1. Introduction

India has 2.4% of the world's total geographical area to support about 17% of world's human population and 15% of the livestock population. Primarily, India is an agrarian country and agriculture is the backbone of Indian Economy. About 65% of Indian population depends directly on agriculture and it accounts for around 22% of GDP (Tyagi, 2012). Livestock sector is an integral part of the agricultural system in India and contributes significantly to the GDP (4.11% in 2012-13). It ensures food and nutritional security on one hand and provides income and employment opportunities on the other hand (Ravikumar *et al*., 2006 and Borah and Halim, 2014). The livestock sector is expected to spur the growth of agricultural sector over the coming decade. Over the last three decades, livestock sector has grown at an annual rate of 7 per cent, which is more than double the growth of the agriculture sector (Meena and Singh, 2013). This growth is driven by the rapidly increasing demand for livestock products mainly because of population growth, urbanization and increasing incomes in developing countries (Delgado, 2005).

However, low productivity of animals owing to low knowledge level of the livestock owners remains an unresolved issue and a major challenge for the future. Agricultural knowledge and related information is the basic criteria for increased productivity and development in India (Das, 2012). Adequate access to knowledge and information is the least expensive input to amend livestock sector. India's public extension system accounts for only a small percentage of farmers information sources. Farmer to farmer informal exchanges remains the main channel for accessing information and new technologies in India (Anonymous, 2005). The main purpose of animal husbandry information sources is to reach farmers who cannot be contacted personally by extension workers, in the shortest possible time. Location of the audience group and availability of time are the deciding factors for choosing information sources (Chauhan and Kansal, 2014).

Traditionally, the potential sources of information for farmers on various aspects of production, marketing and finance include media, government extension

services, consultants and farm service firms, traders, input dealers, other farmers and relatives (Mittal and Kumar, 2000; NSSO, 2005 and Saravanan, 2011). Availability of information assists the process of extension and makes it speedy and more effective. Use of Information and Communication Technology (ICT) tools has potential to change the economy of livestock, agriculture and rural artisans in India (Sasidhar and Sharma, 2006). The delivery of information and knowledge to the farmers on the right time and in right way leads to more productivity and more profitability. Thus, the information delivery system should include technology to impart the information and knowledge to the livestock farmers. So, these ICT tools are the demand of hour.

ICT refers to all information and communication systems and technologies including not only the digital formats such as the internet or the World Wide Web (WWW), but also interfaces with radio, cable and wireless television, video, cellular phones and print media (Hazelman and Flor, 2004). ICTs are integrated with different devices such as computer, internet, mobile phones, television and radio. According to Elijah and Ogunlade (2006), there are three categories of ICTs viz. advance ICTs (computer, internet and mobile phone), conventional ICTs (radio, TV, land line telephone and telegraph) and really old ICTs (newspaper, books and libraries). Some of the modern ICT tools are Geographic Information Systems (GIS), Global Positioning System (GPS), Database Management System (DMS), Computer Aided Design (CAD), Artificial Intelligence (AI), Information System and Learning Management System which are being used effectively and efficiently in various sectors.

Throughout the world, Information Technology together with Communication Technologies has brought about unprecedented changes in the way people communicate, conduct business, pleasure, social interaction, commerce, industries, agriculture, education, health, sports, culture, tourism and livestock management. The evolution of new forms of technologies and imaginative forms of applications of the new and older technologies makes the lives of the people better and more comfortable in several ways. ICT tools are the common denominator that links people, irrespective

of caste, class, sex, religion, race or political alignments. Information delivered through ICT can be timelier and can reach a greater number of farmers directly (Richardson, 1996). Access to ICTs could reduce transaction costs related to information searching and reduce knowledge and information asymmetries, particularly related to market price information (De Silva and Ratnadiwakara, 2008).

Use of ICTs have played very effective role in the agriculture development and in the decision making of farmer's communities in different countries (Cash, 2001; Galloway and Mochrie, 2005; Opara, 2008 and Taragola and Van Lierde, 2010). Emergence of ICT on the national agenda and announcement of ICT policies by several state governments has strengthened India's position in the software-driven ICT sector in the world. For example, states of Tamil Nadu, Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Rajasthan, Sikkim, Uttar Pradesh, West Bengal, Pondicherry etc. announced several ICT policies in their respective states. However, it was indicated that due to lack of knowledge and information about these technologies, farmers are not getting benefit from these technologies in their working places. Furthermore, farmers directly could not communicate with buyers and their customers for selling their production in good prices and track medical expenditure on their livestock as well as expenditure on farm chemicals to receive information from other stakeholders.

ICTs enable the exchange of information about weather forecasting, best production practices, innovations in housing and feeding management of livestock, disease control, species and breed details, dairy herd management, vaccination & immunization, livestock production and marketing of livestock and livestock products and prices etc. Extension should be able to access this kind of information and shift from purely disseminating information to assessing and brokering relevant information.

ICT tools can be used to impart information and knowledge, and that in turn will lead to motivation, mobilization and action to do something better in livestock

sector. Communication technology can encompass different approaches– welfare, participatory and catalyst approaches with extension personnel as change agents. Information, rewarded with success stories, can motivate human to adopt healthy livestock technologies. For instance, information on immunization, calf mortality, maternal mortality, sanitation, nutritional awareness and causes, prevention and treatment of disease can be disseminated far and wide via ICTs. The enhanced and smooth communication results in the overall development of the livestock sector of the country (Saravanan, 2010).

The traditional methods of extension approaches have less accountability and effectiveness in comparison to ICT in terms of time management, larger audience coverage and greater impression on people. In recent years, ICTs have been introduced in livestock projects which have furnished fruitful results in livestock development. ICT based information delivery to livestock sector can significantly improve the quality of decision-making in livestock farming system. Livestock sector should come up with the need based, location specific and local language contents in the form of computer software's and other electronic material in regards to livestock disease control, dairy herd management, livestock production and marketing of livestock and livestock products (Tiwari *et al.*, 2010).

1.1 Need of the study

Need of study is an important step in any successful research study. It is a focus of the research findings of researchers relevant to the present situation. Quite a good numbers of studies have been done on dissemination of information and knowledge through use of ICTs in the area of agriculture but studies relating to dissemination of livestock information and knowledge through use of ICTs are very few, especially in Jaipur district of Rajasthan. This offers broad scope for study on dissemination of livestock information through use of ICTs in Jaipur district of Rajasthan.

1.2 Objectives of the study

The present study was conducted with the following objectives-

1. To study the socio-economic profile of livestock farmers.
2. To measure the accessibility, availability and usage of ICTs by livestock farmers.
3. To study the attitude of livestock farmers towards the ICT based livestock extension services.
4. To find out the constraints in use of ICTs by livestock farmers.

1.3 Scope of the study

1. The results of the study will help in identifying the socio-personal and socio-economic profile of the livestock farmers using ICTs.
2. The present study provides an insight on the availability, accessibility and usage of ICTs among livestock farmers. Therefore, the findings of the study will help the policy makers, social scientists, extension professionals and NGOs etc. to have proper orientation for the selection of appropriate ICT tools for the dissemination of livestock information.
3. The present study is unique attempt to find out and compare the extent and pattern of utilization of ICTs by livestock farmers in Jaipur district of Rajasthan.
4. This study seeks to identify the constraints faced by livestock farmers in accessing and utilizing ICTs and their suggestions for the solution of these constraints.

1.4 Limitations of the study

Although every effort has been made to make this study as objective and systematic as possible, but being a student's dissertation project suffers with usual limitations. Some of limitations are indicated below:

1. The findings of the study are based on the information collected from limited number of respondents from Jaipur district of Rajasthan.
2. The result will be applicable only to the areas of sample drawn and also for those areas with similar socio-economic, culture, environment and agro-climatic conditions.
3. The findings of this investigation are based on the expressed responses of the respondents, which may not be completely free from their individual bias and prejudices and the same may result from the part of the interviewer.
4. This study was conducted as a single student research. Hence, it suffers from usual limitations of time, money and other resources.

A review of literature normally provides guidance to go ahead in certain direction of the study, broadens the mental horizon in respect of the subject, allows contingency for thinking in a manner which accommodates many related matters and therefore, it is of paramount importance for any research work. Keeping in view the objectives of the proposed study the review of the available literature has been presented under the following sub-heads:

2.1 General profile of livestock farmers

2.2 Information dissemination through ICTs in livestock sector

2.3 Accessibility, Availability and Usage of ICTs

2.4 Attitude of livestock farmers towards ICTs

2.5 Constraints faced by livestock farmers in use of ICTs

2.1 General profile of livestock farmers

Sonawane *et al.* (2001) revealed that among the personal localite sources, friends (90.62%) were the major source of information for the farmers followed by neighbourers (76.56%), relatives (60.15%) and progressive farmers (60.15%), whereas, among the personal cosmopolite sources, agricultural assistant (96.87%) was the main source of information followed by university scientists (53.90%), agricultural officer (25.78%) and subject matter specialists (21.87%).

Kalra (2004) in a study on “Cultural artificiality: A study on cyber cafes in Punjab” reported that 75 per cent of internet users were between age group of 15-25 years; among these 79.13 per cent users were males.

Deshmukh (2007) in his study in Parbhani and Nanded districts of Maharashtra stated that 15.97 per cent farmers using ICT had low (up to 2) level of participation followed by 45.13 per cent and 38.88 per cent as Medium (3 to 11) and high (above 12) level of participation.

Biradar (2008) found that family members, friends/relatives and other entrepreneur were the frequently consulted and neighbours were occasionally consulted source of information. Among formal sources, NGO officials and bank

officers were consulted occasionally. Majority of the respondents had rarely consulted the formal sources and agri/horticulture department officials. Mass media sources such as television, radio and newspaper were occasionally used as source of information by majority of the respondents.

Babu (2009) found in Puduchery that 58.5 per cent farmers using ICT had small (< 1 hectare) landholding followed by 27.0 per cent and 14.5 per cent having medium (1-2 hectare) and large (>2 hectare) landholding, respectively.

Prakash (2009) found that majority of farmers (68.75%) had maintained medium size of herd from 2 to 4 animals and 17.96 per cent of dairy farmers were maintaining small herd size. However, 13.28 per cent farmers were maintaining large herd size.

Subash (2009) in his study in Karnal (Haryana) revealed that majority of the livestock farmers (60.83%) were in the middle age (35-50 years) category whereas, 22.50 per cent and 16.67 per cent of the respondents were in the young (upto 34 years) and old age (> 50 years) category respectively. He further revealed that most of the livestock farmers (33.33%) were educated upto higher secondary level, followed by secondary (26.67%), middle (18.33%), college level (13.33%) and primary level (8.33%). Majority of the respondents (67.50%) had medium level of experience in dairy farming, followed by less experienced (18.33%) and 14.17 per cent in highly experienced category.

Dhaka and Chayal (2010) conducted a study in Bundi district of Rajasthan and revealed that majority (46.67%) of the respondents belonged to middle age group followed by young age (38.67%) and old age group (14.67%). The frequency distribution was highly skewed towards the younger respondents which means that more young people are getting involved in making use of ICT services. They further revealed that majority (50.67%) of respondents were functionally literate (up to middle class) followed by high school (42.67%) and graduate and above (6.67%).

Kubkomawa and Salihu (2010) found that most of the livestock producers (70%) contacted were men, 45% were 31-49 years old and 65% of the livestock

producers were married with 30, 20 and 10% having OND/NCE, Nomadic education and degree qualifications, respectively.

Mwakaje (2010) reported in his study that majority of the respondents (60.5%) were between the age group of 21-45 years, 69.5% farmers completed standard seven in their education level and a part of their income came from livestock farming including dairy cows.

Parihar *et al.* (2010) in their study in Kanpur dehat, (U.P.) observed that 31 per cent respondents using ICT were educated up to primary, 17 per cent up to high school, 14.50 per cent were Intermediate, 12 per cent had graduation, 2.5 per cent were above graduation and 23 per cent were illiterate. Further, they revealed that 43.50 per cent farmers had agriculture as their main occupation followed by 21.00, 20.50, 15.00 per cent farmers having agriculture and service, agriculture and business and caste occupation, respectively.

Rani (2010) stated that 49.16 per cent of the respondents were in middle annual income category followed by high and low income category which comprised of 26.67 per cent and 24.17 per cent, respectively.

Subhash *et al.* (2010) found that maximum (31.00%) respondents educated up to primary followed by 17.00, 14.50, 12.00, 2.50 per cent respondents having education up to high school, intermediate, graduation and above graduation, respectively. Only 23.00 per cent respondents were found to be illiterate.

Ghasura *et al.* (2011) found that 57.5 per cent farmers using ICT in Banaskantha district of Gujarat belonged to middle age group (33 – 54 years), 22.5 per cent to older age group (above 55 years) and 20 per cent to younger age group (18 – 32 years).

Ramaraju *et al.* (2011) revealed that 15 per cent respondents were illiterate and 32 per cent of farmers were educated up to middle school followed by 21, 17, 8 and 7 per cent respondents having education upto primary, high school, pre university course and graduation, respectively. Further, in the study they revealed that 62 per cent of farmers mostly contacted their neighbours or friends to get any sort of information on agriculture, followed by local input dealers (46%) and ICT initiative

(32.11%). The other sources of information, the farmers considered were Television (23%), Mobile and Government Extension (21%), NGO and daily Newspaper (18%), Radio (14%) and SAU (8%).

Verma *et al.* (2012) revealed that majority of the respondents (46.7%) were contacting frequently to neighbours followed by 23.30 per cent to progressive farmers as localite sources for livestock related information. Further in the study they revealed that in case of cosmopolite channel majority of the respondents (13.30%) were contacting frequently to V.O. followed by 12.5 per cent to PVSP, 7.5 per cent to BAIF personals and 5.8 per cent to paravets for livestock related information.

Philip (2015) revealed in his study that nearly three-fourth of the respondents belonged to age group of 31-55 years with primary level of education, having animal husbandry as their primary occupation and an average annual income of Rs 8000-10,000 from animal husbandry. It was also reported that more than half of the respondents had low level of mass media exposure and medium level of extension agency contact.

2.2 Information dissemination through ICTs in livestock sector

FAO (1998) reported that the potential of ICT is to support the improvement of currently inadequate extension and education services and ensure farmers have access to reliable information about agricultural technologies and market.

Forno (1999) stated that the traditional media and new ICTs have played a major role in diffusing information to rural communities and to have much more potential. There is a need to connect rural communities with research and extension networks and provide access to the much needed knowledge, technology and services.

Hattotuwa (2003) observed in her study at the North-Eastern Province in Sri Lanka that ICTs have become an effective and reliable force in transforming social, political and economic life globally.

Souter *et al*. (2005) found that lack of timely information is the largest constraint on small-scale agricultural production which leads to poor husbandry practices and so poor production. They further reported that this situation could

probably be improved by making use of ICTs to get the required and timely information.

Phand (2008) reported that ICT based animal health information system was highly effective to disseminate information particularly on animal health management aspects.

Cirad (2009) reported in his study that modern telecommunication systems have made rapid progress, however the benefits have yet to penetrate to small scale livestock owners. He further reported that urban livestock keepers still lack adequate information on livestock keeping practices despite the relatively well developed ICT infrastructure in urban areas.

Dhaka and Chayal (2010) stated that the benefits of ICT are direct access to information, reliable and timely information, more subject matter coverage, minimize time and distance barriers, reduction in transaction cost and improve the quality of decision making.

Ramkumar *et al.* (2011) observed that the information gained from ICT tool such as information kiosk has resulted in direct improvement in the livelihoods of the poor farmers, reflected in the practices they adopt in the respective area.

Nyaga (2012) in his study argued that adoption of ICTs in agricultural extension is crucial among farmers to access information of new markets for their produce and to acquire current trends in agriculture. She observed that ICT improved business and networking between farmers, buyers and extension agents and also facilitated access to hidden markets.

Ali (2013) found in his study on "Farmers perspectives on quality of agricultural information delivery" that private sector information delivery sources provide significantly better quality information to the farming communities as compared to public sector information delivery systems.

Meena *et al.* (2014) observed that ICT services have wide potential to uplift the economy of livestock holders by knowledge gain of improved dairy farming practices through various communication media available.

Sireesha *et al.* (2014) in their study found that ICT tools are useful for organizations to retrieve latest knowledge, quick transmission of reports to higher authorities and helps in quick and timely decision making.

Tiwari *et al.* (2014) in their study reported that rapid growth of ICT and the introduction of ICT enabled information services provide several ways for dissemination of information and knowledge to bridge the information gap existing among the farmers in agricultural sector.

Angello (2015) concluded in his study on "Exploring the use of ICTs in learning and disseminating livestock husbandry knowledge to urban and peri-urban communities" that ICTs are important tools for learning and dissemination of livestock husbandry knowledge.

Philip (2015) concluded that there was a need for conducting more number of ICT based and well-tailored training programmes suited to respondents for promoting the adoption of scientific animal husbandry practices among them.

Smollo *et al.* (2016) revealed in their study in Kenya that there was a statistically significant correlation between utilizing animal husbandry information and milk yield among smallholder dairy farmers.

2.3 Accessibility, Availability and Usage of ICTs

Ramkumar *et al.* (2003) found that the information regarding cattle breeding, health care practices and clean milk production to prevent mastitis were available in information kiosks.

Karunakaran (2004) revealed in his study that majority of the respondents (84.62%) had utilized internet for agricultural purposes. There were 97.44 per cent of the respondents who used the internet once in a week and 25.67 per cent of the respondents stored the information received from websites as hard copies.

Grover *et al.* (2007) reported in their study that the readership for newspaper and magazines in local language among the farming households in their study area was showing a rising trend and also the number of mobiles phones was swiftly increasing while computers were a new entrant, and were used by only few

respondents. It was further reported that mobile phones as latest ICT tools were used extensively for knowing the prevalent prices of various agricultural commodities in different markets and also for marketing of their agricultural produce.

Gakuru *et al.* (2009) observed in their study that there was lack of adequate information on livestock keeping practices among the farmers because they mostly relied on advice services as sources of information which was cited insufficient to perform better in their field enterprises.

Kubkomawa and Salihu (2010) revealed that 20% farmers used ICT tools to obtain agricultural knowledge and 5% used ICT to obtain health information. 30% of the farmers agreed that ICT have positively impacted their livestock and agriculture while 70% confirmed that they have not been able to coordinate and harness information obtained from ICT to improve their productivity in livestock and agriculture.

Ali (2011) found in his study that ICT users were making significantly better quality decisions as compared to non-users. Correlation analysis between frequency of ICT use and socio-demographic profile of livestock farmers indicated a significantly positive relationship with a number of factors, which provided practical insights for designing target based ICT driven information system for livestock sector development.

Ghasura *et al.* (2011) found that people who used ICT to access market information sold a lot more and received relatively better prices, which has a positive impact on their business.

