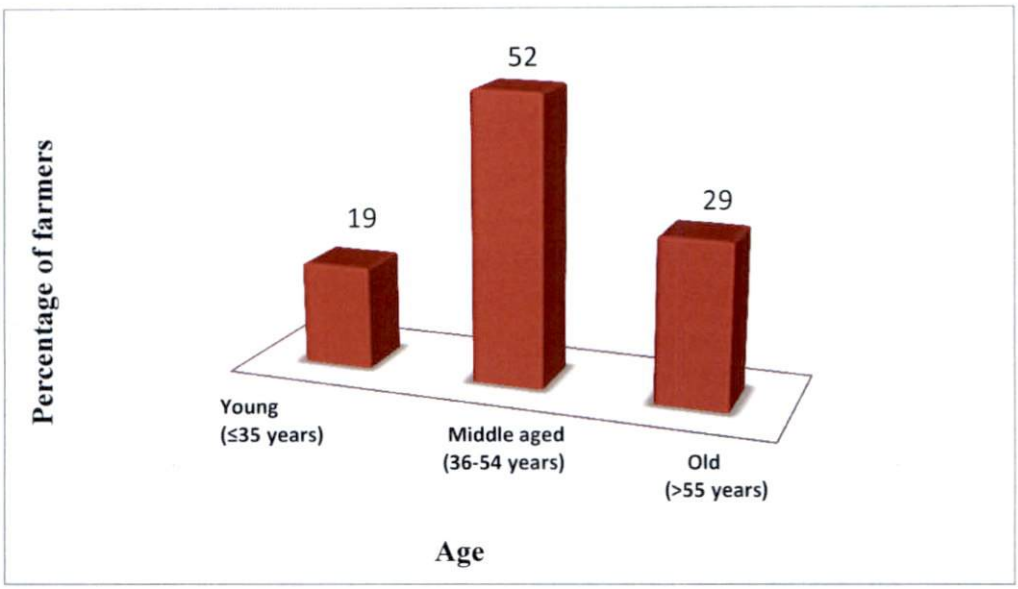


Figure 5. Distribution of respondents based on age

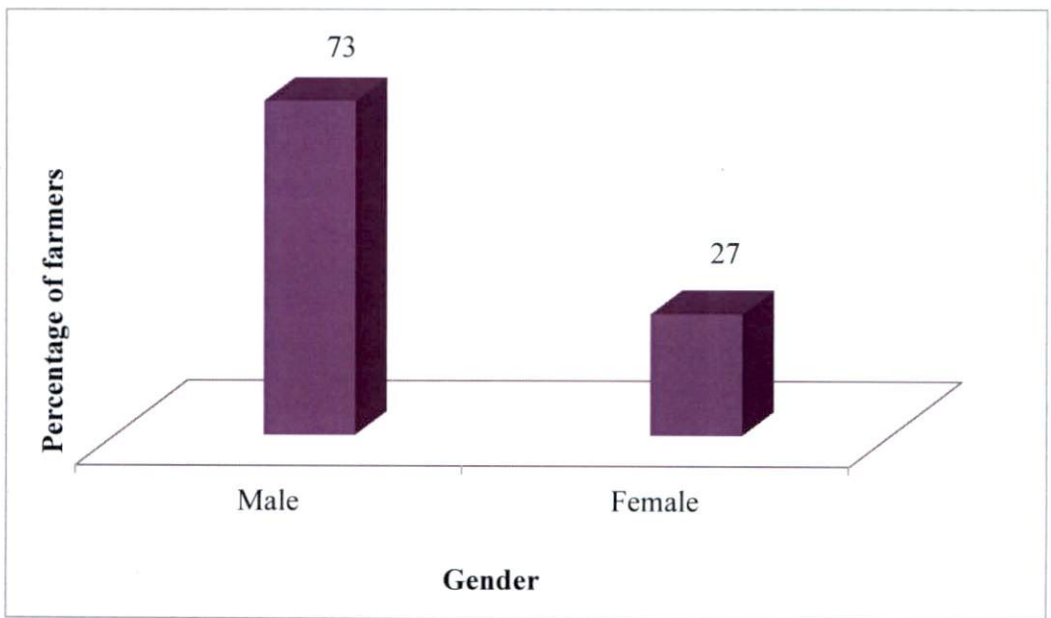


Figure 6. Distribution of respondents based on gender

The result was in line with results reported by Jaganathan (2004), Hanjabam (2013).

4.1.4. Occupation

The results on occupation presented in table 18 reveals that 45 per cent of the respondents who have utilized the services were involved in farming and other activities which included private jobs and business. Forty four per cent of the respondent's major source of income was from farming alone. Only 11 per cent of the respondents were involved in farming as well as government jobs. The graphical representation of occupation is provided in figure 8.

Table 18. Distribution of respondents based on occupation

Sl. No.	Category	Frequency (n=150)	Percentage
1.	Farming as a sole occupation	66	44
2.	Farming + Government	16	11
3.	Farming + others	68	45

The vegetables available in the market are full of pesticides and chemicals and hence to protect ones family from the harmful effects of the pesticides, every family have kitchen gardens in their home. Hence it is not just the full time farmers but also people involved in other occupations are also utilizing the KCC services as and when required. However, the results were in contradiction to Ansari and Pandey (2013) were 77.77 per cent of the respondents utilizing mobile phones in agriculture were involved in primary occupation (Farming) and only 33.33 per cent were involved in primary as well as secondary occupation.

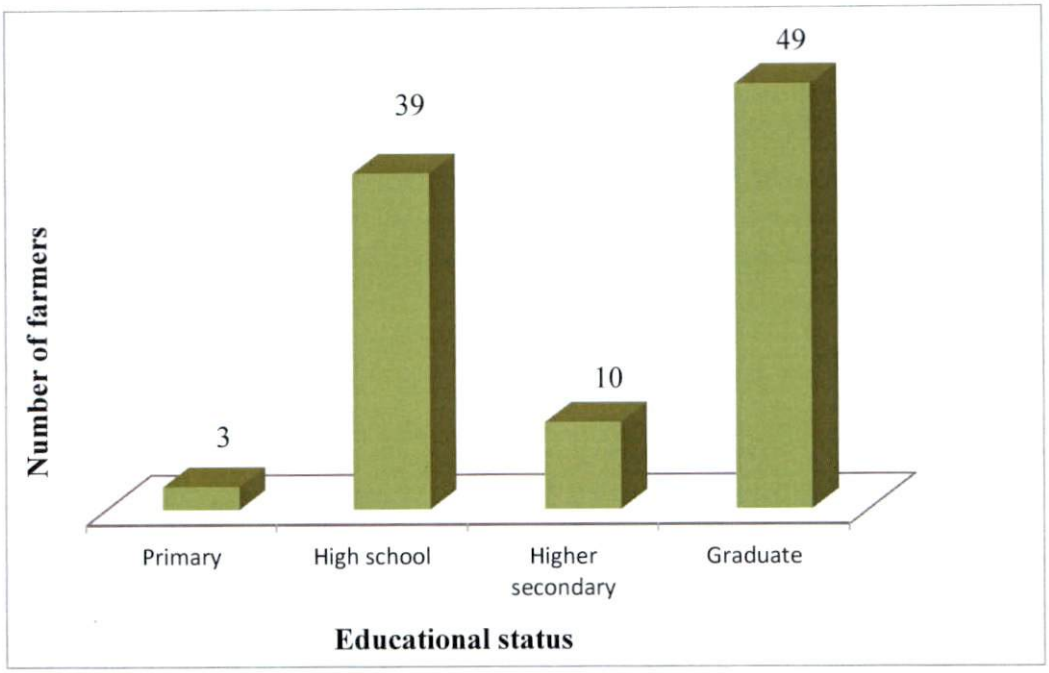


Figure 7. Distribution of respondents based on educational status

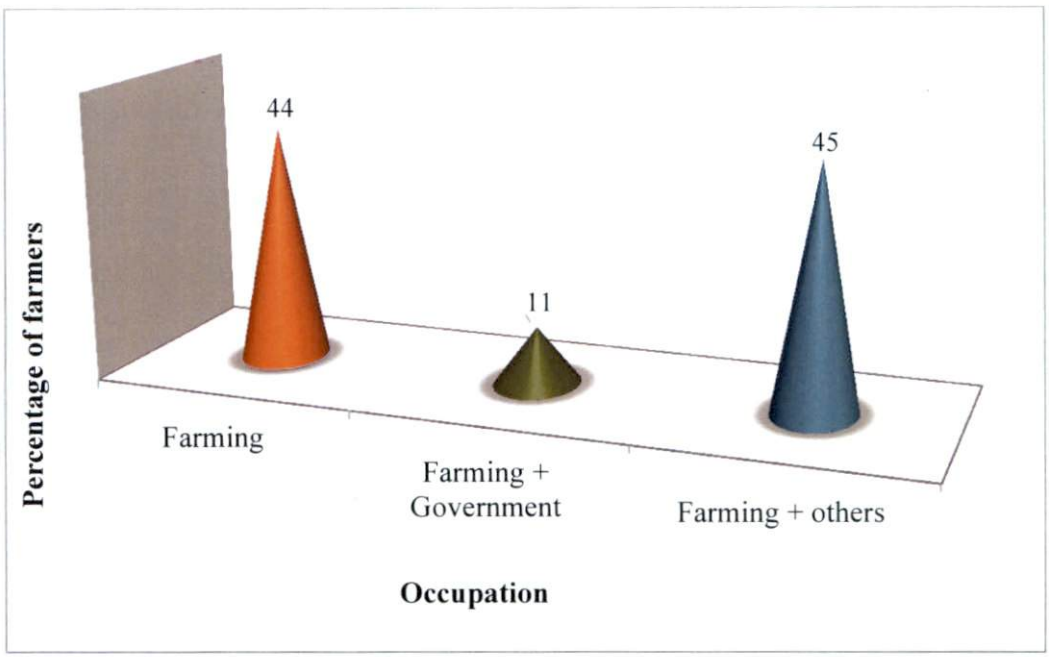


Figure 8. Distribution of respondents based on occupation

4.1.5. Annual Income

The results with reference to annual income are presented in table 19.

Table 19. Distribution of respondents based on annual income

Sl. No.	Categories	Frequency (n=122)	Percentage
1.	Upto Rs 25,000	34	23
2.	Rs 25,001 to 50,000	25	17
3.	Above Rs 50,001	63	42

A cursory view of the results presented in the table 19 and figure 9 shows that 42 per cent of respondents had annual income above Rs. 50,001 and 23 per cent of the respondents had an annual income up to Rs. 25000. The results presented indicated relatively high economic status of the respondents. This can be because the respondents had their major source of income from farming and other occupation. Out of the 150 farmers 28 farmers did not disclose their annual income, may be because they were not interested in revealing their personal details.

4.1.6. Extension Agency Contact

The score range for extension agency contact was 6-18. The mean value of the scores obtained for the extension agency contact was 10.44 and the standard deviation was 2.30. The respondents were classified according to cumulative frequency as low with a score range less than 8.14, medium with a score range of 8.14 – 12.75 and high score range of more than 12.75 respectively.

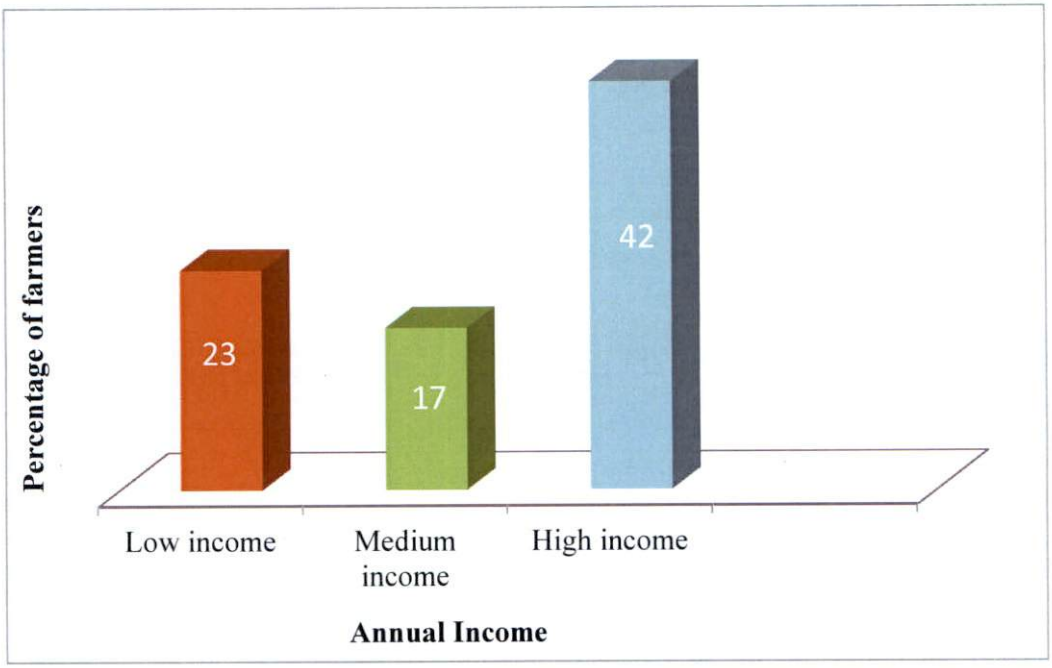


Figure 9. Distribution of respondents based on annual income

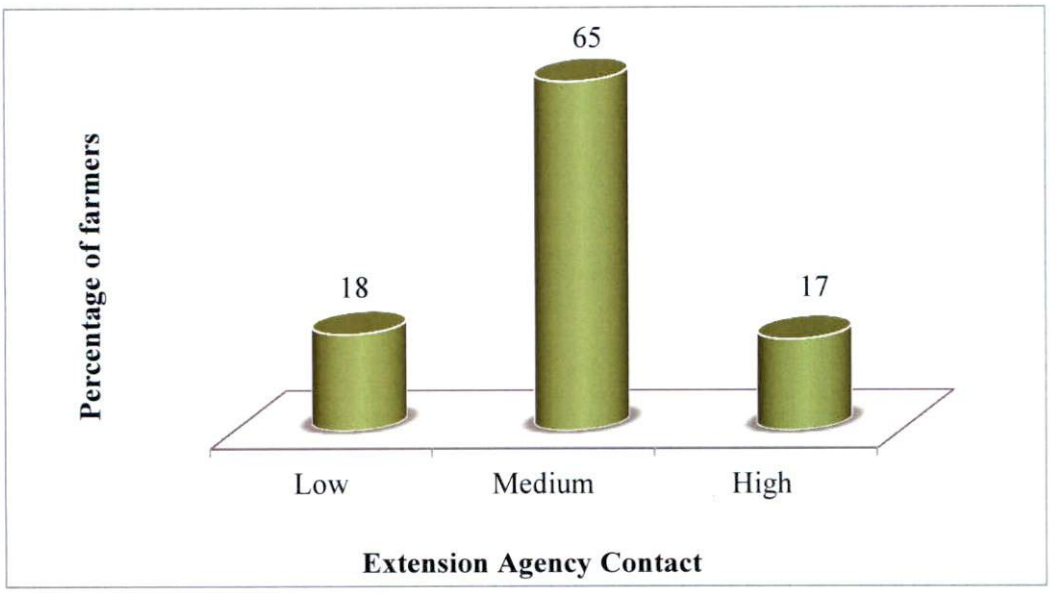


Figure 10. Distribution of respondents based on extension agency contact

Table 20. Distribution of respondents based on their extension agency contact

Category	Score range	Frequency (n=150)	Percentage
Low	<8.14	27	18
Medium	8.14- 12.75	98	65
High	>12.75	25	17
Mean= 10.44		SD = 2.30	

A bird's eye view of the table 20 and figure 10 shows that more than half of the respondents (65 per cent) had medium extension orientation followed by low (18 per cent) and high level (17 per cent) levels of extension orientation.

As observed from table 18, the respondents of the study were not full time farmers. Forty four per cent of the respondents whose main occupation is farming alone were found to have more contacts with Agricultural Officers, agricultural assistants and had attended exhibitions. This finding was in line with Sobha (2013) and Anupama (2014).

4.1.7. Innovativeness

The score range for innovativeness was 1-3. The respondents with score three were found to have high level of innovativeness, respondents with score 2 were found to have medium level of innovativeness and those respondents with a score of 1 were found to have low level of innovativeness respectively.

The results presented in table 21 and figure 11 depicts that majority of the respondents (60 per cent) had low level of innovativeness, 29 per cent had high innovativeness and only 11 per cent of the respondents had medium level innovativeness. High educational status would have created a positive attitude

towards accepting innovations and this might be the reason for high innovativeness among the respondents.

Table 21. Distribution of respondents based on their innovativeness

Category	Score range	Frequency (n=150)	Percentage
High	3	44	29
Medium	2	17	11
Low	1	89	60

The respondents with low and medium level of innovativeness preferred to wait and take their own time before adopting an innovation or they wanted to witness their fellow farmers try the innovation successfully. Twenty nine per cent of the respondents who showed high level of innovativeness adopted an innovation as soon as it was brought to their knowledge.

4.1.8. Experience in Internet Use

The table 22 and figure 12 projects that majority of the respondents (60 per cent) had not used the internet service. Fifteen per cent of the respondents were found to have less than three years' experience in using internet. Twelve per cent of respondents had 3-6 years' experience in using internet and only thirteen per cent of the famers had more than 6 years' experience in internet. The reason for low internet usage might be because of the lack of computer literacy and non-availability of computers. Majority of the information available in the internet is in English language and hence this could be a reason for the low use of internet and this has been rightly pointed by Chauhan and Chauhan (2011) where they reported that farmers were not in position to use information in internet for the development of their agriculture because whatever sites available on agriculture were in English

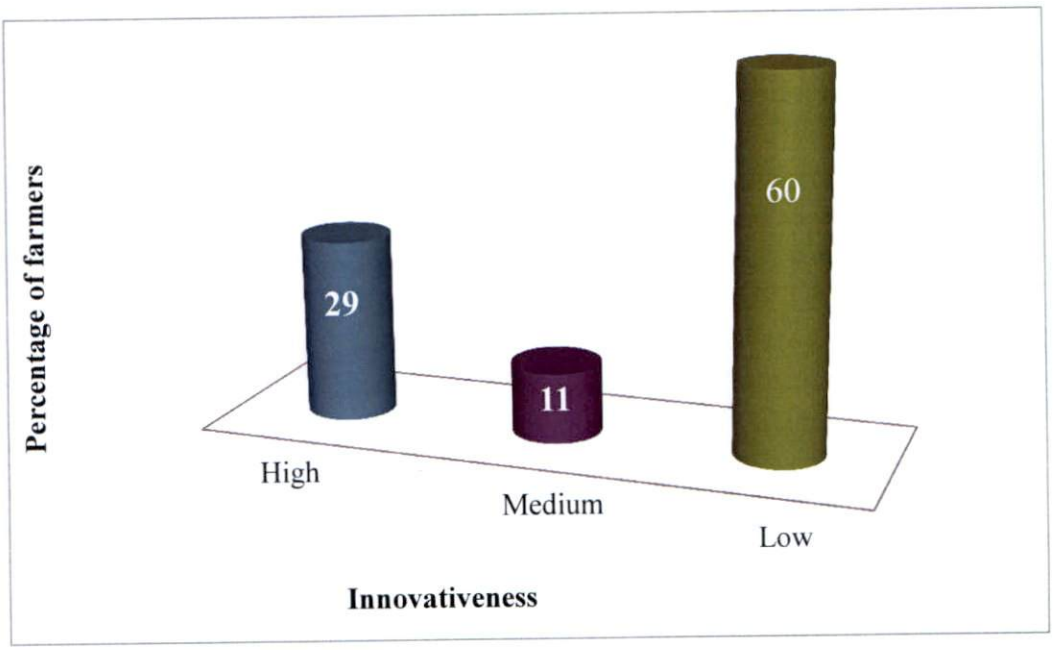


Figure 11. Distribution of respondents based on innovativeness

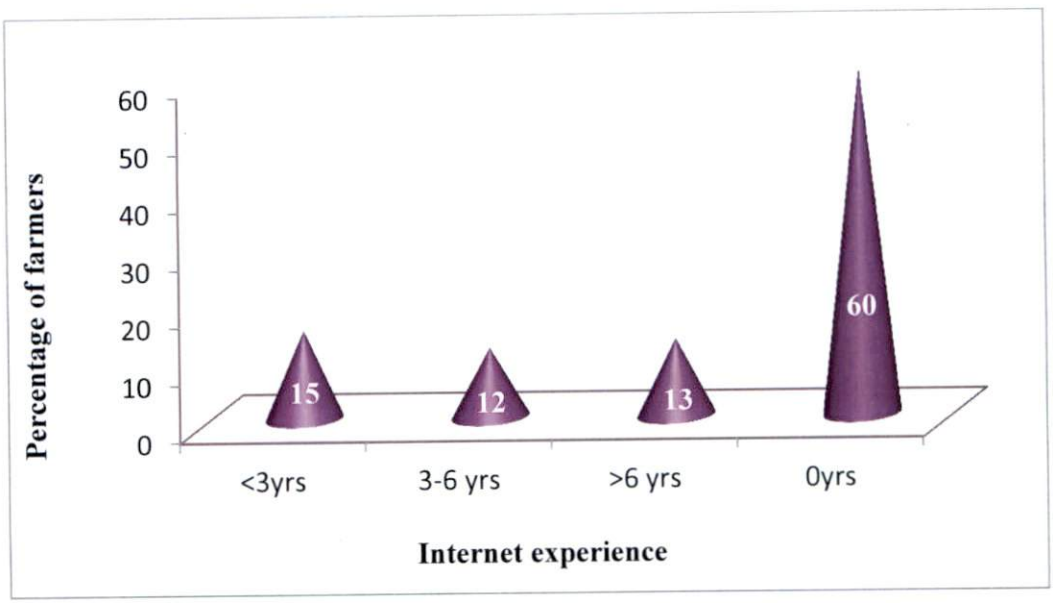


Figure12. Distribution of respondents based on internet use

language. This fact was reflected in their study which stated that 88 per cent of the farmers partially or absolutely realized that information available on Internet was difficult to understand

Table 22. Distribution of respondents based on their experience in internet use

Category	Frequency (n=150)	Percentage
0	89	60
<3 years	23	15
3-6 years	18	12
>6 years	20	13

As reported by Sambasivan *et al.* (2010) in order to meet constraints in literacy and the availability of devices, a common work-around seen is for non-literate or poor members of a community to seek help from someone who has access to technology and is more digitally-literate. This mediated use of technology can amplify its use to many people in the community who would otherwise not be able to use it.

4.1.9. Information Source Utilization

The score range for information source utilization was 9- 45. The mean value of the scores obtained for the information source utilization was 28.80 and the standard deviation was 6.48. The respondents were classified according to the cumulative frequency as low with score range less than 22.32, medium with a score range of 22.32 - 35.28 and high with score range of more than 35.28 respectively.

Table 23. Distribution of respondents based on the information source utilization

Category	Score range	Frequency (n=150)	Percentage
Low	<22.32	18	12
Medium	22.32 - 35.28	106	71
High	>35.28	26	17
Mean= 28.80	SD = 6.48		Range= 9- 41

From the table 23 and figure 13 it can be observed that majority (71 per cent) of the respondents belonged to medium category followed by high (17 per cent) and low (12 per cent) with respect to information source utilization. This is because the respondents were having regular access to televisions, mobile phone, newspaper, radio and contacts with farmer friends. Similar results have been obtained by Beena (2002), Jayawardhana (2007) and Anupama (2014).

The preference of information source for the respondents is provided in table 24 and figure 14. The percentage of preference for each source is provided and has been ranked accordingly.

Table 24 makes it very clear that the most preferred source of information for the respondents were found to be the television followed by newspaper and mobile phones. The least preferred sources were kiosk, relatives and magazines. The finding of the study was similar to the research conducted by Ronald *et al.* (2015).

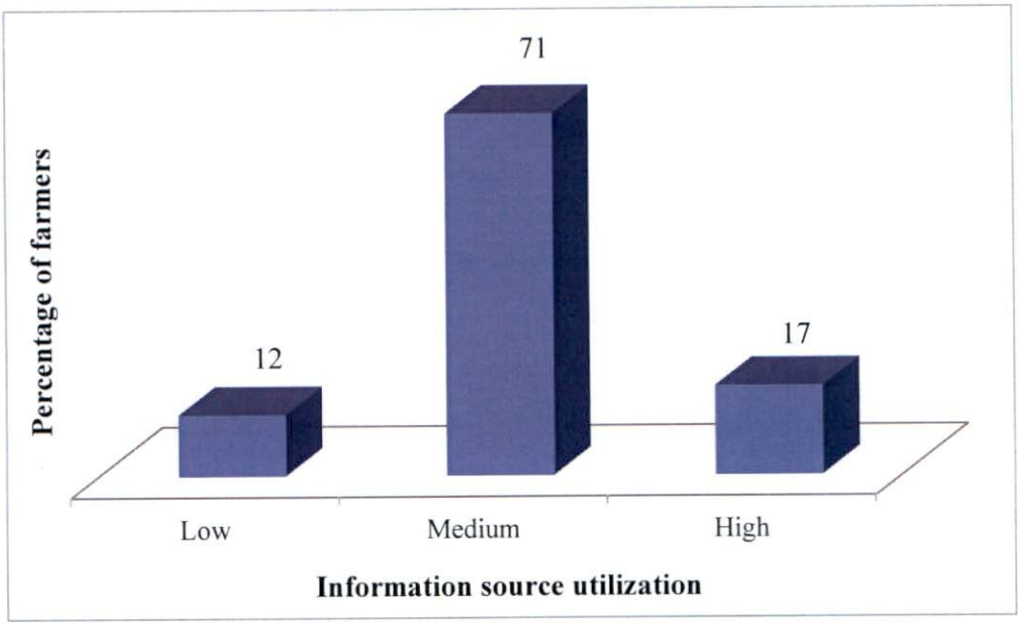


Figure13. Distribution of respondents based on information source utilization

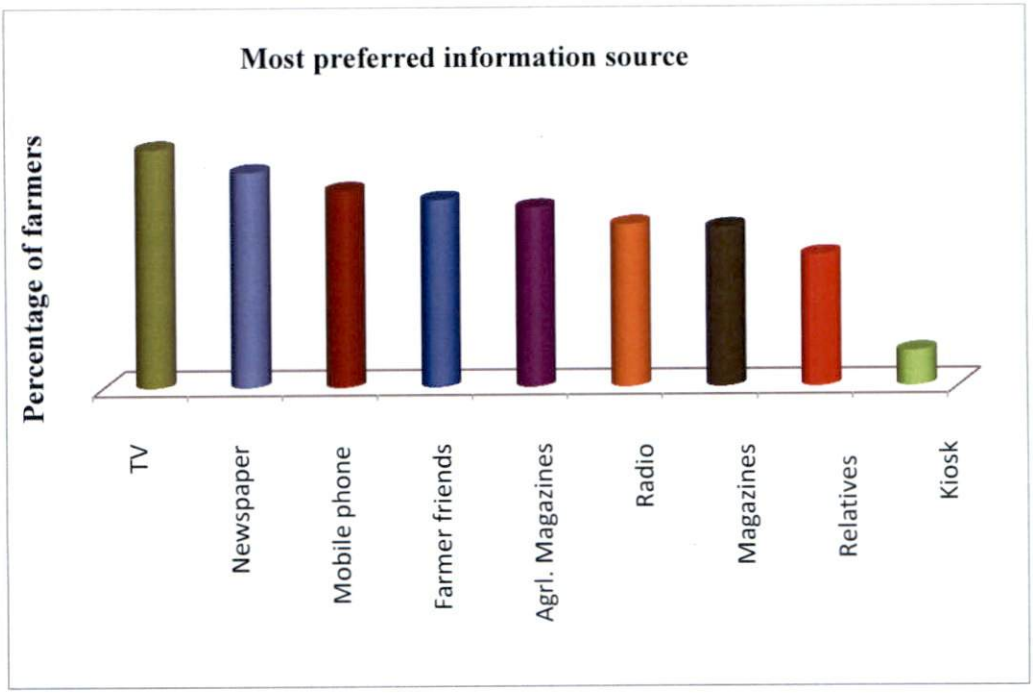


Figure 14. Distribution of respondents based on the preference of information source

Table 24. Preference of information source

Sl. No.	Sources of Information	Percentage	Rank
1.	Television	79	1
2.	Newspaper	71	2
3.	Mobile Phones	65	3
4.	Farmer friends	62	4
5.	Agricultural magazines	59	5
6.	Radio	53	6
7.	Magazines	52	7
8.	Relatives	43	8
9.	Kiosk	12	9

Newspaper is always a source of information that can be referred to at any time and even mobile phones are also available with almost everyone. Therefore quick access to information is possible using these media and hence might be the reason for increased preference by the respondents. But the amount of information that can be received through the mobile phones are less when compared to the media like television and newspaper.

The repetitive nature of programs telecasted and its advantages over the other media might be the reason for increased preference of television as the source for information.

4.2. AWARENESS OF KCC

The services of KCC are provided through out Kerala and hence it was important to find out whether the farmers of Kerala were aware of KCC and have utilized the services. The results on the awareness of respondents on Kisan Call Centre services are provided below.

4.2.1. Awareness of KCC by Farmers of Kerala

The awareness on the KCC by the farmers of Kerala is provided in the table 25.

Table 25. Awareness of KCC by farmers of Kerala

	Category	Frequency	Percentage
Awareness of KCC	Yes	150	100
	No	0	0

From table 25 and figure 15 it can be observed that all the farmers from north, central and south zones of Kerala were aware of KCC. The awareness of all the farmers can be attributed to the increase in the number of advertisement through television, radios and newspapers. The result of the awareness was in line with the study of Kirui *et al.* (2010) were he reported ninety nine per cent of the respondents were aware of the m-banking services.

4.2.2. Utilization of KCC by Farmers Who Were Aware

Even though hundred per cent farmers were aware of KCC, it was essential to know whether they had utilized the services. The results on the utilization of KCC by the farmers of Kerala are provided in table 26 and its graphical representation has been shown in figure 16.

From the table 26 it is evident that though the awareness was 100 per cent, majority of the farmers had not utilized the service. Among the 150 farmers who were aware about KCC only 27 per cent of respondents had utilized the service. Only 11 per cent of the respondents from the Northern zone, seven per cent from the Central zone and nine per cent from the South zone had utilized the service.