Kameswari *et al.* (2011) proposed on the basis of their study that among new ICTs, mobile phones were widely available in the study area but were mostly being used for post sale inquiry rather than price negotiation, accessing markets or price information or increasing production efficiency.

Ramaraju *et al.* (2011) studied in twelve states of India and found that farmers desired information related to both general and specific aspects covering pre-production, production, post-production and value addition in agriculture/horticulture, animal husbandry and fisheries. Further in study they found that most popular

information gadget possessed and accessed by the farmers was the Mobile Phone (82%) followed by Television (73%) and the Newspaper (67%).

Ramkumar *et al.* (2011) observed that livestock owners who exposed to the ICT tools like information kiosk presented the cattle at an early stage for disease diagnosis and were found to follow hygienic milking practices and scientific cattle breeding practices.

Fu and Akter (2012) revealed that the amount and quality of the services and the speed of service delivery had been improved significantly through different ICT tools such as mobile phones. Further, they also revealed that benefits from this ICT-enhanced service delivery system were in the form of greater awareness and knowledge in agriculture technology and information.

Mittal and Mehar (2012) found in their study that mobile phone and mobile phone based services enhances the availability to knowledge and information and will further help in improving awareness, education, better adoption of technology, better health and efficiency, reduced transaction costs, better market efficiencies etc.

Mooventhan and Philip (2012) stated that among web users, only 22.22 per cent of farmers were utilizing agricultural websites and the remaining major junk were using internet for non-agricultural purposes.

Verma *et al.* (2012) in their study revealed that 15 per cent respondents were frequently using radio followed by 11.7 and 10.8 per cent respondents using mobile phone and newspaper as the source of information related to livestock farming while 15.0, 5.0 and 4.2 per cent of the selected farmers were rarely getting information from radio, TV and internet respectively. Information sharing through use of ICT tools assume that 30 per cent farmers were always sharing livestock related information with family members followed by 21.7 per cent with neighbours, equal numbers (9.2%) with friends and fellow farmers and 2.5 per cent with Gram Pradhan.

Oyeyinka and Bello (2013) revealed in their study that the most used ICTs tools among other sources from which the farmers access market information outlet are Radio (85.4%) and GSM (83.3%). This implies that, radio and GSM among other

means of disseminating information are the easiest or the mostly used and common in the study area.

Meena *et al.* (2014) proposed on the basis of their study on "Effectiveness of multimedia digital video disk on knowledge gain of improved dairy farming practices" that the farmers feel more comfortable with the new mode of communication technology and it might result in a paradigm shift from lower level to higher knowledge level category.

Singh *et al.* (2014) in their study found that television and mobile phones were the principal ICT tools in the study area. The frequency of use of television and mobile phone by DCS members was significantly ($P \leq 0.05$) higher in the plains than in the hills. Radio was the third option and was more frequently ($P \leq 0.05$) used by the members in the hills than in plains. The possession of modern ICT tools such as computer and the internet among members, was extremely sparse in plains (9% each) and non-existent (0%) in hills.

Angello (2015) in his study revealed that different types of ICTs were used by urban livestock keepers to learn and disseminate livestock information. Mobile phones were used more (92.1%) than other ICTs like radio (21.7%) and television (24.6%). Internet was used by very few livestock keepers (2.4%) due to computer illiteracy.

Chikaire *et al.* (2015) revealed in their study that ICTs play veritable roles such as increasing access to education, health information, information on diseases/pest outbreak, market information, employment generation and credit opportunities among farmers.

Rebekka and Saravanan (2015) in their study on "Access and usage of ICTs for agriculture and rural development by the tribal farmers in Meghalaya State of North-East India" reported that ICT tools such as mobile phones proved to be useful during health emergencies by the livestock farmers.

Smollo *et al.* (2016) recommended based on their study that deliberate efforts should be made to improve utilization of animal husbandry information from mobile phones to increase milk production in Njoro Sub-County, Kenya.

2.4 Attitude of livestock farmers towards ICTs

Phand (2008) reported that majority (56.67%) of the respondents perceived ICT as very effective in enhancing their knowledge regarding animal health management, while 43.33 per cent found it effective. Not a single respondent felt that it was not effective for knowledge enhancement.

Babu (2009) revealed that 58.50 per cent dairy farmers were aware of availability of dairy information through ICT. About 58.50 per cent had expressed that information on breeding was less adequate. About 53.50 per cent, 48 per cent and 43 per cent of the dairy farmers revealed that availability of information on feeding, management and health care were less adequate, respectively. Except few, most of the farmers expressed that information on dairy farming were inadequate.

Dhaka and Chayal (2010) reported that majority of the farmers had favourable attitude towards the Information Technology. Further, in the study they reported that favourable attitude of farmers towards ICT as an effective and efficient information support tool would lead to stronger conviction and efficient extension programme planning.

Fu and Akter (2012) revealed in their study that farmers had positive attitudes towards trying new technology and new ways of life in the future. Evidence from the evaluation suggested that disadvantaged farmers benefited more from this intervention than those who were better off.

Raghuprasad *et al.* (2012) observed that more than two-fifth (40.83%) of the farmers had favourable attitude towards ICT tools followed by 31.67 per cent and 27.50 per cent with least favourable and most favourable attitude, respectively. Variables such as education, land holding, annual income, economic motivation, risk orientation, scientific orientation and extension participation had positive and significant relationship with attitude of farmers towards ICT tools.

Shankaraiah and Swamy (2012) reported that 40 per cent of farmers and 45 per cent of scientists had favourable attitude towards ICT tools like MMS network. Further, revealed that education, farm size, material possession, economic motivation, innovative proneness, achievement motivation, cosmopoliteness, mass media

participation and extension participation had positive and significant relationship with attitude of farmers.

Kabir (2015) indicated that 58.9 percent of the respondents had moderately favourable attitude, 41.1 percent had highly favourable attitude and there were no farmers in the study area those had slightly favourable attitude towards ICTs.

2.5 Constraints faced by livestock farmers in use of ICTs

Nath (2000) reported that the language barrier was one of the major barriers to adopt information technology in developing countries. Other were lack of relevant and locally specific content, problem in handling ICT, low technical skills and net literacy in hosting of information and retrieving useful information from the net.

Kumar (2003) reported that majority of farmers (52.55%) had difficulty in understanding language in broadcast/telecast and 25 per cent perceived that lack of location specific information was major problem.

Karunakaran (2004) stated that the major constraints in using the modern information technology were lack of information in local language, high cost for establishment, illiteracy of people cannot use, high cost of connecting to internet, lack of site specific information, lack of relevant information and lack of skill to use modern information technology gadgets.

Thomas (2006) pointed out that with respect to diffusion of ICTs to rural areas, the most immediate constraints were deficient telecommunication infrastructure, low penetration of personal computers and poor internet connectivity.

Ramkumar *et al.* (2007) reported that the biggest problem faced at present is the ignorance of farmers, lack of tools and technology, lack of awareness about multiple skills in using equipment, poor works efficiency and high cost.

Agwu *et al.* (2008) revealed in their study that major constraints to the use of ICTs include lack of sufficiently trained computer personnel, lack of confidence in operating modern ICTs, erratic and fluctuating power supply, poor finance, lack of internet access in the rural areas and high cost of ICT hardware and software.

Angello and Wema (2010) in their study on availability and usage of ICTs and e-resources by livestock researchers in Tanzania reported that most livestock researchers were not aware of most of the e-resources availability and hence could not access and use them effectively in their research work.

Dhaka and Chayal (2010) stated that insufficient regional specific information, inadequate facilitator's knowledge, lack of infrastructure facilities and inadequate internet connectivity were the major constraints faced by farmers in Bundi district of Rajasthan.

Kubkomawa and Salihu (2010) observed in their study that 70% respondents confirmed that they had not been able to coordinate and harness information obtained from ICT to improve their productivity in livestock and agriculture. This showed that there is still limited level of awareness on the use of ICT to improve and enhance livestock production in Gombi Local Government Area.

Mwakaje (2010) reported in his study that the cost of using ICT was modest in comparison with the benefits of using ICT for market information access and the use of ICT was constrained by costs, accessibility and reliability.

Ghasura *et al.* (2011) pointed that the major obstacles were lack of idea among farmers to use ICT tools, ignorance about benefit of using ICT, lack of skill and time to use ICT, the lack of penetration of ICT tools, non availability of broadband connectivity and ICT Infrastructure in rural areas.

Ramaraju *et al.* (2011) studied in twelve states of India and revealed that major constraints experienced by the respondents were delivery of generic information delivered, language / literacy barrier and limited records of the farmers and their farming details.

Mooventhan and Philip (2012) stated that problems faced by the farmers in Coimbatore and Trichy districts of Tamil Nadu were lack of information in local language, high cost for establishment, not suitable to illiterate people , difficult in handling of computer mouse, difficulty to type the URL to access the webpage, high cost for internet connection, lack of skill to use modern information technology gadgets, lack of familiarity towards modern information technology gadgets, lack of

relevant information in the website, lack of prompt reply to online queries and clarification, inability to make or receive electronic payments, slow downloading and uploading of photos/files/videos, lack of update information and difficulty in reading online information.

Shankaraiah and Swamy (2012) revealed that the major constraints faced by farmers were lack of practical exposure and difficulty of clarification if any doubt arises.

Ukoha *et al.* (2012) showed in their study that most of the farmers were small scale farmers and literate with reasonable years of experience. Further in their study regression analysis also showed that level of education, farming experience, income and size of flock were determinants of ICT use among livestock farmers in the Ukwa West Lga, Abia state of Nigeria.

Sireesha *et al.* (2014) found that majority of the organizations disagreed to the statements of difficulty in the use of ICT because of its cost and ICTs are not compatible with existing traditional methods while mixed responses were obtained for the statement that they lost natural mathematical or analytical skills after the advent of ICTs.

Angello (2015) concluded in his study on "Exploring the use of ICTs in learning and disseminating livestock husbandry knowledge to urban and peri-urban communities" that various ICT tools usage was hindered by several factors including unawareness of the radio and television programmes and lack of computer skills.

Rebekka and Saravanan (2015) in their study on "Access and usage of ICTs for agriculture and rural development by the tribal farmers in Meghalaya State of North-East India" reported that major problems in the use of ICTs by the farmers were lack of confidence in operating ICTs, erratic power supply, low network connectivity and lack of awareness of the benefits of ICTs.

Authenticity of research findings and their possible explanations depend upon the efficacy, accuracy and sensitiveness of the methods applied to investigate them. This research methodology deals with the details of the methods and techniques employed to explore the possible explanations of the findings in the line of objectives laid down for the investigation. This section has been divided into the following sub-sections for the systematic presentation as under:

3.1 Research design
3.2 Locale of the study
3.3 Sampling technique
3.4 Selection of variables and their measurement
3.5 Data collection
3.6 Data analysis

3.1 Research design

To study the dissemination of livestock information through use of ICTs, exploratory research design was used in the present study.

3.2 Locale of the study

3.2.1 Selection of state

The study was conducted purposively in Rajasthan, which was selected on the basis of following criteria:

1. Rajasthan is rich in livestock wealth and having second position in milk production and first position in wool production in the country.
2. Rajasthan is one of the developing state in the country and people of the state are using various ICT tools in their day to day life to adopt better life style.
3. Very few studies have been conducted on the impact of ICT tools in the dissemination of livestock information in the state.
4. Familiarity with the area, people, field extension personnel, other concerned officials and local dialect by virtue of birth, education and work experience in the state.

3.2.2 Profile of Rajasthan

The Rajasthan state is located at the latitude 23º3' and 30º12' N and the longitude of 69º30' and 78º17' E comprising 342,239 km² of area, with an average rainfall of about 400 millimeters mostly by south west monsoon and temperature ranges from 0º to 46º Celsius. Livestock density is 169 per km^2 as against the national average of 184 per km^2 (Anonymous, 2014). The population density is about 201 per sq. km (Anonymous, 2011). 75.13% of the total population of Rajasthan state lives in the villages of rural areas. As per the 19th Livestock Census, there are 577.32 lacs livestock (which include cattle, buffalo, sheep, goat, horse & ponies, mules, donkeys, camel, pig) and 80.24 lacs poultry.

3.3 Sampling technique

3.3.1 Selection of district

The study was conducted in Jaipur district of Rajasthan. This district was selected purposively on the basis of prospective rate of information acessibility, availability and usage, good informative network and livestock wealth status in the district. Livestock owners of the district are progressive livestock farmers and techno friendly. This district contributes near about 4.86 per cent of total livestock population in the state. The total livestock population in Jaipur district is near about 28 lacs and progressing well as compared to other districts of Rajasthan.

3.3.1.1 Profile of Jaipur district

The Jaipur district is located in the Eastern region of Rajasthan. The district comprises of 11,143 km² area with a total population of 66, 26,178 (Anonymous, 2011). The population density is about 598 per sq. km. The district consists of 16 tehsils and 15 blocks under revenue administration. The district is rich in livestock wealth having about 8.3% buffaloes, 4.8% cattle, 3.8% goats and 2.5% sheep of the state. The livestock density is 252 animals per sq. km. in the district.

3.3.1.2 Jaipur at a glance

Country name	: India
State name	: Rajasthan
Altitude	: 431m above sea level
Location	: Jaipur is sited at North-East direction of Rajasthan
Geographical location	: Latitude: 26.92 Longitude: 75.82
Area	: 11143 sq. kms.
Language	: English, Hindi & Rajasthani
Climate	: Summer : 32.4 ^{o}C to 45 ^{o}C Winter : 4.3 ^{o}C to 22.2 ^{o}C
Seasons	: Summers (March-June) Winters (November- February) Monsoon (July-September)
No. of sub-districts	: 13
No. of tehsils	: 16
Total population	: 66,26,178
Rural population (per cent of total population)	: 47.60%
Urban population (per cent of total population)	: 52.40%
Sex ratio (per thousand)	: 920

Literacy rate	: 75.81%
Schedule Caste (per cent of total population)	: 15.14%
Schedule Tribe (per cent of total population)	: 7.97%
Total livestock population	: 28,03,997
Livestock density	: 252 per sq. km.

3.3.2 Selection of tehsils

Jaipur district has 16 tehsils namely Jaipur, Amber, Bassi, Chaksu, Chomu, Dudu, Mauzmabad, Jamwa Ramgarh, Phagi, Sambhar, Kotputli, Sanganer, Shahpura, Viratnagar, Kishangarh Renwal and Kotkhawada. Out of these tehsils two tehsils viz. Sanganer and Shahpura were selected randomly.

3.3.3 Selection of villages

A comprehensive list of all the villages under the respective tehsils was prepared in discussion with patwaries and tehsildar. In the next stage of sampling, six villages were selected randomly from each selected tehsils. Chhitroli, Bhankrota khurd, Manohariya wala, Watika, Vidhani and Goner villages were selected from Sanganer tehsil and Chimanpura, Amarpura, Govindpura Dhabai, Markhi, Neejhar and Chhapra kalan were selected from Shahpura tehsil. Thus, total twelve villages were selected for the study.

3.3.4 Selection of respondents

The study was confined to users of different ICT tools in the study area. From each village, an exhaustive list of livestock farmers using ICT tools for livestock information was prepared. Out of these, 10 respondents were selected randomly. Thus, total 120 respondents were selected for the study.

3.4 Selection of variables and their measurement

The comprehensive list of variables studied and their empirical measurement has been presented in Table 3.1.

Table 3.1 Variables and their empirical measurement

S. No.	Variables	Instrument used for the measurement
1.	Age	Chronological age in year
2.	Education	Modified scale of Trivedi (1963)
3.	Category	Modified scale of Trivedi (1963)
4.	Religion	Modified scale of Trivedi (1963)
5.	Occupation	Modified scale of Trivedi (1963)
6.	Family size	Modified scale of Trivedi (1963)
7.	Family type	Modified scale of Trivedi (1963)
8.	Land holding	Modified scale of Trivedi (1963)
9.	Herd size	Structured schedule
10.	Annual gross income	Structured schedule
11.	Experience in livestock farming	Structured schedule
12.	Extension contact	Structured schedule

13.	Mass media exposure	Structured schedule
14.	Social participation	Modified scale of Trivedi (1963)
15.	Economic motivation	Modified scale of Supe (1969)
16.	Accessibility of ICTs	Structured schedule
17.	Availability of ICTs	Structured schedule
18.	Usage of ICTs	Structured schedule
19.	Attitude of livestock farmers towards ICTs	Modified scale of Kumar and Ratnakar (2011)
20.	Constraints perceived in use of ICTs	Structured schedule

3.4.1 Operationalization of variables used in the study

3.4.1.1 Age

It refers to the chronological age of the respondents in completed years at the time of investigation. It was ascertained by direct questioning. The respondents were categorized into following three groups as per modified scale of Trivedi (1963):

a) Young - Upto 30 years
b) Middle - 31 to 50 years
c) Old - Above 50 years

3.4.1.2 Education

The term education refers to the formal education obtained successfully from school to the university level by the respondents. It was obtained by questioning the

respondents directly and the categorization was done as per modified scale of Trivedi (1963):

	Category		Scores
a)	Illiterate	-	1
b)	Upto Primary level	-	2
c)	Upto Middle level	-	3
d)	Upto High school level	-	4
e)	Upto Intermediate level	-	5
f)	Graduate and above	-	6

3.4.1.3 Category

Category of an individual is decided by taking birth in a particular family. In present study, the category was measured by direct questioning and scoring was done after assigning weightage of one to General class, two to Backward class, three to Schedule Tribe and four to Schedule Caste as per modified scale of Trivedi (1963).

3.4.1.4 Religion

It refers to the ceremonial ways of expressing people's belief regarding the ultimate power in the universe, which guides the ideal and proper pattern of behaviour. Religion wise the respondents were categorized as Hindu/ Muslim/ Jain/ Sikh/ Christian and others as per modified scale of Trivedi (1963).

3.4.1.5 Occupation

It refers to the source of livelihood of the respondents. Occupation of the respondents was ensured in terms of their primary and secondary occupation. Further, six predominant occupations viz. agriculture, livestock rearing, agricultural labour, non-agricultural labour, trade & commerce and others were enlisted. From this list, the respondents were asked to indicate their primary as well as secondary occupation.

3.4.1.6 Family size

It refers to the total number of individuals living together in a family under a single roof and sharing common kitchen. It was obtained by questioning the respondents directly. The respondents were classified into following three categories as per modified scale of Trivedi (1963):

a) Small - Upto 5 members

b) Medium - 6 to 9 members

c) Large - Above 9 members

3.4.1.7 Family type

Family is the group defined by sex relationship sufficient precise and enduring to provide for the procurement and upbringing of children. In the present study, family refers to whether it was nuclear or joint family system in the respondent's family. The categorization was done as per modified scale of Trivedi (1963) into nuclear and joint family.