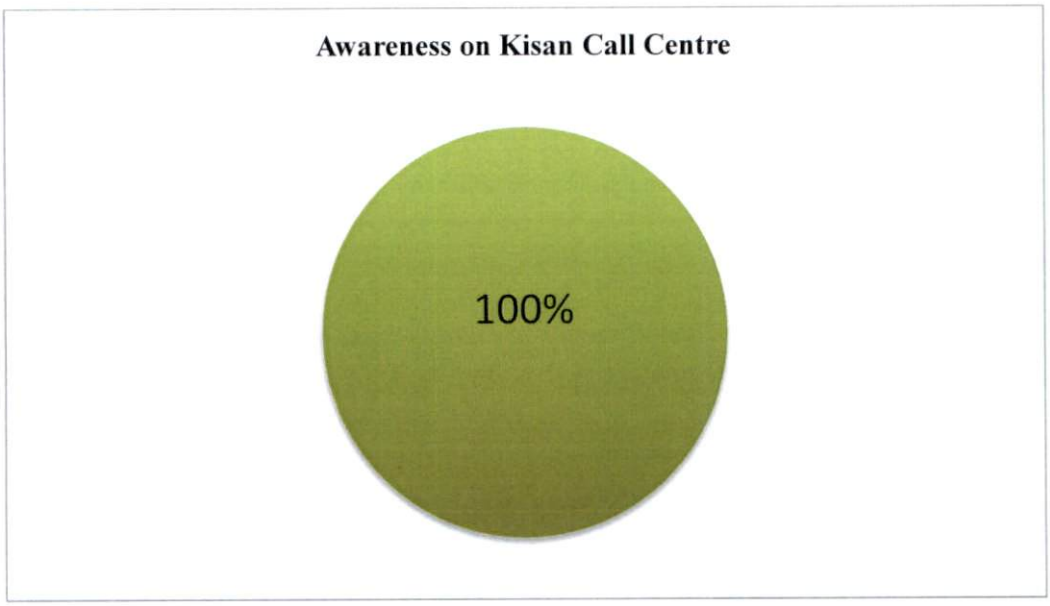


Figure 15. Distribution of respondents based on the awareness on Kisan Call Centres

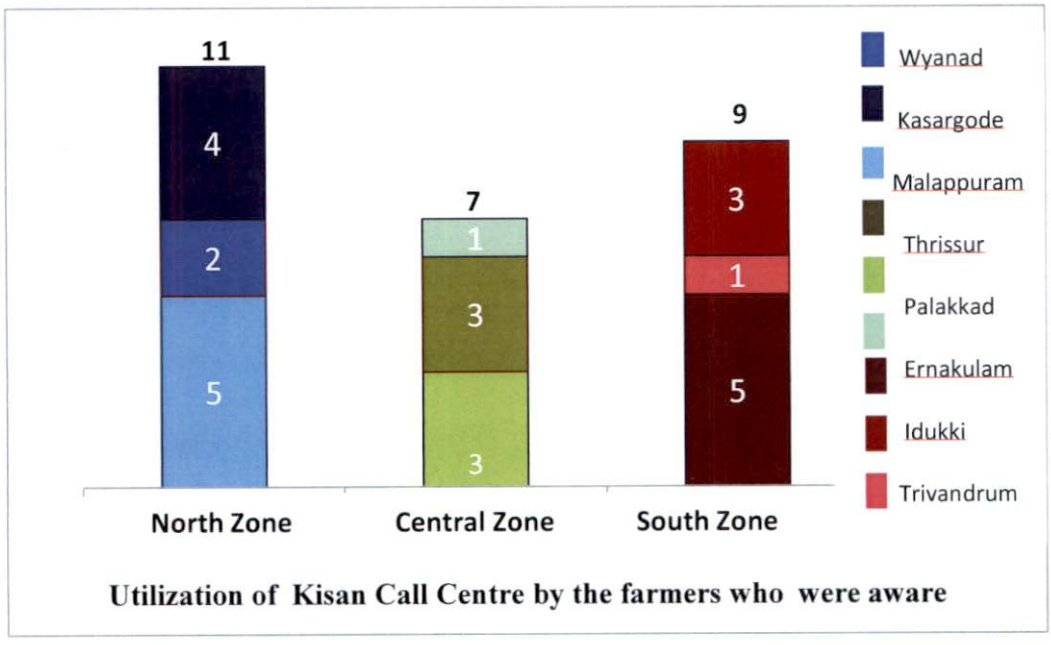


Figure 16. Distribution of respondents based on the utilization of Kisan Call Centre by the farmers who were aware of KCC

Table 26. Utilization on KCC by farmers of Kerala

Awareness		Utilization (n=150)	Percentage
North zone	Wyanad (20)	3	11
	Malappuram(10)	8	
	Kasargode (20)	5	
Central zone	Thrissur (20)	4	7
	Palakkad (20)	5	
	Ernakulam (10)	2	
South zone	Idukki (20)	7	9
	Kottayam (10)	2	
	Trivandrum (20)	5	
Total		**41**	**27**

Awareness without utilization is a waste of time, energy and the infrastructure built for the service. The reason for not availing the service can be due to the efficient services provided through Agricultural offices, Vegetable and Fruit Promotion Council Keralam (VFPCK) and Agricultural Technology Management Agency (ATMA) centres or it can be due to the lack of interest to adopt modern technologies. The farmers who were aware, had complained about not getting connected to the call centre due to the busy lines. This can also be the reason for the non-utilization of the call centre service. Therefore what is required to increase the utilization of call centre is to make available a parallel form of communication. Along with the advertisements on call centre the Agricultural Officers as well as other Extension agents should encourage the farmers to use the service. Farmers can also be made aware of the service through various seminars, exhibitions, farmer meetings etc.

In a study by Sharma *et al.* (2011) he pointed out that out of the 100 households in each cluster villages of Himachal Pradesh, 50 households were

progressive and used the services of the Kisan Call Centre and the remaining 50 households did not use this facility.

4.3. UTILIZATION OF KCC

The utilization of KCC by the farmers was studied by selecting 150 farmers from the database of the call centre.

4.3.1. The Temporal Awareness of KCC

The temporal awareness of KCC was important in order to understand how long the farmers knew about Kisan Call Centre. Table 27 depicts the results on the temporal awareness of the farmers who had utilized the service.

Table 27. Temporal awareness of KCC

	Categories	**Frequency (n=150)**	**Percentage**
Temporal awareness of KCC	<1 year	13	9
	1-2 year	41	27
	> 3 years	96	64

The figure 17 on the temporal awareness of KCC revealed that the majority (64 per cent) of the farmers had more than three years of temporal awareness on the existence of KCC. It has only been less than one year since 9 per cent of the farmers became aware of the services. This shows that majority of the farmers were influenced by the advertisements of KCC. For the past two years there were regular advertisements through various media like radio, television and newspapers on various services available for the farmers that were offered by the Government of India and Kisan Call Centre was one such service. This could be the reason for the increased temporal awareness on KCC.

4.3.2. The Source of Awareness aboutKCC

The table 28 and the graphical representation in figure18 clearly shows that among the 150 farmers, thirty per cent of them came to know about KCC through television followed by radio+ television (16 per cent). Census report (2011) revealed that among the households in Kerala 72.01 per cent of rural and 82.02 per cent of urban families possessed a Television and this might be the reason for the awareness of majority of the farmers about KCC through television. One among the respondents had mentioned about his awareness on call centre through film theatre. The Government of India had taken its maximum effort to popularize the service through various media that could be accessed by public. Twenty five per cent of the farmers came to know about the call centre through multiple media like television, radio, newspaper, friends, and agricultural officer, seminar and extension officers. All other media except extension officers, Agricultural Officers and seminars did not have direct influence on the farming community therefore it is important that the Agricultural Officers, extension workers and the people conducting seminars make sure that the farmers are made aware of the various services that are available to them through various media and they have to be encouraged to utilize the service. Since the Agricultural Officers and the Extension personnel can have a face to face contact with the farmers, it would be useful to create a greater influence on the farming community on awareness of various services and encourage in utilizing the same.

Sokoya *et al.* (2012) observed that interpersonal connectivity between farmers and agricultural extension agents will enhance farmers' information literacy, knowledge and awareness of current trends in farming that will boost stages of farming and result in abundance of food supply.

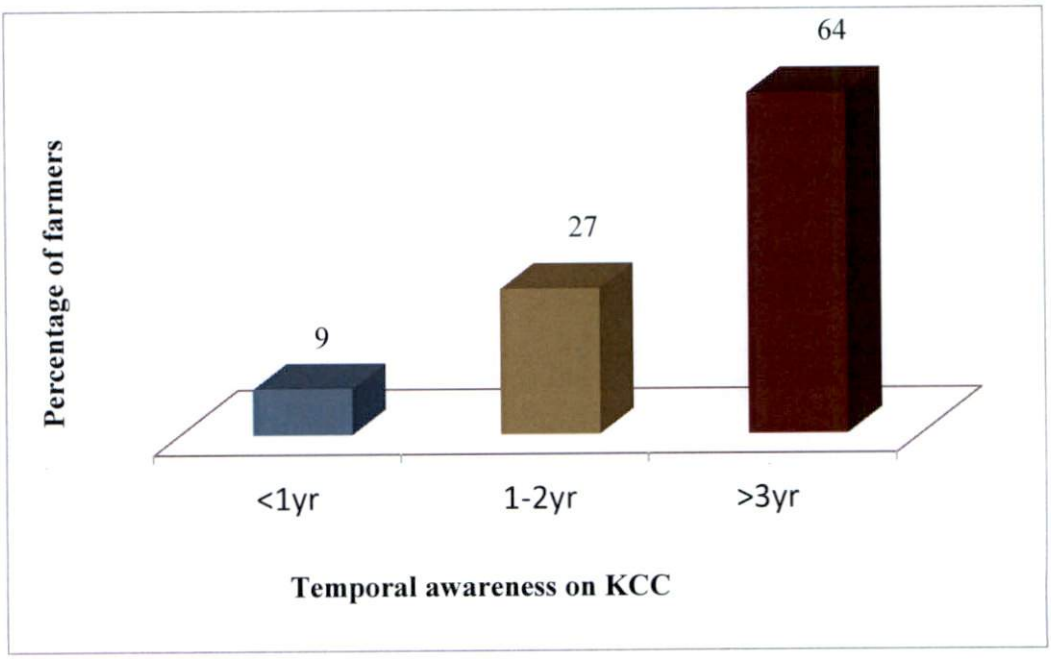


Figure 17. Distribution of respondents based on the temporal awareness on Kisan Call Centre

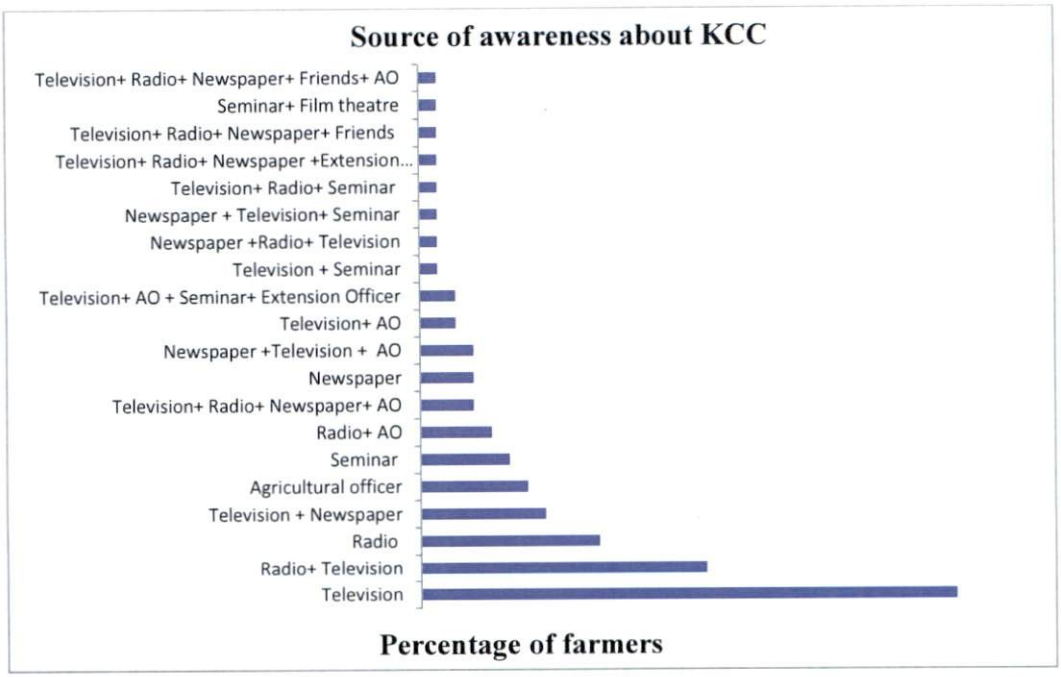


Figure 18. Distribution of respondents based on the source of awareness on Kisan Call Centre

Table 28. The source of awareness about KCC

Categories	Frequency (n=150)	Percentage
Television	45	30
Radio+ Television	24	16
Radio	15	10
Television + Newspaper	10	7
Agricultural officer	9	6
Seminar	8	5
Radio+ AO	6	4
Television+ Radio+ Newspaper+ AO	5	3
Newspaper	4	3
Newspaper +Television + AO	4	3
Television+ AO	3	2
Television+ AO + Seminar+ Extension Officer	3	2
Television + Seminar	2	1
Newspaper +Radio+ Television	2	1
Newspaper + Television+ Seminar	2	1
Television+ Radio+ Seminar	2	1
Television+ Radio+ Newspaper +Extension Officer	2	1
Television+ Radio+ Newspaper+ Friends	2	1
Seminar+ Film theatre	1	1
Television+ Radio+ Newspaper+ Friends+ AO	1	1

Sharma (2014) revealed that majority of farmers 74.25 per cent had maximum satisfaction with the information obtained from radio. 21.5 per cent farmers got average satisfaction, whereas only 4.25 per cent farmers got below average

satisfaction from radio. In the case of television as the source of information through mass contact, 48.5 per cent farmers got maximum satisfaction, 45.5 per cent got average satisfaction and 6 per cent farmers got below average satisfaction. Regarding motion pictures 78 per cent farmers had below average satisfaction, 18 per cent farmers got average satisfaction and only 4 per cent farmers got maximum Similarly, from other sources like farmer rallies and exhibition/ Kisan mela, maximum number of farmers 66 per cent and 76 per cent got below average satisfaction, 30.25 per cent and 18.75 per cent farmers got average satisfaction whereas 3.75 per cent and 21.25 per cent farmers got maximum satisfaction respectively. Thus, it is clear that radio and television are the two most important and effective sources of information for farmer.

4.3.1. Utilization of the Services

The table 29 reveals that majority of the farmers had utilized KCC services more than six times, 30 per cent of the respondents had utilized the service less than 3 times and only 18 per cent of the respondents had utilized the service 3-6 times (figure 19). The realization of benefit derived by utilizing the service can be the reason for increased utilization of the call centre. The result of the study was not in line with the study conducted by Savithramma *et al.* (2014) where she observed that only 9 per cent of the respondents utilized the KCC service more than 3 times.

Table 29. Extent of utilization of services

Categories	**Frequency (n=150)**	**Percentage**
<3 times	44	30
3-6 times	27	18
> 6 times	78	52

4.4. ADOPTION OF THE ADVICE FROM KCC

Though the farmers had utilized the services of KCC it was necessary to know whether they heeded the advices of the call centre agents. The table 30 as well as figure 20 projects how the farmers adopted the services received from the call centre.

Table 30. The extent of adoption of advice from KCC

Sl. No	Categories	Frequency (n=150)	Percentage	Rank
1.	Partly adopted the practice	69	46	I
2.	Completely adopted the practice	64	43	II
3.	Did not act	9	6	III
4.	Contacted extension worker for more details	6	4	IV
5.	Discussed with neighbour	2	1	V

It is evident from the table 30 and figure 20 that 46 per cent of the respondents said that they partly adopted the services whereas 43 per cent of the respondents said they fully adopted the services. Six per cent of the respondents said that they did not adopt the suggestions of the call centre agents at all. The reason behind the rejection of advice can be due to the inability of farmers to follow the information delivered through telephone. The partial adoption can also be due to the unavailability of the inputs or resources suggested by the call centre agents. The study was in line with Karuppasamy and Sriram (2015) where they reported that majority of the respondents who had utilized the paddy expert system symbolically accepted to adopt and follow the new innovations and technologies on paddy cultivation practices and allied aspects due to exposure to expert system.

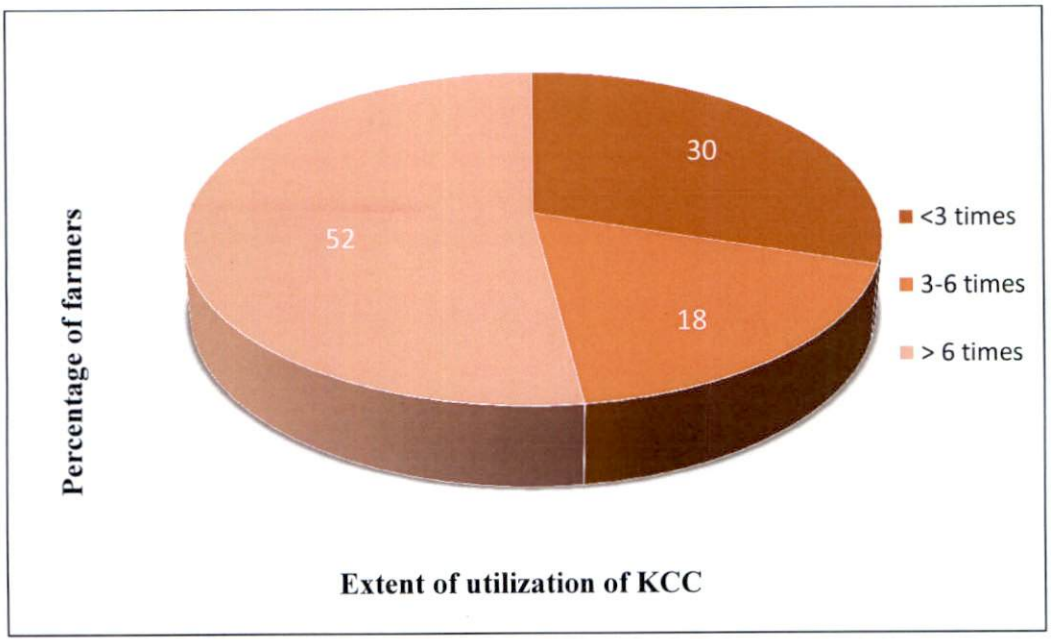


Figure 19. Distribution of respondents based on the extent of utilization of Kisan Call Centre

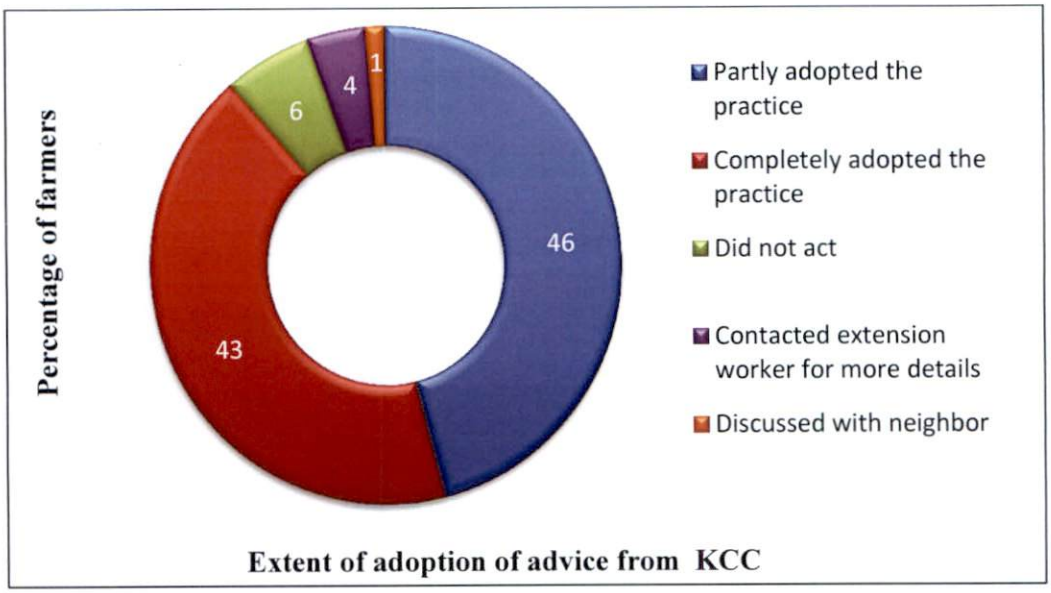


Figure 20. Distribution of respondents based on the extent of utilization of Kisan Call Centre

4.5. ASSESSMENT OF INFORMATION NEEDS OF THE FARMERS

Information is indispensible for any human being living in this Universe. The major aim for interlinking ICT and agriculture is to provide information to whoever requires them with regard to agriculture. Nowadays majority of the farmers have access to modern ICT tools and those who became recently aware are taking their baby steps and walking in to the world of ICT in order to understand more on how to use it and how the usage can benefit their daily life. Therefore it is necessary to understand the range of information required or expected to be found by the farmers through various ICT based agricultural services. The frequency distribution of farmers based on information needs in utilizing KCC is reported in table 31.

The frequency distribution of respondents based on information needs utilizing KCC is presented in table 31. It is evident from the table 31 that majority of the farmers utilizing the KCC had medium level of information needs (60 per cent) followed by high information needs (22 per cent) and low information needs (18 per cent). This is represented in figure 21.

Table 31. Categorization of farmers based on information needs

Category	Score range	Frequency (n=150)	Percentage
Low	<26.69	27	18
Medium	26.69-73.26	90	60
High	>73.26	33	22
Mean= 49.98	SD = 23.28		Range = 6 - 84

The information needs of the respondents who have utilized KCC were studied to understand the information they require with regard to agriculture from

KCC. The information needs were categorized as most needed, needed, less needed and least needed.

4.5.1. Information Needs by the KCC Respondents

The frequency distribution of information needs as perceived by the farmers utilizing KCC is presented in table 32. A rapid glance in to the table 32 reveals that among the twenty eight listed information needs, sixteen were perceived as the most needed information, six were perceived as the needed information, six were perceived as the least needed and no information was perceived as less needed.

The information needs in rank order of their importance in terms of most needed are detailed below. It is represented in figure 22.

Disease or pest early warning system and management

The information on disease or pest early warning system and management was first and the most needed information for 75 per cent of the respondents. All the crops are bound to pest and disease attack. Therefore timely and prompt response of the call centre agents can help the respondents in taking prior precautions to prevent or control the attack of pest and diseases and avoid huge crop loses.

Soil health management

Soil health management was perceived as the second most important information by 66 per cent of the farmers. This might be because only if soil is enriched with proper nutrients and fertilizers the crops will provide a good yield which would lead to higher returns

How to reduce the cost of cultivation

This was the third most important information by 63 per cent of the farmers. This might be because all the farmers or people involved in farming try to maximize their output or yield by reducing their input or cost for cultivation. This is in line with the results of Hinduja (2014).

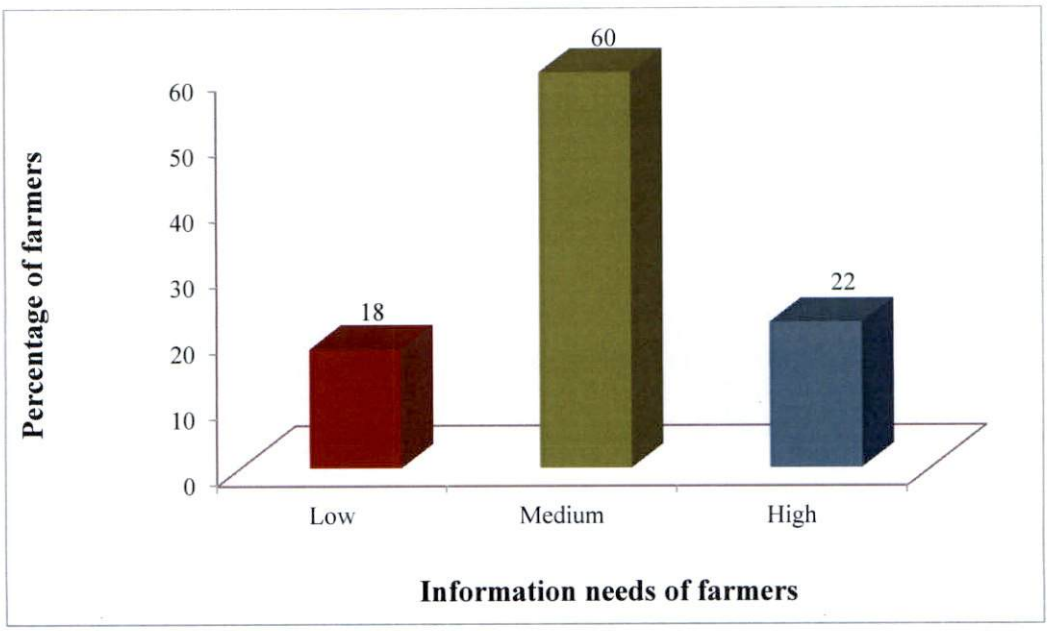


Figure 21: Distribution of farmers based on the information needs of farmers

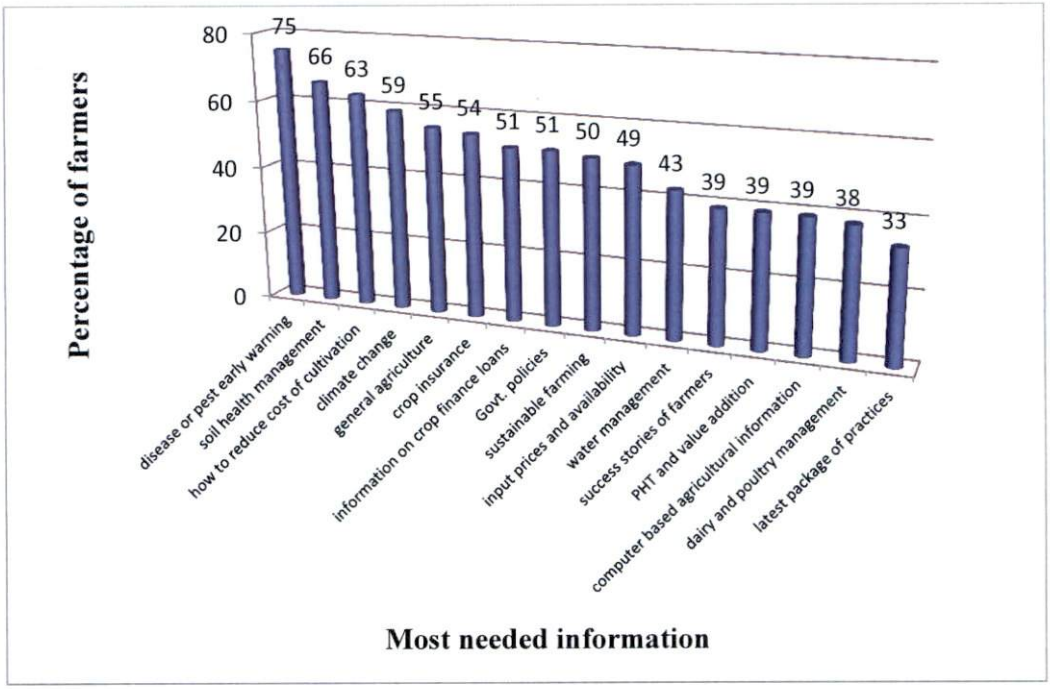


Figure 22. Distribution of farmers based on the most needed information

Table 32. Distribution of farmers based on various information needs to be satisfied from KCC

(n=150)

Sl. No.	Information needs	Least needed	Less needed	Needed	Most needed
1.	Disease or pest early warning system and management	8 (5)	8 (5)	21(14)	**113 (75)**
2.	Soil health management	24 (16)	8 (5)	19 (13)	**99 (66)**
3.	How to reduce cost of cultivation	22 (15)	11 (7)	22 (15)	**95 (63)**
4.	Climate change	34 (23)	8 (5)	20 (13)	**88 (59)**
5.	General agricultural news	23 (15)	3 (2)	42 (28)	**82 (55)**
6.	Crop insurance	32 (21)	10 (7)	27 (18)	**81 (54)**
7.	Information on crop finance loans	36 (24)	15 (10)	23 (15)	**76 (51)**
8.	Govt. policies reg. agriculture	53 (35)	9 (6)	12 (8)	**76 (51)**
9.	Sustainable farming	40 (27)	8 (5)	27 (18)	**75 (50)**
10.	Input prices and availability	29 (19)	20 (13)	29 (19)	**72 (49)**
11.	Water management	38 (25)	13 (9)	34 (23)	**65 (43)**
12.	Post-harvest technology and value addition to produce	44 (29)	17 (11)	30 (20)	**59 (39)**
13.	Success stories of farmers	34 (23)	5 (3)	52 (35)	**59 (39)**
14.	Computer based agricultural information	44 (29)	23 (15)	25 (17)	**58 (39)**
15.	Dairy and poultry management and marketing info	52 (35)	12 (8)	29 (19)	**57 (38)**
16.	Latest package of practices	42 (28)	21 (14)	37 (25)	**50 (33)**
17.	Facilitation of land records	47 (31)	22 (14)	**64 (43)**	16 (11)
18.	Weather forecasting	23 (15)	16 (11)	**64 (43)**	46 (31)
19.	Water conservation through drip and sprinklers	45 (30)	22 (15)	**61 (41)**	22 (15)

table 32 continued

	Information needs	Least needed	Less needed	Needed	Most needed
20.	Information on agricultural loans	55 (37)	11 (7)	**57 (38)**	27 (18)
21.	Dry land crops and practices	48 (32)	22 (15)	**56 (37)**	24 (16)
22.	Commercial agriculture	36 (24)	18 (12)	**49 (33)**	47 (31)
23.	Quality standards of produce for exports	**69 (46)**	7 (5)	26 (17)	48 (32)
24.	Farm business and management info	**66 (44)**	16 (11)	22 (15)	46 (31)
25.	Market infrastructure like warehouses and cold storages	**64 (43)**	19 (13)	30 (20)	37 (25)
26.	Agricultural business	**63 (42)**	18 (12)	14 (9)	55 (37)
27.	Integrated Nutrient Management	**52 (35)**	22 (15)	31 (21)	45 (30)
28.	Information on rural development programme	**46 (31)**	19 (13)	40 (27)	45 (30)

*Figures in parenthesis indicate percentages

Climate change

Climate change is a hot topic for every citizen living in this world. The climatic conditions are changing daily and there have been unpredictable climate disasters. Climate change is of utmost concern especially for the farmers. Almost all the crops are weather bound and slight changes can affect its growth to a great extent and this can be the reason why 59 per cent of the farmers rated the climate change as most important information need.

General agricultural news

This information was perceived as the fifth most important information perceived by fifty five per cent of the respondents as it was important for the respondents to keep themselves updated about the agricultural news that would help them to enhance their farming.

Crop insurance

The information on crop insurance was the sixth important information for the respondents. This may be because it was important for the farmers to understand the nature of damage and compensation so that they could claim for if necessary.

Information on crop finance loans

This information was perceived as the seventh most important information for 51 per cent of the farmers. This may be because they would like to know more about loan they could avail to prosper in farming to support their farming related inputs.

Government policies regarding agriculture

The new Government policies were perceived most important by 51 per cent of the farmers and this may be because the farmers wanted to know the policies that were introduced by the Government that could benefit them in their farming.

Input prices and availability

The prices of input and their availability were perceived as the tenth most important information by the respondents (49 per cent). This may be because the farmers required information on the availability of inputs required, what are the inputs available, where it was available and its prices so that they could manage their farming accordingly.