3.4.1.8 Land holding

It refers to the cultivated land owned by the respondent's family at the time of interview. It was measured in terms of hectares and was ascertained by direct questioning of the respondents. They were classified into following categories as per modified scale of Trivedi (1963):

Category	Land in hectares	Scores
a) Landless	No land	1
b) Marginal	Upto 1 hectare	2
c) Small	1.1 to 2.0 hectares	3
d) Medium	2.1 to 4.0 hectares	4
e) Large	Above 4 hectares	5

3.4.1.9 Herd size

It refers to the total number of livestock (cattle, buffaloes, sheep, goats, pigs etc.) heads including young ones possessed by the farmers at the time of investigation. Farmers were categorized into following three categories using mean and standard deviation.

a) Small - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) Large - More than (Mean + S.D.)

3.4.1.10 Annual gross income

It indicates the total annual income of the respondent's family from all the sources put together. It was ascertained through direct questioning. The categorization of the respondents with regard to the annual income was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.11 Experience in livestock farming

It refers to the total experience of the respondents in years with respect to livestock farming. It was ascertained through direct questioning. The respondents were classified into three categories as low, medium and high based on the number of years of livestock farming experience. The categorization of the respondents with regard to the experience in livestock farming was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.12 Extension contact

This variable was measured in terms of frequency of meeting of the farmers with the Village Development Officer (VDO), Livestock Assistant (LSA), Progressive farmers, Panchayat personnel, Veterinary Officer (VO), University personnel, KVK personnel, NGOs and others in connection with seeking information. The responses were measured in four-point continuum i.e. frequently, sometimes, occasionally and never with a scoring system of 3, 2, 1 and 0 respectively. The pooled score expressed the degree of contact of the respondent with various extension agents. The categorization of the respondents with regard to the extension contact was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.13 Mass media exposure

It was operationally defined as the degree to which the respondents were exposed to different mass media like newspaper, radio, T.V., tour/field trip, farm magazine, kisan mela, livestock show and other etc. The responses were measured in four-point continuum i.e. frequently, sometimes, occasionally and never with a scoring system of 3, 2, 1 and 0 respectively. The pooled score expressed the degree of exposure of the respondent to different mass media. The categorization of the respondents with regard to the mass media exposure was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.14 Social participation

It refers to the degree of involvement of the respondent either as a member or as an office bearer in formal organization. It was measured by the scoring pattern followed by Trivedi (1963) with slight modification.

Category		Score
a) No participation	-	1
b) Member of organization	-	2
c) Office bearer (at present)	-	3

The total score obtained by a respondent indicated his degree of social participation. The categorization of the respondents with regard to the social participation was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.15 Economic motivation

This referred to the extent to which an individual was oriented towards achieving the maximum economic returns. The variable was measured by the scale developed by Supe (1969) with some modification. The scale consisted of six statements (five positive and one negative). A five point-continuum i.e. strongly agree, agree, undecided, disagree and strongly disagree with a scoring of 5, 4, 3, 2 and 1 for positive and vice-versa for the negative statement was adopted. The total score obtained by a respondent indicated his degree of economic motivation.

The categorization of the respondents with regard to the economic motivation was done by using mean and standard deviation.

a) Low - Less than (Mean - S.D.)

b) Medium - Between (Mean ± S.D.)

c) High - More than (Mean + S.D.)

3.4.1.16 Accessibility of ICTs

It is operationalised as the degree to which an individual respondent is able to use ICTs or its applications for the purpose of livestock farming. A scoring of 1 and 0 was given to the respondents accessing ICTs and not accessing ICTs respectively.

3.4.1.17 Availability of ICTs

It is operationally defined as the degree to which an individual respondent possess ICTs or its applications for the purpose of livestock farming. A scoring of 1 and 0 was given to the respondents possessing ICTs and not possessing ICTs respectively.

3.4.1.18 Usage of ICTs

It is operationally defined as the degree of frequency and purpose of use of ICTs by the individual respondents for livestock farming at the time of investigation. The various dimensions to study the usage of ICTs among the individual respondents under livestock sector were availability and quality of inputs, general care and management, scheme and services on animal husbandry and marketing of produce etc. For frequency of usage, very frequently is defined in terms of its usage of ICTs 'daily', frequently in terms of its usage of ICTs 'once a week', occasionally in terms of its usage of ICTs 'once a month' and rarely in terms of usage of ICTs 'once in three months'. The responses were measured with a scoring pattern of 4, 3, 2 and 1 for very frequently, frequently, occassionally and rarely, respectively.

3.4.1.19 Attitude of livestock farmers towards ICTs

Attitude is an organized predisposition to think, feel, perceive and behave towards a cognitive object. Attitude is the degree of positive or negative effect associated with some psychological object.

The Modified scale of Kumar and Ratnakar (2011) was used for measuring the attitude of livestock farmers towards ICT based livestock extension services. The scale consisted of 22 statements (twelve positive and ten negetive). The responses were recorded on a five point continuum representing strongly agree, agree,

undecided, disagree, and strongly disagree with scores of 5,4,3,2, and1 for positive statements and vice-versa for negative statements, respectively. The maximum and minimum obtainable score was 110 and 22 respectively.

After getting the total attitude score of each respondent, they were classified into three groups as follows:

a) Less favourable - Less than (Mean - S.D.)

b) Favourable - Between (Mean ± S.D.)

c) More favourable - More than (Mean + S.D.)

3.4.1.20 Constraints perceived by livestock farmers in use of ICTs

It refers to impediments or obstacles in following a particular way. Constraints for the present study have been operationalised as obstacles or hurdles encountered by the livestock farmers in access and usage of ICTs.

Fourteen possible constraints were enumerated after reviewing related literature, consultation with subject matter specialists and ICT experts. The constraints were also listed by direct questioning with the livestock farmers.

The identified constraints were measured on a four point continuum i.e. most serious constraint, serious constraint, less serious constraint and not a constraint with a scoring system of 4, 3, 2 and 1 respectively. The maximum and minimum obtainable score was 56 and 14 respectively.

3.4.1.21 Possible solutions of the constraints

ICT offers great hope for improving access, quality and efficiency of information dessimination in livestock sector, but there is a need to understand the key issues underlying the problems and to formulate sensible strategies.

Eleven possible solutions were enumerated after reviewing related literature, consultation with subject matter specialists and ICT experts. These possible solutions were also listed by direct questioning with the livestock farmers. The identified

possible solutions were measured on a three point continuum i.e. agree, neutral and disagree with a scoring system of 3, 2 and 1 respectively.

3.4 Data collection

The secondary data were collected from the records, reports and documents available in the offices of patwaries and tehsildars. The primary data were collected with the help of structured interview schedule developed for the study, incorporating all the parameters on which information was required. In each village, before starting the interview, certain time was devoted to develop rapport with the respondents. All the respondents were interviewed personally by the researcher himself in the villages to collect the required information.

3.5 Data analysis

The schedules administered were checked, verified and numbered after getting the responses from the respondents. The data were scored, compiled and tabulated according to the standard procedures keeping in view the objectives of the study. The following statistical methods were used in analysis of the data:

A. **Frequency:** It was used to find out the number of respondents in particular field.

B. **Mean:** It was calculated by adding the scores obtained by the respondent and dividing it by the total number of practices so as to find mean or an average.

C. **Percentage Analysis:** The percentage was calculated for making simple comparison. For calculating percentage, the frequency of a particular cell was divided by the total number of respondent in that particular category and multiplied by 100. Percentage was calculated up to two places after decimal point. All socio-economic and communication characteristics were subjected to percentage analysis to have clear idea about the population from where sample respondents were selected.

D. **Standard deviation:** Standard deviation is a measure of the dispersion of a set of data from its mean. If the data points are farther from the mean, there is higher deviation within the data set. Standard deviation is calculated as the square root of variance by determining the variation between each data point relative to the mean.

E. **Chi Square test:** Chi-square is a statistical test commonly used to compare observed data with data we would expect to obtain according to a specific hypothesis.

The formula for calculating chi-square (x^2) is:

$x^2 = (o-e)^2/e$

That is, chi-square is the sum of the squared difference between observed (o) and the expected (e) data (or the deviation, d), divided by the expected data in all possible categories.

F. **Correlation**

G. **Multiple regression analysis**

This chapter presents the results of the study based on statistical analysis of the data collected from the respondents by using appropriate analytical methods. Further this chapter also provides the possible explanation of the results obtained and reason behind them. The results have been presented under the following heads:

4.1 General profile of livestock farmers

4.2 Accessibility of ICTs to livestock farmers

4.3 Availability of ICTs among the respondents

4.4 Usage and Purpose of utilization of ICTs

4.5 Attitude of livestock farmers towards ICTs

4.6 Perceived constraints in access and utilization of ICTs by respondents and their possible solutions

4.1 General profile of livestock farmers

4.1.1 Age

Data in Table 4.1 reveals that majority (51.67%) of the respondents belonged to middle age group (31-50 years) followed by the category of old (above 50 years) and young (upto 30years) which accounts for 27.50 per cent and 20.83 per cent, respectively. This finding is in line with that of Subash (2009), Dhaka and Chayal (2010) and Ghasura *et al.* (2011) who reported that majority of the respondents were from middle age group. The average age of the respondents was found to be 42.69 years.

4.1.2 Education

It is evident from Table 4.1 that 25.00 per cent of the respondents were educated upto primary level, 20.00 per cent educated upto gradute level, 19.16 per cent were educated upto high school level, 15.83 per cent were middle pass, 13.33 per cent upto intermediate level and 6.67 per cent were illiterate. This finding is in corroboration with that of Subhash *et al.* (2010).

4.1.3 Sex

A persual of Table 4.1 further reveals that a great majority of the respondents (99.17%) were male while 0.83 per cent were female. This finding is in conformity with that of Kubkomawa and Salihu (2010).

Table 4.1: Distribution of livestock farmers according to their personal attributes

S. NO.	PERSONAL ATTRIBUTES	FREQUENCY (*f*)	PER CENT (%)
1.	**Age**		
	(i) Young (Upto 30 years)	25	20.83
	(ii) Middle (31 to 50 years)	62	51.67
	(iii) Old (Above 50 years)	33	27.50
	Mean ± S.D.	**42.69 ± 12.74**	
2.	**Education**		
	(i) Illiterate	8	6.67
	(ii) Upto Primary level	30	25.00
	(iii) Upto Middle level	19	15.83
	(iv) Upto High school level	23	19.17
	(v) Upto Intermediate level	16	13.33
	(vi) Graduate and above	24	20.00
3.	**Sex**		
	(i) Male	119	99.17
	(ii) Female	01	0.83

4.	**Category**		
	(i) General class	36	30.00
	(ii) Other Backward class	75	62.50
	(iii) Schedule Tribe	7	5.83
	(iv) Schedule Caste	2	1.67
5.	**Religion**		
	(i) Hindu	120	100.00
	(ii) Muslim	0	0.00
	(iii) Jain	0	0.00
	(iv) Sikh	0	0.00
	(v) Christian	0	0.00
6.	**Primary occupation**		
	(i) Agriculture	74	61.67
	(ii) Livestock rearing	0	0.00
	(iii) Agricultural labour	0	0.00
	(iv) Non-agricultural labour	4	3.33
	(v) Trade & commerce	19	15.83
	(vi)Others	23	19.17
7.	**Secondary occupation**		
	(i) Agriculture	2	1.67
	(ii) Livestock rearing	118	98.33
	(iii) Agricultural labour	0	0.00
	(iv) Non-agricultural labour	0	0.00
	(v) Trade & commerce	0	0.00
	(vi) Others	0	0.00

8.	**Family size**		
	(i) Small (Upto 5 members)	49	40.83
	(ii) Medium (6 to 9 members)	53	44.17
	(iii) Large (Above 9 members)	18	15.00
	Mean ± S.D.	**6.56 ± 2.86**	
9.	**Family type**		
	(i) Nuclear	99	82.50
	(ii) Joint	21	17.50
10.	**Land holding**		
	(i) Landless (No land)	2	1.67
	(ii) Marginal (Upto 1 hectare)	53	44.16
	(iii)Small (1.1 to 2.0 hectares)	36	30.00
	(iv)Medium (2.1 to 4.0 hectares)	20	16.67
	(v) Large (Above 4 hectares)	9	7.50
	Mean ± S.D.	**1.65 ± 1.43**	
11.	**Herd size**		
	(i) Small (Upto 4 animals)	17	14.17
	(ii) Medium (5 to 14 animals)	87	72.50
	(iii) Large (Above 14 animals)	16	13.33
	Mean ± S.D.	**8.93 ± 4.96**	
12.	**Annual gross income**		
	(i) Low (Upto 87,836 INR)	24	20.00
	(ii) Medium (87,837 to 4,09,363 INR)	85	70.83
	(iii) High (Above 4,09,363 INR)	11	9.17
	Mean ± S.D.	**248600 ± 160764.3**	

13.	**Experience in livestock farming**		
	(i) Low (Upto 12.22 years)	23	19.17
	(ii) Medium (12.23 to 36.82 years)	76	63.33
	(iii) High (Above 36.82 years)	21	17.50
	Mean ± S.D.	**24.53 ± 12.30**	
14.	**Extension contact**		
	(i) Low (Upto 5.64 score)	07	5.83
	(ii) Medium (5.65 to 6.20 score)	113	94.17
	(iii) High (Above 6.20 score)	0	0.00
	Mean ± S.D.	**5.93 ± 0.28**	
15.	**Mass media exposure**		
	(i) Low (Upto 5.04 score)	40	33.33
	(ii) Medium (5.05 to 6.20 score)	80	66.67
	(iii) High (Above 6.20 score)	0	0.00
	Mean ± S.D.	**5.63 ± 0.58**	
16.	**Social participation**		
	(i) Low (Upto 0.80 score)	0	0.00
	(ii) Medium (0.81 to 1.62 score)	94	78.33
	(iii) High (Above 1.62 score)	26	21.67
	Mean ± S.D.	**1.22 ± 0.41**	
17.	**Economic motivation**		
	(i) Low (Upto 12.47 score)	12	10.00
	(ii) Medium (12.48 to 14.48 score)	83	69.17
	(iii) High (Above 14.48 score)	25	20.83
	Mean ± S.D.	**13.48 ± 1.00**	

4.1.4 Category

Table 4.1 indicates that 62.50 per cent of the respondents belonged to OBC category followed by 30.00, 5.83 and 1.67 per cent belonging to General, ST and SC category, respectively.

4.1.5 Religion

It is observed from Table 4.1 that all (100.00%) the respondents belonged to Hindu religion. None of the respondents were from Muslim, Sikh, Jain or Christian community.

4.1.6 Primary occupation

It is evident from Table 4.1 that majority of the respondents (61.67%) had agriculture as their primary occupation followed by others (service), trade and commerce and non agricultural labour which accounts for 19.67, 15.83 and 3.33 per cent, respectively. The finding is in contradiction with the findings of Philip (2015) who revealed that nearly three-fourth of the respondents had animal husbandry as their primary occupation.

4.1.7 Secondary occupation

The distribution of the respondents as per their secondary occupation presented in Table 4.1 shows that a great majority of the respondents (98.33%) had livestock rearing as their secondary occupation followed by agriculture (1.67%).

4.1.8 Family size

The size of family plays an important role for taking a decision regarding adoption of an innovation thought and action of the individual members. A perusal of Table 4.1 represents that majority of the livestock farmers (44.67%) had medium family size (6 to 9 members) followed by 40.83 per cent with small family size (upto 5 members) and 15.00 per cent with large size families. The average family size of the respondents was found to be 6.56 members.

4.1.9 Family type

The data presented in Table 4.1 clearly indicates that majority of the respondents (82.50%) were living in nuclear family system while 17.50 per cent in

joint family system. The occurance of this result may be due to modern thinking about freedom and privacy that may not be possible in joint families.

4.1.10 Land holding

The results from Table 4.1 reveal that majority (44.16%) of the livestock farmers were marginal farmers followed by small (30.00%), medium (16.67%), large (7.50%) and landless (1.67%) farmers. The average land holding of the respondents was found to be 1.65 hactares.

4.1.11 Herd size

It can be concluded from Table 4.1 that majority of the livestock farmers (72.50%) had medium size (5 to 14 animals) of herd followed by 14.17 per cent with small herd size (upto 4 animals) and 13.33 per cent with large size herd (above 14 animals). The average herd size of the livestock farmers was found to be 8.93 animals.

4.1.12 Annual gros income

Table 4.1 shows that majority (70.83%) of the livestock farmers were in the medium income group (87,837 – 4,09,363 INR) followed by 20.00 per cent in low income group (upto 87,836 INR) and 9.17 per cent in high income group (above 4,09,363 INR). The average annual gross income of livestock farmers was 2,48,600 INR per year.

4.1.13 Experience in livestock farming

Table 4.1 indicates that 63.33 per cent livestock owners had medium level of experience (12.23 – 36.82 years) in animal husbandry followed by 19.17 per cent with low level of experience (upto 12.22 years) and 17.50 per cent with high level of experience (above 36.82 years). The average livestock farming experience of livestock farmers was 24.53 years.

4.1.14 Extension contact

From Table 4.1 it is interesting to note that a great majority of the livestock farmers (94.17%) had medium level of extension contact, followed by 5.83 per cent with low level of extension contact. None of the respondents had high level of extension contact. These results are in agreement with the findings of Philip (2015).

4.1.15 Mass media exposure

Mass media plays a great role in making livestock farmers accessible to various developments taking place from time to time, which enhances awareness as well as knowledge. Results presented in Table 4.1 reveal that majority (66.67%) of the livestock farmers had medium level of mass media exposure followed by 33.33 per cent with low level of mass media exposure. None of the respondents had high level of mass media exposure. The findings do not agree with the findings of Philip (2015) who reported that more than half of the respondents had low level of mass media exposure.

4.1.16 Social participation

Social participation denotes extent to which an individual is actively involved in the affairs of the community. Active participation of the respondents in organizations such as village panchayat, local youth club, co-operative society, religious organization and NGO was considered in this study. The results presented in Table 4.1 shows that majority (78.33%) of the livestock farmers had medium level of social participation followed by 21.67 per cent with high level of social participation. None of livestock farmers had low level of social participation.

4.1.17 Economic motivation

Table 4.1 depicts that majority of the livestock farmers (69.17%) had medium level of economic motivation followed by 20.83 per cent, 10.00 per cent with high and low level of economic motivation, respectively.

4.2 Accessibility of ICTs to livestock farmers

The tabulated data (Table 4.2) for the level of accessibility of ICTs to the livestock farmers reveals that all the livestock farmers (100%) had accessibility to mobile phones. The reason for higher accessibility of mobile phones compared to other ICT tools might be due to fact that it is affordable, portable as well as useful during emergencies. This is in accordance with the findings of Angello (2015), Chikaire *et al.* (2015) and Rebekka and Saravanan (2015).

Besides mobile phones, newspaper and television were also reported to be accessed by a great majority of the livestock farmers included in the study of selected

district which were 93.33 and 92.50 per cent, respectively. The results are in agreement with the findings of Ramaraju *et al.* (2011) and Singh *et al.* (2014).

Internet, facebook, whatsapp, e-mail, computer and youtube were reported to be accessed by 72.50, 68.35, 65.00, 53.33, 50.00 and 60.00 per cent livestock farmers, respectively. The reason for higher accessibility of these ICT tools might be due to the fact that most of the livestock farmers were from young and middle age category and were literate.

Table 4.2: Accessibility of ICTs to livestock farmers (n=120)

S. NO.	ICT TOOLS	ACCESSIBLE		NOT ACCESSIBLE	
		f	%	*f*	%
1.	Mobile	120	100.00	0	0.00
2.	Television	111	92.50	9	7.50
3.	Radio	22	18.33	98	81.67
4.	Information kiosk/CSC	20	16.67	100	83.33
5.	Newspaper	112	93.33	8	6.67
6.	Farm Magazine	0	0.00	120	100.00
7.	Internet	87	72.50	33	27.50
8.	Facebook	82	68.33	38	31.67
9.	Whatsapp	73	60.83	47	39.17
10.	E-Mail	64	53.33	56	46.67
11.	Computer	60	50.00	60	50.00
12.	E-Books	3	2.50	117	97.50
13.	CD/DVD	20	16.67	100	83.33
14.	Youtube	72	60.00	48	40.00
15.	Others (Projector)	2	1.67	118	98.33

The data in table further reveals that other ICT tools viz. radio, Information Kiosk/CSCs, CD/DVD and e-books were accessed by few respondents which were

18.33, 16.67, 16.67 and 2.50 per cent, respectively. None of the livestock farmers were accessing farm magazine.

4.3 Availability of ICTs among the respondents

Table 4.3 presents the level of availability of different ICTs tools among the livestock farmers. It is clear from the table that all the livestock farmers (100.00%) had mobile phones. This may be due to the reason that mobile phones are easily affordable and can be used by illiterate livestock farmers also. About 93.33, 82.50 and 63.33 per cent livestock farmers had television, newspaper and internet, respectively. Similar finding were reported by Angello (2015).

Table 4.3: Availability of ICTs among livestock farmers (n=120)

S. NO.	ICT TOOLS	AVAILABLE		NOT AVAILABLE	
		f	%	*f*	%
1.	Mobile	120	100.00	0	0.00
2.	Television	112	93.33	8	6.67
3.	Radio	22	18.33	98	81.67
4.	Information kiosk/CSC	56	46.67	64	55.33
5.	Newspaper	99	82.50	21	17.50
6.	Farm Magazine	0	0.00	120	100.00
7.	Internet	76	63.33	44	36.67
8.	Facebook	71	59.17	49	40.83
9.	Whatsapp	73	60.83	47	39.17
10.	E-Mail	50	41.67	70	58.33
11.	Computer	42	35.00	78	65.00
12.	E-Books	0	0.00	120	100.00
13.	CD/DVD	24	20.00	96	80.00
14.	Youtube	61	50.83	59	49.17
15.	Others (Projector)	1	0.83	119	99.17

It is also evident from Table 4.3 that many of the livestock farmers had availability of whatsapp (60.83%), facebook (59.17%) and youtube (50.83%). Among other ICT tools, Information Kiosk/CSCs, e-mail and computer were available to 46.67, 41.67 and 35.00 per cent livestock farmers, respectively. These findings are similar to Fu and Akter (2012). Further in the study it was reported that 20.00 and 18.33 per cent livestock farmers had availability of CD/DVD and radio, respectively. None of the livestock farmers had availability of ICT tools such as e-book and farm magazine.

4.4 Usage and purpose of utilization of ICTs

It can be observed from Table 4.4 that mobile phone was regarded as the most frequently used ICT tool among the livestock farmers using it very frequently by 97.50 per cent respondents. Similar finding was reported by Angello (2015). This indicates that the usage of mobile phones is increasing at an alarming rate. This may be due to the reason that mobile phones are easily affordable and could be used by even illiterate farmers. The usage trend in mobile phones also indicates that it can offer huge scope in the future if appropriately used for the purpose of livestock farming. Next to mobile phones, television and newspaper were used occasionally by 42.50 and 25.00 per cent, frequently by 26.67 and 20.00 per cent and rarely by 18.33 and 33.33 per cent livestock farmers, respectively. This finding is in line with that of Ramaraju *et al.* (2011).

It is also clear from Table 4.4 that the use of radio was lower as compared to mobile phones, newspaper and television since the level of availability and accessibility of this ICT was also lower as compared to other ICTs. Further, 5.00 per cent and 11.67 per cent livestock farmers visited the infotmation kiosk/CSCs occasionally and rarely, respectively. Computers and CD/DVD were being used rarely by 33.33 and 16.67 per cent livestock farmers, respectively. Web based services like internet (40.00%), facebook (65.83%), whatsapp (57.50%), E-mail (53.33%) and youtube (50.00%) were also being used rarely by livestock farmers. This finding is in conformity with that of Ghasura *et al.* (2011).

The distribution of respondents on the basis of purpose of utilization of ICTs in livestock sector has been presented in Table 4.5. It is clear from the table that usage

of ICTs for availability and quality of inputs was mainly through internet (5.00% each). The usage of ICTs for market price of inputs and marketing of produce was mainly through mobile phone (65.00% each) followed by newspaper (13.33% each) and internet (11.67% each).

The findings shows that livestock farmers mainly used mobile phone to communicate with the middlemen in the markets to communicate efficiently and to prevent the middlemen from cheating them as through the use of mobile phones they could track in which market and at what price they are selling from time to time. This is also in line with the findings of Oyeyinka and Bello (2013).

This table further reveals that mobile phone was the most widely used ICT tool used for the purpose of general care and management (61.67%), health management (60.83%), sanitation (57.50%), treatment (52.50%), vaccination (45.83%), details about trainings, animal fairs/livestock show and kisan mela (44.17% each) and information about schemes & services on animal husbandry (33.33%). It can be concluded from the results that mobile phone was reported to be used by the livestock farmers to contact experts, extension personnel, veterinary officers, livestock assistants and progressive farmers to enquire about the recommended health management, treatment, vaccination, scheme and services on animal husbandry, trainings, animal fairs/livestock show and kisan mela etc. The result is in agreement with the findings of Angello (2015) who revealed that mobile phones were used more than any other ICTs.

A persual of Table 4.5 reveals that many respondents were also using television for getting informtion on general care and management & health management (15.00% each), sanitation (14.17%) and vaccination and feed and fodders (7.50% each) livestock farmers preferred to watch the television programmes broadcasted through Doordarshan Kendra, Jaipur to gather information on these aspects. Newspaper was also used by many livestock farmers for getting informtion on scheme and services on animal husbandry (26.67%), training (23.33%), animal fair/livestock show (22.50%), kisan mela (21.67%) and market price of inputs (13.33%). This finding is in agreement with the findings of Chikaire *et al.* (2015).

Table 4.4: Frequency of usage of ICTs among livestock farmers (n=120)

List of ICTs	Frequency of usage							
	Very frequently		Frequently		Occasionally		Rarely	
	f	%	*f*	%	*f*	%	*f*	%
i. Mobile	117	97.50	2	1.67	1	0.83	0	0.00
ii. Television	6	5.00	32	26.67	51	42.50	22	18.33
iii. Radio	0	0.00	6	5.00	9	7.50	7	5.83
iv. Information kiosk/ CSC	0	0.00	0	0.00	6	5.00	14	11.67
v. Newspaper	18	15.00	24	20.00	30	25.00	40	33.33
vi. Farm Magazine	0	0.00	0	0.00	0	0.00	0	0.00
vii. Internet	7	5.83	12	10.00	20	16.67	48	40.00
viii. Facebook	0	0.00	0	0.00	3	2.50	79	65.83

ix.	Whatsapp	0	0.00	0	0.00	4	3.33	69	57.50
x.	E-Mail	0	0.00	0	0.00	0	0.00	64	53.33
xi.	Computer	0	0.00	2	1.67	18	15.00	40	33.33
xii.	E-Books	0	0.00	0	0.00	0	0.00	3	2.50
xiii.	CD/DVD	0	0.00	0	0.00	0	0.00	20	16.67
xiv.	Youtube	0	0.00	8	6.67	4	3.33	60	50.00
xv.	Other (Projector)	0	0.00	0	0.00	0	0.00	2	1.67

Table 4.5: Purpose of usage of ICTs in livestock sector (n=120)

PURPOSE	MOBILE		T.V.		NEWSPAPER		INTERNET	
	f	%	*f*	%	*f*	%	*f*	%
i. Availability of inputs	2	1.67	0	0.00	0	0.00	6	5.00
ii. Quality of inputs	1	0.83	0	0.00	0	0.00	6	5.00
iii. Market price of inputs	78	65.00	7	5.83	16	13.33	14	11.67
iv. Marketing of produce	78	65.00	0	0.00	16	13.33	14	11.67
v. General care and management	74	61.67	18	15.00	9	7.50	10	8.33
vi. Sanitation	69	57.50	17	14.17	11	9.17	10	8.33
vii. Health management	73	60.83	18	15.00	9	7.50	10	8.33
viii. Treatment	63	52.50	6	5.00	4	3.33	6	5.00

ix.	Vaccination	55	45.83	9	7.50	5	4.17	9	7.50
x.	Feed and fodders	15	12.50	9	7.50	4	3.33	6	5.00
xi.	Availability of breeds	4	3.33	2	1.67	0	0.00	7	5.83
xii.	Clean milk production	4	3.33	5	4.17	1	0.83	7	5.83
xiii.	Value addition of products	0	0.00	0	0.00	0	0.00	0	0.00
xiv.	Schemes and services on animal husbandry	40	33.33	1	0.83	32	26.67	8	6.67
xv.	Trainings	53	44.17	0	0.00	28	23.33	4	3.33
xvi.	Animal fairs/ Livestock show	53	44.17	0	0.00	27	22.50	4	3.33
xvii.	Kisan mela	53	44.17	0	0.00	26	21.67	4	3.33
xviii.	Insurance	0	0.00	0	0.00	0	0.00	0	0.00
xix.	Online loan/Banking	0	0.00	0	0.00	0	0.00	0	0.00

A great majority of the livestock farmers were unaware about usage of ICTs for getting information on availability of breeds, clean milk production, availability of inputs, quality of inputs, value addition of products, insurance and online loan/Banking.

4.4.1 Association between accessibility, availability and usage of ICTs with independent variables

Table 4.6 shows that all the variables *viz*. age, education, family size, land holding, herd size, annual gross income, experience in livestock farming, extension contact, mass media exposure and social participation had a significant association with the level of accessibility and availability of ICTs of the livestock farmers.

Table 4.6: Association between accessibility and availability of ICTs with independent variables

S. No.	Variables	Accessibility and Availability of ICTs	
		Chi-square	Asymp. Sig. (2 tailed)
1.	Age	245.52	0.000**
2.	Education	416.752	0.000**
3.	Family size	242.695	0.000**
4.	Land holding	287.206	0.000**
5.	Herd size	186.878	0.000**
6.	Annual gross income	188.447	0.000**
7.	Experience in livestock farming	218.624	0.000**
8.	Extension contact	53.361	0.000**
9.	Mass media exposure	152.763	0.000**
10.	Social participation	125.438	0.000**

*** Significant at 1 per cent level*

This is evident as majority of young and middle aged livestock farmers included in the study with high level of education were found to have more degree of availability and accessibility of ICTs as compared to old aged farmers with low level of educational qualification. The study also reveals that livestock farmers with larger family size, herd size and land holding had higher annual income resulting into higher purchasing ability of ICTs. The higher degree of experience in livestock farming, extension contact, mass media exposure and extent of social participation also influenced the livestock farmers to avail and access ICTs. This implies that the variables included in the study had a significant association that led to the increased or decreased accessibility and availability of ICTs among the livestock farmers.

Table 4.7: Association between usage of ICTs with independent variables

S. No.	Variables	Usage of ICTs	
		Chi-square	Asymp. Sig. (2 tailed)
1.	Age	245.520	0.000**
2.	Education	416.752	0.000**
3.	Family size	242.695	0.000**
4.	Land holding	288.649	0.000**
5.	Herd size	186.878	0.000**
6.	Annual gross income	188.447	0.000**
7.	Experience in livestock farming	218.624	0.000**
8.	Extension contact	53.361	0.000**
9.	Mass media exposure	152.763	0.000**
10.	Social participation	125.438	0.000**

*** Significant at 1 per cent level*

Table 4.7 indicates that all the variables viz. age, education, family size, land holding, herd size, annual gross income, experience in livestock farming, extension contact, mass media exposure and social participation included in the study had a significant association with the usage of ICTs of the livestock farmers. With regards to usage of ICTs, it was found that old aged livestock farmers had lesser degree of usage of ICTs when compared to young and middle aged livestock farmers with preferably higher level of educational qualification. Since, family size, herd size, land holding and annual income of livestock farmers were significantly associated with the availability of ICTs, this implies that there would be increased usage among livestock farmers with large value of these variables. Livestock farmers included in the study also stated that the level of ownership and usage of ICTs was higher among livestock farmers with better annual income. Further, it was also found in the study that livestock farmers with higher experience in livestock farming, extension contact, mass media exposure and social participation had higher degree of usage of ICTs.

4.5 Attitude of livestock farmers towards ICTs

The attitude of the livestock farmers towards dissemination of livestock information through use of ICTs has been analysed in Table 4.8. A persual of this table reveals that a great majority of livestock farmers were in agreement with positive statements about information dissemination through ICTs like ICT based disease outbreak warning system facilitate farmers to take preventive measures (92.50%), ICTs provide possible solutions to the present animal husbandry situation (86.67%), ICT based extension services assist the farmer in planning and decision making aspects in animal husbandry (85.83%), ICTs are potential tools to reach the needy farmers (83.33%) and ICTs based extension services provide new opportunities to build a skilled and knowledgeable community (83.33%).

Majority of them were also in agreement with the other positive statements like access to information centre at village level is boon to the farming community (76.67%), phone-in-live with scientists gives first hand information about queries (74.17%), weather forecasting through ICTs assists farmers in timely decisions (72.50%), farmers feed back is fast through ICTs than traditional methods (71.67%), expert advice make the farmers enterprise/activities productive (69.17%), farmers.

Table 4.8: Distribution of livestock farmers on the basis of their attitude towards ICTs

S. No.	Statements	SA		A		UD		DA		SDA	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
1.	ICTs provide possible solutions to the present animal husbandry situation	3	2.50	104	86.67	10	8.33	3	2.50	0	0.00
2. *	ICTs can not meet location specific needs of the livestock farmers	0	0.00	18	15.00	52	43.33	41	34.17	9	7.50
3.	ICTs are potential tools to reach the needy farmers	6	5.00	100	83.33	9	7.50	5	4.17	0	0.00
4.	Farmers feed back is fast through ICTs than traditional methods	33	27.50	86	71.67	1	0.83	0	0.00	0	0.00
5. *	Illiteracy will not deter farmers in availing ICT services	20	16.67	82	68.33	10	8.33	5	4.17	3	2.50

6. *	ICTs can not deliver personalized information	0	0.00	10	8.33	91	75.83	19	15.83	0	0.00
7.	ICT based extension services assist the farmer in planning and decision making aspects in animal husbandry	6	5.00	103	85.83	5	4.17	6	5.00	0	0.00
8. *	ICT services are a distant dream for resource poor farmers	0	0.00	6	5.00	4	3.33	55	45.83	55	45.83
9.	Farmers can get remunerative prices to their produce through ICT based market intelligence	36	30.00	79	65.83	3	2.50	2	1.67	0	0.00
10.	Expert advice make the farmers enterprise/activities productive	33	27.50	83	69.17	2	1.67	1	0.83	1	0.83
11. *	All kinds of information exchange are possible only through ICTs	3	2.50	2	1.67	12	10.00	84	70.00	19	15.84

12.	Existing infrastructure of ICTs is not enough to meet the needs of the farming community	13	10.83	53	44.17	41	34.17	8	6.67	5	4.17
13. *	Only resourceful farmers can get the benefit of the ICTs	3	2.50	15	12.50	12	10.00	55	45.83	35	29.17
14.	Access to information centre at village level is boon to the farming community	13	10.83	92	76.67	11	9.17	3	2.50	1	0.83
15.	Phone-in-live with scientists gives first hand information about queries	29	24.17	89	74.17	0	0.00	1	0.83	1	0.83
16. *	ICTs alone would solve the problems of farmers	1	0.83	22	18.33	15	12.50	61	50.83	21	17.50
17.	ICT based disease outbreak warning system facilitate farmers to take preventive measures	1	0.83	111	92.50	4	3.33	3	2.50	1	0.83

18. *	ICT based extension services avoid the personal extension contact	0	0.00	10	8.33	55	45.83	53	44.17	2	1.67
19.	ICTs based extension services provide new opportunities to build a skilled and knowledgeable community	10	8.33	100	83.33	8	6.67	2	1.67	0	0.00
20. *	ICT is a valuable tool, but it will never influence farmers' own decision making	0	0.00	12	10.00	44	36.67	59	49.17	5	4.17
21.	Weather forecasting through ICTs assists farmers in timely decisions	32	26.67	87	72.50	1	0.83	0	0.00	0	0.00
22. *	ICT based extension services are alternative to the present extension system	0	0.00	0	0.00	10	8.33	98	81.67	12	10.00

SA: Strongly agree, A: Agree, UD: Undecided, DA: Disagree and SDA: Strongly disagree * Negative Statements

can get remunerative prices to their produce through ICT based market intelligence (65.83%) and existing infrastructure of ICTs is not enough to meet the needs of the farming community (34.17%).

Majority of the respondents had no opinion about the negative statements like ICTs can not deliver personalized information (75.83%), ICT based extension services avoid the personal extension contact (45.83%) and ICTs can not meet location specific needs of the livestock farmers (43.33%). Most of the livestock farmers were in disagreement with the other negetive statements like ICT based extension services are alternative to the present extension system (81.67%), ICTs alone would solve the problems of farmers (50.83%), ICT is a valuable tool, but it will never influence farmers own decision making (49.17%) and only resourceful farmers can get the benefit of the ICTs (45.83%). Equal per cent respondent (45.83%) were in disagreement and strongly disagreement with the negative statement 'ICT services are a distant dream for resource poor farmers'.