Water management

Water management was perceived as the eleventh most important information by 43 per cent of the farmers. Nowadays our country as well as our state is facing an acute shortage of water. But it is also necessary to provide enough water to plants for its survival. Therefore it would be a need of the farmer to acquire information on how well the water can be managed to get maximum benefit.

Success stories

Success stories was also perceived as most important by thirty nine per cent of respondents and this may be to adapt the paths of those farmers who were successful in various agricultural venture that are big and small. The success stories would

definitely motivate other farmers to try out new things and also to try new innovative ideas.

Post-harvest technology and value addition to produce

This was considered as the most important information by 39 per cent of the respondents. This may be because the post-harvest technology and value addition of products helps the farmers to fetch a greater price for the produce more over value addition can help a person to fetch more price for a produce during lean period. Information on post-harvest technology would help the farmers to increase the shelf life of the harvested produce or helps to store the harvested produce without compromising on its quality.

Dairy and poultry management and marketing info

In this study 44 per cent of the respondents major occupation is farming and hence this can be the reason why 38 per cent of the respondents rated the dairy and poultry management and marketing information as the most important information

Latest package of practises

The latest package of practices was perceived as the sixteenth most important information need of 33 per cent of farmers. This may be because the farmers wanted to do the farming in the most scientific and proven way so that they achieve maximum yield for the crops cultivated.

The following information was felt as needed by the respondents. This is represented in figure 23.

Facilitation of land records and weather forecasting

These ranked as the first needed information by 43 per cent of the respondents. This might be because respondents required quick information with regard to information on their land.

Weather forecasting was also the first needed information by 43 per cent of the farmers and this may be because the farmers could take appropriate precaution in advance with regard to farming.

Water conservation through drip and sprinklers

This was the second most needed information by forty one per cent of the farmers. The shortage of water is a problem in many parts of Kerala. Hence it was felt by the respondents that it is necessary to judiciously use water through drip and sprinklers

Information on agricultural loans

This was perceived as very much needed information by 38 per cent of the respondents. This might be because the respondents need to know more about agricultural loans, how to avail them and to know on what documents to be submitted to avail them.

Dry land crops and practices

The information on dry land crops and practices was perceived as important by 37 per cent of the farmers. This information can be beneficial for the farmers during dry season and to understand more about crops that can be raised under constrained irrigation water availability.

Commercial agriculture

This was the third needed information for 33 per cent of the farmers. This may be because of the respondent's interest in knowing about how to produce crops in large scale. Nowadays there is a huge demand for crops that are grown organically due to the increased rate of diseases reported. Hence commercialising organic products can increase the farmer's income

The following information was felt as least needed by the respondents. This is represented in figure 24.

Quality standards of produce for exports

This was perceived as least important by 46 per cent of the respondents and this can be due to their lack of interest in doing export as they are not equipped or are not involved in farming with a view to do export.

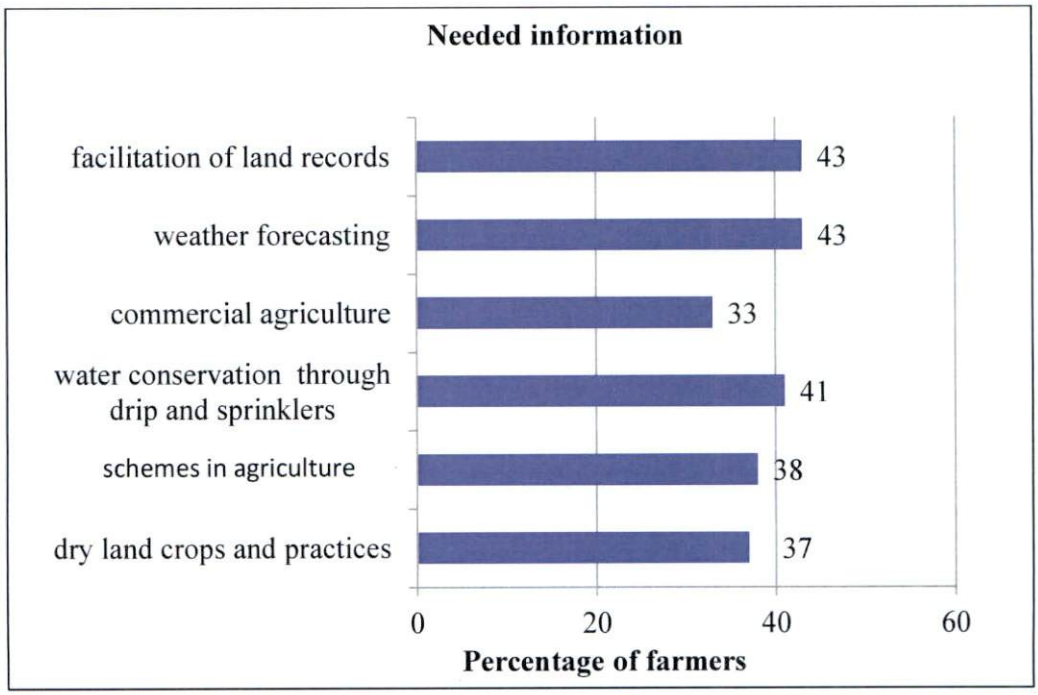


Figure 23. Distribution of farmers based on the needed information

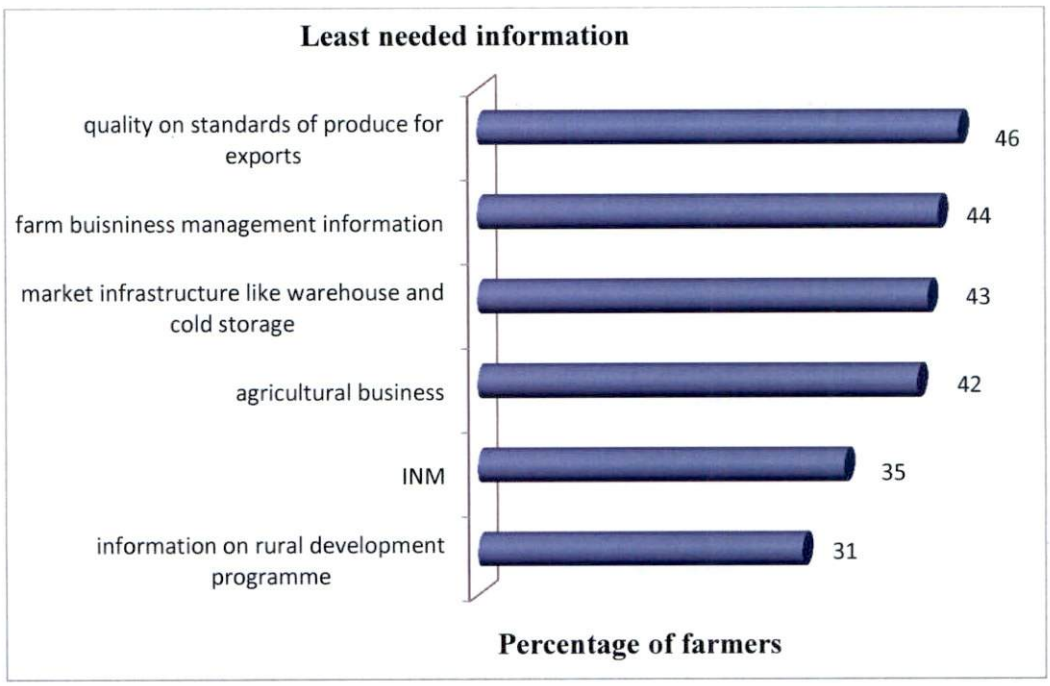


Figure 24. Distribution of farmers based on the least needed information

Farm business and management info

This information was perceived as the second least important information by 44 per cent of the farmers and this might be because majority of the respondents are involved in other professions apart from farming

Market infrastructure like warehouses and cold storages

Since the respondents do not have large scale farm production they might have marked the information of infrastructure like warehouses and cold storage as the third least important information

Agricultural business

Agricultural business was also marked as the least important information by 42 per cent of the respondents and this can also be attributed to the respondent's lack of interest in large scale production of crops

Integrated Nutrient Management

The integrated nutrient management (INM) was perceived as least important by 35 per cent of the farmers. This may be because of the lack of knowledge about INM. Since majority of farmers have other occupations apart from farming their knowledge about INM would be less.

Information on rural development programme

This was the sixth least important information for 31 per cent of the respondents and this might be because the respondents might have felt that it was not important for them to know about rural development

4.6. PEER GROUP CONTACT

Peer group contact was the degree of persuasion the respondents received from his peer group in farming related matters. This was important to understand as it was necessary to know how far the co farmers and friends influenced the respondents farming decision. The results of the study are presented in table 33.

From the table 33 it is very clear that fifty seven percentage of farmers reported that they had medium level of peer group influence. Twenty three percentage

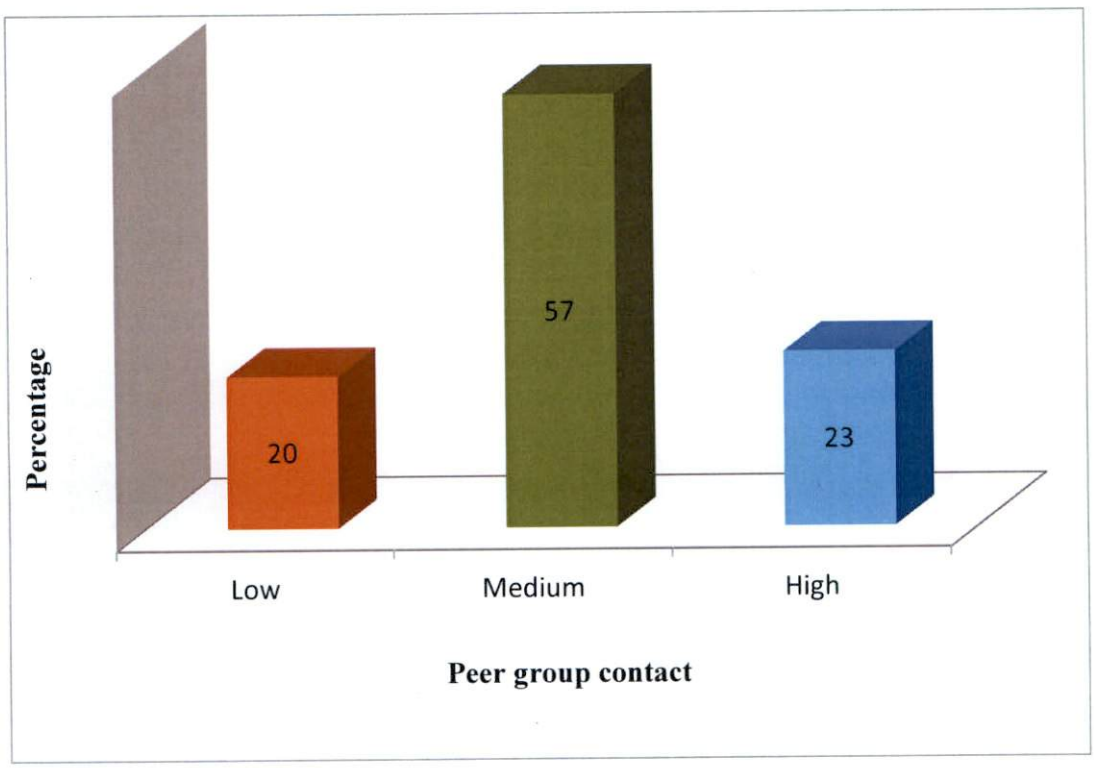


Figure 25. Distribution of respondents based on peer group contact

of respondents had high level of peer group contact and only twenty per cent of the farmers had low peer group contact (figure 25).

Table 33. Distribution of farmers based on the peer group contact

Category	**Score range**	**Frequency (n=150)**	**Percentage**
Low	<2.37	31	20
Medium	2.37- 4.67	85	57
High	>4.67	34	23
Mean= 3.50	SD = 1.13		Range = 1 - 5

Since human being is a social animal he forces himself to keep contact with fellow beings in one way or the other. With respect to agriculture the farmers become more aware about developments in agriculture through these contacts and also they will be encouraged to accept innovations by directly experiencing his fellow farmer's experiences.

4.7. PERFORMANCE AUDITING OF KCC

Government of India launched the KCC service with a view to incorporate ICT in to agriculture. The call centre was launched during January 21, 2004 and the service is available throughout the country. Till the year 2009 KCC of Kerala was functioning from Trissur District but in the year 2010 the call centre was shifted to Bangalore due to the reduced calls from the Kerala State. Today the call centre for Karnataka, Kerala and Lakshadweep is being operated from Bangalore by the call centre agents of the respective states. Till date no effort has been taken to analyze the performance effectiveness of KCC and hence the performance of KCC was studied in the present research. The performance of KCC was measured using tools like SWOC analysis, bench marking and outcome oriented investigation

Plate 1 A. Interaction with farmers

Plate 2 B. Interaction with farmers

4.7.1. SWOC Analysis of KCC

The Strength, Weakness, Opportunities and Challenges of KCC helps to conclude services competencies as well as to ascertain the forthcoming chances. It helps to recap the crucial problems of the service and the strengths of the service that are most likely to create a positive development of the service. The SWOC of KCC was understood by analyzing the working of KCC and on the basis of the feedback and suggestions from the respondents, call centre agents and the Agricultural Officers. The figure 26 depicts the SWOC of KCC.

- **Strength**

The call centre functions from 6.00 am to 10.00 pm. Therefore farmers and farming interested individuals can utilize this service any time they want. Since this is a toll free service farmers can utilize the service without any limit of calls. The calls can be made to the toll free number. The two call centre agents out of the five had more than two years of experience hence they were experts in identifying the problems very easily.

- **Weakness**

The lack of field experience was the major weakness. The call centre agents are not given field level training for easy identification of problems. Though the experienced call centre agents can identify the problems out of their experience the other agents found it a bit difficult to manage. But the data base assist the call centre agents to deliver the advices fast to the farmers but if there was an internet connectivity problem or the software problem the call centre agents would not be able to give an immediate solution to the queries and this problem stood out more if the call centre agents were not agricultural graduates. Most of the call centre agents working in KCC are Cooperation and Banking graduates followed by Agricultural engineering graduates and less of Agricultural graduates. Even though agricultural

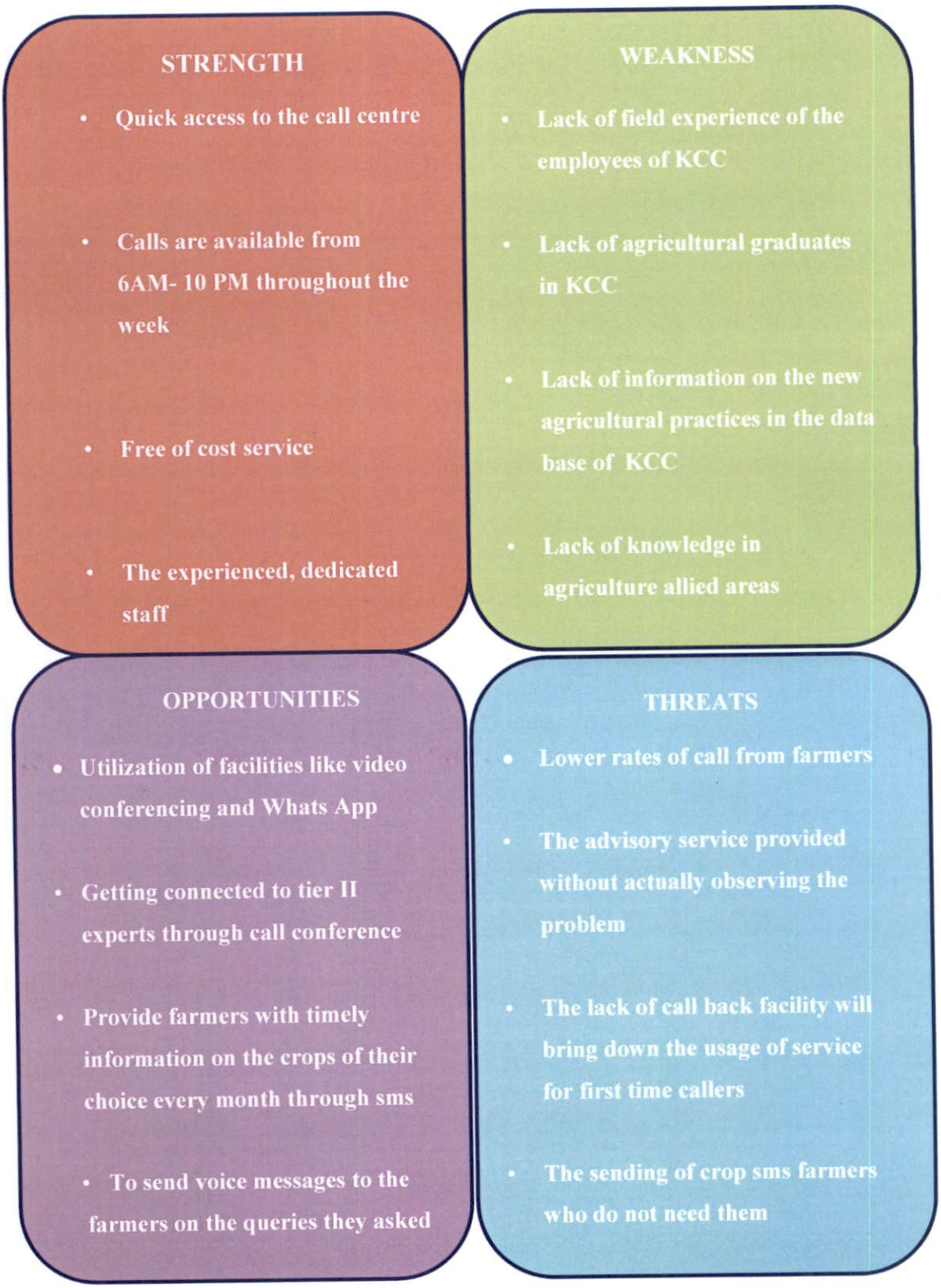


Figure 26. SWOC of KCC

graduates join they don't stay for more than one year as the KCC job was on contract basis. Another weakness was the lack of information on modern agricultural practices and the lack of information on agriculture allied areas like veterinary, fisheries, poultry etc in the database of KCC.

- **Opportunities**

The call centre itself was an opportunity that was exploited by incorporating ICT and agriculture. Since the services was being provided for the past 12 years, there have been many areas where the call centre could bring improvement in the service. The call centre could exploit the video conferencing facility to interact with the farmers directly and this could improve the clarity of communication between farmers and call centre agents. At times when the queries could not be answered by the call centre agents it was found that the call centre agents would provide the respective contact number to the farmers and ask them to call. This was a problem because the service was popularized by quoting that any queries regarding agriculture could be solved through the toll free number but then when the farmers have to contact the tier 2 officers on their own the service becomes a paid one hence it would be better if the call centre could exploit the option of putting the farmers with the level 2 officers from Kisan Call Centre itself through conference call. Another service the call centre could provide to the farmers utilizing KCC is to understand the crops of their interest and send messages regarding the crops regularly. If the details of the crops sent are not of interest to the farmers then those messages would become a nuisance. Sending voice messages of solutions to the farmers soon after the utilization of KCC would also be an added benefit as it has more clarity than the sending messages. Another opportunity for the call centre to increase their trustworthiness is to conduct effective quarterly seminars in each district by contacting farmers who utilize their service and also by collecting the contact number of farmers from respective Krishi Bhavans. This will not only popularize the call centre service but also would increase the trust of the farmers.

➢ **Challenges**

The major challenge faced by the call centre is the low rate of calls received. The calls received by Kerala KCC are much lower when compared to the calls received by Tamil Nadu KCC and Karnataka KCC. This was the major reason for shifting the call centre from Thrissur to Bengaluru. A second challenge faced by the call centre agent is the blind advice given. When the farmers enquire about a problem the call centre agents gives them advice just by listening to what the farmers have said. There are diseases with similar symptoms and the farmers also can go wrong in explaining the symptoms therefore the advice provided may also go wrong which can result in the complete destruction of the plant.

A third major challenge is the lack of call back facility. Sometimes the callers have to wait for a long time before getting connected to the call centre agents during this wait the callers pass through interactive voice response service (IVRS) and in spite of holding for a long time the calls sometimes get dropped. This will definitely develop negative attitude among the callers towards the call centre service. Hence if there is a call back facility it would definitely encourage the farmers to use the call centre.

The fourth challenge is the sending of the crop related messages to those farmers who do not need them. Many of the farmers during the survey had complained of receiving as well as not receiving the messages of their interest. Therefore there should be some mechanism to ensure that the farmers who need messages receive them and those who do not need them do not receive them.

4.7.2. Benchmarking

Benchmarking is the process of comparing one's business processes and performance metrics to industry bests and best practices from other companies. Hence the performance of KCC was compared with the standards of International Finance Corporation (2010).

From the table 34 it is evident that call centre has showcased an overall good performance when compared with the global matrix of International Finance Corporation (2010).

Eighty percentage of the calls received by the Kerala KCC was attended only within thirty to forty seconds. This shows that the call centre did not meet the service level standard which is 20 second. Therefore the callers have to wait for a longer time and this can also be the reason for the call drops.

The average speed to answer the calls was 20 seconds against the standard measure 28 seconds. The average speed to answer refers to the amount of time callers wait in a queue while the agent's phone rings, but not the time it takes for callers to navigate through the Interactive Voice Response (IVR). Mostly all the calls are answered within four rings. The abandonment rate was found to be eight per cent and that of the global matric which was the standard measure was five to eight percent. Hence the abandonment rate was also found to be on par with the standard measure. Out of the 150 calls received per day twelve calls were found to get abandoned due to call waiting and network problems. It was mentioned by the call centre agents that during the lean days, no calls got abandoned.

All the call centre agents adhered ninety per cent to the schedule of the call centre. The work time of the call centre was morning 6 am to night 10 pm. There were two shifts in the call centre and hence an agent needs to work for eight hours.

But since the number of call centre agents are less the agents were required to work for more than 8 hours. A total of five call centre agents were working for Kerala KCC. The agent attrition refers to the annual staff turnover. According to the standard measure the agent attrition should only be 15 per cent but the agent turnover in Kerala KCC was found to be eighty per cent which was five times higher than the standard measure. The reason for high turnover was the contractual job and no scope for promotions or other benefits. Moreover the time of working hours were more than what they actually had to work. The cost of living in Bangalore was definitely high since the call centre agents are from Kerala they would have to take

shelter in hostels or as paying guests who would charge a high rate for their stay and hence their savings would also be less. If the call centre was in Kerala, it would have been more comfortable for the call centre agents with regard to everything from stay, travel as well as savings.

The Call Wrap-up Time that is the time an agent takes to complete all work associated with after the call has ended is much lesser than the standard global matrix. The time taken to complete the work associated with a call is one minute per call and that of the global standard measure is 6 minutes per call.

When the call centre receives a call the call centre agents note the details in their software Kisan Knowledge Management Service (KKMS) simultaneously while attending the caller and all the work regarding the call would have been entered by the time the queries are cleared. Each agent can login to the KKMS software using their unique user id and password and when a call gets connected the page that needs to be filled with the details of the caller pops up automatically.

According to the global matrix the first call resolution which means the percentage of all calls where the caller's issues were resolved on the first attempt, without the agent needing to escalate the call, transfer the call or call the customer back. The global matrix for this was 70-75 per cent and that of the call centre was found to be 90-95 per cent. The call centre agents solve 90-95 per cent of the queries of the farmers and only 5- 10 per cent of calls are escalated to tier 2 of KCC. The call centre agents usually escalates the calls to the KVK and Krishi Bhavans or the telephone numbers of those organizations who were experts in the field of the queries asked were given to the respondents.

Occupancy rate of the call centre was found to be seventy five per cent. The occupancy rate refers to the amount of time the agents are on live calls as well as completing work associated with the calls (after call work). Two hour out of the eight hour work schedule of the call centre agents, are left without any calls. When compared to the global matrix the KCC does showcase a good performance.

Table 34. Benchmarking of KCC

Sl. No.	Standards	Standard Measure	KCC Measure
1.	**Service Level** The percentage of calls answered within a predefined timeframe	80 per cent of calls - 20 seconds	30 seconds
2.	**Average Speed to Answer** The average time for calls to be answered. This includes the amount of time callers wait in a queue while the agent's phone rings, but not the time it takes for callers to navigate through the IVR	28 seconds	20 seconds
3.	**Abandonment Rate** The number of callers that hang up before an agent answers.	5 - 8 per cent.	8 per cent
4.	**Adherence to Schedule** A call center agent's degree of compliance with their assigned schedule.	95 per cent	90 per cent
5.	**Agent Attrition** Measure of staff turnover annually	15 per cent	80 per cent
6.	**Call Wrap-up Time** Time an agent takes to complete all work associated with after the call has ended	6 min/call	1 min/ call
7.	**First Call Resolution** The percentage of all calls where the caller's issues were resolved on the first attempt, without the agent needing to escalate the call, transfer the call or call the customer back.	70-75 per cent	90-95 per cent
8.	**Occupancy Rate** The amount of time agents are on live calls as well as completing work associated with the calls (after call work)	60-80 per cent	75 per cent

Plate 3. Interaction with Kisan Call Centre agent

Therefore from the above table it can be said that except for agent attrition factor the call centre is working very well when compared to the global matrix standards.

4.7.3. Outcome- Oriented Investigation

The out-come oriented investigation was mainly done to understand the effectiveness of the call centre. Therefore the effectiveness of the call centre can be studied only by understanding how far the call centre was effective in delivering their service to community. Hence the outcome oriented investigation was found out by understanding the satisfaction of respondents on the service offered by KCC. The table 35 and figure 27 shows the results of outcome oriented investigation.

Table 35. Categorization of respondents based on the outcome- oriented investigation

Category	**Score range**	**Frequency (n=150)**	**Percentage**
Low	< 4.14	28	19
Medium	4.14- 7.08	66	44
High	>7.08	56	37
Mean= 5.61	SD = 1.46		Range = 1 - 7

From table 35 it was evident that forty four per cent of the farmers had medium level of satisfaction with regard to the working of KCC. Thirty seven per cent of the farmers had high level of satisfaction on the working of KCC and nineteen per cent of the farmers had low level of satisfaction. The reason for the medium and low level satisfaction might be because of the constraints faced by the respondent as they found it difficult to get connected to the call centre at times and some of the respondents had also mentioned their difficulty in understanding the advice due to the

inability to comprehend the advice from the call centre agents. The high level of satisfaction can be attributed to the improvement in the fields of the farmers after adopting the advice of call centre agents. The study was in line with the results of Ajayi *et al.* (2015) who reported that majority (82.4 per cent) of the cassava farmers had medium level of satisfaction with the advisory service provided by the extension agency.

4.8. EFFICIENCY OF KISAN CALL CENTRE

The efficiency of KCC was determined from the respondent's point of view and the efficiency index for KCC was measured with the help of the scale developed for the study as detailed in chapter III. The respondents are categorized based on their perceived efficiency towards KCC in to low efficiency, medium efficiency, and high efficiency category and has been given it the table 36 and figure 28.The efficiency index obtained for each indice is provided in table 37 and figure 29.

Table 36. Distribution of farmers based on their perception on the efficiency of KCC

Category	**Score range**	**Frequency (n=150)**	**Percentage**
Low	<49.03	22	15
Medium	49.03 - 91.81	104	69
High	>91.81	24	16
Mean= 70.42	SD = 21.38	Range = 0 - 100	

From the table 36 it could be understood that majority of the respondents (69 per cent) perceived that KCC had medium level of efficiency. Sixteen per cent of the respondents perceived KCC had high level of efficiency and 15 per cent perceived low level efficiency for KCC. The reason for rating medium on efficiency of KCC might be because the call centre needs to showcase a better performance in order to provide their service at the maximum best. If the call centre could make a solution

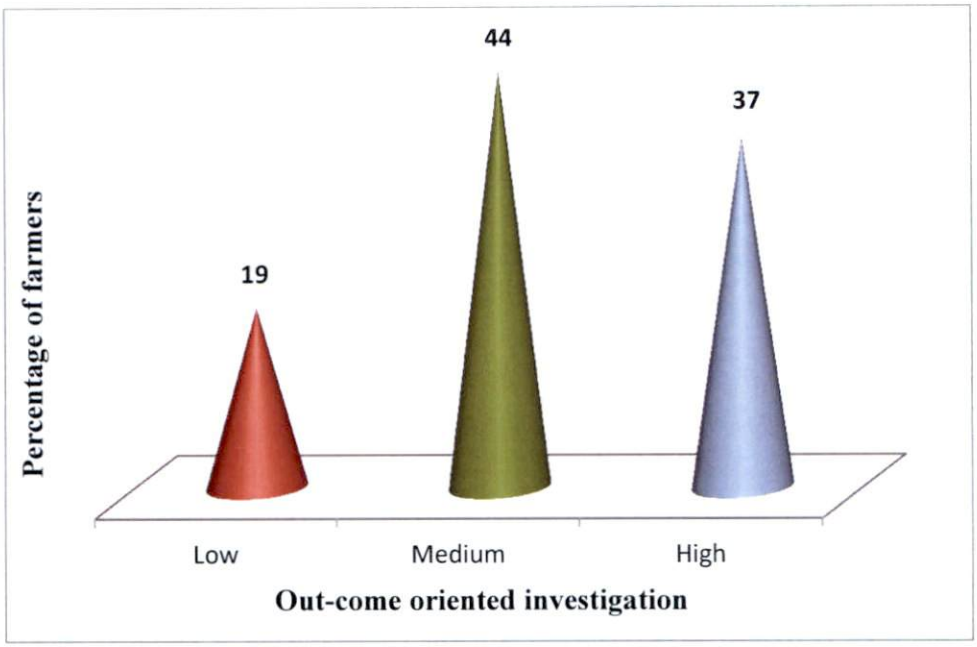


Figure 27. Distribution of respondents based on out-come oriented investigation

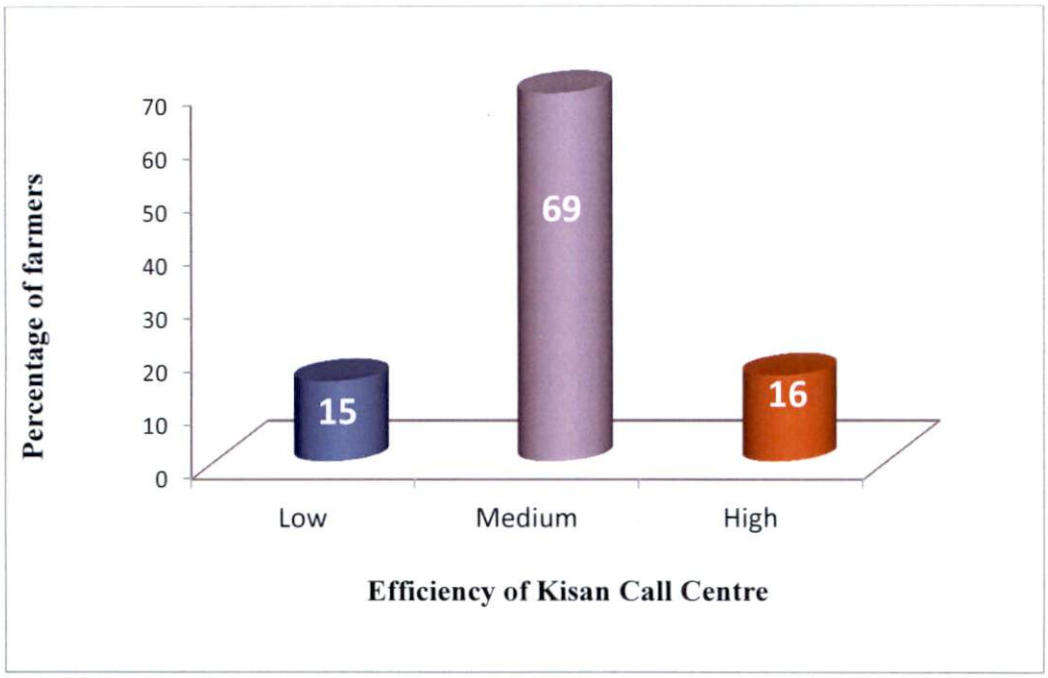


Figure 28. Efficiency of KCC as perceived by the respondents

for the low connectivity problem, flexibility and give more practical solutions then the efficiency of the call centre could be improved. The distribution of the respondents is provided in figure 28.

The study was in line with the findings of Meera (2002) who reported effectiveness of the services of Gyandoot as medium. It is in contrast with the findings of Hanumankar (2005) who concluded that Kisan Call Centre was highly effective in addressing information need of farmers and with the findings of Muhamed *et al.* (2015) which revealed that 46.66 per cent of the total farmers perceived that the m-KRISHI was highly effective as a means of getting information followed by 21.66 per cent farmers who perceived it very highly effective in obtaining the information regarding their farming needs.

Table 37. Efficiency index of KCC

Sl. No.	**Indices**	**Efficiency Index**	**Rank**
1.	Understandability	78.00	I
2.	Completeness	75.00	II
3.	Knowledge gain	73.50	III
4.	Accuracy	72.66	IV
5.	Reliability	71.67	V
6.	Timeliness	70.50	VI
7.	Practicality	65.50	VII
8.	Flexibility	64.83	VIII
9.	Connectivity	62.17	IX

From the table 37 it is clear that among the nine indices that were formed to measure the efficiency of KCC understandability had the highest indices and this might be because of the clear and crisp advices given by the call centre agent to the

respondents. The second rank was for the completeness of the advices given by the call centre agents. The third most efficient quality was the knowledge gain and this might be because of the novel information the respondents while interacting with the call centre agents. The least ranked efficiency index was the connectivity. Majority of the respondents had the constraint in getting connected to the call centre due to the busy lines and this might be the reason for ranking connectivity as the least efficient one.

4.9 ATTITUDE OF RESPONDENTS TOWARDS KCC

Results on the attitude of respondents towards KCC are presented in table 38 and figure 30.

Table 38. Distribution of the KCC respondent based on their attitude towards KCC

Category	**Score range**	**Frequency (n=150)**	**Percentage**
Less favourable	<276.31	24	15
Moderately favourable	276.31- 372.55	87	58
Highly favourable	>372.55	39	26
Mean= 324.43	SD = 48.11	Range =101.38 – 416.79	

A cursory view of the table 38 shows that majority of the respondents had moderately favourable attitude towards KCC and twenty six per cent of the respondents had highly favourable attitude towards KCC and fifteen per cent of the respondents had less favourable attitude towards KCC. The less favourable and moderately favourable attitude towards KCC might be because of the efficiency of KCC and the constraints faced by the respondents like getting connected to the call and the unavailability of the inputs in the markets as suggested by the call centre agents. The table 39 shows the scores obtained for various statements.

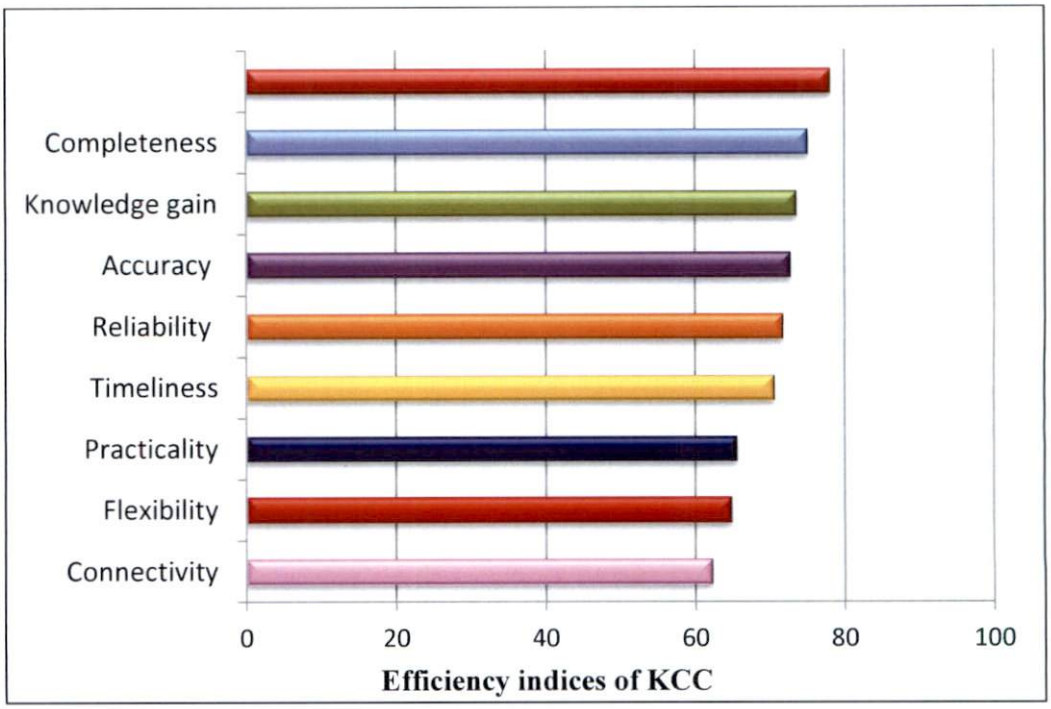


Figure 29. Efficiency indices of KCC

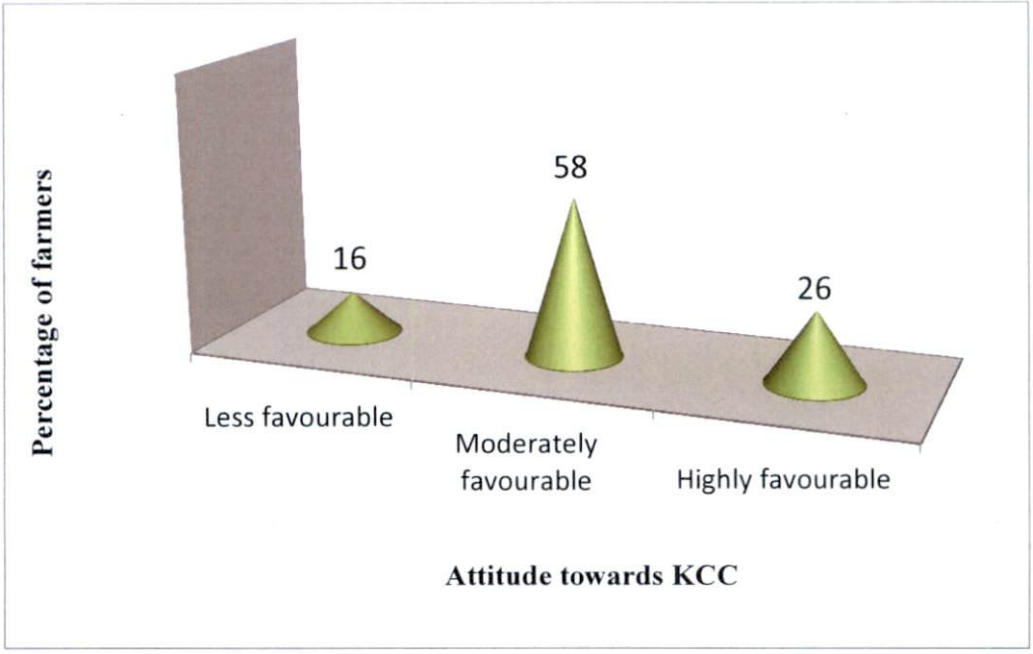


Figure 30. Distribution of respondents based on their attitude towards KCC

Table 39. Attitude statements

Sl. No.	Statements	Scores
1.	KCC extension service is faster when compared to the traditional extension services	655
2.	KCC extension services has been helpful in building a skilled and knowledgeable community	652
3.	Recommendations provided through telephone is clear and easy to understand	648
4.	All kinds of information exchange are possible through KCC	645
5.	Work assignments are not fully explained in KCC by the officials*	641
6.	KCC based extension services are alternative to the present extension system	631
7.	KCC extension services avoid the personal extension contact*	621
8.	For instant information KCC is always used	614
9.	KCC saves farmers time	607
10.	KCC provides fair amount of information for the query farmers ask	607
11.	KCC agents often fail to comprehend the queries*	601
12.	KCC is one of the potential tools of ICT to reach needy farmers	598
13.	The benefits received from KCC are as good as most other organizations offer to other farmers	581
14.	Solutions provided through KCC is very helpful	580
15.	Illiteracy will not deter farmers in availing KCC services	574
16.	The farmers following KCC recommendations get positive results	565
17.	KCC services' is a distant dream for resource poor farmers*	557
18.	KCC can never replace traditional method of extension service*	495
19.	The centre provides solutions for only regular farm related problems*	483
20.	At times, KCC is not good at all in terms of dairying*	463
21.	KCC provides new methods for solving field problems	395
22.	Phone-in-line with scientists gives first-hand information about queries	395
23.	The chemicals recommended by the agents are never available in the input shops*	380

*-Negative statements

The second statement with a score of 652 was "KCC extension services have been helpful in building a skilled and knowledgeable community" this may be because majority of the respondents might be new to different types of pest and diseases attacking their crop.

The third statement with the highest score was "the recommendations provided through telephone are clear and easy to understand" this might be because of the slow, clear and the understandable manner in which the recommendations are provided by the call centre agents. The statement "All kinds of information exchange are possible through KCC" was the fourth statement with maximum score and this may be because the respondents might have felt that any sort of exchange of information is possible through the KCC. "KCC provides new methods for solving field problems" was the third statement with the least score and this might be because there was no novelty in the recommendations provided. The second least scored statement was the "Phone-in-line with scientists' gives first-hand information about queries". Ninety per cent of the queries aroused are solved by the call centre agents itself without escalating and hence majority of the farmers would have not got connected to the second level scientist and hence least score was obtained. The statement with the least score was "The chemicals recommended by the agents are never available in the input shops". Many of the respondents did mention this in their suggestion to improve the service of call centre. The respondents had complained that the chemicals recommended were not available in the shops nearby and hence this could be the reason for the least score.

4.10. EXTENT OF USE OF KISAN CALL CENTRES FOR AGRICULTURAL INFORMATION BY THE FARMERS IN TAMIL NADU, KARNATAKA IN COMPARISON TO KERALA

Table 40. Extend of use of KCC by the beneficiaries of KCC from Tamil Nadu, Karnataka and Kerala.

States / Categories		Tamil Nadu	Karnataka	Kerala
Crops		Paddy Black gram Ground nut Sugar cane	Cotton Pomegranate Coconut Arecanut	Chilly Banana Coconut Paddy
Number of call centre agents working		16	21	6
Average calls, 2014	Jan	1012	1258	121
	Feb	918	1003	118
	Mar	829	886	94
	Apr	905	650	81
	May	876	102	14
	Jun	779	493	51
	Jul	737	1204	134
	Aug	690	1426	123
	Sep	681	1582	129
	Oct	740	1727	198
	Nov	778	1846	240
	Dec	687	1677	223
Total		9632	13854	1219

In the study the need to compare the Kerala KCC was necessary with the neighboring states Karnataka and Tamil Nadu in order to investigate on the low rates of call.

The table 40 reveals that major crops for which queries are asked from Tamil Nadu was for paddy, black gram, ground nut, sugar cane. The major crop queries from Karnataka were on cotton, pomegranate, coconut and arecanut and from Kerala the queries were asked for crops like chilly, banana, coconut and paddy.

Karnataka state had the highest employee strength with 21 call centre agents. They worked in two shifts that is ten call centre agents in the morning shift from 6 am to 2 pm and eleven call centre agents from 2 pm to 10 pm. In Tamil Nadu there are sixteen call centre agents where they too worked in shifts. For morning shift there were nine call centre agents and for the night shift seven call centre agents were available. For Kerala KCC only five agents were available and usually they worked extra hours due to the lack of call centre agents to take shift.

The average calls received among the three states are presented in the figure 31. The results reveal that that the least average calls from Jan to Dec during the year 2014 was received for Kerala (1219 calls). Tamil Nadu received the second highest number of average calls (9632 calls).Karnataka received the highest average calls (13854 calls) among the three states during the year 2014. Therefore from this it can be concluded that the call made by the individuals from Kerala was very less when compared to our neighboring states Karnataka and Tamil Nadu. The reason behind this can be the lack of motivation from the agricultural departments and extension agents of various state departments. The busy line and the waiting of the individuals to get connected to the call centre can also be a reason for reduced attempt to make calls to the call centre. This was the reason why there should be a definite call back facility from the KCC. The highest call received for Kerala and Karnataka was during the month of November and least during the month of May. The second crop season

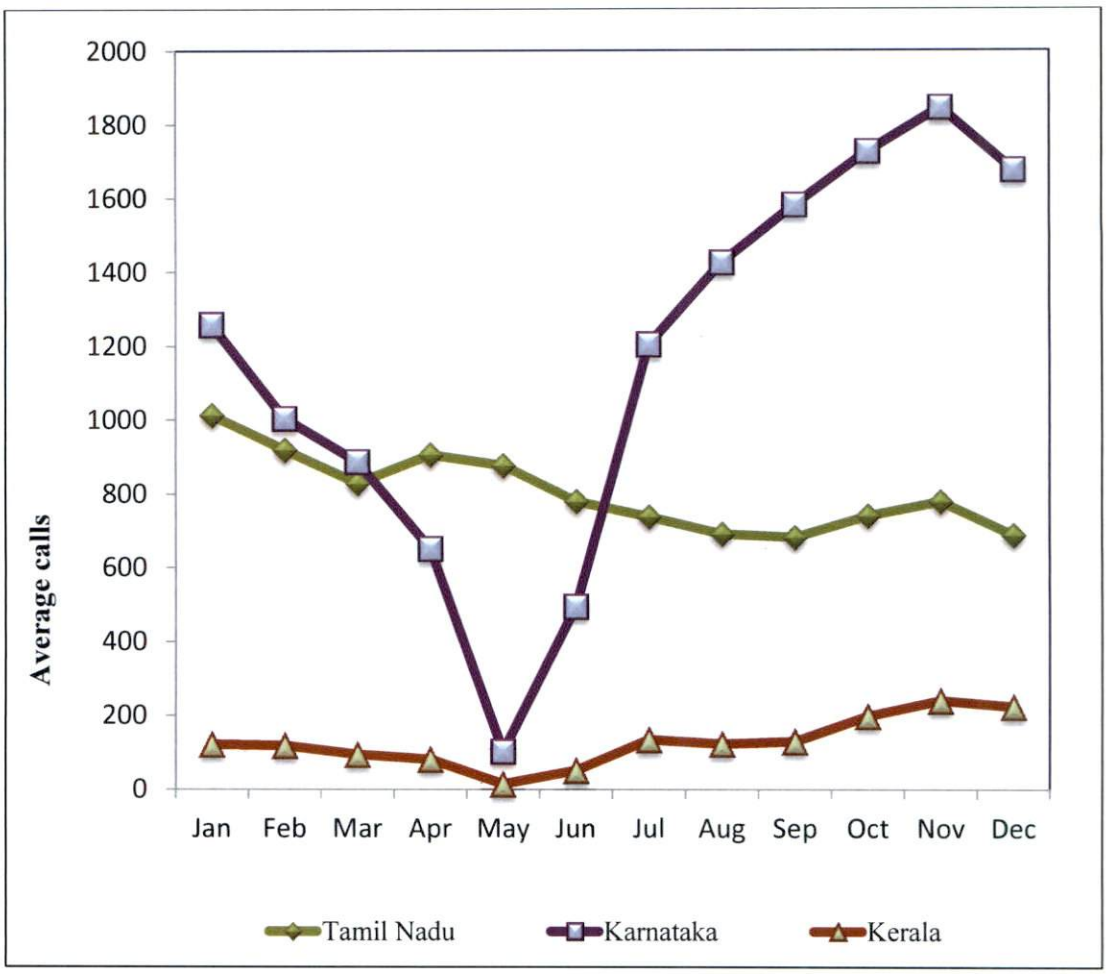


Figure 31. Average calls received during 2014 by Tamil Nadu, Karnataka and Kerala Kisan Call Centres

might be the reason for increased calls received during the month of November and the summer season where availability of water is less and hence cultivation of crops is also less and hence might be the reason for receiving low number of calls during the month of May. Tamil Nadu received maximum number of average calls during the month of January and this can be attributed to the Pongal festival where crops are harvested. Least number of average calls were received during the month of September and this might be because in Tamil Nadu September is a lean season and hence cultivation of crops is found to be very less.

4.11. DIGITAL DIVIDE

The table 41 shows the digital divide among the respondent using KCC

Table 41. Digital divide among the respondent of KCC

Category	**Score range**	**Frequency (n=150)**	**Percentage**
Low	<43.06	24	16
Medium	43.06-73.33	97	65
High	>73.33	29	19
Mean=58.2	SD=15.13	Range = 20 - 86.66	

The table 41 and figure 32 shows that only 16 per cent of the respondents faced high level of digital divides this means that their availability and accessibility to the ICT tools were low. Sixty five per cent of the respondents had medium level of accessibility towards ICT tools which means that certain ICT tools where available and accessible while certain others were not available and accessible. Only nineteen per cent of the respondents had low digital divide. These respondents were found to have accessibility and availability to majority of the ICT tools.

The table 42 shows the list of those ICT tools that were available and accessible, available and not accessible, not available and accessible, and not available and not accessible to the respondents.

Table 42. Availability and accessibility of ICT tools

(n=150)

Sl. No.	Tools	Available + Accessible	Available + Inaccessible	Unavailable + Accessible	Unavailable + Inaccessible
1.	Television	149(99)	0(0)	0(0)	1(1)
2.	Agricultural Magazines	140(93)	3(2)	0(0)	7(5)
3.	Land phone	125(83)	3(2)	7(5)	15(10)
4.	Mobile	109(72)	3(2)	4(3)	34(23)
5.	Newspaper	101(67)	12(8)	6(4)	31(21)
6.	Radio	77(52)	6(4)	20(13)	47(31)
7.	Computers	52(35)	8(5)	19(13)	71(47)
8.	Tablets	40(27)	9(6)	25(16)	76(51)
9.	Internet	12(8)	3(2)	15(10)	120(80)
10.	Kiosk	0(0)	0(0)	14(9)	136(91)

*Figures in parenthesis indicate percentages

From the table 42 and figure 33 it is clearly evident that television (149), agricultural magazines (140), land phone (125), mobile phone (109), newspaper (101), radio (77) were available as well as accessible to majority of the respondents. All the respondents except one had accessibility and availability of television. This was followed by mobile phone. The next ICT tool owned or accessible to all the respondents was the newspaper. Nowadays every house has television, mobile phones and newspaper. These three media are indispensible in a man's life as majority of the information is being communicated through these media. Kiosk, tablet, internet and

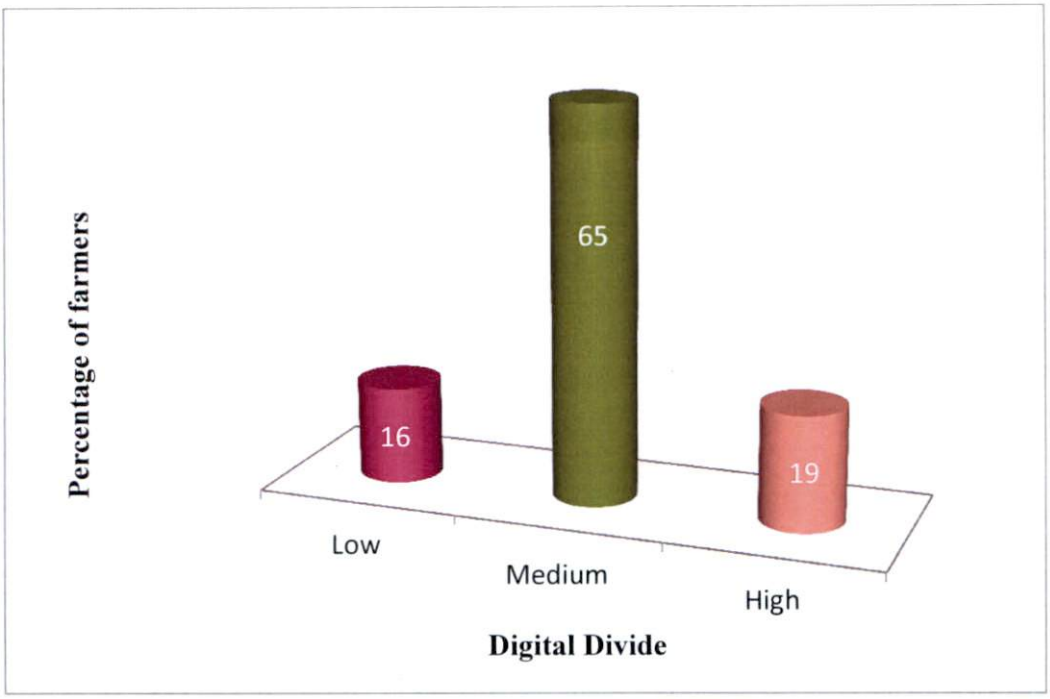


Figure 32. Distribution of respondents based on their digital divide

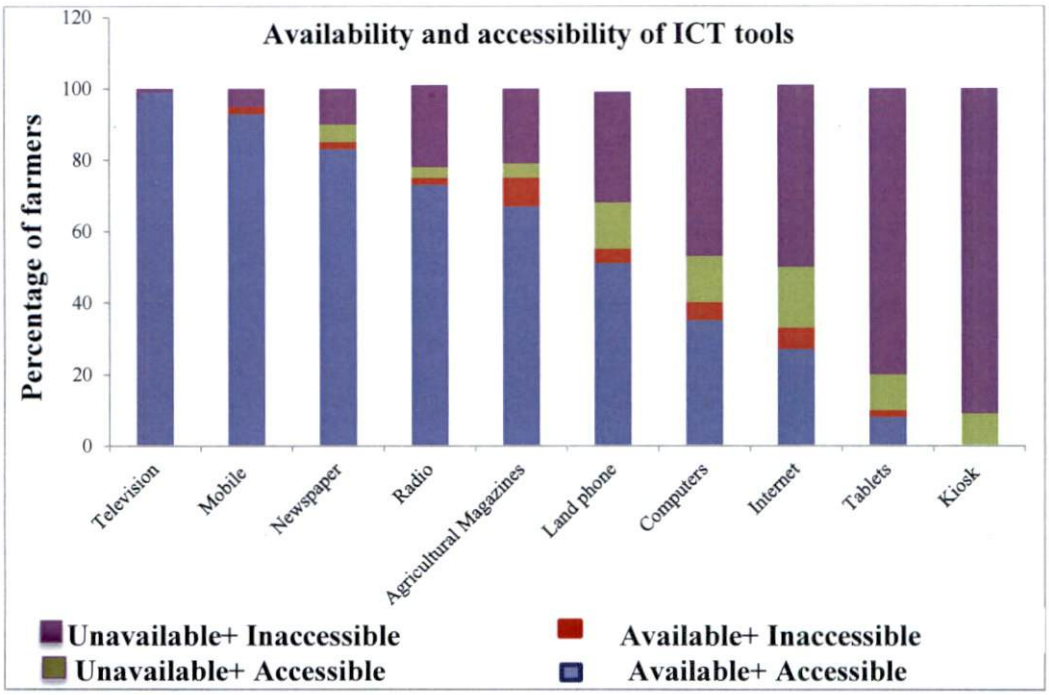


Figure 33. Distribution of respondents based on the availability and accessibility towards ICT tools

computers were the tools that were not available as well as inaccessible to the respondents.

This observation was in line with the study conducted by Olaniyi, (2013), Chhachar *et al.* (2014) and Syiem and Raj (2015) who pointed that mobile phones, radio and television are the most important tools of communication available and can be accessed by farmers for agricultural related information and knowledge.

4.12. CATEGORIZATION OF CALLS RECEIVED BY THE KERALA KCC

The calls received by KCC of Kerala were categorized based on the information provided by the call centre agents on the basis of the month in which maximum calls were received, queries received by the Kerala KCC, the crops for which major queries were aroused and the Districts from which major queries were received.

4.12.1. Month in which Maximum Calls are Received

Table 43. Average calls received per month during 2014

Sl. No.	Month, 2014	Average calls
1.	January	121
2.	February	118
3.	March	94
4.	April	81
5.	May	14
6.	June	51
7.	July	134
8.	August	123
9.	September	129
10.	October	198
11.	November	240
12.	December	223

The table 43 and figure 34 showing the average calls received during different month during the year 2014 reveals that highest number of average calls were received during the month of November and least calls were received during the month of May. November is the second crop season and lots of vegetables are cultivated during that period. This might be the reason for receiving more number of calls during November. The cultivation during the month of May would be less as it was the summer season and hence could be the reason for receiving low calls.

4.12.2. Categorization of Queries Based on the Calls Received

The table 44 shows majority of the queries (87.50 per cent) were asked on agriculture. Five per cent calls received by KCC were other calls which included calls from other states as well as call that were dialed wrongly. Four per cent of call received by KCC attended queries on Veterinary this was followed by queries on fisheries which accounted for 1.47 per cent, Dairy and Engineering which accounted for 1.02 per cent (figure 35). This observation was found in line with the research of Savithramma *et al.* (2013). Therefore the pattern of queries received by the KCC of Karnataka and Kerala was found to be same.

Table 44. Queries received by KCC

Sl. No.	**Queries asked**	**Percentage**
1.	Agriculture	87.50
2.	Veterinary	4.00
3.	Fisheries	1.47
4.	Dairy	1.02
5.	Engineering	1.02
6.	Other calls	5.00

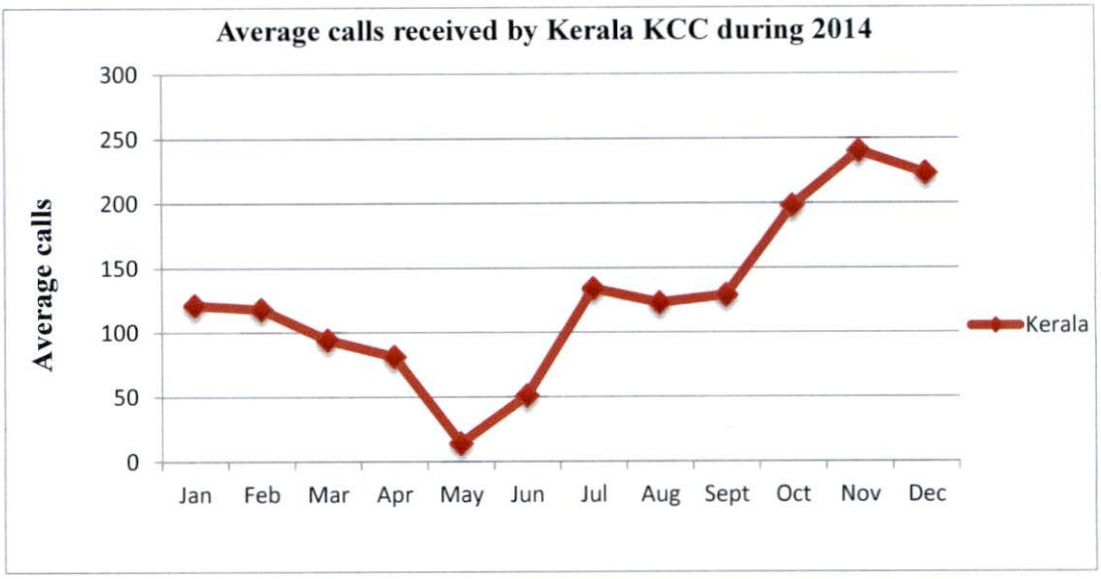


Figure 34. Average calls received by Kerala KCC during 2014

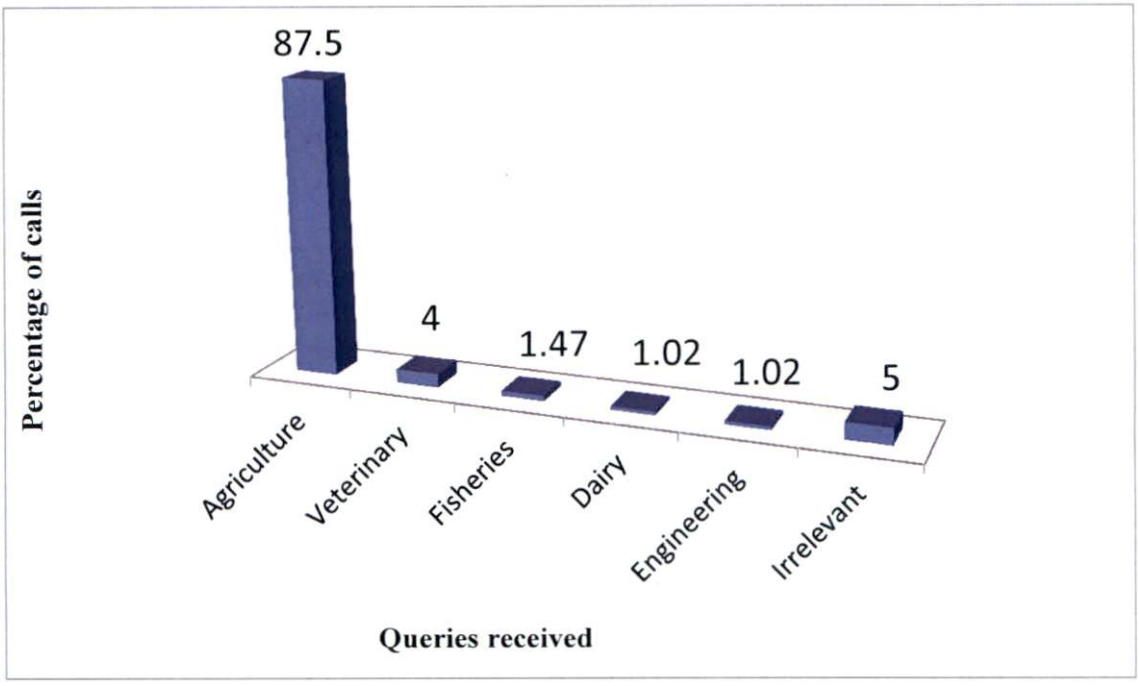


Figure 35. Distribution of queries received by Kerala KCC

4.12.3. Districts from Which Majority of Calls are Received

When enquired about the district from where major calls were received, the call centre agents opined that majority (>70 per cent) of calls came from Malappuram District followed by Palakkad, Ernakulum, Thrissur and Trivandrum District. They found that they received low calls from Kottayam region. It was found out that majority of calls coming from Ernakulum District was from terrace farmers and kitchen garden related queries.