The results presented in Table 4.9 suggests that majority of the livestock farmers (73.33%) had favourable attitude towards dissemination of information through different ICT tools in livestock sector followed by 15.83 per cent with more favourable attitude and 10.83 per cent with less favourable attitude. This finding indicates that livestock farmers of the study area were enthusiastic to perceive different ICTs tools to get their required information. This might be due to the fact that livestock farmers are getting timely and accurate livestock information and services based on their needs and desires. Livestock farmers are aware about the benefits of different ICT tools and their role in information dissemination towards livestock farming in near future

Table 4.9: Overall attitude of livestock farmers towards ICTs (n=120)

S. NO.	Attitude	*f*	%
1.	Less favourable (upto 71.43 score)	19	15.83
2.	Favourable (71.44 to 79 score)	88	73.33
3.	More favourable (Above 79 score)	13	10.83

4.5.1 Relationship between selected independent variables and attitude of livestock farmers towards ICTs

The data presented in Table 4.10 indicates that age, family size, land holding, herd size, extension contact and social participation had positive and non-significant relationship with attitude of livestock farmers towards ICTs, while experience in livestock farming had negative and non-significant relationship. Education, mass media exposure and annual gross income had positive and significant relationship with attitude of livestock farmers towards ICTs.

Table 4.10: Pearson's correlation for attitude of livestock farmers towards ICTs with independent variables

S. No.	Independent variables	Pearson's Correlation Cofficient (r_p)
1.	Age	0.101
2.	Education	0.186*
3.	Family size	0.122
4.	Land holding	0.023
5.	Herd size	0.014
6.	Annual gross income	0.242**
7.	Experience in livestock farming	-0.024
8.	Extension contact	0.014
9.	Mass media exposure	0.219*
10.	Social participation	0.093

*** Significant at 1 per cent level* ** Significant at 5 per cent level*

Positive and significant association of education of livestock farmers with attitude towards ICTs may be attributed to the fact that educated people know the importance of ICTs and their positive impact on productivity of animals. Further, positive and significant association of annual gross income and mass media exposure

with attitude of livestock farmers towards ICTs clearly indicates that when the farmers have more annual gross income then their purchasing ability of ICTs increases and increased mass media exposure increases their awareness regarding the benefits of ICTs.

Table 4.11: Linear regression analysis for attitude of livestock farmers towards ICTs with independent variables

S. No.	Independent variables	β	t- value
1.	Age	.295	2.111*
2.	Education	.237	1.984
3.	Family size	.074	.802
4.	Land holding	-.142	-1.396
5.	Herd size	.059	.620
6.	Annual gross income	.130	1.199
7.	Experience in livestock farming	-.134	-.952
8.	Extension contact	.039	.404
9.	Mass media exposure	.202	2.163*
10.	Social participation	.124	1.349

** Significant at 5 per cent level*

The data presented in Table 4.11 reveals that only two variables i.e. age and mass media exposure had positive and significant contribution on the attitude of livestock farmers towards ICTs. Land holding and experience in livestock farming had negative and non-significant contribution, whereas education, family size, herd

size, annual gross income, extension contact and social participation had positive and non-significant contribution on the attitude of livestock farmers towards ICTs.

4.6 Perceived constraints in access and utilization of ICTs and their possible solutions

4.6.1 Constraints perceived by livestock farmers

The constraint analysis is important to reach out the voice of the livestock farmers and the problems faced by them in order to enable planners, administrators, development workers and policy makers to implement developmental programmes and interventions which could cater to the needs of the farmers and benefit them in an improved manner. The constraints in the use of ICTs by livestock farmers were measured using four point continuum scale. The results are presented in Table 4.12.

High cost of repairing ICTs, lack of training and practical exposure towards ICTs and low ICT literacy were perceived as 'most serious constraints' by 66.67, 60.00 and 58.33 per cent livestock farmers, respectively while 'serious constraints' by 26.67, 33.33 and 30.00 per cent respondents, respectively.

Lack of awareness of benefits of ICTs, lack of skills in handling ICTs, poor finance, erratic power supply, lack of confidence in operating ICTs, lack of repairing facilities & centres in village and high cost of ICT tools were perceived as 'serious constraint' by 56.67, 50.83, 44.17, 44.17, 42.50, 42.50 and 36.67 per cent livestock farmers, respectively. Among the 'less serious constraints' were low network connectivity (44.17%), insufficient regional specific language (38.33%) and unavailability of different ICT tools (32.50%). Negative attitude towards ICTs was perceived as 'not a constraint' by 80.00 per cent of livestock farmers.

4.6.2 Possible solution of constraints in the use of ICTs

Perusal of Table 4.13 shows that a great majority of the livestock farmers were in agreement with the possible solutions like subsidy in the procurement of ICT equipments (98.33%), provision of finance facilities (92.50%), setting up of low cost repairing centres in villages (90.83%) and confidence build up through trainings and practical exposure to ICTs (90.00%).

Table 4.12: Constraints in the use of ICTs among livestock farmers (n=120)

S. No.	Constraints	MC		C		LC		NC	
		f	%	*f*	%	*f*	%	*f*	%
1.	Unavailability of different ICT tools	22	18.33	34	28.33	39	32.50	25	20.83
2.	High cost of ICT tools	41	34.17	44	36.67	33	27.50	2	1.67
3.	Lack of confidence in operating ICTs	23	19.17	51	42.50	37	30.83	9	7.50
4.	Erratic power supply	9	7.50	53	44.17	26	21.67	32	26.67
5.	Low Network connectivity	10	8.33	26	21.67	53	44.17	31	25.83
6.	Lack of awareness of benefits of ICTs	13	10.83	68	56.67	29	24.17	10	8.33
7.	Lack of skill in handling ICTs	31	25.83	61	50.83	21	17.50	7	5.83
8.	Low ICT literacy	70	58.33	36	30.00	9	7.50	5	4.17
9.	Lack of repairing facilities and centres in villages	41	34.17	51	42.50	18	15.00	10	8.33

10.	Negative attitude towards ICTs	0	0.00	11	9.17	13	10.83	96	80.00
11.	Poor finance	39	32.50	53	44.17	25	20.83	3	2.50
12.	Lack of training and practical exposure towards ICTs	72	60.00	40	33.33	7	5.83	1	0.83
13.	High cost of repairing ICTs	80	66.67	32	26.67	5	4.17	3	2.50
14.	Insufficient regional specific language	27	22.50	38	31.67	46	38.33	9	7.50

MC: Most serious constraint, C: Serious constraint, LC: Less serious constraint, NC: Not a constraint

Table 4.13: Possible solution of constraints in the use of ICTs (n=120)

S. No.	Possible Solutions	Agree		Neutral		Disagree	
		f	%	*f*	%	*f*	%
1.	Facility of different ICT tools and services	95	79.17	3	2.50	22	18.33
2.	Confidence build up through trainings and practical exposure to ICTs	108	90.00	2	1.67	10	8.33
3.	Provision of continuous power supply or power backup	83	69.17	14	11.67	23	19.17
4.	Enhancement in network connectivity	83	69.17	14	11.67	23	19.17
5.	Creation of awareness regarding benefits of ICTs	107	89.17	4	3.33	9	7.50
6.	Improvement in ICT literacy	105	87.50	10	8.33	5	4.17
7.	Setting up of low cost repairing centres in villages	109	90.83	3	2.50	8	6.67

8.	Counteracting negative attitude towards ICTs through proper motivation	24	20.00	3	2.50	93	77.50
9.	Provision of finance facilities	111	92.50	7	5.83	2	1.67
10.	Subsidy in the procurement of ICT equipments	118	98.33	2	1.67	0	0.00
11.	Development of different ICT tools with regional specific languages	107	89.17	6	5.00	7	5.83

Majority of the respondents were also in agreement with the possible solution like development of different ICT tools with regional specific languages (89.17%), creation of awareness regarding benefits of ICTs (89.17%), improvement in ICT literacy (87.50%), facility of different ICT tools and services (79.17%), provision of continuous power supply or power backup (69.17%) and enhancement in network connectivity (69.17%).

This table further reveals that majority of the respondents (77.50%) disagreed with the statement ‘counteracting negative attitude towards ICTs through proper motivation’.

5. Summary and Conclusion

This chapter is devoted to summary and conclusion of the present investigation along with implication of the findings of the study.

Primarily, India is an agrarian country and agriculture is the backbone of Indian economy. Livestock sector is an integral part of the agricultural system in India and contributes significantly to the GDP (4.11% in 2012-13). It ensures food and nutritional security on one hand and provides income and employment opportunities on the other hand. However, low productivity of animals owing to low knowledge level of the livestock owners remains an unresolved issue and a major challenge for the future.

Traditionally, the potential sources of information for farmers on various aspects of production, marketing and finance include media, government extension services, consultants and farm service firms, traders, input dealers, other farmers and relatives. India's public extension system accounts for only a small percentage of farmers information sources. Farmer to farmer informal exchanges remains the main channel for accessing information and new technologies in India. The traditional methods of extension approaches have less accountability and effectiveness in terms of time management, larger audience coverage and greater impression on people. The delivery of information and knowledge to the farmers on the right time and in right way leads to more productivity and more profitability.

Use of Information and Communication Technology (ICT) tools has potential to change the economy of livestock, agriculture and rural artisans in India. ICT refers to all information and communication systems and technologies including not only the digital formats such as the internet or the World Wide Web (WWW), but also interfaces with radio, cable and wireless television, video, cellular phones and print media. ICT tools are the common denominator that links people, irrespective of caste, class, sex, religion, race or political alignments. Information delivered through ICT can be timelier and can reach a greater number of farmers directly. Access to ICTs could reduce transaction costs related to information searching and reduce knowledge and information asymmetries, particularly related to market price information.

ICT tools can be used to impart information and knowledge, and that in turn will lead to motivation, mobilization and action to do something better in livestock sector. Information, rewarded with success stories, can motivate human to adopt healthy livestock technologies. For instance, information on immunization, calf mortality, maternal mortality, sanitation, nutritional awareness and causes, prevention and treatment of disease can be disseminated far and wide via ICTs. The enhanced and smooth communication results in the overall development of the livestock sector of the country.

However, it was indicated that due to lack of knowledge and information about these technologies, farmers are not getting benefit from these technologies in their working places. Furthermore, farmers directly could not communicate with buyers and their customers for selling their production in good prices and track medical expenditure on their livestock as well as expenditure on farm chemicals to receive information from other stakeholders.

Keeping all these facts in view the present study entitled "Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan – An Exploratory Study" was undertaken with the following specific objectives:

1. To study the socio-economic profile of livestock farmers.
2. To measure the accessibility, availability and usage of ICTs by livestock farmers.
3. To study the attitude of livestock farmers towards the ICT based livestock extension services.
4. To find out the constraints in use of ICTs by livestock farmers.

The study was conducted purposively in Jaipur district of Rajasthan. Out of 16 tehsils, two tehsils viz. Sanganer and Shahpura were selected randomly. In the next stage of sampling, six villages were selected randomly from each selected tehsils. Thus, total twelve villages were selected for the study. From each village, an exhaustive list of livestock farmers using ICT tools for livestock information was prepared and 10 respondents were selected randomly. Thus, a total sample size of 120 respondents, who possess livestock for their livelihood along with different ICT tools

were selected for the study. The data were collected through structured interview schedule from the respondents. The collected data were tabulated and analysed by using appropriate statistical tools.

5.1 Salient findings of study

5.1.1 General profile of livestock farmers

1. Majority of the respondents were middle aged (51.66%), educated upto primary level (25.00%), male (99.17%) and belonging to Hindu religion (100.00%) and were from OBC category (62.50%).
2. Majority of the respondents had agriculture as their primary occupation (61.67%) and livestock farming as their secondary occupation(98.67%).
3. Majority of the livestock farmers had medium family size (44.67%) and were living in nuclear family system (82.50%).
4. Majority of the livestock farmers were marginal farmers (44.16%), had medium size of herd (72.50%) and medium level of experience in animal husbandry (63.33%). The average livestock farming experience of farmers was 24.53 years.
5. The average annual gross income of farmers was 2,48,600 INR per annum and majority of livestock farmers (70.83%) were under medium income group.
6. Majority of them had medium level of extension contact (63.33%), mass media exposure (66.67%), social participation (78.33%) and economic motivation (69.17%).

5.1.2 Accessibility of ICTs to livestock farmers

1. All the livestock farmers had accessibility to mobile phones. A great majority of the livestock farmers had accessibility to newspaper (93.33%) and television (92.50%) also.
2. A large number of livestock farmers had accessibility to internet (72.50%) and other web-based services such as facebook (68.33%), whatsapp (65.00%) youtube (60.00%), e-mail (53.33%) and computer (50.00%).
3. Very few respondents had accessibility to other ICT tools such as radio (18.33%), information kiosk/CSCs (16.67%), CD/DVD (16.67%) and e-books (2.50%).

5.1.3 Availability of ICTs among respondents

1. All the livestock farmers (100.00%) had mobile phones. Besides this, majority of them also had television (93.33%), newspaper (82.50%) and internet (63.33%).
2. Many of the livestock farmers had availability of whatsapp (60.83%), facebook (59.17%), youtube (50.83%), Information Kiosk/CSCs (46.67%), e-mail (41.67%) and computer (35.00%).
3. Very few respondents had availability of other ICT tools such as CD/DVD (20.00%) and radio (18.33%). None of them had availability of e-book and farm magazine.

5.1.4 Usage and purpose of utilization of ICTs

1. Mobile phone was the most frequently used ICT tool among the livestock farmers using it very frequently by 97.50 per cent respondents. Next to this, television was used occasionally by 42.50 per cent and newspaper was used rarely by 33.33 per cent livestock farmers.
2. Web based services like facebook (65.83%), whatsapp (57.50%), E-mail (53.33%), youtube (50.00%), internet (40.00%), computers (33.33%) and other ICT tools such as CD/DVD (16.67%), information kiosk/CSCs (11.67%), radio (5.83%) and e-book (2.50%) were used rarely by livestock farmers. None of them were using farm magazine.
3. Usage of ICTs for availability and quality of inputs was mainly through internet (5.00% each).
4. Usage of ICTs for market price of inputs and marketing of produce was mainly through mobile phone (65.00% each) followed by newspaper (13.33% each) and internet (11.67% each).
5. Mobile phone was the most widely used ICT tool used for the purpose of general care and management (61.67%), health management (60.83%), sanitation (57.50%), treatment (52.50%), vaccination (45.83%), details about trainings, animal fairs/livestock show and kisan mela (44.17% each) and information about schemes & services on animal husbandry (33.33%).

6. A great majority of the livestock farmers were unaware about usage of ICTs for getting information on availability of breeds, clean milk production, availability of inputs, quality of inputs, value addition of products, insurance and online loan/Banking.
7. All the independent variables *viz*. age, education, family size, land holding, herd size, annual gross income, experience in livestock farming, extension contact, mass media exposure and social participation had a significant association with the level of accessibility, availability and usage of ICTs.

5.1.5 Attitude of livestock farmers towards ICTs

1. A great majority of livestock farmers were in agreement with positive statements about information dissemination through ICTs like ICT based disease outbreak warning system facilitate farmers to take preventive measures (92.50%), ICTs provide possible solutions to the present animal husbandry situation (86.67%), ICT based extension services assist the farmer in planning and decision making aspects in animal husbandry (85.83%), ICTs are potential tools to reach the needy farmers (83.33%) and ICT based extension services provide new opportunities to build a skilled and knowledgeable community (83.33%).
2. Majority of the respondents had no opinion about the negative statements like ICTs can not deliver personalized information (75.83%), ICT based extension services avoid the personal extension contact (45.83%) and ICTs can not meet location specific needs of the livestock farmers (43.33%).
3. Most of the livestock farmers were in disagreement with the other negative statements like ICT based extension services are alternative to the present extension system (81.67%), ICTs alone would solve the problems of farmers (50.83%), ICT is a valuable tool, but it will never influence farmers own decision making (49.17%) and only resourceful farmers can get the benefit of the ICTs (45.83%).
4. Equal per cent respondents (45.83%) were in disagreement and strongly disagreement with the negative statement ‘ICT services are a distant dream for resource poor farmers’.

5. On an overall, majority of livestock farmers had favourable attitude (73.33%) towards dissemination of information through different ICT tools in livestock sector followed by 15.83 per cent with more favourable attitude and 10.83 per cent with less favourable attitude.
6. Age, family size, land holding, herd size, extension contact and social participation had positive and non-significant relationship with attitude of livestock farmers towards ICTs, while experience in livestock farming had negative and non-significant relationship. Education, mass media exposure and annual gross income had positive and significant relationship with attitude of livestock farmers towards ICTs.

5.1.6 Perceived constraints in access and utilization of ICTs and their possible solutions

5.1.6.1 Constraints perceived by livestock farmers

1. Among the 'most serious constraints' were high cost of repairing ICTs (66.67%), lack of training and practical exposure towards ICTs (60.00%) and low ICT literacy (58.33%).
2. Among the 'serious constraints' were lack of awareness of benefits of ICTs (56.67%), lack of skills in handling ICTs (50.83%), poor finance (44.17%), erratic power supply (44.17%), lack of confidence in operating ICTs (40.50%), lack of repairing facilities & centres in village (40.50%) and high cost of ICT tools (36.67%).
3. Among the 'less serious constraints' were low network connectivity (44.17%), insufficient regional specific language (38.33%) and unavailability of different ICT tools (32.50%). Negative attitude towards ICTs was perceived as 'not a constraint' by 80.00 per cent of livestock farmers.

5.1.6.2 Possible solution of constraints in the use of ICTs

1. A great majority of the livestock farmers were in agreement with the possible solutions like subsidy in the procurement of ICT equipments (98.33%), provision of finance facilities (92.50%), setting up of low cost repairing centres in villages (90.83%) and confidence build up through trainings and practical exposure to ICTs (90.00%).

2. Majority of the respondents were also in agreement with the possible solution like development of different ICT tools with regional specific languages (89.17%), creation of awareness regarding benefits of ICTs (89.17%), improvement in ICT literacy (87.50%), facility of different ICT tools and services (79.17%), provision of continuous power supply or power backup (69.17%) and enhancement in network connectivity (69.17%).
3. Majority of the respondents (77.50%) disagreed with the statement 'counteracting negative attitude towards ICTs through proper motivation'.

5.2 Conclusions

1. It could be concluded from findings that majority of the livestock farmers in the study area were middle aged, educated upto primary level, having marginal land holding with agriculture as primary and livestock farming as their secondary occupation.
2. It was observed during the study that livestock farmers had medium size of herd, medium level of experience in animal husbandry and medium level of extension contact, mass media exposure, social participation and economic motivation.
3. All the livestock farmers had availability and access to mobile phones because it is affordable, portable as well as useful during emergencies. Besides mobile phones, newspaper, television and internet were also reported to be available and accessible by majority of the livestock farmers.
4. Mobile phone was the most frequently and widely used ICT tool among the livestock farmers being used for the purpose of getting information and knowledge on different aspects of livestock farming.
5. The results based on data analysis suggested that majority of the livestock farmers had favourable attitude towards dissemination of information through different ICT tools in livestock sector.
6. The livestock farmers were facing lot of constraints in using different ICT tools. Most important among them were high cost of repairing ICTs, lack of training and practical exposure towards ICTs, low ICT literacy, high cost of ICT tools and lack of repairing facilities and centres in villages.

7. Further in the study it was found that most of the livestock farmers were in agreement with the considered possible solutions for the constraints in the use of ICTs.