4.12.4. The Crops Related Queries

The call centre agents said that majority (>80 per cent) of queries came for chilly, banana, cowpea, coconut, tomato and paddy. The pest and diseases related queries were the most received ones. For chilly and cowpea queries on white flies, crinkling of leaves etc. were asked. For banana crop the solution for pseudo stem borer was asked. The queries related to paddy came mostly from Palghat farmers and they wanted to know about various schemes that were offered by the Kerala State Government and wanted to know on how to avail the schemes.

4.13. CORRELATION BETWEEN EFFICIENCY INDEX AND ATTITUDE OF RESPONDENTS ON KISAN CALL CENTRE WITH THE INDEPENDENT VARIABLES

The correlation between the set of independent variables with the dependent variables efficiency and attitude was carried out in order to understand the relationship among the variables. The correlation analysis was carried out to assess the relationship of characteristics of respondents with efficiency of KCC as perceived by the farmers as well as with farmer's attitude. The correlation coefficients were worked out and the significance was tested by comparing with the table values. The results are presented below.

4.13.1. Correlation between the Efficiency of Call Centre with the Independent Variables

The correlation coefficient between the dependent variable efficiency and the independent variables are presented in the table 45. Efficiency of KCC was found to be positively correlated with temporal awareness of respondents about KCC, satisfaction, utilization and adoption of advice at one per cent significant level. Extension agency contact, experience in internet use, information source utilization and constraints were found to have negative correlation with the efficiency of KCC.

The temporal awareness of KCC, satisfaction, utilization of KCC, adoption of advice, peer group contact was found to have a positive relationship with the respondent's perception on efficiency of KCC.

The temporal awareness refers to how long the farmers where aware of KCC service. When the degree of awareness of KCC increases the utilization of the service will also be more. The increased utilization can be attributed to the satisfaction derived in utilizing the service. From the outcome- oriented investigation study it was found that the respondents had fairly high satisfaction towards KCC service therefore it could be the reason for having positive correlation towards perception on the efficiency of KCC. The adoption of advice, utilization of KCC services and satisfaction are also interrelated. The adoption of advice provided by the call centre agents could be because of the positive results found in the fields of the farmers this increases the satisfaction with regard to KCC service and hence their utilization of service will also be more.

Table 45. Correlation between the efficiency of call centre with the independent variables

Sl. No.	Independent variables	Efficiency of KCC
1.	Age	0.014
2.	Education	0.039
3.	Income	0.077
4.	Occupation	-0.006
5.	Extension Agency Contact	**-0.519****
6.	Innovativeness	-0.029
7.	Digital divide	-0.067
8.	Experience in internet use	**-0.351****
9.	Information source utilization	**-0.302****
10.	Temporal awareness of KCC	**0.368****
11.	Satisfaction	**0.762****
12.	Utilization of KCC	**0.337****
13.	Adoption of advice	**0.457****
14.	Constraints	**-0.384****
15.	Information need	0.046
16.	Peer group contact	**0.213****

** - 1 per cent significance level

Extension agency contact, experience in internet use, information source utilization and constraints were found to be negatively correlated with the efficiency of KCC.

As the extension agency contact and information source utilization is reduced the perception on the efficiency about KCC by the respondents were found to increase. When the dependence on other information sources like magazines,

television and extension agents like Agricultural Officers, extension personals increase the dependence on a service like KCC would be lowered. This is true with the internet also. Those respondents who are aware of agricultural services available through internet would not be interested in depending on tele-advisory services like KCC. Therefore it can be concluded that when the farmers dependence on other medias and extension agency increases for availing agricultural information the utilization of KCC will be low and the low utilization leads to reduced perception towards the efficiency of KCC.

Constraints in using KCC were also found to be negatively correlated with the efficiency of KCC. When the difficulties in utilizing the KCC services were more the perceived efficiency of KCC was also found to be less among the respondents

4.13.2. Correlation between the Attitude of Farmers on Call Centre with the Independent Variables

The correlation between the attitude and the independent variables are presented in the table 46. The correlation coefficient indicated that digital divide, temporal awareness of KCC, utilization of KCC and satisfaction towards KCC were positively correlated with the attitude at 1 per cent significant level. The constraints in utilizing KCC were found to be negatively correlated with the attitude towards KCC.

Digital divide was found to have positive correlation with the attitude toward KCC. When the digital divide was found to increase (when the availability and accessibility of ICT tools were found to be low) the attitude toward KCC was also found to increase this may be because when other ICT tools are less utilized, one of the easiest and quickest way to get agricultural information was through KCC, moreover among all the ICT tools mobile phone was one which was available and accessible for all the respondents.

Table 46. Correlation between the attitude of farmers on call centre with the independent variables

Sl. No	Independent variables	Attitude towards KCC
1.	Age	-0.133
2.	Education	0.012
3.	Income	-0.057
4.	Occupation	-0.076
5.	Extension Agency Contact	-0.092
6.	Innovativeness	-0.057
7.	Digital divide	0.233**
8.	Experience in internet use	-0.120
9.	Information source utilization	0.045
10.	Temporal awareness of KCC	0.275**
11.	Satisfaction	0.293**
12.	Utilization of KCC	0.242**
13.	Adoption of advices	-0.087
14.	Constraints	-0.364**
15.	Information need index	-0.036
16.	Peer group contact	0.077

** - 1 per cent significance level

Temporal awareness of KCC is the number of year for which the respondents had been aware about KCC. As the temporal awareness increases the utilization of the call centre also increases and the reason for increased utilization can be due to the increased satisfaction in the performance of KCC. Hence this could be the reason for the positive correlation of the independent variables like temporal awareness of KCC,

utilization of KCC and satisfaction towards KCC on the dependent variable attitude towards KCC.

The independent variable constraint in using KCC was also found to have negative correlation with the dependent variable attitude. This is true because as the constraints in using the call centre service when the respondents find it difficult to use the call centre service they are likely to develop a negative attitude towards the KCC. The study was in line with the results of Patel and Padheria (2010) where they reported that the attitude towards safflower technology of the farmers was found to have negative correlation with the constraint in adoption of safflower technology.

Empirical relationship between the independent variables and the dependent variable efficiency of KCC and attitude towards KCC are given in figure 36 and figure 37.

4.14. DIRECT AND INDIRECT EFFECT OF INDEPENDENT VARIABLES ON DEPENDENT VARIABLES

The direct and indirect effect of independent variables on the dependent variables were found using path analysis which is a special multiple regression analysis. Its aim is to provide estimates of the magnitude and significance of hypothesized causal connections between sets of variables. Therefore in path analysis it is possible to separate out the direct influence of an independent variable on the dependent variable as well as the indirect effect of the independent variables on the dependent variable through other variables which is known as indirect effect.

Scale of path coefficients are given in the table 47 below which shows the value of direct and indirect effects and its corresponding rate of scale.

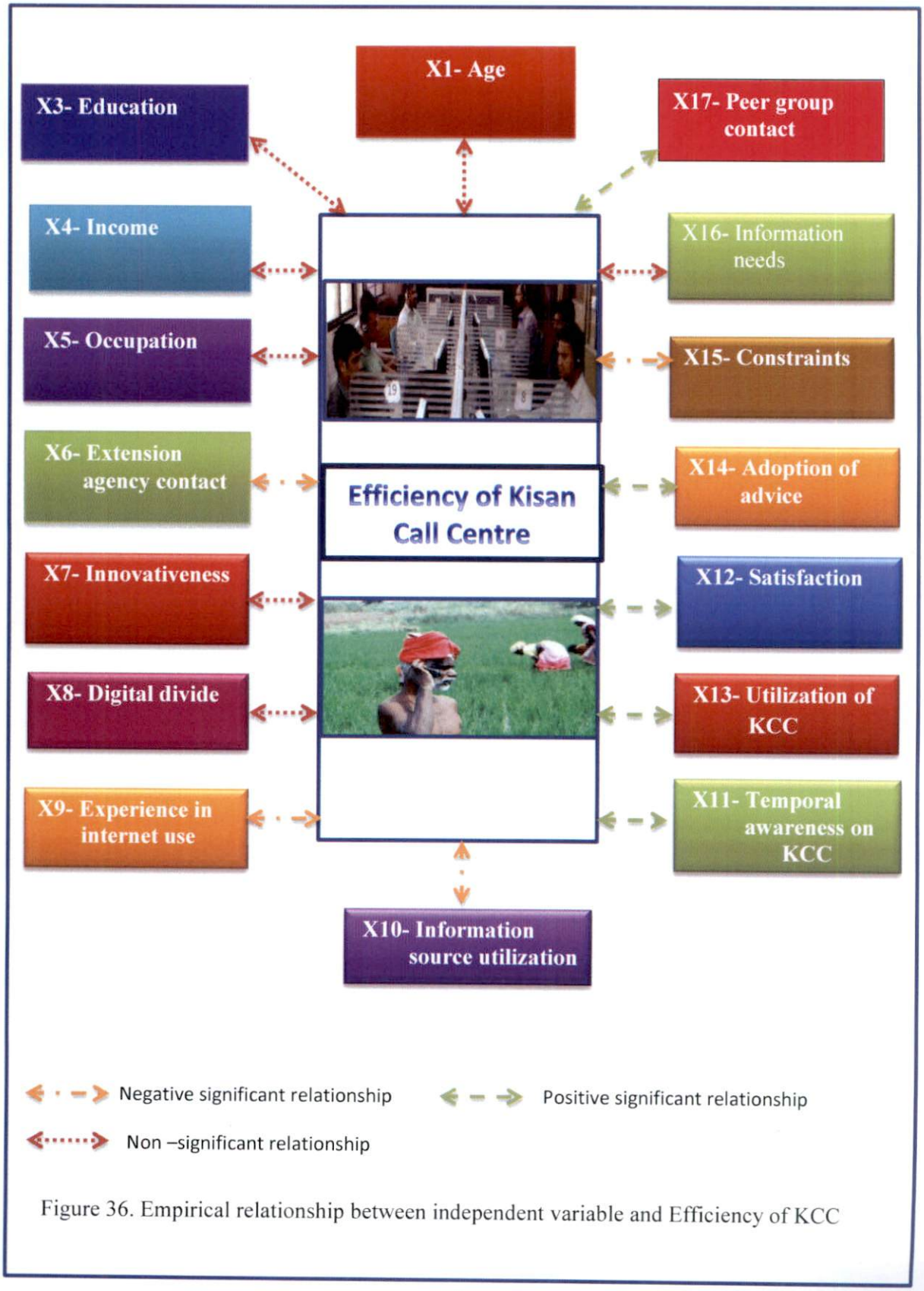


Figure 36. Empirical relationship between independent variable and Efficiency of KCC

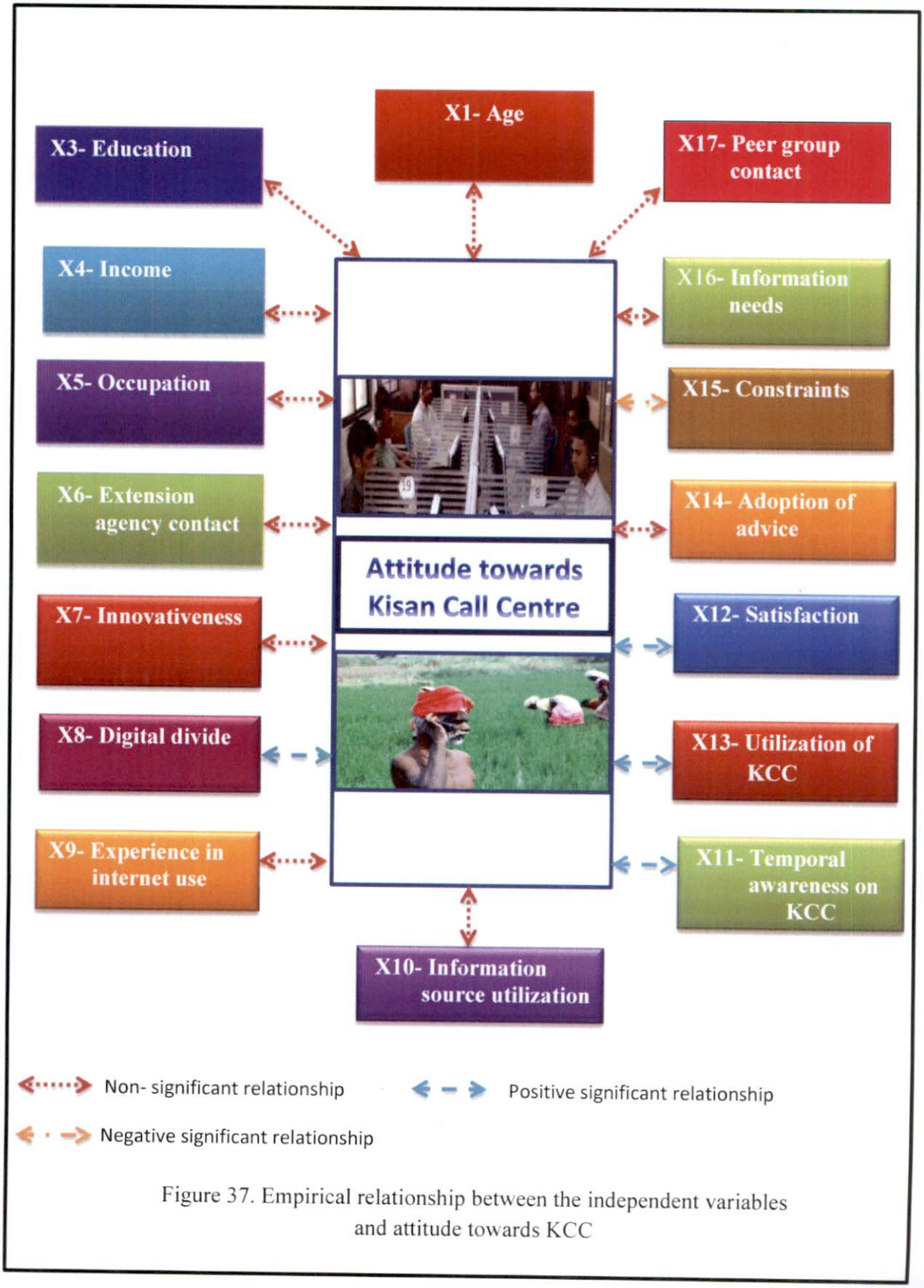


Figure 37. Empirical relationship between the independent variables and attitude towards KCC

Table 47. Scale of path coefficients

Sl. No.	Value of direct and indirect effects	Rate of scale
1.	0.00 to 0.09	Negligible
2.	0.10 to 0.19	Low
3.	0.20 to 0.29	Moderate
4.	0.30 to 0.99	High
5.	More than 1.00	Very high

(Source: Panse and Sukhatme, 1967)

The correlation between the independent variables and the dependent variables are provided in the table 48. The variables that exhibited a correlation coefficient of more than ± 0.2 were selected to carry out the path analysis.

Therefore out of the seventeen independent variables eight variables namely, extension agency contact (X6), information source utilization (X10), temporal awareness of KCC (X11), satisfaction (X12), utilization of KCC (X13), adoption of advices (X14), constraints in using KCC (X15) and peer group contact (X17) were found to have correlation coefficient more than the mentioned with the dependent variable efficiency of KCC.

The variables digital divide (X8), temporal awareness of KCC (X11), satisfaction (X12), utilization of KCC (X13), constraints in using KCC (X15) were found to have correlation coefficient of more than ±0.2 with the dependent variable attitude.

Table 48. Correlation of dependent variables with the independent variables

Independent variables		Attitude	Efficiency
Age	(X1)	-0.133	0.014
Education	(X2)	0.012	0.039
Income	(X4)	-0.057	0.077
Occupation	(X5)	-0.076	-0.006
Extension agency contact	(X6)	-0.092	**-0.519****
Innovativeness	(X7)	-0.057	-0.029
Digital divide	(X8)	**0.233****	-0.067
Experience in internet	(X9)	-0.120	**-0.351****
Info. source utilization	(X10)	0.045	**-0.302****
Temporal awareness	(X11)	**0.275****	**0.368****
Satisfaction	(X12)	**0.293****	**0.762****
Utilization of KCC	(X13)	**0.242****	**0.337****
Adoption of advices	(X14)	-0.087	**0.457****
Constraints	(X15)	**-0.364****	**-0.384****
Information need index	(X16)	-0.036	0.046
Peer group contact	(X17)	0.077	**0.213****

** - 1 per cent significance level

4.14.1. Direct Effect and Total Indirect Effect of Independent Variable on Dependent Variable on Efficiency of KCC

The table 49 and figure 38 shows the direct and total indirect effect of selected independent variables on the dependent variable 'efficiency of KCC'.

The results of direct and total indirect effect as observed in the table 49, indicates that out of eight variables information source utilization, temporal

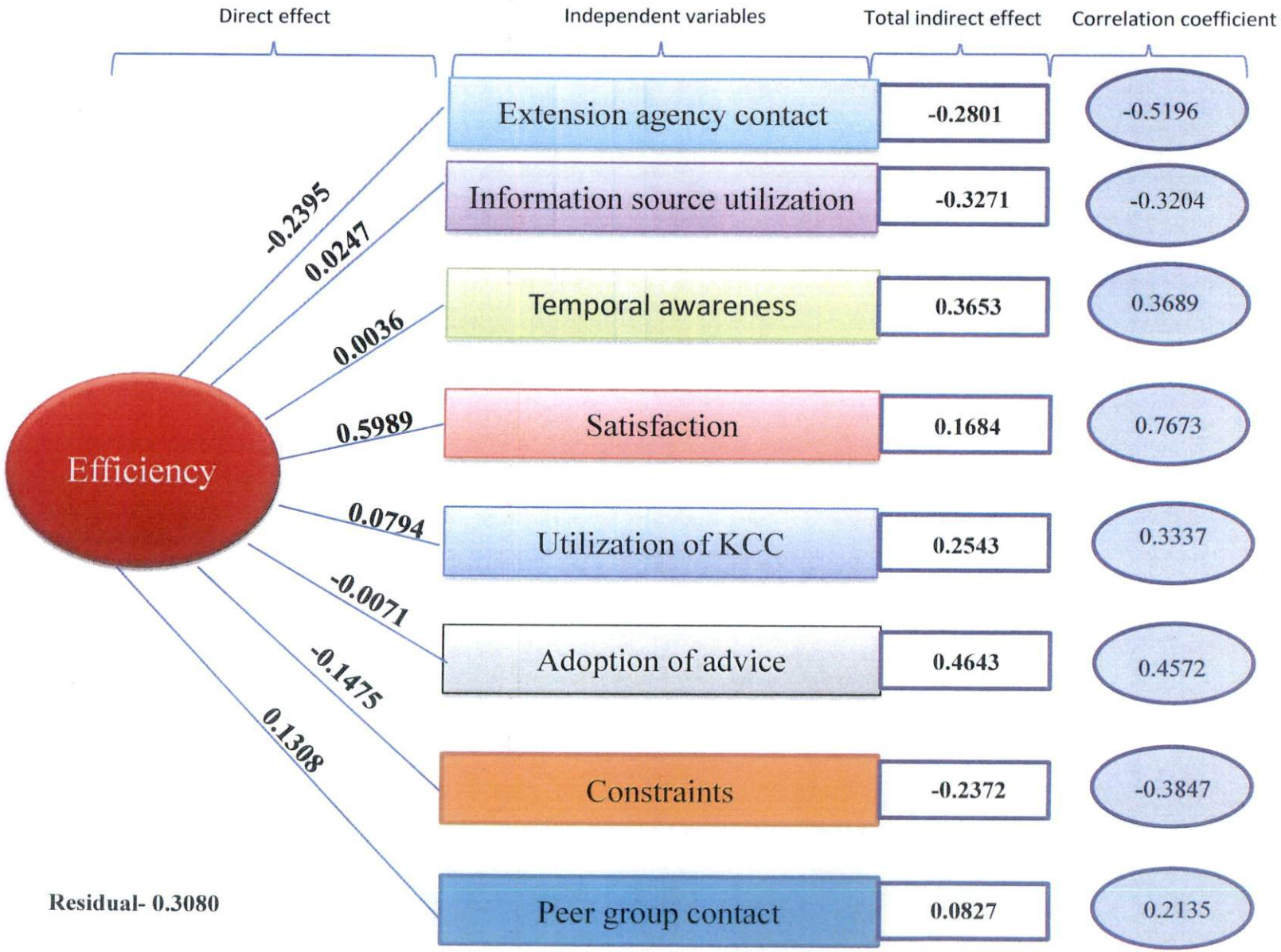


Figure 38. Pictorial representation of direct and total indirect effect of independent variables towards efficiency of KCC

awareness of KCC, satisfaction on KCC, utilization of KCC and peer group contact had positive direct influence on the efficiency of KCC. The variables age, extension agency, adoption of advices and constraints had negative direct significance on the efficiency of KCC.

Detailed perusal of the table shows that maximum direct effect on the dependent variable efficiency was attributed by the independent variable satisfaction on KCC.

However the direct effect of independent variables indicates that the rate of scale was high for satisfaction on KCC (0.5989). Whereas negligible for other independent variables.

The analysis revealed that satisfaction of the respondents was the most important variable in influencing the efficiency of KCC. Since it is one of the vital factors for the utilization of service, the emergence of the variable satisfaction as important is not beyond reasoning.

The study is in line with Kazemi (2013) where he reported that satisfaction had the greatest impact on rapseed farmers' insurance adoption, that is, the higher the satisfaction, the more highly it is for farmers to adopt the rapeseed insurance, moreover, the higher the informational features, the more probable it is for farmers to adopt rapseed insurance and finally, the higher the economic features, the more possible it is for farmers to adopt the insurance.

The reason for satisfaction to have a direct positive effect on the variable efficiency may be due to the fact that increased satisfaction increases the efficiency of KCC as perceived by the respondent.

Table 49. Direct and indirect of independent variables contributing to the efficiency of Kisan Call Centre

Variables	Direct effect	Total Indirect effect
X6-Extension agency contact	-0.2395	-0.2801
X10- Information source utilization	0.0247	-0.3271
X11- Temporal awareness	0.0036	0.3656
X12- Satisfaction	0.5989	0.1684
X13-Utilization of KCC	0.0794	0.2543
X14- Adoption of advices	-0.0072	0.4644
X15- Constraints	-0.1475	-0.2372
X17- Peer group contact	0.1308	0.0827

Residual= 0.3080

4.14.2. Direct Effect and Total Indirect Effect of Independent Variable on Dependent Variable on Attitude Towards KCC

The table 50 and figure 39 shows the direct and total indirect effect of selected independent variables on the dependent attitude towards KCC.

From the table 50 it could be understood that variable digital divide, temporal awareness, satisfaction and utilization of KCC had positive direct effect on the dependent variable attitude. The variables constraint was found to have negative direct effect on the attitude on KCC.

Among the direct effect from the variables, satisfaction was found to have the highest direct effect on the attitude and its total indirect effect towards attitude was found to be -0.04162.

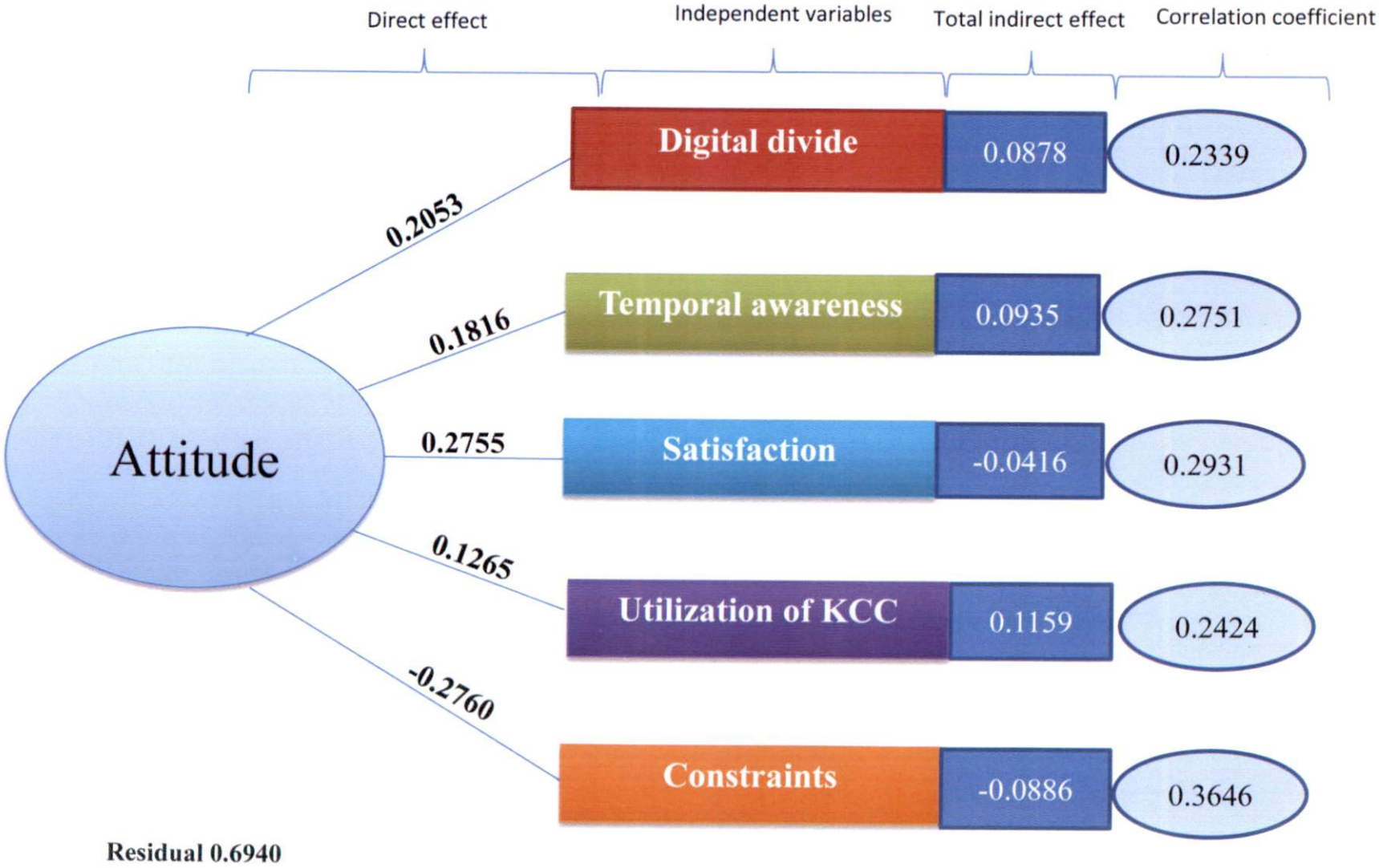


Figure 39. Pictorial representation of direct and total indirect effect of independent variables on attitude towards KCC

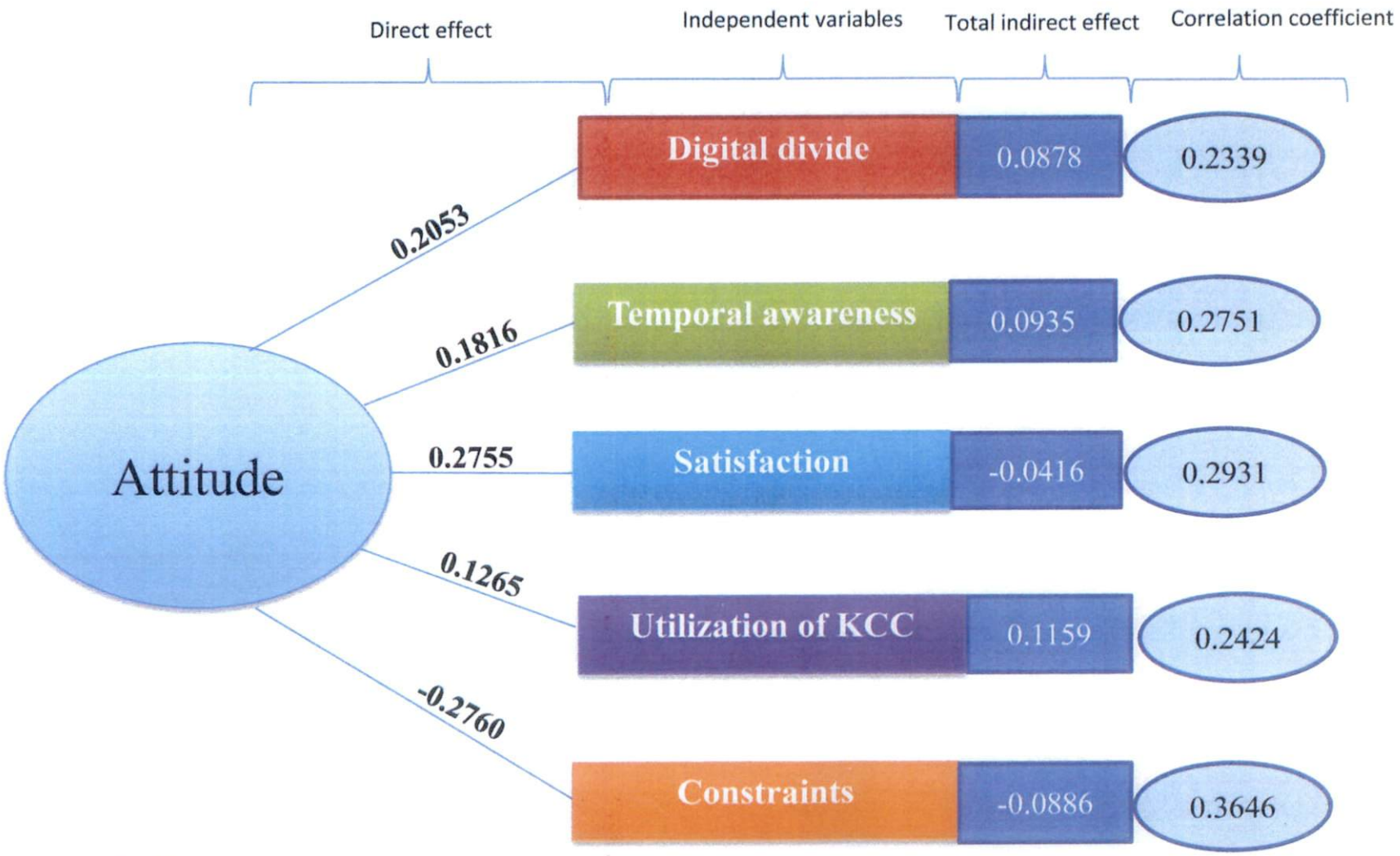


Figure 39. Pictorial representation of direct and total indirect effect of independent variables on attitude towards KCC

Table 50. Direct and indirect effect of independent variables on the dependent variable attitude

Variables	Direct effect	Total Indirect effect
X8 – Digital Divide	0.2053	0.0878
X11- Temporal awareness	0.1816	0.0935
X12- Satisfaction	0.2755	-0.0416
X13-Utilization of KCC	0.1265	0.1159
X15- Constraints	-0.2760	-0.0886

Residual= 0.6940

As mentioned in the direct and indirect effect of variables towards efficiency, attitude was also found to be directly influenced by the variable satisfaction. To have a positive attitude it was necessary that the service was useful to the beneficiaries and they are satisfied with the service provided.

The result was in line with Qtaishat and Al-sharafat (2012) where they concluded that vegetable growers' attitude toward the agricultural extension services was negative and they are not satisfied with the services

The results of digital divide effect was in line Palaiah *et al.* (2016) where he reported that majority of the farmers were not aware of ICT tools and only 40 per cent of the farmers having favourable attitude towards ICT tools which becomes the major bottleneck in accepting this technology.

4.15. CONSTRAINTS ELICITED BY THE FARMERS, CALL CENTRE AGENTS AND AGRICULTURAL OFFICERS

4.15.1. Constraints Faced by the Farmers in Using KCC

The identification of constraints in using an introduced program or service is an unavoidable process because only then the necessary changes can be made in the program/ service in order to deliver them in a better way. As Kisan Call Centre is a service provided through the telephone line there will be a number of problems faced by the respondents. Hence the constraints faced by the respondents were analyzed. The frequency distribution of constraints faced by the respondents while using KCC is reported in table 51.

From the table 51 and figure 40 it is clear that the highest score was obtained for the constraint 'Lack of Connectivity'. The lack of connectivity of the calls might be because of the busy lines. As all the Government services toll free number starts with "1800 180", there could be a queue in the telephone lines. This observation is in line with Savithramma *et al.* (2013) where she reported that 55 per cent of the respondents utilizing KCC services in Tamil Nadu faced the problem of busy lines. The second felt constraint in using KCC was the lack of training. This might be because of the lack of awareness of the respondents on ICT based services in agriculture. The third felt constraint was the lack of infrastructure with a score of 47. This constraint was followed by the constraints illiteracy and lack of awareness about ICT tools with a score of 39 each.

Negative mentality in accepting new things was the sixth felt constraint with a score of 36. Inability to comprehend the advice from the call centre agents was ranked seventh among the constraints faced by the respondents and this was the third least felt constraint by majority of the respondents and this might be due to the absolute clarity with which the call centre agents gives advice to the respondents. The constraint not compatible with the culture was ranked as the eighth constraint faced

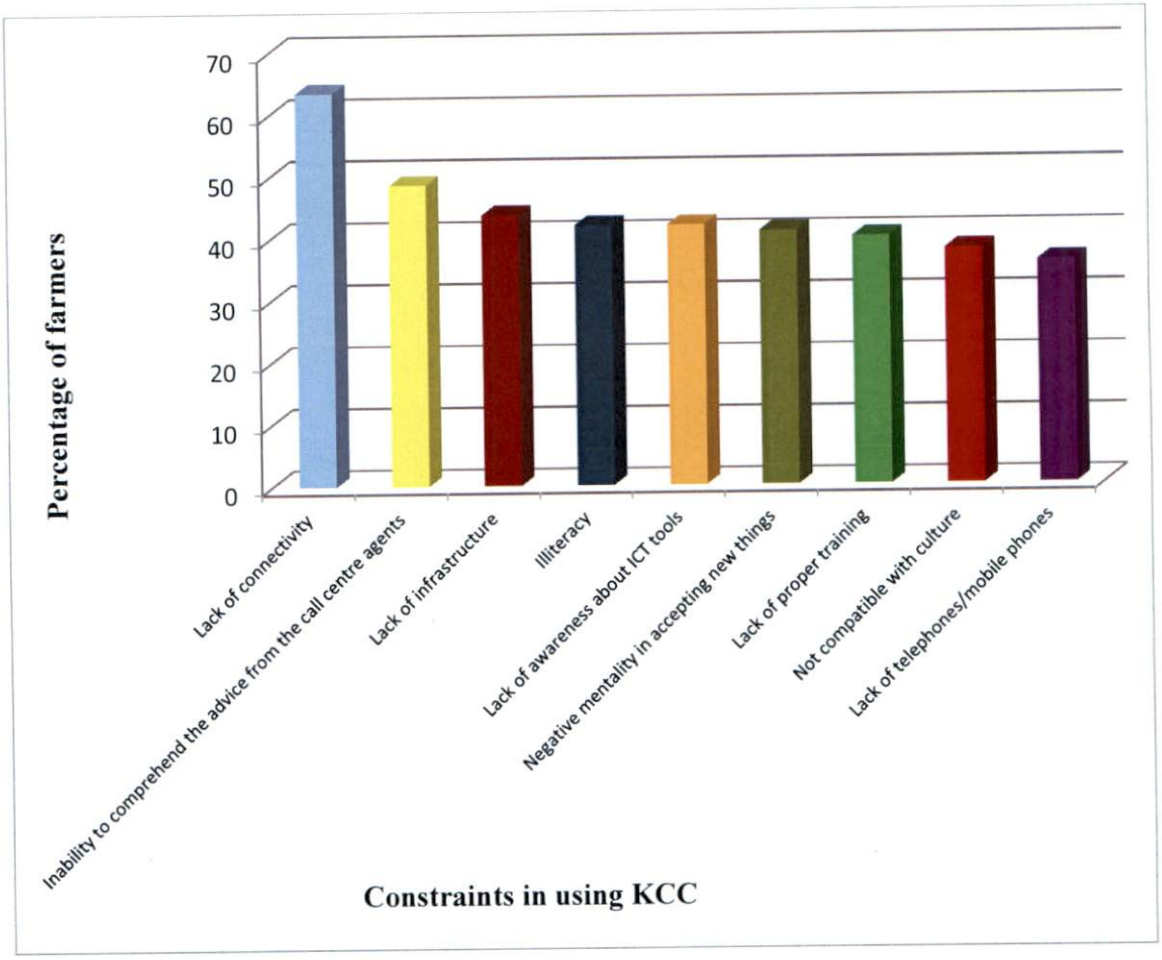


Figure 40. Distribution of respondents based on constraints in using KCC

by the respondents. The least felt constraint was the lack of telephones and mobile phones. As the mobile/ telephones were available with every individual the lack of telephones and mobile phones was the least felt constraint.

Table 51. Distribution of farmers based on the constraints faced in using KCC

Sl. No.	Information needs	Irrelevant	Relevant	Most Relevant	Total score	Rank
1.	Lack of connectivity	60 (40)	44 (29)	46(31)	136	I
2.	Lack of proper training	100 (66)	31 (21)	19(13)	31	II
3.	Lack of infrastructure	116 (77)	21 (14)	13 (9)	47	III
4.	Illiteracy	124 (83)	13 (9)	13 (9)	39	IV
5.	Lack of awareness about ICT tools	117 (78)	27 (18)	6 (4)	39	IV
6.	Negative mentality in accepting new things	122 (81)	20 (13)	8 (5)	36	VI
7.	Inability to comprehend the advice from the call centre agents	127 (81)	27 (18)	2 (1)	69	VII
8.	Not compatible with culture	134 (89)	10 (7)	6 (4)	22	VIII
9.	Lack of telephones/mobile phones	143 (95)	2 (1)	5 (3)	12	IX

*Figures in parenthesis indicate percentages

4.15.2. Constraints Faced by the Call Centre Agents

The constraints mentioned by the call centre agents were the difficulty in understanding the local dialects of different districts. The call centre agents mentioned that they had difficulty in understanding the problems of the callers from Northern part of Kerala. A second constraint mentioned by the call centre agents were the names of various crops. The various crops were known in different names in each district hence this was also a problem felt by call centre agents in understanding the callers. A third problem was the problems in the telephone/ mobile connection. When the callers used the landline especially when it was BSNL, it was found to get disconnected most of the time and mobile phones where the signal was low posted a problem in proper and clear communication between the beneficiary and the call centre.

4.15.3. Constraints Felt by the Farmers According to the Agricultural Officers

The farmers who are illiterate find it difficult to accept new recommendations and products because they are not aware of the recommendations. A second constraint was the que the callers have to face in order to get connected to the call centre. It was explained by the agricultural officer that many of the recommendations especially those that require the use of bio-control agents were not available for the farmers locally hence they drop those recommendations.

4.16. SUGGESTIONS OF FARMERS, CALL CENTRE AGENTS AND AGRICULTURAL OFFICERS

4.16.1. Suggestions from Farmers in Improving KCC Service

The suggestions from the respondents in improving KCC service are provided in the table 52. The need for call back facility was major suggestion of 83 per cent of the respondents. Seventy seven per cent of the respondents suggested transferring the calls to the tier 2 experts through call conference mechanism. Seventy five per cent of

the respondents suggested providing organic ways to solve the pest and diseases in their field. Seventy per cent of the respondents suggested to provide information on the shops were the inputs suggested by the call centre agents would be available and also to provide services of KCC by opening their offices in each District. Sixty five per cent of the respondents also suggested providing quickest, easiest and practical solutions to solve the field level problems.

Table 52. Suggestions from farmers in improving KCC service

Sl. No.	Suggestions	Percentage
1.	Call back facility	83
2.	Transfer calls to tier 2 through conferencing	77
3.	Organic way of reducing pests and diseases	75
4.	To provide information of shops where the suggested inputs are available in the respective area/ place	70
5.	To provide services in each district by opening offices of KCC	70
6.	Quickest ,easiest and practical solutions	65
7.	To continue the messages through mobile phones	63

Sixty three per cent of the respondents also suggested continuing the SMS services provided through the mobile phones. Some important suggestions provided by the respondents included, to provide the advisory services slowly, elaborately without rushing. This suggestion was put forward by aged respondents as it was difficult for the aged people to grasp the information through telephones. Another farmer had suggested providing advisory services that were specific to the locality. It was also suggested to provide information from the most knowledgeable person available in the respective field.

4.16.2. Suggestions from Call Centre Agents

The suggestions provided by the call centre agents was to provide some ready to use technologies that would help the call centre agents to provide a better service to the callers.

4.16.3. Suggestions from the Agricultural Officers

The Agricultural Officers suggested recruiting post graduates in agriculture since they have deep knowledge in the related field or to provide the call centre agents with proper field level training so that they are more aware of the possible queries they would face. A second suggestion by Agricultural Officers was to provide Malayalam SMS of recommendations in a format that would be accepted by all type of mobile phones as many of the farmers did not have an advanced mobile phone. It was also suggested by the agricultural officer to provide some mechanism that would enable the farmers to send photos of the diseases or pest to the call centre so that the recommendations provided would be more accurate.

SUMMARY

5. SUMMARY

Information and Communication Technologies (ICTs) has been now accepted as a tool for development worldwide and this is because of the increased benefits and changes it has brought to the various sectors in the economy. The benefits of ICT have also been realized in the field of agriculture also.

Information and Communication Technologies (ICTs) are emerging as an important tool for development world-wide. ICTs are no more confined to assist research and development; the new technologies have made substantial expansions in the life-styles and the efficiency-levels of all sectors of economy. The Agriculture sector is also gearing itself to make optimal use of the new information and communication technologies.

The farmer: extension workers ratio was found to be 2879: 1 by Mukerjee and Maity (2015) which clearly shows that it is impossible for the extension agents to contact all the farmers simultaneously. It is here where ICT plays the role of a life saver. There are umpteen numbers of services that can be accessed by the farming community if educated with proper knowledge on the ICT based services are available.

Agriculture has been the backbone of India since the day human can remember. Every decade a vast number of changes are being faced by the Indian agriculture. It was the green revolution that changed fate of the Indian agriculture and the production and productivity was found to be shooting. The positives in the production were accompanied by the negative effects as well. To meet the increased production criteria farmers started using pesticides, insecticides, and fertilizers more than what was required. Hence the use of pesticides and other chemical was found to increase many diseases and illnesses spreading in the country.

The vegetables and fruits sold in the Kerala markets are flooded with chemicals and the people are reluctantly consuming them. To overcome this situation majority of the households have started cultivating the vegetable crops

they can consume from their own kitchen gardens. The people involved in farming apart from the farmers would lack awareness and knowledge on the pest, diseases, and their management, new technologies in agriculture, availability of seeds etc. Therefore the best answer to the unawareness of the practices is to make use of Kisan Call Centres. Kisan Call Centre which is a flagship project of the Government of India utilizes the ICT technology to provide agricultural advisory services to the farming community by making use of telecommunication devices.

The telecom network in India is highly remarkable and almost every village has got telephone services. This telephone network can be used for delivering information to the farmers. Thus Kisan Call Centres (KCC), a facility to get agricultural information over telephone, plays a significant role. The Kisan Call Center is a synthesis of two hitherto separate technologies namely, the Information & Communication Technology (ICT) and the Agricultural Technology. According to Batchelor and Sugden (2003) simpler technology often produces better results. Telephone access and use can add considerable value to the communication systems of the poor in developing countries. Anurag and Kumar (2012), found out that mobile phone was the most popular ICT gadget among the farming community

The Kisan Call Centre addresses the need of the farming community making use of increased tele-density and Information Technology, making professional help and information available to farmers at their doorstep, on a telephone number, putting the farmers directly in contact with Agricultural Experts and making authentic field data available for Agriculture Policy decisions by the authorities. Expert advice is provided by trained Agricultural Graduates (Level I) in local language. If complex problems exist then the calls would be transferred to the State Agriculture University Scientists, State Department Officials and other responsible experts on-line. Until 2010 the Kisan Call Centre for Kerala was functioning at Thrissur. In 2011 the centre was shifted to Bangalore jointly for Kerala, Karnataka and Lakshadweep. Since the inception of KCC in Kerala, no studies have been conducted and hence the present study

"Agricultural information support service vis-à-vis Kisan Call Centre: A Performance auditing" was undertaken with the objective to conduct a performance audit of Kisan Call Centre (KCC) aimed at suggesting performance improvement of agricultural advisory services, to delineate, categorize and document the constraints and solutions in imparting agricultural advisory service through KCC and to develop an efficiency index that can be used for the further analysis of KCC. Besides the study also aimed to find out the awareness of farmers on KCC and its service, and the utilization and satisfaction derived out of the KCC, which would throw light on the performance/ lacunae in the KCC service with the reasons thereof to stream line the KCC for improved effectiveness.

The study was conducted in the three zones of Kerala. From South zone Thiruvananthapuram, Kottayam and Idukki districts were selected. Ernakulam, Thrissur and Palghat districts were selected from the Central Zone and from Northern zone Kasargode, Wyanad and Malappuram was selected.

There were two categories of respondents. One hundred and fifty farmers were selected from south, central and north zones of Kerala using random sampling for studying the awareness of farmers on KCC and 150 farmers were selected purposefully from the data base of KCC for studying the utilization of KCC. Total there were 300 respondents.

The design of the study was ex- post facto research. The independent variables were selected based on the judges rating. Performance audit and the two dependent variables efficiency of Kisan Call Centre and the attitude of the respondents towards KCC was also measured for the study. All the data were collected using structured questionnaires which were mailed as well distributed among the respondents. The data were subjected to statistical analysis such as mean, standard deviation, percentage analysis, correlation analysis and path analysis.

5.1. SALIENT FINDINGS OF THE STUDY

1. In the study majority of the respondents fell under the middle age group i.e., 52 per cent and 29 per cent of the respondents fell under the high age group which was above 55 years.
2. Seventy three per cent of the respondents in the study were male and only twenty seven per cent of the respondents were female.
3. Forty nine per cent of the respondents were found to have graduate level education, 38 per cent of the respondent had high school level of education followed by higher secondary education (10 per cent) and primary level education (3 per cent).
4. Forty five per cent of the respondents were involved in farming and other occupations. Forty four per cent of the respondent's major source of income was through farming and eleven per cent of the respondents was involved in farming as well as had Government jobs.
5. Most of the respondents (42 per cent) had high level of income per annum which was above Rs 50,000 and 23 per cent of the respondents had low level of income which was less than Rs 25000.
6. More than half of the respondents had medium level of extension agency contact (65 per cent) followed by low level of extension agency contact (18 per cent) and high level of extension agency contact (17 per cent).
7. Low level of innovativeness (60 per cent) was found among the respondent followed by high (29 per cent) and medium level of innovativeness (11 per cent)
8. Sixty per cent of the respondents said that they would prefer to wait and take their own time before adopting an innovation. Twenty nine per cent of the respondents with high level of innovativeness preferred to adopt an innovation as soon as it was brought to their knowledge. Eleven per cent of the respondents adopted an innovation after they saw the other farmers try it successfully

9. Sixty per cent of the respondents were found to have no experience in using internet. Fifteen per cent of the respondents were found to have less than three years of experience to use internet followed by more than six years of experience in using internet (13 per cent) and three to six years of experience in internet usage (12 per cent)
10. Majority of the respondents were found to have medium level of information source utilization (71 per cent). Seventeen percent of the respondents had high level of information source utilization followed by low level of information source utilization (12 per cent).
11. Respondents opted television as the most preferred information source (79 per cent) followed by newspaper (71 per cent), mobile phones (65 per cent), farmer friends (62 per cent), agricultural magazines (59 per cent), radio (53 per cent) and other magazines (52 per cent). The least preferred information sources were relatives (43 per cent) and kiosk (12 per cent).
12. All the respondents from the three zones of Kerala were aware about Kisan Call Centre Services
13. The utilization among the farmers who were aware about the KCC from the three zones only twenty seven percent of the respondents had utilized the service. Eleven percent of the respondents from the northern zone, seven percent of the respondents from the central zone and nine percent of the respondents from the southern zone had utilized the service
14. Sixty four per cent of the respondent from the data base of KCC had temporal awareness on KCC for more than 3 years followed by one to two years of temporal awareness (27 per cent) and less than one year of temporal awareness (9 per cent)
15. Thirty per cent of the respondents source of awareness on KCC was through Television, 16 per cent through radio and television, 10 per cent through radio, 7 per cent through television and newspaper.
16. Majority of the respondents had utilized the service more than six times (52 per cent). Thirty per cent of the respondents utilized the service less than three

times and 18 per cent of the respondents had utilized the service three to six times.

17. Forty six per cent of the respondents partly adopted the practices recommended by the call centre agents, 43 per cent of the respondents adopted the practice completely, 6 per cent of the respondents did not act on the advices, 4 percent of the respondents contacted the extension worker for more details and 1 percent of the respondent discussed the advice with the neighbor.
18. Medium levels of information needs (60 per cent) were found among the respondents followed by high (22 per cent) and low level of information needs (18 per cent).
19. Most of the respondents opined Disease or pest early warning system and management (75 per cent), Soil health management (66 per cent), how to reduce cost of cultivation (63 per cent), climate change (59 per cent), general agriculture (55 per cent), crop insurance (54 per cent), information of crop finance (51 per cent), Government policies (51 per cent), sustainable farming (50 per cent), input prices and availability (49 per cent), water management (43 per cent), success stories of farmers (39 per cent), PHT and value addition (39 per cent), computer based agricultural information (39 per cent), dairy and poultry management (38 per cent), latest package of practices (33 per cent) as most needed information.
20. Facilitation of land records (43 per cent), weather forecasting (43 per cent), commercial agriculture (33 per cent), water conservation through drip and sprinkles (43 per cent), information on agricultural loans (38 per cent), dry land crops and practices (37 per cent) were the needed information by the respondents
21. Quality standards of produce for exports (46 per cent), farm business management information (44 per cent), market infrastructure like ware house and cold storage (43 per cent), agricultural business (42 per cent), INM (35 per cent), information on rural development programme (31 per cent) were the least needed information by the respondents of KCC.

22. Medium level (57 per cent) of peer group contact was found among the respondents followed by high (23 per cent) and low (20 per cent).
23. Seventy seven percent of the respondent found low level of constraint in using the KCC and medium level was constraint was found among 23 per cent of the respondents.
24. Lack of connectivity(64 per cent), inability to comprehend the advice from the call centre agents (49 per cent), lack of infrastructure(44 per cent), illiteracy (42 per cent), lack of awareness about ICT tools (42 per cent), negative mentality in accepting new things (41 per cent), lack of proper training (40 per cent), not compatible with culture (38 per cent), lack of telephones/mobile phones (36 per cent) were the constraints faced by the respondent in using the KCC service.
25. The major queries on the crop black gram, ground nut, sugarcane and paddy were received by Tamil Nadu. Karnataka received crop queries on cotton, pomegranate, coconut and arecanut. Kerala received queries on crops like chilly, banana, coconut and paddy.
26. Karnataka had the highest number of call centre agents(21 call centre agents) followed by Tamil Nadu (16 call centre agents) and Kerala (6 call centre agents).
27. Karnataka received the highest number of average calls (13854 calls) followed by Tamil Nadu with 9632 average calls and Kerala with 1219 average calls
28. Karnataka and Kerala received maximum number of calls during the month of November and least during the month of May. Tamil Nadu received maximum number of average calls during the month of January and least during the month of September.
29. Majority of the respondents were found to have medium level of digital divide (65 per cent) followed by high level of digital divide (19 per cent) and low level of digital divide (16 per cent).
30. Television (99 per cent), mobile phone (93 per cent), newspaper (83 per cent), radio (73 per cent), agricultural magazines (67 per cent), land phones (51 per cent), computer (35 per cent), internet (27 per cent), tablets (8 per cent) were

the tools that were available and accessible to the respondents of the study and the least available and accessible tool was kiosk (91 per cent).

31. Kerala Kisan Call received maximum number of calls during the month of November and least during the month of May.
32. Major calls were received by Kerala on agriculture related queries (87.50 per cent) followed by veterinary (4 per cent), fisheries (1.47 per cent), dairy (1.02 per cent), engineering (1.02 per cent), irrelevant queries/ calls (5 per cent).
33. The Kerala KCC received majority of calls from Malappuram, Palghat, Thrissur, Ernakulam and Trivandrum district and queries on crops like chilly, banana, cowpea, coconut, tomato and paddy were received.
34. Constraints faced by the call centre agents with KCC was the difficulty to understand local dialects, difficulty in understanding the names of different crops and the problem of connectivity
35. The constraints faced by the farmers as perceived by the agricultural officers were illiteracy, the waiting time to get connected to the call centre and the unavailability of the inputs recommended by the call centre agents.
36. Farmer's suggestion to improve the services of KCC included to enable call back facility (83 per cent), to transfer calls to level 2 of KCC through call conferencing (77 per cent), to suggest organic ways of fighting pest and diseases (75 per cent), to provide information of shops where the suggested inputs are available in the respective area/ place (70 per cent), to provide services in each district by opening offices of KCC, (70 per cent), to provide quickest, easiest and practical solutions (65 per cent), to continue the messages through mobile phones (63 per cent),to provide information in elaborate and slow manner without rushing, to suggest solution based on the respective area and to provide service from the most knowledgeable person.
37. Agricultural officers suggestion to improve working of KCC was to appoint subject matter specialist i.e., post graduates in agriculture, to provide field level training to the call centre agents, m to provide Malayalam messages in a universal format suited for all types of mobiles, and to provide a facility to send the photos of disease and pest for better provision of solutions.

38. The call centre agents suggested to provide ready to use technologies to provide better agricultural advisory services to farmers
39. The strength of KCC was found to be its free service provided sixteen hour, seven days a week service provided by the dedicated and experienced staff.
40. The weakness in the functioning of KCC included its lack of agricultural graduates at the time of study, lack of field experience by the staff and lack of knowledge new technologies in agriculture and other allied areas of agriculture.
41. The opportunities of KCC was to make use of new facilities of video conferencing and Whats App, to get connected to level 2 experts through call conferencing from KCC, to provide farmers with timely information on the crops of their choice every month through sms and to send voice messaged to the farmers on the queries they asked immediately after the call ended.
42. The challenges faced by the Kerala KCC was the lower call rate received from the farmers, providing advisory services without actually observing the problem, the lack of call back facility that would bring down the usage of the service by the first time callers and sending messages of crops to those farmers who do not need them
43. In benchmarking study service level standard of KCC was found that 80 per cent of the calls were answered in 30-40 seconds (standard measure- 20 seconds), Average speed to answer which reveals the average time for calls to be answered which includes the amount of time callers wait in a queue while the agent's phone rings, but not the time it takes for callers to navigate through the IVR was found to be 20 seconds (standard measure- 28 seconds). The abandonment rate standard which measures the number of callers that hang up before an agent answers was found to be 8 per cent for Kerala KCC (standard measure 5-8 per cent). Adherence schedule that measures the call center agent's degree of compliance with their assigned schedule was found to be 90 per cent (standard measure 90-95 per cent). Agent attrition that helps to measure the staff turnover annually was found to be 8 per cent for Kerala KCC (standard measure 15 per cent). The call wrap up time standard where

the agent takes time to complete all work associated with after call has ended was found to be 1 min/call (standard measure 6 min/call). The First Call Resolution measures the percentage of all calls where the caller's issues were resolved on the first attempt, without the agent needing to escalate the call, transfer the call or call the customer back was found to be 90-95 per cent (standard 70-75 per cent). The occupancy rate that measures the amount of time agents are on live calls as well as completing work associated with the call was 75 per cent(standard measure (60-80 per cent)

44. The outcome oriented study revealed that 44 per cent of the respondents had medium level of satisfaction and 37 per cent of the respondents had high level of satisfaction towards the KCC.
45. Majority of the respondents perceived that KCC had medium level of efficiency (69 per cent) followed by high (16 per cent) and low (15 per cent).
46. Seventy eight per cent of the respondents rated understandability as the most efficient quality KCC followed by completeness (75 per cent), knowledge gain (73.50 per cent), accuracy (72.67 per cent), reliability (71.67 per cent), timeliness (70.50 per cent), practicality (65.50 per cent), flexibility (64.83 per cent) and connectivity (62.17 per cent).
47. More than half of the respondent had moderately favourable attitude towards KCC followed by highly favourable attitude (26 per cent) and low attitude (26 per cent).
48. Efficiency of KCC was found to have positive correlation with temporal awareness on KCC, satisfaction, utilization of KCC, adoption of advice, peer group contact and negative correlation with extension agency contact, experience in internet use, information source utilization and constraints at 1 per cent significance level.
49. Attitude of respondents towards KCC was found to have positive correlation with digital divide, temporal awareness on KCC, satisfaction, utilization of KCC and negative correlation with constraints at 1 per cent significance level.
50. Satisfaction contributed the maximum direct effect towards the efficiency of KCC (0.5989) and maximum total indirect effect was contributed to the

efficiency of KCC through the variable adoption of advices (0.4644) in path analysis.

51. Satisfaction contributed the maximum direct effect on attitude towards KCC (0.2755) and the maximum total indirect effect was contributed by the utilization of KCC on the attitude towards KCC (0.1159) in path analysis.

5.2 CONCLUSION

Kisan Call Centres services are truly beneficial for the farming community. But the reduced utilization of the services by the farmers is deafening the working of KCC. This has been the major reason for shifting the call centre to Bangalore during the year 2011. The advertisements on KCC has definitely popularized the service among the farmers but the lack of influence from the interpersonal channels like Agricultural officers and Extension agents to utilize the service is the reason for the low usage of the service. Therefore for a state like Kerala a parallel mode of communication is required i.e., the influence of both mass media and interpersonal channels. The call centre is also required to overcome their negatives as well. The problems with regard to connectivity, and sending messages to farmers who do not need them should be corrected by implementing alternative methods to overcome the problems. Finally the KCC which was shifted to Bangalore needs to be brought back to Kerala so that the call centre agent attrition can be reduced.

Kisan Call Centre is the need of the hour for this world where everybody is busy and lacks times. The call centre is just a dial away which brings the agro advisory services to the doorstep of the farmers. If the call centre is better utilized it can bring changes in the farmers life with respect to the agro advisory services received.

5.3. SUGGESTIONS FOR FURTHER RESEARCH

The results of the present study probe the need for further inquiry in other directions. The following suggestion are made for the further research who under take similar studies

- The study was limited to the selected districts from south zone, central zone and north zone due to the limitation of time therefore a survey on the entire Kerala would give a better picture of KCC in Kerala.
- The study was conducted as an ex- post facto research design. Further studies can be conducted using exploratory research design.
- Similar studies can be conducted to measure the KCC working in other states of India where no studies has been conducted
- There is a need to conduct experimental research by making the respondents utilize the service of KCC and then elicit their perception and attitude towards KCC.

REFERENCES

REFERENCES

Acharya, H. S., Dutta, S. R., and Bhoi, R. K. 2013.Information technology and its role to manage sustainable finance. *Int. J. Advanced Res. Manag. Social Sci.* 2(2): 144-149

Adamides, G., Stylianou, A., Kosmas, P. C., Apostolopoulos, C. D. 2013. Factors Affecting PC and Internet Usage by the Rural Population of Cyprus. *Agric. Econ. Rev.* 14(1): 16-35.

Agwu, A. E., Uche-Mba, U. C. and Akinnagbe, O. M. 2008. Use of Information Communication Technologies (ICTs) among Researchers, Extension Workers and Farmers in Abia and Enugu States: Implications for a National Agricultural Extension Policy on ICTs. *J. Agric. Ext.* 12(1): 37-49.

Ahmed, S. M. S., Rayhan, S. J., Islam, A. and Zannath, N. E. 2012. Customers' attitude towards agro based benefits provided by the telecommunication operators in Bangladesh. *Eur. J. Business Manag.* 4(1): 70-81.

Ajala, A. O., Ogunjimi, S.I. and Farinde, A.J. 2013. Assessment of extension service delivery on improved cassava technologies among cassava farmers in Osun State, Nigeria. *Int. J. Appl. Agric. Apicultural Res.* 9(1): 71-80.

Ajayi, O. J., Muhammed, Y., Tsado, J. H., Jibrin, S. and Olorunshola, A. E. 2015. Effects of extension services on cassava production in Akoko North-East of Ondo State, Nigeria. *Nigerian J. Agric. Food Environ.* 11(3):19-24.

Ajijola, S., Awoyemi, D. O., Egbetokun, O. A. , Odetola, S. K. Usman, J. M. 2015. Socio economic effect on the use of Information and Communication Technology among rural farming households in Afijio Local Government area, Oyo State, Nigeria. *J. Econ. Sustain. Dev.* 6(19): 51-58.

Akpabio, I. A., Okon, D. P. and Inyang, E. B. 2007. Constraints affecting ICT utilisation by Agricultural Extension Officers in the Niger Delta, Nigeria. *The J. of Agric. Educ. Ext.* 13: 263-272.

Akudolu, L.R., 2004, 'Information and Communication Technology (ICT) centered education: a necessity for national development. *Nigeria J. Comput. Literacy* 3(1): 12-15.

Alvare, J. and Nuthall, P. 2006. Adoption of computer based information systems. The case of dairy farmers in Canterbury, NZ, and Florida, Uruguay. *Comput. Electr. Agric.* 50(1): 48-60.

Anandaraja, N. 2002. Developing farmers friendly interactive multimedia compact disc and testing its effectiveness in transfer of farm technology. Ph. D. thesis, TNAU, Coimbatore, 177p.

Anderson, N. and Baskin, C. 2002; Can we leave it to chance? New learning technologies and the problem of professional competence. *Int. Educ. J.* 3(3):126-137.

Ankuya, K. J. and Ashwar, P. B. 2014. Influence of socio-economic factors on adoption of poultry farming. *Guj. J. Ext. Educ.* 25(1): 33-39.

Ansari, M. A. and Pandey, N. 2013. Assessing the potential and use of mobile phones in agriculture. *Karnataka J. Agric. Sci.* 26 (3): 388-392.