5.3 Recommendations

Based upon the findings of the present investigation and discussion made there upon, following recommendations can be made:

1. The level of extension contact, social participation and mass media exposure were found medium among the livestock farmers. Therefore, efforts should be made to further strengthen them in the state.
2. Availability and accessibility of different ICT tools except mobile, television and newspaper were found low. Also different ICT tools except mobile were used rarely by the livestock farmers for the purpose of getting information and knowledge on different aspects of livestock farming. Hence, awareness should be created about these ICT tools and their benefits among the livestock farmers.
3. The favourable attitude of livestock farmers towards ICTs could be helpful in popularization of ICTs for dissemination of information in livestock sector.
4. It was found that there were serious constraints faced by the livestock farmers in using different ICT tools. Unless these constraints are mitigated by appropriate action, the dissemination of livestock information through ICTs will not be effective.

5.4 Suggestions for future research

1. Looking to shortage of time, paucity of funds and manpower at the disposal of researcher, the present investigation was carried out covering a small geographical area with small number of respondents. It is therefore, suggested that similar research covering large geographical area with more numbers of respondents can be conducted so that the results can be generalized for a large area of the state.
2. Gender based study in use of ICTs for receiving livestock information can be undertaken.

3. Socio-economic impact of ICTs on life of livestock farmers can be studied.
4. The present study was restricted to use of ICTs by livestock farmers. A separate project could be formed to study the use of ICTs by Extension workers and factors limiting their use.
5. Similar kind of research projects could be conducted in other areas of country with inclusion of more variables for an in-depth study.

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Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan: An Exploratory Study

M.V.Sc. Thesis

Department of Veterinary and Animal Husbandry Extension Education
Post Graduate Institute of Veterinary Education & Research (PGIVER), Jaipur
Rajasthan University of Veterinary and Animal Sciences, Bikaner

Submitted by : Sunil Rajoria
Major Advisor : Dr. Sanjay Kumar Rewani

ABSTRACT

The present study was conducted in purposively selected Jaipur district of Rajasthan. A total 120 livestock farmers, who were using ICTs for information in livestock sector, were selected randomly from each of six villages of Sanganer and Shahpura tehsils of Jaipur district. Data were collected by personal interview with the help of a structured interview schedule. The study revealed that majority of the livestock farmers were middle aged, educated upto primary level, belonging to OBC category, having marginal land holding with agriculture as primary and livestock farming as their secondary occupation. Majority of the respondents had medium level of income and medium family size and were living in nuclear family system. Most of them had medium size of herd, medium level of experience in animal husbandry and medium level of extension contact, mass media exposure, social participation and economic motivation.

All the livestock farmers had availability and accessibility of mobile phones. Besides this newspaper, television and internet were also available and accessible to the majority of the livestock farmers. Mobile phone was the most frequently and widely used ICT tool among the livestock farmers. Usage of ICTs for market price of inputs and marketing of produce was mainly through mobile phone (65.00% each) followed by newspaper (13.33% each) and internet (11.67% each). Mobile phone was the most widely used ICT tool used for the purpose of general care and management (61.67%), health management (60.83%), sanitation (57.50%), treatment (52.50%), vaccination (45.83%), details about trainings, animal fairs/livestock show and kisan mela (44.17% each) and information about schemes & services on animal husbandry (33.33%).

On an overall, majority of the livestock farmers (73.33%) had favourable attitude towards dissemination of information through different ICT tools in livestock sector followed by 15.83 per cent with more favourable attitude and 10.83 per cent with less favourable attitude. Major constraints faced by the livestock farmers were high cost of repairing ICTs, lack of training and practical exposure towards ICTs, low ICT literacy, lack of awareness of benefits of ICTs, lack of skills in handling ICTs, poor finance, erratic power supply, lack of confidence in operating ICTs, lack of repairing facilities & centres in village and high cost of ICT tools. Most of the livestock farmers were in aggrement with the considered possible solutions for the constraints in the use of ICTs.

राजस्थान के जयपुर जिले में आई.सी.टी. के उपयोग के माध्यम से पशुओं के बारे में जानकारी का विस्तार : एक खोजपूर्ण अध्ययन

स्नातकोत्तर शोध ग्रंथ

पशुचिकित्सा एवं पशुपालन प्रसार शिक्षा विभाग

स्नातकोत्तर पशुचिकित्सा शिक्षा एवं अनुसंधान संस्थान (पीजीआईवीईआर), जयपुर

राजस्थान पशुचिकित्सा एवं पशु विज्ञान विश्वविधालय, बीकानेर

शोधकर्त्ता : सुनील राजोरिया

मुख्य उपादेष्टा : डॉ. संजय कुमार रेवानी

अनुक्षेपण

वर्तमान अध्ययन उद्देश्यपूर्वक चयनित राजस्थान के जयपुर जिले में किया गया। जयपुर जिले के सांगानेर और शाहपुरा तहसीलों के प्रत्येक छह गांवों में से कुल 120 पशुपालको का निरुद्देश्य ढंग से चयन किया गया, जो पशुओं के क्षेत्र में जानकारी के लिए आई.सी.टी. इस्तेमाल कर रहे थे। आंकड़े एक संरचित साक्षात्कार अनुसूची की मदद से व्यक्तिगत साक्षात्कार द्वारा एकत्र किए गए। अध्ययन से पता चला कि अधिकांश पशुपालक मध्यम आयु वर्ग, प्राथमिक स्तर तक शिक्षित, ओ.बी.सी. वर्ग से संबंधित तथा सीमांत भूमि धारक थे जिनका प्राथमिक व्यवसाय कृषि तथा द्वितीय व्यवसाय पशुपालन था। अधिकांश पशुपालक मध्यम आय वर्ग तथा मध्यम पारिवारिक आकार के थे जो एकल परिवार प्रणाली में रह रहे थे। उनमें से अधिकांश पशुपालको का झुंड आकार, पशुपालन में अनुभव, प्रसार संपर्क, जनसंपर्क पहुँच, सामाजिक भागीदारी एवं आर्थिक प्रेरणा मध्यम स्तर का था।

सभी पशुपालको को मोबाइल फोन की उपलब्धता और पहुंच थी। इसके अलावा अखबार, टीवी और इंटरनेट भी अधिकांश पशुपालको के लिए सुलभ और उपलब्ध थे। मोबाइल फोन पशुपालको के बीच में सबसे अधिक और व्यापक रूप से इस्तेमाल किया जाने वाला आई.सी.टी. उपकरण था। आदानों के बाजार मूल्य एवं विपणन के लिए मोबाइल फोन (65.00% प्रत्येक) मुख्य रूप से उपयोग किया जा रहा था तथा समाचार पत्र (13.33% प्रत्येक) और इंटरनेट (11.67% प्रत्येक) भी इस्तेमाल किये जा रहे थे। मोबाइल फोन पशुओं की सामान्य देखभाल और प्रबंधन (61. 67%), स्वास्थ्य प्रबंधन (60.83%), स्वच्छता (57.50%), उपचार (52.50%), टीकाकरण (45.83%) एवं अन्य प्रयोजनों जैसे प्रशिक्षण, पशु मेलों/पशुधन प्रदर्शनी और किसान मेला (44.17%) तथा पशुपालन योजनाओं और सेवाओं के बारे में जानकारी (33.33%) के लिए सबसे व्यापक रूप से इस्तेमाल किया जा रहा था।

समग्र रूप से, पशुधन क्षेत्र में आई.सी.टी. उपकरणों के उपयोग द्वारा सूचना विस्तार के प्रति अधिकांश पशुपालको (73.33%) का अनुकूल दृष्टिकोण था जबकि 15.83 प्रतिशत का अधिक अनुकूल दृष्टिकोण और 10.83 प्रतिशत का कम अनुकूल दृष्टिकोण पाया गया। पशुपालको को प्रमुख रूप से आई.सी.टी. के मरम्मत की उच्च लागत, प्रशिक्षण की कमी और आई.सी.टी. के प्रति व्यावहारिक ज्ञान का अभाव, आई.सी.टी. साक्षरता की कमी, आई.सी.टी. के लाभों के बारे में जागरूकता की कमी, आई.सी.टी. नियत्रंण दक्षता में कमी, वित्तीय समस्या, अनियमित बिजली आपूर्ति, आई.सी.टी. परिचालन में कौशल की कमी, गांवों में मरम्मत केन्द्रों और सुविधाओं की कमी तथा आई.सी.टी. उपकरणों की उच्च लागत जैसी समस्याएं थी। अधिकांश पशुपालक आई.सी.टी. के उपयोग में समस्याओं के निदान के लिए बताये गये संभावित समाधान के पक्षधर थे।

Department of Veterinary and Animal Husbandry Extension Education

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Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan: An Exploratory Study

M. V. Sc. Scholar: Dr. Sunil Rajoria **Advisor: Dr. Sanjay Kumar Rewani**

INTERVIEW SCHEDULE

Respondent No.:	**Date:**
Name of the respondent:	
Sex (Male/Female):	
Father's/Husband's name:	
Village:	
Tehsil:	

SECTION-I

GENERAL INFORMATION

1. Age of the respondent (in completed years):

2. Education: Illiterate/Primary/Middle/ High School/Intermediate/ Graduate & above

3. Category: Schedule Tribe/Schedule Caste /Other Backward Caste/General

4. Religion: Hindu/Muslim/Jain/Sikh/Christian/Others

5. Family type: Nuclear / Joint

6. Family size:

a) Adult: Male:

Female:

b) Children: Male:

Female:

Total:

7. Occupation:

S. No.	Occupation	Primary	Secondary
1.	Agriculture		
2.	Livestock rearing		
3.	Agricultural labour		
4.	Non-agricultural labour		
5.	Trade & commerce		
6.	Others		

8. Land holding (in hectares):

9. Herd size:

Type of Livestock	No. of Animals			
	Young Animals		Adult Animals	
	Male	Female	Male	Female
Cattle				
Buffalo				
Sheep				
Goat				
Horse				

Donkey				
Pig				
Camel				
Others				

10. Annual gross income (in Rs.):

11. Experience in livestock farming (in years):

12. Extension contact:

Please indicate the frequency with which you meet the following extension personnel:

S. No.	**Extension Agency**	**Frequency of meeting**			
		Frequently	**Sometimes**	**Occasionally**	**Never**
1.	Village Development Officer				
2.	Livestock Assistant				
3.	Progressive farmers				
4.	Panchayat personnel				
5.	Veterinary Officer				
6.	Private Veterinarians				
7.	University personnel				
8.	KVK personnel				
9.	NGOs				
10.	Other (specify)				

13. Mass media exposure:

S. No.	Source	Frequency of utilization			
		Frequently	**Sometimes**	**Occasionally**	**Never**
1.	Newspaper				
2.	Radio				
3.	Television				
4.	Tour/Field Trip				
5.	Farm Magazine				
6.	Kisan Mela				
7.	Livestock Show				
8.	Other (specify)				

14. Social participation:

S. No.	Social Institutions	No Participation	Member	Office bearer
1.	Village Panchayat			
2.	Youth club			
3.	Co-operative			
4.	Religious organization			
5.	NGO			
6.	Other (specify)			

15. Economic Motivation:

S. No.	Statements	A	UD	DA
1.	A livestock owner should work towards more savings and economic profit			
2.	A most successful livestock farmer is the one who makes the most profit			
3.	A livestock owner should try new livestock practices which may earn him more money			
4.	Livestock owner should rear graded breeds to increase profits in comparison to indigenous breeds			
5.	It is difficult for livestock owner's children to make a good start, unless this livestock practices provides them with economic assistance			
6.	A livestock owner must earn his living but most important thing in life cannot be defined in economic terms			

A- Agree, UD- Undecided and DA- Disagree

SECTION- II

ACCESSIBILITY, AVAILABILITY AND USAGE OF ICTs

1. Accessibility of ICTs among farmers:

Sl. No.	Category	Accessible	Not Accessible
1.	Mobile		
2.	Television		
3.	Radio		
4.	Information kiosk/Common Service Centers		

5.	Newspaper		
6.	Farm Magazine		
7.	Internet		
8.	Facebook		
9.	Whatsapp		
10.	E-Mail		
11.	Computer		
12.	E-Books		
13.	CD/DVD		
14.	Youtube		
15.	Other (specify)		

2. Availability of ICTs among farmers:

S. No.	Category	Available	Not Available
1.	Mobile		
2.	Television		
3.	Radio		
4.	Information kiosk/Common Service Centers		
5.	Newspapers		
6.	Farm Magazine		
7.	Internet		
8.	Facebook		

9.	Whatsapp		
10.	E-Mail		
11.	Computer		
12.	E-Books		
13.	CD/DVD		
14.	Youtube		
15.	Other (specify)		

3. Frequency of usage of ICTs:

S. No	**List of ICTs**	**Frequency of Usage**			
		Very Frequently	**Frequently**	**Occasionally**	**Rarely**
1.	Mobile phones				
2.	T.V				
3.	Radio				
4.	Kiosk				
5.	Newspaper				
6.	Farm Magazine				
7.	Internet				
8.	Computer				
9.	Facebook				
10.	Whatsapp				
11.	E-Mail				
12.	E-Books				

13.	CD/DVD				
14.	Youtube				
15.	Other (specify)				

4. Purpose of usage of ICTs in Livestock farming:

S. No.	Items	Yes	No	If yes then specify the tool used
1.	Availability of inputs			
2.	Quality of inputs			
3.	Market price of inputs			
4.	Marketing of produce			
5.	General Care and management			
6.	Sanitation			
7.	Health Management			
8.	Treatment			
9.	Vaccination			
10.	Feed and fodders			
11.	Availability of breeds			
12.	Clean milk production			
13.	Value addition of products			
14.	Schemes and services on animal husbandry			
15.	Trainings			
16.	Animal fairs/ Livestock show			

17.	Kisan mela			
18.	Insurance			
19.	Online Loan/Banking			
20.	Others			

SECTION- III

ATTITUDES OF FARMERS TOWARDS USE OF ICTS

S. No.	Statements	SA	A	UD	DA	SDA
1.	ICTs provide possible solutions to the present animal husbandry situation					
2. *	ICTs can not meet location specific needs of the livestock farmers					
3.	ICTs are potential tools to reach the needy farmers					
4.	Farmers feed back is fast through ICTs than traditional methods					
5. *	Illiteracy will not deter farmers in availing ICT services					
6. *	ICTs can not deliver personalized information					
7.	ICT based extension services assist the farmer in planning and decision making aspects in animal husbandry					
8. *	ICT services are a distant dream for resource poor farmers					
9.	Farmers can get remunerative prices to their produce through ICT based market intelligence					

10.		Expert advice makes the farmers enterprise/activities productive					
11.	*	All kinds of information exchange are possible only through ICTs					
12.		Existing infrastructure of ICTs is not enough to meet the needs of the farming community					
13.	*	Only resourceful farmers can get the benefit of the ICTs					
14.		Access to information centre at village level is boon to the farming community					
15.		Phone-in-live with scientists gives first hand information about queries					
16.	*	ICTs alone would solve the problems of farmers					
17.		ICT based disease outbreak warning system facilitate farmers to take preventive measures					
18.	*	ICT based extension services avoid the personal extension contact					
19.		ICTs based extension services provide new opportunity to build a skilled and knowledge community					
20.	*	ICT is a valuable tool, but it will never influence farmers' own decision making					
21.		Weather forecasting through ICTs assists farmers in timely decisions					
22.	*	ICT based extension services are alternative to the present extension system					

SA: Strongly agree, A: Agree, UD: Undecided, DA: Disagree and SDA: Strongly disagree

* Negative Statements

SECTION- IV

CONSTRAINTS IN THE USE OF ICTs

1. Constraints in the use of ICTs among livestock farmers:

S. No.	Constraints	MC	C	LC	NC
1.	Unavailability of different ICT tools				
2.	High cost of ICT tools				
3.	Lack of confidence in operating ICTs				
4.	Erratic power supply				
5.	Low Network connectivity				
6.	Lack of awareness of benefits of ICTs				
7.	Lack of skill in handling ICTs				
8.	Low ICT literacy				
9.	Lack of repairing facilities and centres in villages				
10.	Negative attitude towards ICTs				
11.	Poor Finance				
12.	Lack of training and practical exposure towards ICTs				
13.	High cost of repairing ICTs				
14.	Insufficient regional specific language				
15.	Others (Specify)				

MC: Most serious constraint, C: Serious constraint, LC: Less serious constraint, NC: Not a constraint

2. Suggestions for the possible solution of the constraints:

S. No.	Possible Solutions	Agree	Neutral	Disagree
1.	Facility of different ICT tools and services			
2.	Confidence build up through trainings and practical exposure to ICTs			
3.	Provision of continuous power supply or power backup			
4.	Enhancement in network connectivity			
5.	Creation of awareness regarding benefits of ICTs			
6.	Improvement in ICT literacy			
7.	Setting up of low cost repairing centres in villages			
8.	Counteracting negative attitude towards ICTs through proper motivation			
9.	Provision of finance facilities			
10.	Subsidy in the procurement of ICT equipments			
11.	Development of different ICT tools with regional specific languages			
12.	Others (Specify)			

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Sunil Rajoria

Thesis

Master of Veterinary Science
(Veterinary and Animal Husbandry Extension Education)

।।पशुधनं नित्यं सर्वलोकोपकारकम्।।

2017

Department of Veterinary and Animal Husbandry Extension Education

Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur

(RAJASTHAN UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES, BIKANER)

Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan : An Exploratory Study

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Thesis

Submitted to the

Rajasthan University of Veterinary and Animal Sciences, Bikaner

In partial fulfillment of the requirements for

the degree of

Master of Veterinary Science

(Veterinary and Animal Husbandry Extension Education)

Faculty of Veterinary & Animal Sciences

By

Sunil Rajoria

2017

Rajasthan University of Veterinary and Animal Sciences, Bikaner

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CERTIFICATE – I

Date……

This is to certify that **Sunil Rajoria** has successfully completed the comprehensive examination held on 20-09-2016 and 22-09-2016 as required under the regulation for master's degree.

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Date……..

This is to certify that the thesis entitled **"Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan: An Exploratory Study"** submitted for the degree of **Master of Veterinary Science** in the subject of **Veterinary and Animal Husbandry Extension Education** embodies bonafide research work carried-out by **Sunil Rajoria** under my guidance and supervision and that no part of this thesis has been submitted for any other degree. The assistance and help received during the course of investigation have been fully acknowledged. The draft of the thesis was also approved by the advisory committee on _____.

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CERTIFICATE – III

Date……..