Anupama, S. 2014. Content development for an Agricultural Expert System on organic vegetable cultivation. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 74p.

Anurag, T. S. and Kumar, S. 2012. Interactive information dissemination system: architecture for disseminating information to farmer. Info. Technol. Developing Countries 22(2): 2-5.

Armstrong, L., and Gandhi, N. 2012. Factors influencing the use of Information and Communication Technology (ICT) tools by the rural famers in Ratnagiri District of Maharashtra, India. Proceedings of the third national conference on agro informatics and precision agriculture, Hyderabad, India. Allied Publishers Private Ltd, Maharashtra, pp. 58-63.

Arya, N. 2004. Kisan Call Centre- a brilliant defunct. *Agric. Spectrum* 1(3): 8-11.

Asiedu-Darko, E. 2014. Effects of gender, education and age on the adoption of agricultural technologies in Ashanti, Northern and Eastern regions of Ghana. *J. Appl. Sci. Res.* 2 (1):112-118.

Avgerou, C. 2000. Recognizing alternative rationalities in the development of information system. *The Electr. J. Inf. Syst. Dev. Countries* 3(7): 1-15.

Babu, S. C., Glendenning, C. J., Okyere, K. A. and Govindarajan, S. K. 2011. Farmers' information needs and search behaviors: Case study in Tamil Nadu, India. In: *Abstracts International Association of Agricultural Economists*; 18- 24, August, 2002, Brazil. International Food Policy Research Institute, Brazil, p. 54.

Bachhav, N. B. 2012. Information needs of the rural farmers: A study from Maharashtra, India: A Survey. *Libr. Philos. Practice* [e-journal] 866. Available http://digitalcommons.unl.edu/libphilprac/866. ISSN 1522-0222 [10 March 2016].

Batchelor, S. and Sugden, S. 2003. An Analysis of info Dev Case Studies: Lessons Learned. InfoDev, Washington [on-line]. Available: http:// www.sustainableicts. org/ infodev/ infodevreport. pdf [22 May 2015].

Beena, S. 2002. Performance andpotential of grama sabhas in crop production in Anthiyanoor block of Thiruvananthapuram district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 74p.

Bharud, R. W., Andhale, R. P. and Darekar, A. 2015. e-Kapas network – extension of technologies on cotton cultivation through ICT. In: *International Conference in Recent Research Developments in Environment, Social Science and Humanities*, 27 September 2015, Delhi. University of Delhi, Conference Center, New Delhi, pp. 94-100.

Bondale, H. P., Chavali, A. M., Tarde, V. J. and Susane, G. K. 2005. Role of Kisan Call Centre in dissemination of agricultural technology. *J. Agric. Ext. Manag.* 6(2): 77-83.

Boote, D.N. and Beile, P. 2005. Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educ. Res.* 34(6): 3-15.

Carter, B.R. and Batte, M. T. 1993. Identifying needs and audiences in farm management outreach education. *Rev. Agric. Econ.* 15(3): 403-415.

Cecchini, S. 2003. Tapping ICT to Reduce poverty in rural India. *IEEE Technol. Soc. Mag.* 22(2): 20-27.

Census report. 2011. Government of India [on-line]. Available: http://www.censusindia.gov.in/2011census/PCA/PCA_Highlights/pca_highlights_file/India/Chapter-1.pdf [8 July 2016].

Chauhan, N. M. 2010. Expectations of the farmers from ICT in agriculture. *Indian Res. J. Ext. Educ.* 10(1): 42-45.

Chauhan, N. M. and Chauhan, N. B. 2011. Opinion of the farmers about use of internet technology in agriculture in India. *Karnataka J. Agric. Sci.* 24 (4): 599-600.

Chauhan, N. M. and Thakur, R. F. 2004. Expectations of the farmers towards community internet centers at village level. *Guj. J. Ext. Educ.* 15: 55-59.

Chen, W. and Wellman, B. 2004. The global digital divide – within and between countries. *IT & Soc.* 1(7): 39-45.

Chhachar, A. R., Querestic, B., Khushk, G.M. and Ahmed, S. 2014. Impact of ICTs in Agriculture Development. *J. Basic Appl. Sci. Res.* 4(1):281-288.

Chowdhury, N. 2000. Information and Communications Technologies and IFPRI's Mandate: A Conceptual Framework. [on-line].Available: http://www.ifpri.org/divs/cd/dp/ictdp01.pdf [01 May 2016].

CIMMYT(International Maize and Wheat Improvement Center) 1993. The Adoption of Agriculture Technology: A guide for survey design. CIMMYT, Mexico, 88p.

Demiryurek, K. 2008. Agricultural information systems and communication networks: the case of dairy farmers in the Samsun province of Turkey. *Inf. Res.* 13(2):343-349.

Derso, D., Yared Mamo, Y. and Haji, J. 2014. Analyzing socio-economic factors affecting the use of information and communication technologies among farmers in central highlands of Ethiopia. *Afr. J. Agric. Sci. Technol.* 2(8): 163- 17.

Devi, U. and Verma, S. 2011. Farm women preferences of communication sources for farm information. *Indian. Res. J. Ext. Educ.* 11(2): 3-5.

Dhaka, B.L. and Chayal, K. 2010. Farmers' experience with ICTs on transfer of technology in changing agri-rural environment. *Indian Res. J. Ext. Educ.* 10(3): 114-118.

Dittenhofer, M. 2001. Performance auditing in governments. *Managerial Auditing J.* 16(8): 438-442.

Durga, P. K. 2004. Farmers help line- A new dimension. *Kisan World* 31(12): 25-26.

Edwards, A. L. 1957. *Techniques of Attitude Scale Construction.* Ardent Media, New York, 256p.

Elsey, B. and Sirichoti, K. 2003. The theory and practice of workplace learning in the adoption of integrated pest management by tropical fruit growers in Thailand. *J. of Workplace Learning* 15(2): 53-62.

Etwire, P. M., Al-Hassan, R. M., Kuwornu, J. K. M. and Osei-Owusu, Y. 2013. Smallholder farmers' adoption of technologies for adaptation to climate change in Northern Ghana. *J. Agric. Ext. and Rural Dev.* 5(6): 121-129.

FAO (Food and Agriculture Organization) 2009. *How to feed the world in 2050.* Food and Agriculture Organization, Rome, Italy, 32p.

Farooqi, M. S., Singh, N., and Islam, S. 2002. Information technology potential and prospects. *Agric. Ext. Rev.* 14(5): 25-27.

Feinberg, R. A., Trotter, M. and Anton, J. 2000. Anytime, anywhere, anyhow," In: Anderson C. (ed.), *Defying the Limits.* Montgomery Research, San Francisco, pp. 297-303.

Fereshteh, G. G. and Ali, A. M. 2012. Analyzing of Agricultural wheat farmers behavior related to agricultural advisory services. *World Appl. Sci. J.* 16(9): 1321-1328.

Fryer, K., Antony, J. and Ogden, S. 2009. Performance management in the public sector. *Int. J. Public Sector Manag.* 22(6): 478-498.

Funkhouser, M. 2011. Accountability, performance and performance auditing: reconciling the views of scholars and auditors. In: Lonsdale, J., Wilkins, P. and Ling, T. (eds.), *Performance Auditing: Contributing to Accountability in Democratic Government.* Edward Elgar Publishing Limited, Cheltenham, pp. 209- 230.

Furubo, J. E. 2011. Performance Auditing: audit or misnomer?, In: Lonsdale, J., Wilkins, P. and Ling, T. (eds.), *Performance Auditing: Contributing to Accountability in Democratic Government.* Edward Elgar Publishing Limited, Cheltenham, pp. 22- 50.

Ganesan, M., Kavitha, K., Suma, P. and Jayalakshmi, U. 2013. Use of mobile multimedia agricultural advisory systems by Indian farmers: Results of a survey. *J. Agric. Ext. and Rural Dev.* 5(4): 89-99.

Ganesh, K. P. 2008. Information and communication technologies enabled agricultural extension system in Andhra Pradesh- A critical analysis. Ph. D. (Ag) thesis, ANGRAU, Hyderabad, 138p.

Gautam, D. K. 2014. Impact of digital divide and public libraries. *J. Humanities Social Sci.* 19(12): 59-63.

Gopalakrishnan, G. 2012. That influences the effectiveness and efficiency of a human resource management in an organisation. *Int. J. Econ. Manag. Sci.* 1(6): 65-70.

Gosh, S. 2001. Information and Communication Technology in Rural Development. *Kurushetra*, Nov. 2001, pp 2: 5.

Government of India. 2008. Planning Commission- Kerala Development Report. Academic Foundation [on-line]. Available: http ://worldsci.Net ee /documents /IT _i n_ Kerala_-_ Final_ draft_-_ January_27. Pdf [1 July 2016].

GOK [Government of Kerala]. 2016. GOK home page [on line]. Available: https://www.kerala.gov.in/web/guest/districts [08 May. 2016].

Grudzinski, J. and Panasiewicz, M. 2000. Agricultural extension aid by means of information- perspectives and limitation. *J. Inzynieria-Rolnicza* 6(7): 54-60.

Hanglem, A., Saravanan, R. and Pradhan, K. 2015. Utilization pattern of communication sources among the farmers of Manipur. *Indian Res. J. Ext. Educ.* 15 (1): 31-34.

Hanjabam, S. 2013. Analysis of constraints and strategies for scaling up of precision farming in Kerala. M. Sc. (Ag.) Thesis. Kerala Agricultural University, Thrissur, 95p.

Hanumankar, H. R. 2005 Effectiveness of Kisan Call Centre for Agricultural Information Delivery. In: Sarvanan, C and Indira D. T. (eds), *Information and Communication Technology for Agriculture and Rural Development*. New India Publishing Agency, New Delhi, pp. 143-150.

Heeks, R. 1999. *Information and Communication Technologies, Poverty and Development*. Development Informatics Working Paper Series No. 5, Institute for Development Policy and Management, Manchester, 14p.

Hinduja, N. A. 2014. Innovations in e- Agricultural Extension Technology (e-AET): Diffusion and adoption of information kiosks and mobile initiatives among the farmers of Thiruvananthapuram district, Kerala. MSc. (Ag) Thesis, Kerala Agricultural University, Thrissur, 150p.

IASB (International Accounting Standards Board) 2008. *Exposure Draft on an improved Conceptual Framework for Financial Reporting: The Objective of Financial Reporting and Qualitative Characteristics of Decision-useful Financial Reporting Information.* International Accounting Standards Board, London, 64p.

Ingale, N. S. 2002. India – ICT use in Agricultural Extension. In: *Proceedings of Study Meeting on Application of Information Technology for Effective Agricultural Extension*; 8-14, December, 2002, New Delhi. Asian Productivity Organization, Tokyo, pp 34-44.

International Finance Corporation. 2010. Measuring Call Center Performance Global Best Practices [on-line]. Available:

http://www.ifc.org/wps/wcm/connect/75ce96004cf85d4f8752c7f81ee631cc/Tool+9.4.+Measuring+Call+Center+Performance.pdf?MOD=AJPERES [04 June 2016].

Islam, S., Islam, M., Abdullah and Yesmin, R. 2014. Rural womens awareness on agricultural extension services: a case study on Manikgonj district in Bangladesh. *J. Agric. Vet. Sci.* 7(9): 54-58.

Jaganathan, D. 2004. Analysis of organic farming practices in vegetable cultivation in Thiruvananthapuram district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 115p.

Jayawardhana, J. K. J. P. 2007. Organic agricultural practices in coconut based homesteads in Thiruvananthapuram district. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 99p.

Jensen, R. 2007. The digital provide: information (technology) market performance, and welfare in the South Indian fisheries sector, *The Q. J. Econ.* 122(3): 879-924.

Jones, G.E. 1997. The history, development and the future of agricultural extension. In. Swanson, B.E., Bentz, R.P. and Sofranko, A.J. (eds), *Improving agricultural extension – A reference manual, Rome*. Food and Agriculture Organisation of the United Nations, Rome, pp. 1-15.

Kabir, K. H. 2015. Attitude and level of knowledge of farmers on ICT based farming. *Eur. Acad. Res.* 2(10): 13177-13196.

Kadiam, P., Reddy. M. J. M. and Rao, V. A. 2012. *Information technology: An effective tool in agricultural communication.* Kalyani Publishers, New Delhi, 107p.

Kalim Qamar, M. 2005. *Modernizing national agricultural extension systems; A Practice Guide for Policy-Markets of Developing Countries.* Food and Agricultural Organisation: of the United Nations, Rome, 69p.

Karnka, S. 2006. ICTs appropriate model for e-farmers group development in Thailand. *Proceedings of the 4th World Congress Conference: Computer in Agriculture and National Resources*, Florida: Orlando, pp. 140 - 145.

Karuppasamy. A and Sriram. N. 2015. Effectiveness of paddy expert system in terms of knowledge gain, skill acquisition and symbolic adoption behaviour among the paddy growers of Thoothukudi District in South Tamil Nadu. *Int. J. Innovative Res. Sci. Technol.* 1(10): 129-132.

Kazemi, M. 2013. Modeling the adoption of rapeseed product insurance among rapeseed farmers in Sari. *Int. J. Agric. Crop Sci.* 6 (6): 313-320.

Kerlinger, F. N. 1973. *Foundations of Behavioral Research.* American Problem Series, New York, 741p.

Khan, M. A. 1988. Performance auditing- the three 'E's. *Asian J. Govt. Audit* 6:15-20.

Khobragade, A. M., Ade, A. U. and Vaseem, A. M. G. 2014. Usefulness of Agro Advisory Services (AAS) Regarding climate change in selected villages of AICRPAMNICRA project for Marathwada region. *J. Agroecology Nat. Resour. Manag.* 1(3): 127-129.

Kilelu, C., Klerkx, L. and Leeuwis, C. 2013. Unraveling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a small holder dairy development programme. *Agric. Syst.* 118: 65-77.

Kirui, O. K., Okello, J. J. and Nyikal, R. A. 2010. Awareness and use of m-banking services in agriculture: The case of smallholder farmers in Kenya. In: *Abstracts, 3rd African Association of Agricultural Economics, AAEA/ AEASA Conference*; Cape Town, South Africa, 19-23 September, 2010, Africa, p 17.

Kumar, G. and Sankarakumar, R. 2012. Impact of Information and Communication Technology in Agriculture – Perception of the Farmers in Ramanathapuram District. *Int. J. of Statistika and Mathematika* 4(2): 33-41.

Kumari, N., Choudhary, S. B., Jha, S. K. and Singh, S. R. K. 2014. Radio: An Educational Media to Transfer Agricultural Information among Farmers. *Indian Res. J. Ext. Educ.* 14 (2): 130-132.

Lavanya, P., Karthikeyan, C. and Venkata, P. J. 2009. Needs and expectations of the farmers with the services of Kisan Call Centre. *J. Rural Dev.* 28(9): 1-2.

Lawal, A.O. 2008. Information and Communication Technology Usage in Research – Extension-Farmers Linkages system for Agricultural Development in South West Nigeria. Ph. D. thesis, University of Agriculture Abeokuta, Nigeria, 200p.

Leeuw, F. L. 1996. Performance auditing, new public management and performance improvement: questions and answers. *Accounting, Auditing, and Accountability J.* 9(2): 92-102.

Lenk, K. and Traunmuller, R. 1996. Innovative Public Information system. In: Bots, P., Lenk, K. and Traunmuller, R.(eds), *Advanced IT Tools.* The

International Federation for Information Processing, Germany, pp11-18.

Ling, T. 2009. A framework for understanding the contribution of public services to public benefit. In: Ling, T. and Dijk, L. V. (eds), *Performance Audit Handbook, Routes to effective evaluation*. Rand Corporation, United Kingdom, pp. 6-10.

Llewellyn, R. S. 2007. Information quality and effectiveness for more rapid adoption decisions by farmers. *Field Crops Res.* 104: 148-156.

Low, J. 2000. The value creation index. *J. Intellectual Capital* 1(3): 252 – 262.

Lucky, A. T. and Achebe, N. E. E. 2012. The effect of digital divide on information accessibility among undergraduate students of Ahmadu Bello University, Zaria. *Res. J. Info. Technol.* 5(1): 01-10.

Malhan, I. V. 2009. Trends of building and accessing digital collections and problems of digital divide in the emerging digital era. *Srilankan J. Librarianship and Inf. Manag.* 2(1): 5-10.

Meera S. N. 2002. A critical analysis of information techbology in agricultural development: Impact and implications. Ph. D. thesis, IARI, New Delhi 185p.

Meera, S. N., Jhamtani, A., and Rao, D. U. M. 2004. Information and communication technology in agricultural development: a comparative analysis of three projects from India [on line]. Available:http://www.odi.org.uk/work/projects/agren/papers/agrenpaper_135.pdf [12th Sept 2015].

Meitei, S. L. and Devi, P. T. 2009. Farmers information needs in rural Manipur. *Lib. Info. Stud.* 56(2): 35-40.

Michiel, S., and Crowder, V. L. 2001. Discovering the Magic Box - Local appropriation of information and communication technologies (ICTs) [on-line]. Available: http://www.fao.org/sd/2001/KN0602aen.html [09 Feb. 2016].

Mittal, S. and Mehar, M. 2013. Agricultural information networks, information needs and risk management strategies: a survey of farmers in Indo-Gangetic plains of India [on-line]. Available: http://libcatalog .cimmyt.org/download/cim/98167.pdf. [24 Sept.2015].

Moghaddam, K. and Khatoon-Abadi, A. 2013. Factors affecting ICT adoption among rural users: A case study of ICT Centres in Iran. *Telecommunications Policy* 37: 1083-1094.

Mohan, B. and Singh, K. 2007. Role of Information Communication Technologies (ICT) for Developing Better Management Skills in Agriculture & Allied Sectors. *Agric. Ext. Rev.* 19(1): 33-38.

Muhammad N., Mondol, A. S. and Hasan, F. 2015. Effectiveness of union information and services centre in utilization of farm information. *Int. J. Agic. Ext.* 3(1): 37- 45.

Mukherjee, A. and Maity, A. 2015. Public–private partnership for convergence of extension services in Indian agriculture. *Current Science* 109(9): 1557-1563.

Murali, A. 1993. Audiotex system for monitoring and control of pests in field crops. *EPPO Bulletin.* 23(4):583-588.

Muthiah, G., Prashanth, S., Umadikar, J. and Karthikeyan, K. 2013. An exploratory study of mobile multimedia agricultural advisory system:

challenges and lessons from Tamil Nadu, India. *The Electr. J. Info. Syst. Dev. Countries* 56(5): 1-14.

Namisiko, P. and Aballo, M. 2013. Current Status of e-Agriculture and Global Trends: A Survey Conducted in Trans Nzoia County, Kenya. *Int. J. of Sci. and Res.* 2(7) 18-22.

Nayak, S. K., Throat, S. B. and Kalyankar, N. V. 2010. Reaching the unreached: A Role of ICT in sustainable Rural development. *Int. J. Comput. Sci. Inf. Security* 7(1):220-224.

Neethi, B., Sailaja, A. and Soumya, B. 2014. A Study on utilisation pattern of information sources by the farmers of Mahabubnagar District in Andhra Pradesh. *Int. J. Sci. Res.* 3(8): 15-17.

Ngathou, I. N., Bukenya, J. O. and Chembezi, D. M. 2002. Managing agricultural risk: examining information sources preferred by limited resource farmers. *J. Ext.* 44(6): 29-36.

Nyaga E. K. Is ICT in Agricultural Extension Feasible in Enhancing Marketing of Agricultural Produce in Kenya: A Case of Kiambu District. *Q. J. Intl. Agric.* 51(3): 245-256.

Obinna, L. O. and Agu - Aguiyi, F. N. 2014. Group Dynamics and Innovation Dissemination among Female Cassava Farmers in Ikwuano Local Government Area of Abia State, Nigeria. *Discourse J. of Agric. Food Sci.* 2(10): 284-290.

Okoedo-Okojie, D. U. and Omoregbee, F. E. 2012. Determinants of Access and Farmers' use of Information and Communication Technologies (ICTs) in Edo State, Nigeria. *J. Appl. Sci. Environ. Manag.* 16(1): 41 – 44.

Olaniyi, O. A. 2013. Assessment of utilization of Information and Communication Technologies (ICTs) among poultry farmers in Nigeria: An emerging challenge. *J. of Anim. Sci. Adv.* 3(7): 361-369.

Oppenheim, A. N. 2001. *Questionnaire, Design, Interview and Attitude Measurement*. Bloomsbury Academic, London, 312p.

Orhan, O. O., Boz, I. K., Demiryurek, D., Bostan B., Karaturhan, B. and Akcaoz, H. 2011. Developing participatory extension applications in Turkey. *Afr. J. Agric. Res.* 6(2): 407-415.

Owhotu, V. B. 2009. Goals, challenges and prospects of UNESCO teacher training initiative in Sub-Saharan Africa. In: V. B. Owhotu (ed.) Innovation and Best Practices in Teacher Education. Sibon Books Ltd, Nigeria, pp 35-37.

Palaiah, R. K., Bharatesh, S. M., Dechamma, S. and Devaraj, K. 2016. Attitude of farmers about use of IT tools in farm communication. In: Proceedings of the twenty first International Academic Conference, 9 February 2016, Miami, pp 117-127.

Panda, I., Chhatar, D. C. and Mharana. B. 2013. A Brief view to digital divide in Indian scenario. *Int. J. Sci. Res.* 3(12): 1-7.

Panse, V. G., Sukhatme, P. V. 1967. Genetics and quantitative characters in relation to plant breeding. *Indian J. Gen.* 17: 318-332.

Paonam, M. and Ram, D. 2015. Awareness Level of Poultry Husbandry Practices by the Poultry Farmers in Imphal West District of Manipur. *Indian J. of Ext. Educ.* 51(3): 172-174.

Patel, Y. V. and Padheria, M. M. 2010. Extent of technological gap and its relationship with Situational, Socioeconomic, Psychological and

Communicational characteristics of safflower growers. *Indian Res. J. Extn. Educ.* 10(2): 93-98.

Pessanelli, D. 1993. The plug-in school: A learning environment for the 21 st century. *The Futurist* 27(5): 29-32.

Pinprayong, B. and Siengthai, S. 2012. Restructuring for organizational efficiency in the banking sector in Thailand: a case study of Siam Commercial Bank. *Far East J. Psychol and Business* 8(2): 29-42.

Popa, M. 2011. Framework for evaluation of the IT&C audit metrics impact. *Informatica Economică* 15(4): 119-133.

Purohit, H.C. 2009. Advancement of information technology and its impact on agriculture productivity. *Kurukshetra.* 57: 20-24.

Qtaishat, T. and Al-sharafat, A. 2012. Attitudes of vegetable farmers towards public agricultural extension services. *Am. J. of Agric. Biol. Sci.* 7(3): 370-377.

Raghuprasad, K. P., Devaraja, S. C. and Gopala, Y. M. 2012. Attitude of farmers towards utilization of Information CommunicationTechnology (ICT) tools in farm communication. *Res. J. Agric. Sci.* 3(5): 1035-1037.

Rahul, K. 2013. Techno socio- economic characterization of specialized homegardens: a dominance- diversity approach. M. Sc. (Ag.) Thesis. Kerala Agricultural University, Thrissur, 136p.

Raj. S. 2015. Agricultural Innovation Systems (AIS): A Study of stakeholders and their relations in System of Rice Intensification (SRI). *J. Agric. Educ. Ext.* 21(4): 343-368.

Rajula, S. T. and Thiagarajan, R. 2011. Interactive multimedia instruction versus traditional programmes: Analysis of their effectiveness and perception. *J. Agric. Educ. Ext.* 17(5): 459-472.

Rakesh, K. 2010. Precision farming in sugarcane- A diagnostic study. M. Sc. (Ag.) thesis, Tamil Nadu Agricultural University, Coimbatore. 75p.

Ram, K., Bhati, G. S. and Patel, G. K. 2014. Dynamic personality of farmers and their attitude towards use of Kisan Call Centre. *Guj. J. Ext. Educ.* 25(1): 104-107.

Rashid, M., Mondol, A.S., Rahman, S. and Noman, R. A. F. 2015. Use of communication sources by the women beneficiaries of RDRS in income generating activities. *Int. J. Agric. Ext.* 3(3): 185-194.

Rebecca, A. A. 2012. Attitude of women farmers towards agricultural extension services in Ifelodun local government area, Osun State. Am. *J. Social Manag. Sci.* 3(3): 99- 105.

Richardson, D. 1996. *The Internet and rural development: recommendations for strategy and activity – final report.* Sustainable Development Department of the Food and Agriculture Organization of the United Nations, Rome [on-line]. Available: http://www.fao.org/sd-dimensions [23 May 2015].

Robert, E. 2001. The economics of extension incepting in rural extension. In: Swanson, B. E., Bentz, R. P. and Sofranko, A. J. (eds), *Improving Agricultural Extension: a Reference Manual.* Elsevier applied sciences publication, Amsterdam, pp 65-91.

Roman, R and Colle, R. D. 2003. Content creation for ICT development projects: Integrating normative approaches and community demand. *Info. Technol. Dev.* 10(2): 85–94.

Ronald, B., Silayo, G. F. and Abdalah, K. J. 2015. Preference sources of information used by seaweeds farmers in Unguja, Zanzibar. *Int. J. Acad. Lib. Info. Sci.* 3(4): 606-616.

Sokoya, A. A., Adefunke, O. A. and Fagbola, B. O. Farmers information literacy and awareness towards agricultural produce and food security: FADAMA III programs in Osun state Nigeria [on-line] Available: http://library.ifla.org/1001/1/140-sokoya-en.pdf [24 Aug. 2016]

Saghier, N. E and Nathan, D. 2013. Service Quality Dimensions and Customers' Satisfactions of Banks in Egypt. Proceedings of 20th International Business Research Conference, 4 - 5 April 2013, Dubai, UAE, pp 1-13.

Šakalytė, E. 2013. Organizational Assessment: Effectiveness VS Efficiency. *Social Transformations in Contemporary Soc.* 1(1): 45-53.

Sakib, H., Afrad, S. I. and Ali, M. 2015. Information source preference of farmers regarding modern aquaculture technologies in Bogra District of Bangladesh. *Int. J. Agric. Ext.* 3(1): 1-5.

Sambasivan, N., Cutrell, E., Toyama, K. and Nardi, B. 2010. Intermediated Technology Use in Developing Communities. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 4 October 2010*, New York, pp 2583-2592.

Sammadar, A. 2006. Traditional and Post-Traditional: A Study of Agricultural Rituals in Relation to Technological Complexity among Rice Producers in Two Zones of West Bengal, India. *J. of Cult. Agric.* 28(2): 108-121.

Sangeetha, S. 2008. Study on factors influencing the adoption of precision farmning technologies in tomato cultivation. M. Sc. (Ag.) thesis, Tamil Nadu Agricultural University, Coimbatore. 78 p.

Saravan, R., Raja, P., Tayeng S. 2008. Information input pattern and information need of Tribal Farmers in Arnuchal Pradesh. *Indian J. Ext. Educ.* 45 (2): 51-54.

Saravanan, R., and Suchiradipta B. 2014. Mobile Phone Applications for Agricultural Extension in India. In: Saravanan, R (ed.).*Mobile Phones for Agricultural Extension: Worldwide mAgri Innovations and Promise for Future.* New India Publishing Agency, New Delhi. pp. 1-75

Sasankan, V. R. 2004. Production system typology and technology utilization pattern in cassava cultivation in Thiruvananthapuram district. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 97 p.

Savithramma, Manjunathm, M., Parvathamma, T., Naika, K. V. R. 2013. Farmers awareness of kisan call centre and the symbolic adoption of advices in Karnataka. *J. of Extn. Educ.* 26(2): 5236-5240.

Schnitkey, G., Batte, M., Jones, E. and Botomogno, J. 1992. Information preferences of Ohio commercial farmers: Implications for extension. *Am. Agric. Econ. Assoc.* 74: 486- 497.

Shah, P. 2009. Operationalizing ICT in the rural space [on-line] Available: http://web//world bank.org [24 May 2016]

Shankaraiah, N. and Swamy, B. K. N. 2012. Attitude of Farmers and Scientists Towards Dissemination of Technologies Through Mobile Message Service (MMS). *Trop. Agric. Res.* 24 (1): 31 - 41.

Sharma, A. K. 2014. Farmer's satisfaction with information sources and services: a study on farmer's opinion. *Int. J. Info. Res.* 3(4): 346-359.

Sharma, B.R., Singh, P. and Sharma, A. 2011. Role of Kisan Call Centres in Hill Agriculture. *Ind. Jn. of Agri. Econ.* 66(3): 533-538.

Shlomo, M. and Idit, N. W. 2007. Evaluating the Effectiveness of Auditing in Local Municipalities using Analytic Hierarchy Process (AHP): A General Model and the Israeli Example. International Journal of Auditing 11(3): 187-210.

Singh A.K., Singh L., and Riyajuddeen 2008. Role of Helpline Services in Technology Dissemination. *Indian Res. J. Ext. Educ.* 8(1): 1-4.

Singh, N. P. 1971. Risk taking and anxiety among successful, unsuccessful, traditional and progressive agricultural entrepreneurs of Delhi. *Br. J. Social Clin. Psychol.* 9:301-308.

Sireesha, P., Rao, S. and Thammi, D. 2014. Constraints encountered in the utilization of information and communication technology (ICT) tools by various animal husbandry (A.H.) organizations in Andhra Pradesh. *Int. J. Innovative Res. Sci. Eng. Technol.* 3(6): 13693 -13701.

Slathia, P. S., Paul, N. and Nain, M. S. 2011. Awareness among farming community regarding Kisan Call Centres in Jammu Region. *Int. J. Ext. Educ.* 7: 41-46.

Smith, C. H., Lanier R. A. and. Taylor, M. E. 1972. The Accounting Review April, pp. 270-283.

Sobalaje, A. J. and Adigun, G. O. 2013. Use of Information and Communication Technologies (ICTs) by Yam Farmers in Boluwaduro Local Government Area of Osun State, Nigeria [on-line]. Available: http://digitalcommons.unl.edu/libphilprac/1018 [7 Oct. 2015].

Sobha, S. 2013. Farm telecast in Kerala- Acritical appraisal. M. Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 110p.

Solano, C. and Shiro, U. 2008. A case study of DIY ICT. Journal of Information Management. 10: 46-60.

Sundar, J. and Ramakrishnana, L. 2013. A Study on Farmers' Awareness, Perception and Willing To Join and Pay for Crop Insurance. *Int. J. of Business Manag. Invention* 2(1): 48-54.

Swaminathan, B. and Balan, K. C. S. 2013. An inquiry in to the role of group dynamics in enhancing farm remuneration. *Am. Int. J. Res. Humanities, Arts and Social Sci.* 4(1): 41-44.

Syiem, R. and Raj, S. 2015. Access and usage of ICTs for agriculture and rural development by the tribal farmers in Meghalaya State of North-East India. *J. of Agric. Informatics* 6(3): 24- 41.

Talbot, C. 1999. Public Performance- towards a new model?. *Public Policy and Administration.* 14(15):15-33.