This is to certify that the thesis entitled **"Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan: An Exploratory Study"** submitted by **Sunil Rajoria** to the Rajasthan University of Veterinary and Animal Sciences, Bikaner, in partial fulfillment for the degree of **Master of Veterinary Science** in the subject of **Veterinary and Animal Husbandry Extension Education**, after recommendation by the external examiner, was defended by the candidate before the following members of the examination committee. The performance of the candidate in the oral examination on his thesis has been found satisfactory, we therefore, recommend that the thesis be approved**.**

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CERTIFICATE – IV

Date……

This is to certify that **Sunil Rajoria** of the Department of Veterinary and Animal Husbandry Extension Education, Post Graduate Institute of Veterinary Education & Research, Jaipur has made all corrections /modifications in the thesis entitled **"Dissemination Of Livestock Information Through Use Of ICTs In Jaipur District Of Rajasthan: An Exploratory Study"** which were suggested by the external examiner and the advisory committee in the oral examination held on…….. The final copies of the thesis duly bound and corrected were submitted on……are forwarded herewith for approval.

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Acknowledgement

I, with a deep sense of gratitude and indebtedness, would like to express, acknowledge and put on record the help, assistance, guidance, advice and encouragements of those noble personages, without which the completion of the present study would have been a distant dream.

I accept my long awaited turn to express my heartfelt gratitude and thanks to my Major Advisor Dr. Sanjay Kumar Rewani, Assistant Professor, Department of Veterinary and Animal Husbandry Extension Education, Post Graduate Institute of Veterinary Education and Research, Jaipur for his excellent guidance, unreserved cooperation, constant supervision and thought-provoking counsel throughout the period of study.

I shall remain grateful to Dr. Sanjita Sharma, Professor and Head, Department of Livestock Production Management and a member of the Advisory Committee for her generous help, constant supervision, advice and encouragement during the course of my study.

I am deeply indebted to Dr. Samita Saini, Assistant Professor, Department of Animal Genetics and Breeding and a member of the Advisory Committee for her altruistic help, unbiased suggestions and exquisite advice for the successful completion of the research works and compilation of the manuscript.

I extend my sincere thanks to Prof. (Dr.) Vishnu Sharma, Dean, Post Graduate Institute of Veterinary Education and Research, Jaipur for providing necessary facilities, guidance and cooperation to carry out the research work.

I feel great honour to place on record my sincere gratitude and reverence to Dr. Sajad Ahmed Wani and Dr. Janmoni Shyam Teaching Associate, Department of Veterinary and Animal Husbandry Extension Education, Post Graduate Institute of Veterinary Education and Research, Jaipur for rendering their keen interest, valuable guidance, kind cooperation and encouragement to carry out the works of my study.

I sincerely admire the unwavering effort, unflinching help and support of my seniors Dr. Amit Sharma, Dr. Manish Kumawat, Dr. Sunil Dutt Choudhary, Dr. Mahendra Pal Poonia, Dr. Ravi Raman and Dr. Anita Meena without which this research would not have been possible.

I shall be failing in my duties, if I do not recognize the constant help and support received from Dr. Virendra Ola, Dr. Brijesh Nanda, Dr. Rohit Tiwari, Dr. Ankur Verma, Dr. Sandeep Marodia, Dr. Kuldeep Mann, Dr. Yashashree Gautam, Dr. Priyanka Meena, Dr. Reenu Tanwar and Dr. Prerna Yadav all throughout the study period. I could not thought of achieving this goal well in time without the support of my loving juniors, Dr. Manisha Singodia, Dr. Gara Ram Saini, Dr. Vijay Saini, Dr. Brajesh Kumar, Dr. Santosh Rao, Dr. Sudharshan Mehla, Dr. Gaurav Meena and Dr. Asmaan Singh Gurjar. They had always been there to help me, even at odd hours or situations. Mr. Shiv and Mr. Nirmal kumar Sonwal from PGIVER is cherished for his technical support.

I extend my heartiest thanks to Dr. Khushiram Yadav, Dr. Vikram Dhabai and Dr. Ashish Saini for their untiring help and cooperation, during the period of data collection.

My sincere thanks goes to all the members of the non-teaching staff of the Department of Veterinary and Animal Husbandry Extension Education for their co-operation and help throughout the period of study.

I would like to express my extreme reverence and gratefulness to my beloved parents and all other family members Mr. praveen Gangwal, Sanjana Rajoria, Amit Rajoria, Ashish Rajoria, Komal Rajoria, Malti Rajoria, Shubham Rajoria, Sumit Chawla, Sapna Chawla, Ritik Chawla, Mahi Nagar and Neha Yadav for their unending blessings, affectionate advice, gracious sacrifices, continuous support and constant inspiration throughout the course of study.

Lastly, I express my deepest sense of gratitude and indebtedness to all the well wishers, who were directly or indirectly involved during the course of research work and whose names could not be mentioned for one or the other reason. May the benevolent Almighty bless all of them and make all their dreams come true.

Date:

Place: Jaipur, Rajasthan

(Sunil Rajoria)

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LIST OF ABBREVIATIONS

%	:	Percentage
^{0}C	:	Degree Celsius
A	:	Agree
AI	:	Artificial Intelligence
C	:	Serious constraint
CAD	:	Computer Aided Design
CD/DVD	:	Compact Disk/ Digital Versatile Disk
CSC	:	Common Services Centers
DA	:	Disagree
DCS	:	Dairy Cooperative Societies
DMS	:	Database Management System
F	:	Frequency
FAO	:	Food and Agriculture Organization
Fig.	:	Figure
GDP	:	Gross Domestic Product
GIS	:	Geographic Information Systems
GPS	:	Global Positioning System
ICT	:	Information and Communication Technology
INR	:	Indian Rupee
KVK	:	Krishi Vigyan Kendra
LC	:	Less serious constraint
LSA	:	Livestock Assistant
MC	:	Most serious constraint
MMS	:	Multimedia Messaging Service
NC	:	Not a constraint
NCE	:	Nigeria Certificate In Education
NGO	:	Non Governmental Organization
NSSO	:	National Sample Survey Organisation
OBC	:	Other Backward class
OND	:	Ordinary National Diploma
SA	:	Strongly agree
SAU	:	State Agricultural University
SC	:	Schedule Caste
SD	:	Standard Deviation
SDA	:	Strongly disagree
ST	:	Schedule Tribe
TV	:	Television
U.P.	:	Uttar Pradesh
UD	:	Undecided
URL	:	Uniform Resource Locator
V	:	Village
V.O.	:	Veterinary Officer
VDO	:	Village Development Officer
Viz	:	Namely
WWW	:	World Wide Web
x^2	:	Chi-square

Introduction

Review of Literature

Materials and Methods

Results and Discussion

Summary and Conclusion

Literature Cited

Abstract
(English & Hindi)