Tilleman, S. and Bogt, H. J. 2010. Performance auditing Improving the quality of political and democratic processes?. *Critical Perspectives on Accounting* 21(3): 754-769.

Tirfe, A. G. 2014. Smallholder farmers' innovation and its determinants the case of Hirty Mekan seed producers' cooperative, Tigray, Ethiopia. *Developing Country Studies* 4(21): 104-114.

Tologbonse, D., Fashola, O. and Obadiah, M. 2008. Policy Issues in Meeting Rice Farmers Agricultural Information Needs in Niger State. *J. Agric. Ext.* 12(2): 84-94.

Tucker, M. and Napier, T. L. 2002. Preferred sources and channels of soil and water conservation information among farmers in three Midwestern US watershed. *Agric. Ecosyst. Environ.* 92(1): 297:313.

Van Looke, E. and Put, V. 2011. The impact of performance audits: a review of the existing evidence. In: Lonsdale, J., Wilkins, P. and Ling, T. (eds.), *Performance Auditing: Contributing to Accountability in Democratic Government*. Edward Elgar Publishing Limited, Cheltenham, pp. 175-208.

Varghese, L. 2011. Organic vegetable issues and strategies- A review. *Agrl. Rev.* 21: 211-222.

Verbeeten, F. H. M. 2008. Performance management practice in public sector organizations Impact on performance. *Accounting, Auditing & Accountability J.* 21(3): 427-454.

Vignare, K. 2013. Options and Strategies for Information and Communication Technologies within Agricultural Extension and Advisory Services, MEAS [on-line]. Available: http:?/www. meas-extension. org/measoffes /best- practice. [21 June 2015].

Vosough, A., Eghtedari, N. and Binaian, A. 2015. Factors affecting ICT adoption in rural area: A Case Study of Rural users in Iran. *Res. J. Fish. Hydrobiol.* 10(10): 611-616.

Waller, B. E., Hoy, C. W., Henderson, J. L., Stinner, B. and Welty. C. 1992. Matching innovations with potential users, a case study of potato IPM practices. *Agric. Ecosyst. Environ.* 70(3): 203-215.

World Bank. 2011. *World Development Report 2011: Agriculture in Development* [online]. Available: http://siteresources.worldbank.org/INTWDR 2008 / Resources /2795087- 1192111580172 / WDROver 2008- ENG .pdf [7 May 2016].

Wright, S. 1921. Correlation and causation. *J. Agric. Res.* 20: 557-585.

Yelapure, S. J. and Kulkarni, R. V. 2012. Literature Review on Expert System in Agriculture. *Int. J. Comp. Sci. Inf. Technol.* 3(5): 5086-5089.

Zijp, W. 1994. *Improving the Transfer and Use of Agricultural Information: A Guide to Information Technology.* World Bank Discussion Paper *No.* 247, Washington: World Bank, 118p.

AGRICULTURAL INFORMATION SUPPORT SERVICE VIS-À-VIS KISAN CALL CENTRE: A PERFORMANCE AUDITING

by

SHELY MARY KOSHY
(2013- 21- 119)

Abstract of the thesis
submitted in partial fulfillment of the
requirement for the degree of

DOCTOR OF PHILOSOPHY IN AGRICULTURE
Faculty of Agriculture
Kerala Agricultural University

DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
VELLAYANI, THIRUVANANTHAPURAM- 695 522
KERALA, INDIA
2016

ABSTRACT

The present study "Agricultural information support service vis-à-vis Kisan Call Centre: A Performance auditing" was undertaken with the objective to conduct a performance audit of Kisan Call Centre (KCC) aimed at suggesting performance improvement of agricultural advisory services, to delineate, categorize and document the constraints and solutions in imparting agricultural advisory service through KCC and to develop an efficiency index that can be used for the further analysis of KCC. Besides the study also aimed to find out the awareness of farmers on KCC and its service, and the utilization and satisfaction derived out of the KCC, which would throw light on the performance/ lacunae in the KCC service with the reasons thereof to stream line the KCC for improved effectiveness.

There were two categories of respondents. One hundred and fifty farmers were selected from south, central and north zones of Kerala using random sampling for studying the awareness of farmers on KCC and 150 farmers were selected purposefully from the data base of KCC for studying the utilization of KCC. Total there were 300 respondents.

The strength of KCC was found to be its free sixteen hour seven days a week service provided by the dedicated staff. The weakness in the functioning of KCC included its lack of agricultural graduates at the time of study, lack of field experience by the staff and lack of knowledge on other areas apart from agriculture. The opportunities that KCC could make use were the new social media platforms like Whats App and video conferencing facility. The challenges faced by KCC were the low call rates, providing solutions without actually seeing the problem and sending the crop messages to those farmers who do not need them.

The benchmarking study to evaluate the performance of KCC revealed that KCC matched to the standards set by the International Finance Corporation (2010) except for the service level standard (where 80 per cent of calls needs to be answered

within 20 seconds) which was 30 seconds for KCC and agent attrition standard (measure of staff turnover annually should only be 15 per cent) which was 80 per cent.

The out-come oriented study that measured the satisfaction of the respondents showed that the respondents had fairly high level of satisfaction towards the KCC service.

Sixty nine percent of the respondents opined that KCC had medium level of efficiency. The Efficiency index was calculated with nine indices such as understandability, completeness, knowledge gain, accuracy, reliability, timeliness, practicality, flexibility and connectivity. Understandability was rated as the most efficient quality (78 per cent) with regard to the working of KCC and connectivity was the least efficient quality (62.17 per cent) of KCC.

The major constraint faced by the respondents was lack of connectivity of the calls and the least faced constraint by the respondents was the lack of mobile phone/ telephones. The call centre agent's constraints were the difficulty in understanding the local dialect, the names of the crops in different region and the difficulty to understand the queries when there was a connectivity problem. The constraints faced by the farmers as perceived by the agricultural officers were the illiteracy, the long wait to get connected to the call centre when the lines were busy and the lack of availability of suggested inputs in the nearby shops.

The suggestions to improve the working of KCC by the farmers includes to initiate a call back facility (83 per cent), to transfer the calls to the second tier through call conferencing (77 per cent), to suggest organic way of fighting pest and diseases (75 per cent), to provide information on the shops where the suggested inputs were available in their respective area (70 per cent), to open their service branches in each district (70 per cent), to provide quickest, easiest and practical solutions to solve the farm problems (65 per cent) and to continue the messages through mobile phones (63 per cent).

The agricultural officer's opinion to improve KCC services was to appoint Post graduates in agriculture who are having more knowledge in their respective field, to provide field level training to the call centre agents, to send Malayalam messages in a format that would be compatible in any type of mobile phones. A facility for sending the photos of pest and diseases by the farmers were also suggested by both agricultural officers and call centre agents for better agro advisory service.

Among the three states Karnataka, Tamil Nadu and Kerala, Karnataka received the maximum number of average calls (13854 calls) followed by Tamil Nadu (9632 calls) and Kerala (1219 calls). The average calls received were maximum during the month of November for Karnataka and Kerala and least during the month of May. Tamil Nadu received the maximum number of calls during the month of January and least during the month of September.

In the study the independent variables temporal awareness on KCC, satisfaction towards KCC, utilization of KCC, adoption of advices and peer group contact were found to have positive correlation and extension agency contact, experience in internet use, information source utilization and constraints were found to have negative correlation with the dependent variable efficiency of KCC.

The variables digital divide, temporal awareness on KCC, satisfaction and utilization of KCC were found to have positive correlation and constraint in using KCC was found to have negative correlation on the attitude of respondents towards KCC. Satisfaction was the variable that contributed maximum direct effect towards the efficiency as well as attitude towards KCC.

The study revealed that in order to increase the utilization of KCC by the farming community there requires a parallel mode of communication along with the increased advertisements through various mass medias, that is the extension personnel should encourage and pursue the farmers to utilize the service by convincing them the benefits of using the service.

സംഗ്രഹം

കാർഷിക വിവര സംവിധാനത്തിന്റെ ഉന്നമനത്തിനായി കിസാൻ കോൾ സെന്ററിന്റെ പ്രകടനം മെച്ചപ്പെടുത്തുന്നതിനും കോൾ സെന്റർ വഴി വിവരങ്ങൾ നല്കുന്നതിലുള്ള പ്രശ്നങ്ങളും മാർഗങ്ങളും കണ്ടെത്തുന്നതിനും കോൾ . സെന്ററിനായി കാര്യക്ഷമത സൂചിക വികസിപ്പിക്കുന്നതിനും സെന്ററിനെക്കുറിച്ചുള്ള കർഷകരുടെ അറിവും അതിന്റെ ഉപയോഗവും സംതൃപ്തിയും മനസിലാക്കുന്നതിനുമായി "കാർഷിക വിവര സംവിധാനം കിസാൻ കോൾ സെന്ററിലൂടെ: പ്രകടന ഔഡിറ്റിംഗ" എന്ന വിഷയവുമായിബന്ധപ്പെട്ട് ഒരു പഠനം നടത്തുകയുണ്ടായി.

പഠനത്തിനായി രണ്ടു വിഭാഗങ്ങളിലായി മുന്നൂറു കർഷകരെ തിരഞ്ഞെടുത്തു. കോൾ സെന്ററിനെക്കുറിച്ചുള്ള കർഷകരുടെ അറിവ് മനസിലാക്കുന്നതിനായി കേരളത്തിന്റെ വിവിധ ഭാഗങ്ങളിൽ നിന്നായി ഏഴം കർഷകരെയും കർഷകർക്കിടയിൽ അവയുടെ ഉപയോഗം അറിയുന്നതിനായി കോൾ സെന്ററുമായി ബന്ധപ്പെടാറുള്ള 150 കർഷകരെയുമാണ് തിരഞ്ഞെടുത്തത്.

കിസാൻ കോൾ സെന്ററിന്റെ കാര്യമെടുത്താൽ അർപ്പണബോധമുള്ള ജീവനക്കാരും അവരുടെ 365 ദിവസവുമുള്ള കാര്യക്ഷമമായസേവനവും കോൾ സെന്ററിന്റെ പ്രവർത്തനത്തെ ശക്തിപ്പെടുത്തുന്നു എന്നാൽ ജീവനക്കാരുടെ കൃഷിയെക്കുറിച്ചും അതിന്റെ പ്രായോഗിക തലങ്ങളെക്കുറിച്ചുമുള്ള അറിവില്ലായ്മയും, കാർഷിക ബിരുദധാരികളുടെ ലഭ്യതക്കുറവും സെന്ററിന്റെ ദൗർബല്യങ്ങളാണ്.

നൂതന സമൂഹമാധ്യമങ്ങളെ ഉപയോഗപ്പെടുത്തുകയാണ് കോൾസെന്ററിന്റെ മുന്നിലുള്ള അവസരങ്ങൾ എങ്കിൽ കോളുകളുടെ എണ്ണത്തിലുള്ള കുറവും, പ്രശ്നങ്ങളെ കാര്യമായി മനസ്സിലാക്കാതെയുള്ള ഉപദേശങ്ങളും കോൾ സെന്റർ നേരിടുന്ന വെല്ലുവിളികൾ തന്നെയാണ്.

ഈ പഠനം സാധൂകരിക്കുന്നത്, ഇന്റർനാഷണൽ ഫിനാൻസ് കോർപ്പറേഷന്റെ അഗികാരമുള്ള കോൾസെന്ററിന്റെ പ്രവർത്തനത്തിൽ കർഷകർ ഏറയും തൃപ്തരാണ്. കോൾസെന്ററിന്റെ മിതമായ രിതിയിലുള്ള കര്യക്ഷമതയാണ് 69% കർഷകരും അഭിപ്രായപ്പെട്ടിരിക്കുന്നത്. കൂടാതെ 9 വത്യസ്ത സൂചികകളുടെ അടിസ്ഥാനത്തിൽ കണ്ടെത്തിയ മനസിലാക്കൽ" എന്നത് കോൾസെന്ററിന്റെ ഏറ്റവും കാര്യക്ഷമമായ. ഗുണവും "ബന്ധിപ്പിക്കൽ" എന്നത് തീർത്തും കാര്യക്ഷമമല്ലാത്തതാണ് എന്നതാണ്. "കോൾ ബന്ധിചിക്കുന്നതിലുള്ള പ്രയാസങ്ങൾ" സെന്ററിന്ററുമായി ബന്ധപ്പെട്ട് കർഷകർ നേരിടുന്നു ഏറ്റവും പ്രധാനപ്പെട്ട പ്രശ്നവും എന്നാൽ മൊബൈൽ അല്ലെങ്കിൽ ടെലിഫോണിന്റെ ലഭ്യതക്കുറവ് തിർത്തും അപ്രസക്തമായ പ്ര ശ്നവുമാണ്. എന്നാൽ കോൾ സെന്റർ ജീവനക്കാരുടെ പ്രശ്നങ്ങൾ മനസിലാക്കുന്നതിലുള്ള അപൂർണത തുടങ്ങിയവ അവർ നേരിടുന്ന പ്രധാന വെല്ലുവിളികളാണ്.

കൃഷി ഓഫീസർമാരായുള്ള വിവര ശേഖരണത്തിൽ നിന്നും തെളിയുന്നത് നിരക്ഷരത, കോൾ സെന്ററിന്ററുമായി ബന്ധപ്പെടുന്നതിലുള്ള പ്രശ്നങ്ങൾ വിദഗ്ധരുടെ നിർദേശമനുസരിച്ച് അസംസ്കൃത വസ്തുക്കളുടെ ലഭ്യതക്കുറവ് എന്നിവയാണ് കർഷകർ നേരിടുന്ന പ്രധാന പ്രശ്നങ്ങൾ.

കോളുകൾ തിരിച്ചുവിളിക്കാനുള്ള സംവിധാനം, കോൾ കോൺഫറൻസിംഗ് വഴി ഉന്നതവിദഗ്ധരിലേക്ക് കോൾ കൈമാറാനുള്ള സംവിധാനം, ജൈവരിതിയിലുള്ള രോഗകിട നിയന്ത്രണ മാർഗങ്ങൾ നിർദ്ദേശങ്ങൾ, ആവശ്യവസ്തുക്കളുടെ ലഭ്യതയ്ക്കനുസരിച്ചുള്ള നിർദ്ദേശങ്ങൾ, കൃഷിയിടങ്ങളിലെ പ്രശ്നങ്ങൾ എളുപ്പമായി സാധൂകരിക്കാനുള്ള മാർഗങ്ങൾ നിർദ്ദേശിക്കൽ, മൊബൈൽ വഴിയുള്ള മെസ്സേജ് സംവിധാനങ്ങൾ ഉപയോഗപ്പെടുത്തൽ എന്നിവയാണ് കോൾസെന്ററിന്റെ പ്രവർത്തനം മെച്ചപ്പെടുത്താനായി കർഷകർ നൽകുന്ന നിർദ്ദേശങ്ങൾ.

കൃഷി ഓഫീസർമാരുടെ അഭിപ്രായത്തിൽ വിവരങ്ങൾ നിർദ്ദേശിക്കാനായി ബിരുദാനന്തര ബിരുദധാരികളെ നിയമിക്കൽ,

കോൾ കോൾസെന്റർ ജീവനക്കാർക്കായി വ്യത്യസ്ത ക്ലാസുകൾ സംഘടിപ്പിക്കൽ, രൊഗകീടബാധയുടെ ഫോട്ടോ അയച്ചുകൊടുക്കുന്നതിനുള്ള സംവിധാനങ്ങൾ ഒരുക്കൽ എന്നിവയാണ് കോൾസെന്ററിന്റെ പ്രവർത്തനം മെച്ചപ്പെടുത്താനുള്ള നിർദേശങ്ങൾ.

കർണാടക, കേരളം, തമിഴ്നാട് എന്നിവടങ്ങളിലെ കോൾസെന്ററിന്റെ പ്രവർത്തനങ്ങൾ താരതമ്യം ചെയ്യുമ്പോൾ മനസിലാകുന്നത് എറ്റവും കൂടുതൽ കോളുകൾ വന്നിരിക്കുന്നത്, കർണാടക, തമിഴ്നാട്, കേരളം എന്നീ ക്രമത്തിലാണ്. കർണാടകയിലും കേരളത്തിലും കൂടുതൽ കോളുകൾ വന്നിരിക്കുനത് നവംബർ മാസത്തിലും ഏറ്റവും കുറവ് മെയ് മാസത്തിലുമാണ്. എന്നാൽ തമിഴ്നാട്ടിൽ കൂടുതൽ കോളുകൾ ജനുവരിയിലും കുറവ് സെപ്റ്റംബറിലുമാണ്.

കിസാൻ കോൾസെന്ററിന്റെ കാര്യക്ഷമതയും അവയോടുള്ള മനോഭാവവും പൂർണമായും ബന്ധപെട്ടിരിക്കുന്നത് കോൾസെനെക്കുറിച്ചുള്ള അറിവ്, ഉപയോഗം, നിർദേശങ്ങളുടെ ഉപയോഗപ്പെടുത്തൽ സംതൃപ്തി എന്നിവയാണ്.

ഈ പഠനംവ്യക്തമാക്കുനത് കോൾസെന്ററിന്റെ പ്രയോജനങ്ങൾ കൂടുതലായും കർഷകരിലെക്കെതിക്കുന്നതിനായി സമൂഹമാദ്ധ്യമങ്ങളിലുടെ കോൾസെന്ററിനെക്കുറിച്ചുള്ള അവബോധം വർധിപ്പിക്കുകയും വിജ്ഞാന വ്യാപന വിദഗദ്ധ വഴി കർഷകരെ ഇതിനെക്കുറിച്ച് കൂടുതൽ ബോധാവന്മാരക്കുകയും ചെയ്യേണ്ടത് തിർത്തും അനിവാര്യമാണ്.

APPENDICES

List of Independent variables

Please rate the following independent variables by putting a (✓) in the appropriate column based on the importance of each variable which would help in the study. The independent variables are given in bold cases and their respective meaning is explained for easy understanding of intended meaning

Sl. No.	Variables	Most Imp.	More imp.	Important	Less imp.	Least imp.
1.	**Age** (chronological age of the respondents in completed year at the time of interview)					
2.	**Education** (refers to the level of formal education attained by the respondents)					
3.	**Sex** (refers to the male and female respondents)					
4.	**Occupation** (refers to the extent to which a respondent is occupied in agriculture)					
5.	**Annual income** (total income of all members of the family of the respondents from farming and other sources for a period of one year)					
6.	**Land holding** (total are owned by the respondent)					
7.	**Animal wealth** (refers to the livestock owned by the respondent)					
8.	**Type of family** (refers to nuclear or joint family)					
9.	**Handy technology** (convenient to handle the technology)					

APPENDIX - I

KERALA AGRICULTURAL UNIVERSITY

College of Agriculture, Vellayani, Thiruvananthapuram 695 522
DEPARTMENT OF AGRICULTURAL EXTENSION

Dr. N. Kishore Kumar
Professor and Chairman

Sir/ Madam,
Greetings.

Ms. Shely Mary Koshy, Ph.D. Scholar of this department is taking up research titled, "Agricultural Information Support Service vis-a – vis Kisan Call Centre: A performance auditing". The objective of the study is to :

- To conduct performance audit of the Kisan Call Centre (KCC) aimed at suggesting performance improvement of agricultural advisory services
- To delineate, categorize and document the constraints and solutions in imparting agricultural advisory service
- To develop an efficiency index for further analysis of Kisan Call Centre

In this connection, I request you to go through the enclosed schedule for selecting the independent variables and give your rating for each criterion as "Most important", "More important", "Important", "Less important" and "Least important" considering the importance of each criterion.

Considering your expertise and knowledge in the field 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 faithfully

(Dr. N. Kishore Kumar)

List of Independent variables

Please rate the following independent variables by putting a (✓) in the appropriate column based on the importance of each variable which would help in the study. The independent variables are given in bold cases and their respective meaning is explained for easy understanding of intended meaning

Sl. No.	Variables	Most Imp.	More imp.	Important	Less imp.	Least imp.
1.	**Age** (chronological age of the respondents in completed year at the time of interview)					
2.	**Education** (refers to the level of formal education attained by the respondents)					
3.	**Sex** (refers to the male and female respondents)					
4.	**Occupation** (refers to the extent to which a respondent is occupied in agriculture)					
5.	**Annual income** (total income of all members of the family of the respondents from farming and other sources for a period of one year)					
6.	**Land holding** (total are owned by the respondent)					
7.	**Animal wealth** (refers to the livestock owned by the respondent)					
8.	**Type of family** (refers to nuclear or joint family)					
9.	**Handy technology** (convenient to handle the technology)					

Sl. No.	Variables	Most Imp.	More imp.	Important	Less imp.	Least imp.
10.	**Farming experience** (the total number of years the respondent has been engaged in farming)					
11.	**Economic Motivation** (refers the extent to which a respondent is oriented towards profit maximization and its relative value he places on monetary gains)					
12.	**Experience of internet use** (no. of years the respondent has been using internet)					
13.	**Mass media exposure** (refers to the extent to which farmer is exposed to different mass media channels)					
14.	**Extension contact** (refers to the degree to which the respondent maintains contact with various extension agency for farm related information)					
15.	**Innovativeness** (refers to the degree to which the respondent is relatively earlier in adopting new ideas)					
16.	**Rural/urban background** (Panchayat area/Muncipal area/ Corporation area where the respondent resides)					
17.	**Risk orientation** (degree to which the farmer is oriented towards encountering risk and uncertainty in adopting new ideas in farming)					

Sl. No.	Variables	Most Imp.	More imp.	Important	Less imp.	Least imp.
18.	**Desirability** (the degree to which technology is desired and perceived as worth)					
19.	**Scientific orientation** (Degree to which farmer is oriented to use scientific methods in farming)					
20.	**Cosmopoliteness** (tendency of the respondent to be in contact with outside village on the belief that all the needs of an individual cannot be satisfied within his own village)					
21.	**Social participation** (refers to the participation of individuals in various formal social institutions either as member or as office bearer)					
22.	**Accessibility to technologies** (refers to the degree to which the farmers utilize various technologies					
23.	**Information source utilization** (sources from which the farmer respondent receives agricultural information ad their relative frequency)					
24.	**Risk orientation** (the degree to which the farmer is oriented towards encountering risk and uncertainty in adopting new idea in farming)					
25.	**Dogmatism** (positiveness in assertion of opinion especially when unwarranted or arrogant)					

Sl. No.	Variables	Most Imp.	More imp.	Important	Less imp.	Least imp.
26.	**Physical compatibility** (degree to which the technology is perceived as consistent with the infrastructural availability, past experience and needs of the respondents)					
27.	**Flexibility** (degree to which technology is characterized by a ready capability to adopt to new alternatives or changing requirement or condition					
28.	**Social acceptability** (degree to which a technology is considered useful, practical and feasible by the respondent)					
29.	**Timely information** (information is given as and when it is required)					
30.	**Source credibility** (the trust worthiness of the source)					
31.	**Trial and satisfaction** (tried once and get satisfaction)					
32.	**Network contact** (persuasion from peer group)					
33.	**Instant recommendation** (complete package of information)					
34.	**Others specify**					

Name: Designation: Signature:

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY
Department of Agricultural Extension, College of Agriculture
Vellayani, Thiruvananthapuram

QUESTIONNAIRE

(For Academic purpose only)

Name of the Ph.D. Scholar: Shely Mary Koshy

Major Advisor : Prof(Dr.)N. Kishore Kumar

This is a study on "Agricultural Information Support Service vis- a- vis a Kisan Call Centre: A performance auditing" which aims study how far the Kisan call centre is effective in their service they are providing for the farming community. Therefore I request you to kindly spare your valuable time for answering the following questions.

General Information

1. Name:
2. Age:
3. Sex:
4. Education:
5. Annual Income
6. **Occupation:**

   What is your primary as well as secondary occupation in which you are involved to make an income?

Sl. No	Occupation	
1	Farming as a sole occupation	
2	Farming + Government	
3	Farming + others	

7. **Extension contact**

   How often do you make contact with various extension agency/ methods for farm related information?

Sl. No.	Extension contacts	Often	Sometimes	Never
1	Agricultural Scientist			
2	Agricultural officer			
3	Agricultural Assistant			
4	Block extension officer			
5	Exhibition			
6	Study Tour			
7	Demonstrations			

8. Innovativeness

How would you adopt a new idea when introduced?

Sl. No	Statements	
1	As soon as it is brought to my knowledge	
2	After I have seen other farmers try it successfully	
3	I prefer to wait and take my own time	

9. Accessibility to ICT tools

The degree to various ICT tools are available (in your house) as well as it is accessible (can utilize it) to you

Sl. No	Tools	Available + Accessible	Available + Inaccessible	Unavailable + Accessible	Unavailable + Inaccessible
1	Television				
2	Agricultural Magazines				
3	Land phone				
4	Mobile				
5	Newspaper				
6	Radio				
7	Computers				
8	Tablets				
9	Internet				
10	Kiosk				

10. Experience of Internet use

Since how long have you been utilizing the various internet services?

.....

11. Information source utilization

How frequently do you use various information sources?

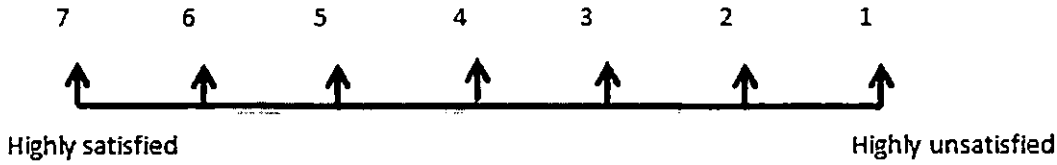
Sl. No.	Sources	Most frequently	Frequently	Less frequently	Occasionally	Never
1	Radio					
2	Television					
3	Newspaper					
4	Magazines					
5	Agricultural literatures					
6	Kiosk					
7	Mobile					
8	Farmer friends					
9	Relatives					

12. Awareness of Kisan Call Centre

Statements	
1.Are you aware about KCC	(Yes / No)
2. Have you ever contacted	(Yes / No)
3. Since how long you know about KCC	Less than one year ( ) One to two year ( ) More than two years ( )
4. How did you become aware of the KCC?	Through friend/ relative ( ) Through radio ( ) Through television ( ) Through Agricultural officer/ Krishi Bhavan ( ) Through seminars ( ) Through extension personnel ( ) Through newspaper/magazines ( ) Media advertisements ( )

13. Satisfaction level

How satisfied are you in the services provided by the Kisan Call Centre on a scale from 1-7 where **1 shows highly unsatisfied** and **7 shows highly satisfied?**



14. Utilization

How many times have you utilized the Kisan Call Centre Service?

Sl. No	No of times called	
1	1-3 times	
2	3-6 times	
3	More than 6 times	

15. How did you act on the information provided by the call centre agents

Sl. No	How did you act on the advice	
1	Did not act	Yes / No
2	Discussed with neighbor	Yes / No
3	Contacted extension worker for more details	Yes / No
4	Partly adopted the practice	Yes / No
5	Completely adopted the practice	Yes / No

16. Constraints

What were the constraints faced by you while utilizing the call centre service?

Sl. No	Category	Most relevant	Relevant	Irrelevant
1	Not compatible with the culture of the person			
2	Not available at all times			
3	Negative mentality in accepting new things			
4	Illiteracy			

Sl. No	Category	Most relevant	Relevant	Irrelevant
5	Lack of infrastructure facilities			
6	Lack of telephone/ mobile phone facilities			
7	Content problems			
8	Difficulty in receiving the information from the other end			
9	Lack of training programmes			
10	Lack of awareness about ICT tools			

17. **Information Needs**

What are the specific areas in which you need more information?

Sl. No	Statement	Most needed	Needed	Less needed	Not needed
1	Market information and price trends				
2	Latest package of practices				
3	Disease or pest early warning system and management				
4	Input prices and availability				
5	Weather forecasting				
6	Information on rural development programme				
7	Crop insurance				
8	General agricultural news				
9	Farm business and management info				
10	Facilitation of land records				
11	Quality inputs				
12	Commercial agriculture				
13	Soil health management				
14	INM				
15	Water management				

Sl. No	Statement	Most needed	Needed	Less needed	Not needed
16	Water conservation through drip and sprinklers				
17	Post-harvest technology				
18	Dry land crops and practices				
19	Quality standards of produce for exports				
20	Dairy and poultry management and marketing info				
21	Market infrastructure like warehouses and cold storages				
22	Advises of scientists on crop management				
23	Information on crop loans				
24	Success stories of farmers				
25	Value addition/ PHT				
26	How to reduce cost of cultivation				
27	Govt. policies reg. agriculture				
28	Computer application in agriculture				
29	Precision farming				
30	Climate resilience				

18. Peer group contact

How frequently does the peer group persuade you in making decisions?

Sl. No.	Peer group contact	
1	Most frequently	
2	Frequently	
3	Less frequently	
4	Occasionally	
5	Rarely	

19. Efficiency of Kisan Call Centres

Please mark your satisfaction with regard to the following qualities of Kisan Call Centre

Sl. No.	Qualities	Most satisfied	More satisfied	Satisfied	Least satisfied	Unsatisfied
1	**Understandability** (the degree to which you can understand the solutions provided for the queries)					
2	**Completeness** (the degree to which the solution answer to your needs)					
3	**Timeliness** (the degree of providing the timely information)					
4	**Accuracy** (the degree to which the call centre agents actually identifies your actual problems)					
5	**Practicality** (the degree to which the solutions are practical)					
6	**Reliability** (are you satisfied with the reliability of the service)					
7	**Knowledge gain** (are you satisfied with the knowledge gained through KCC)					
8	**Connectivity** (are happy with the speed with which you are connected to the call centre?)					
9	**Flexibility** (are you satisfied with the flexibility of the Kisan Call Centre with your time schedule)					

20. Attitude towards Kisan Call Centre

A set of statements are provided below. Please mark your agreement or disagreement after analyzing the statement by putting ✓ in the appropriate column.

Sl. No.	Statements	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	KCC has a faster service than the traditional services					
2	KCC is the best tool to the needy farmers					
3	The call centre agents do not explain the solutions completely to the farmers					
4	The call centre agents are not familiar with other aspects of farming like marketing, credit, input supply etc					
5	The centre provides only solutions for regular farm related problems					
6	Innovative practices are provided by KCC for solving the problems					
7	Complete information regarding a particular problem is explained by the call centre agents					
8	For instant information KCC is always used					
9	Positive results are observed after following the suggestion of KCC					
10	KCC should provide field assistance also along with advisory services					
11	The service received from KCC are as good as most other extensions organizations offers					
12	KCC service is a distant dream for resource poor farmers					
13	Illiteracy will not hold back the farmers in utilizing the service					

Sl. No.	Statements	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
14	KCC saves farmers time					
15	Recommendations provided through telephone is clear and easy to understand					
16	All kinds of information exchange are possible through KCC					
17	Sometimes the call centre agents find it difficult to understand the queries asked					
18	The recommendations provided by the scientists has more clarity when the call gets transferred					
19	Solutions provided through KCC is very helpful					
20	KCC equips farmers with new skill and knowledge					
21	KCC based extension services are alternative to the present extension system					
22	KCC can never replace traditional method of extension service					
23	Often the fertilizers and chemicals provided by the Call centre agents are not available in market					