Appendices

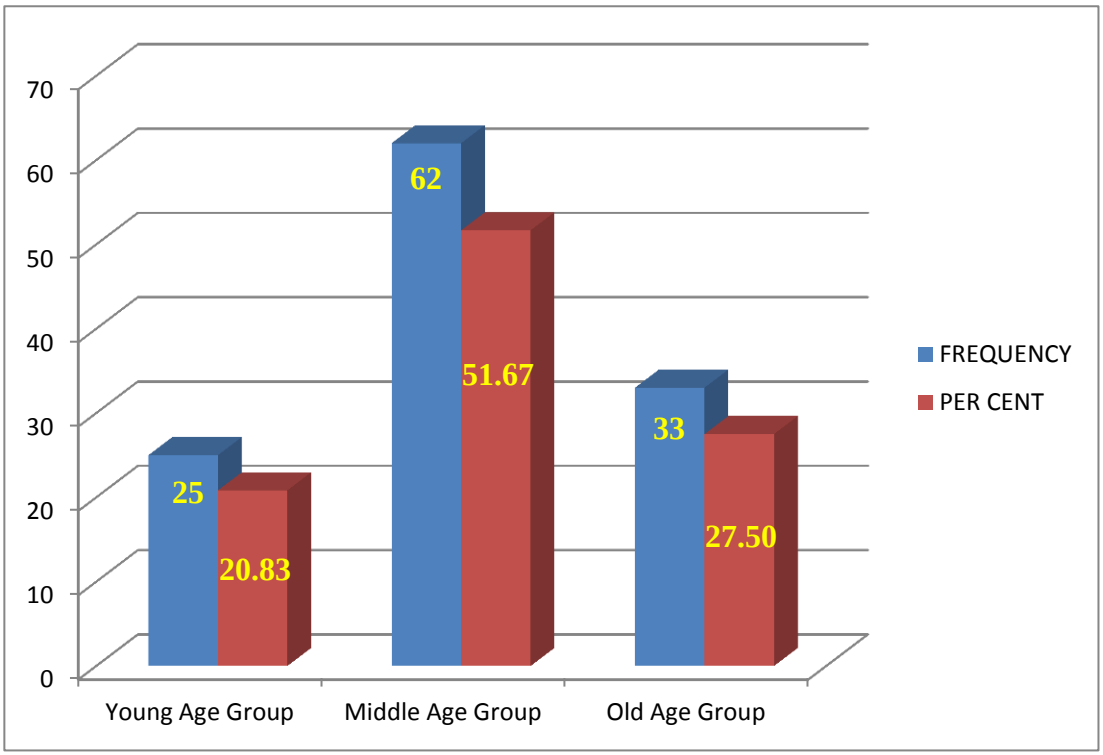


Fig. 4.1: Distribution of livestock farmers based on their age

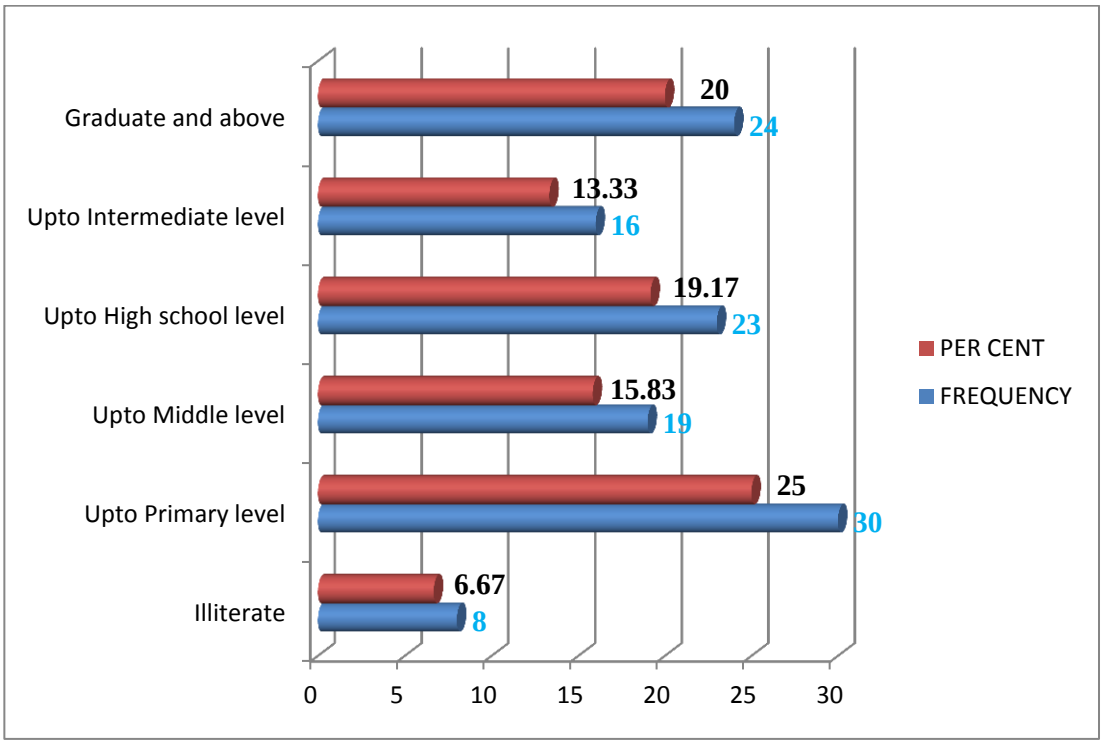


Fig. 4.2: Distribution of livestock farmers based on their education status

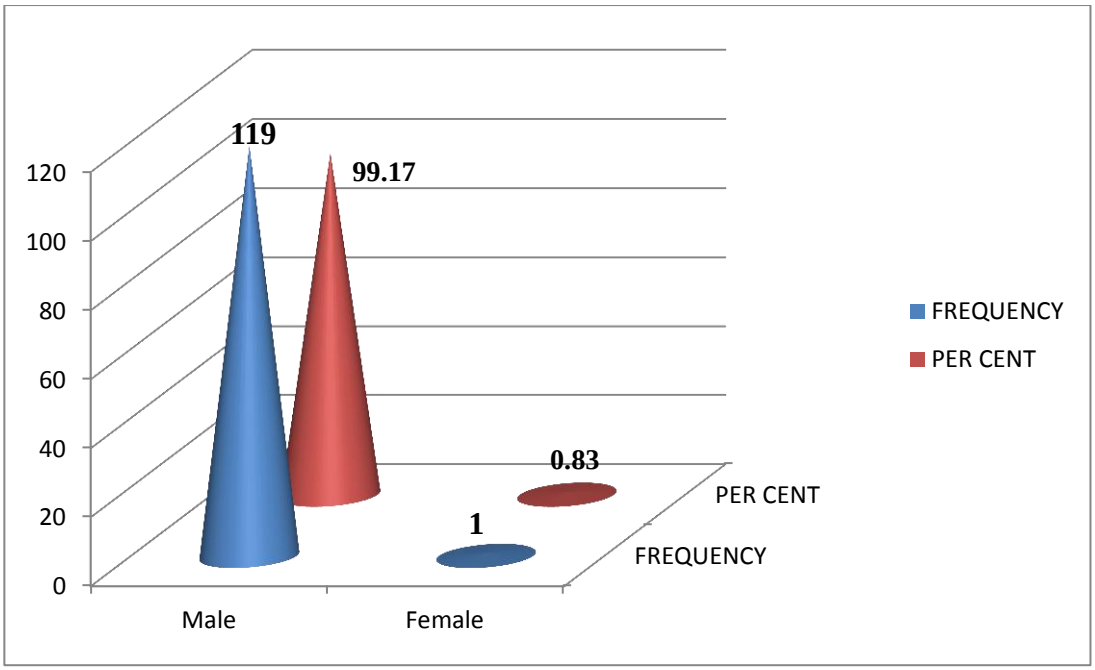


Fig. 4.3: Distribution of livestock farmers based on their sex

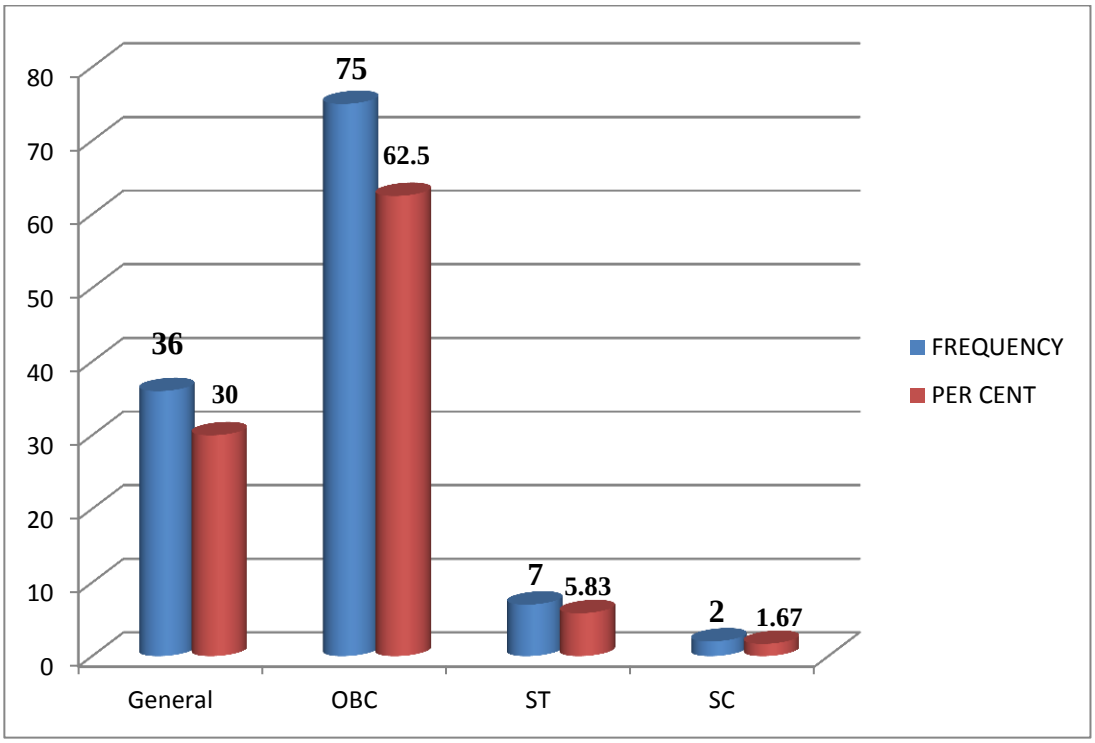


Fig. 4.4: Distribution of livestock farmers based on their category

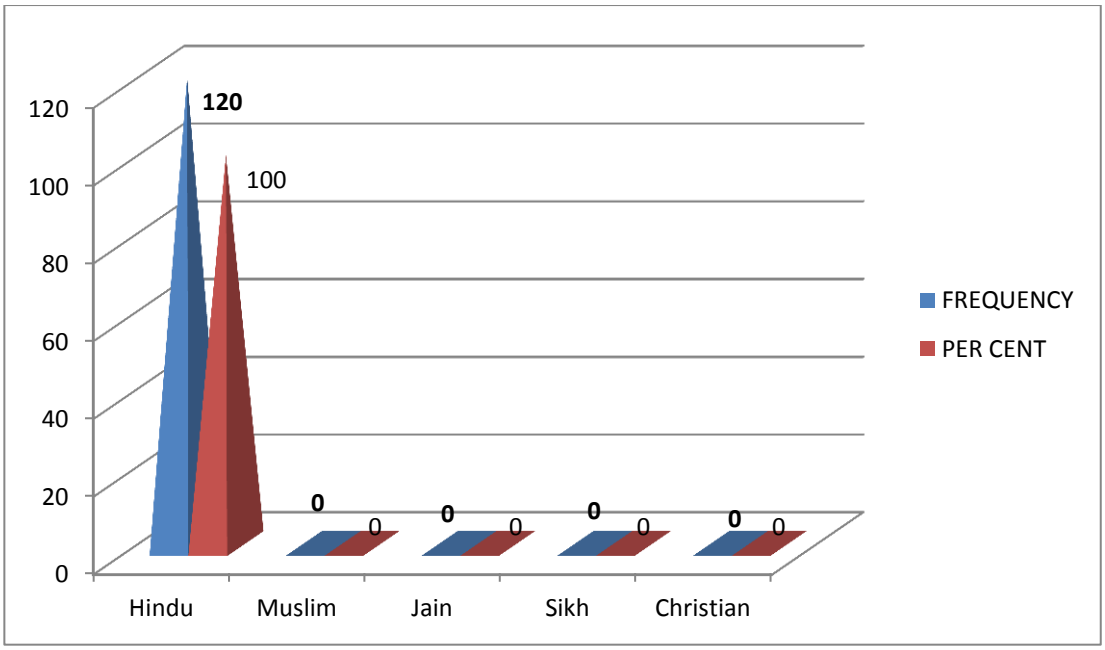


Fig. 4.5: Distribution of livestock farmers based on their religion

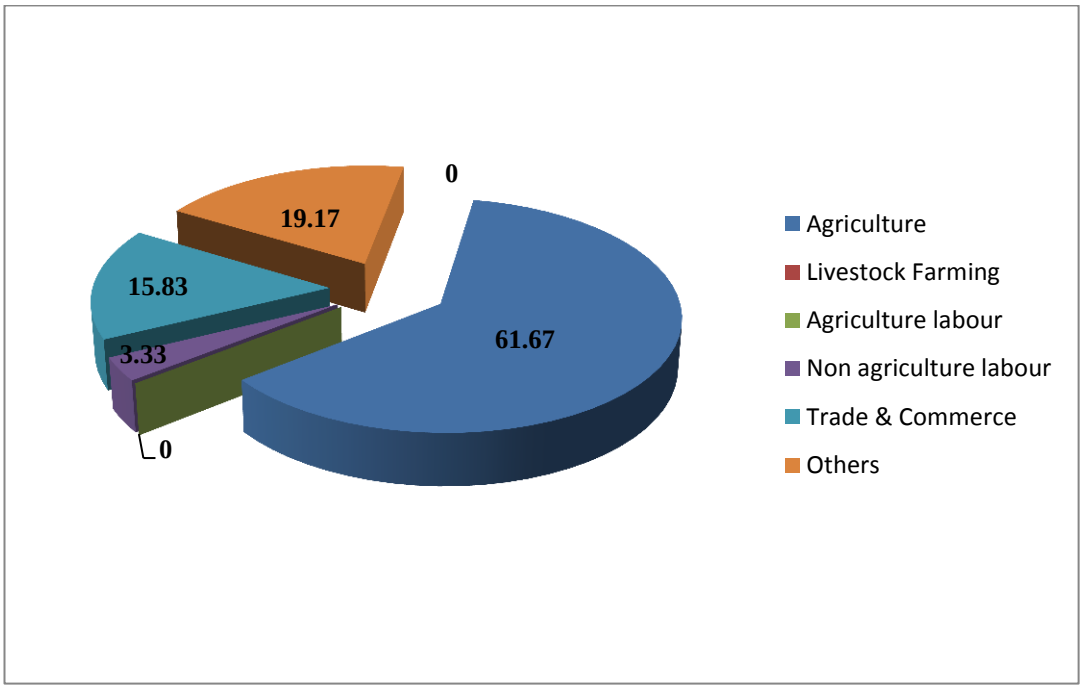


Fig. 4.6: Distribution of livestock farmers based on their primary occupation

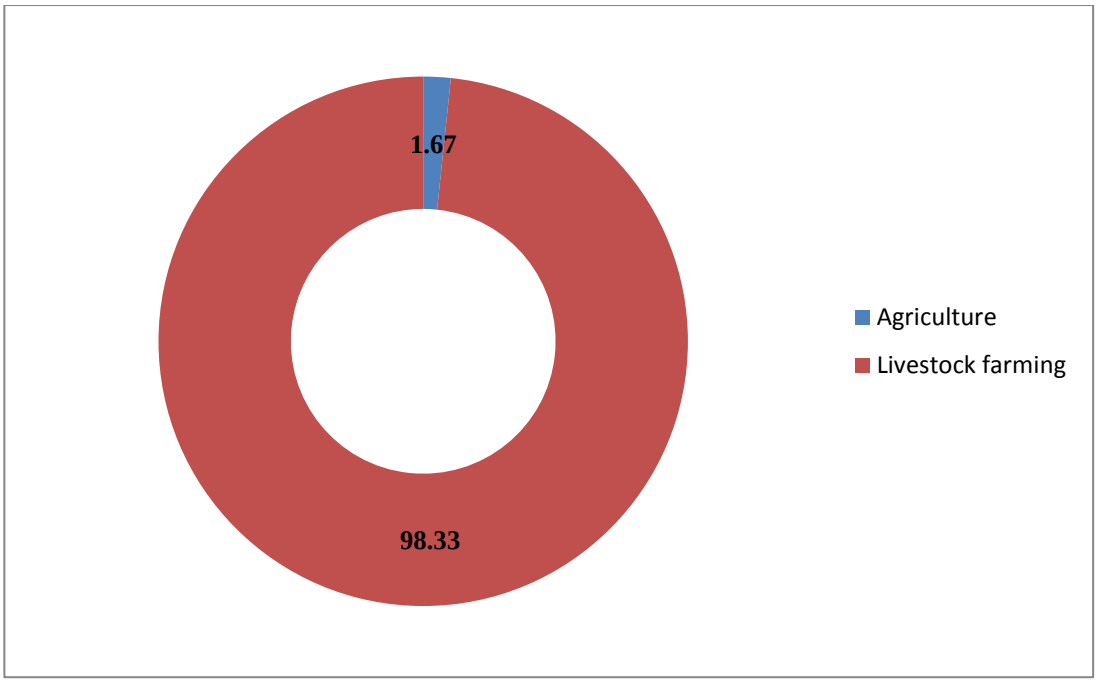


Fig. 4.7: Distribution of livestock farmers based on their secondary occupation

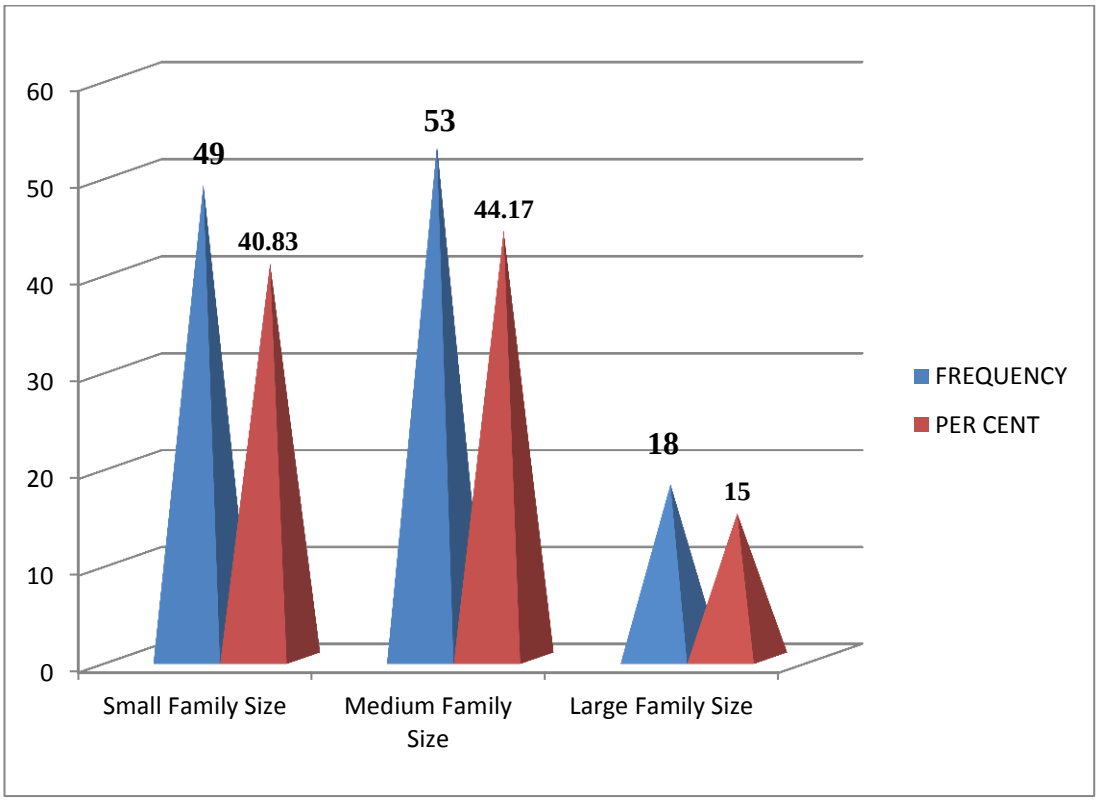


Fig. 4.8: Distribution of livestock farmers based on their family size

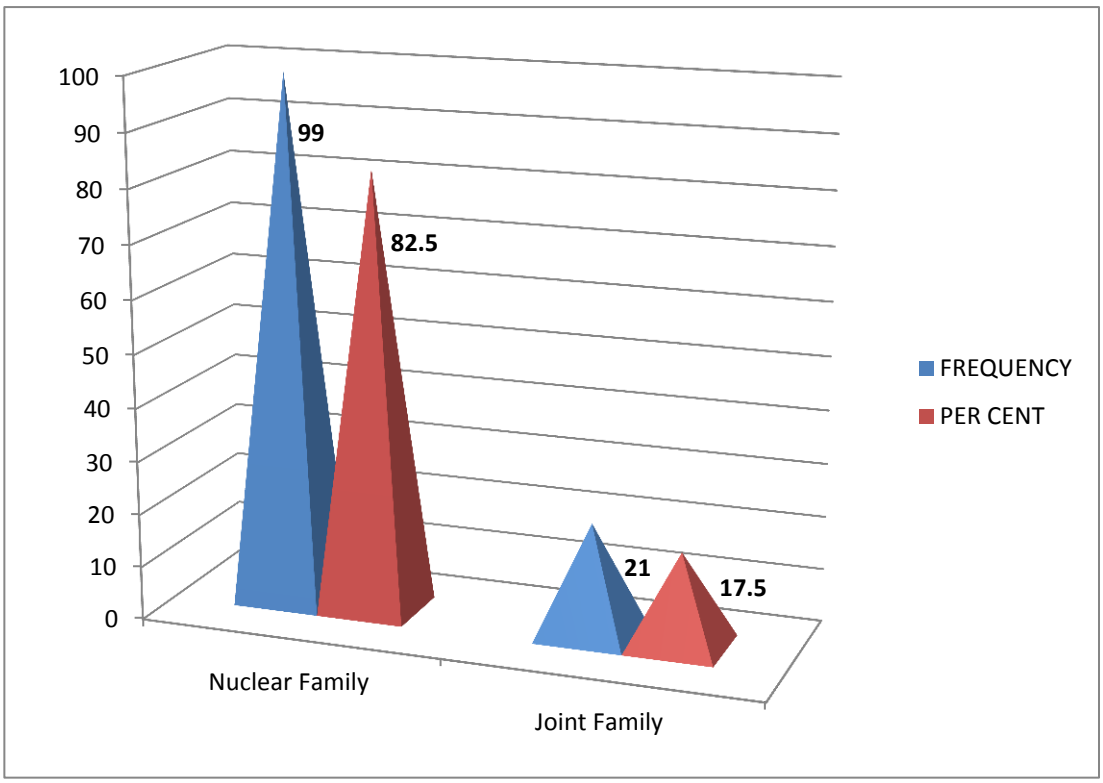


Fig. 4.9: Distribution of livestock farmers based on their family type

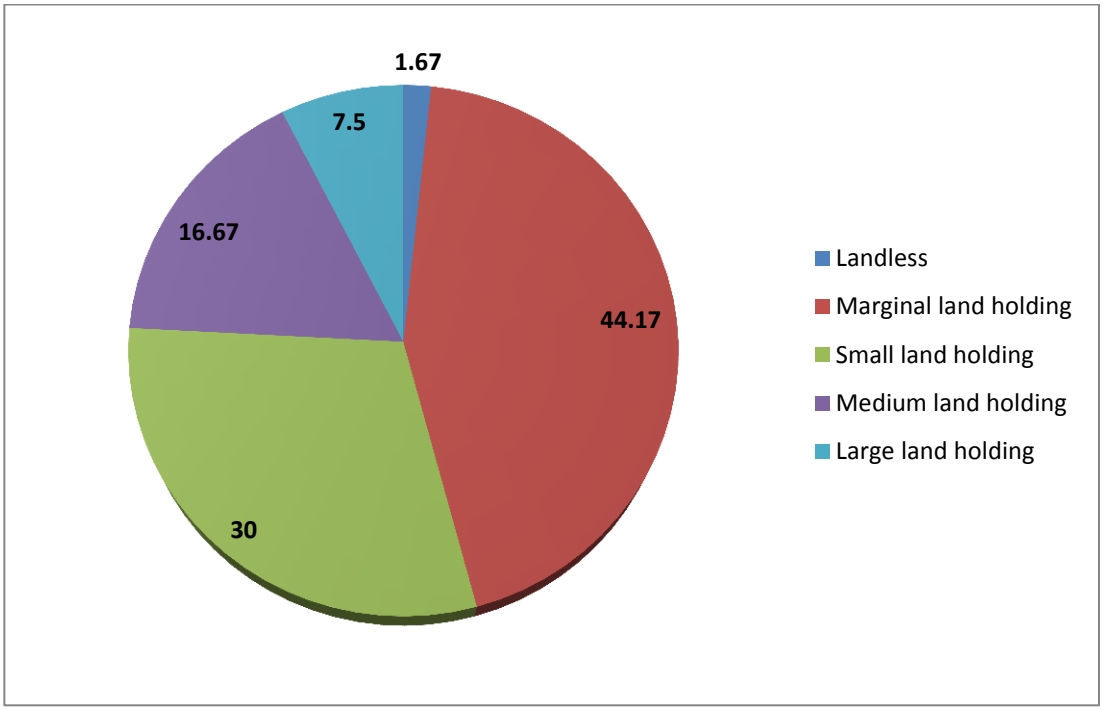


Fig. 4.10: Distribution of livestock farmers based on land holding

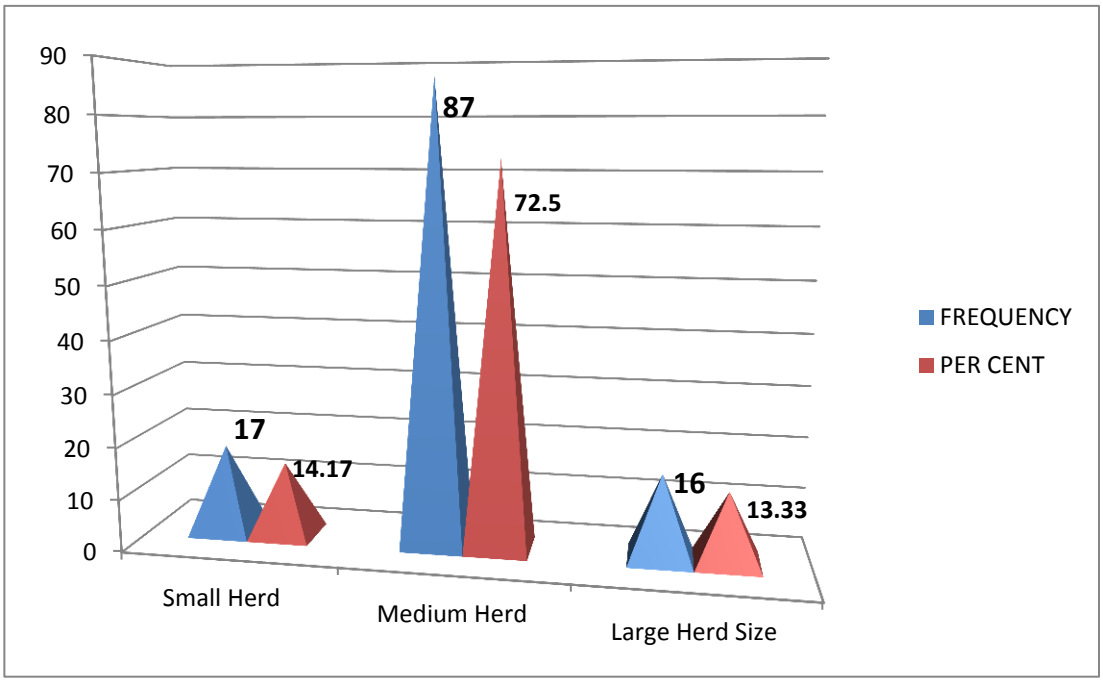


Fig. 4.11: Distribution of livestock farmers based on their herd size

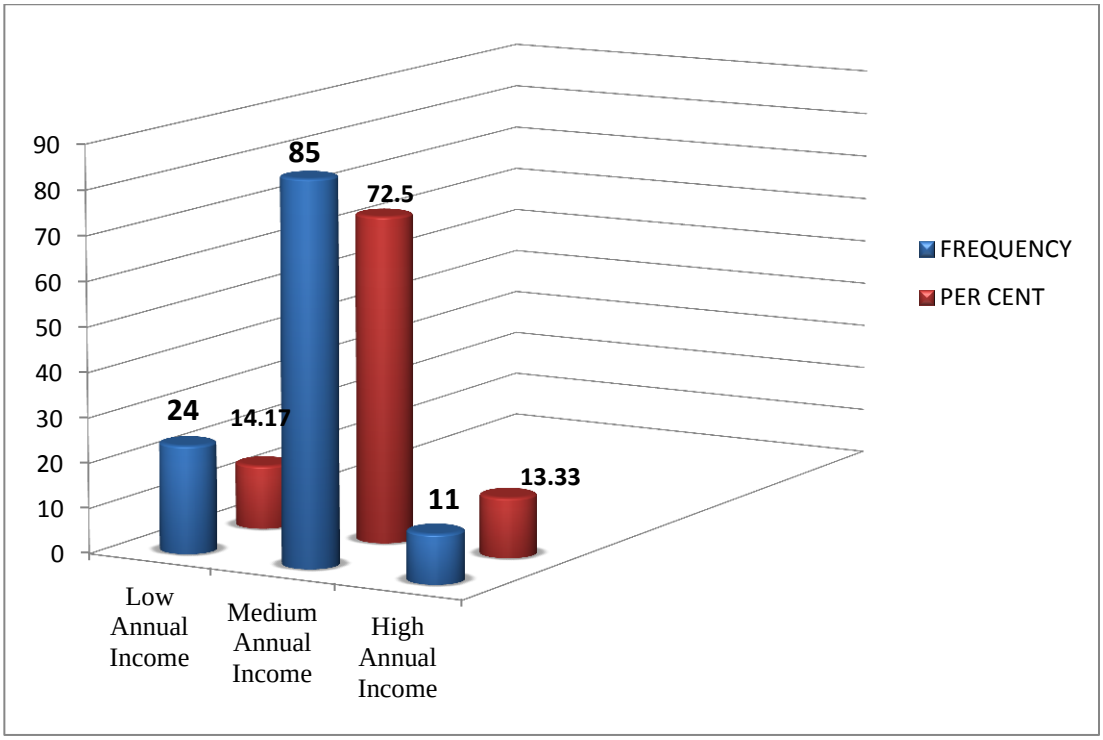


Fig. 4.12: Distribution of livestock farmers based on their annual gross income

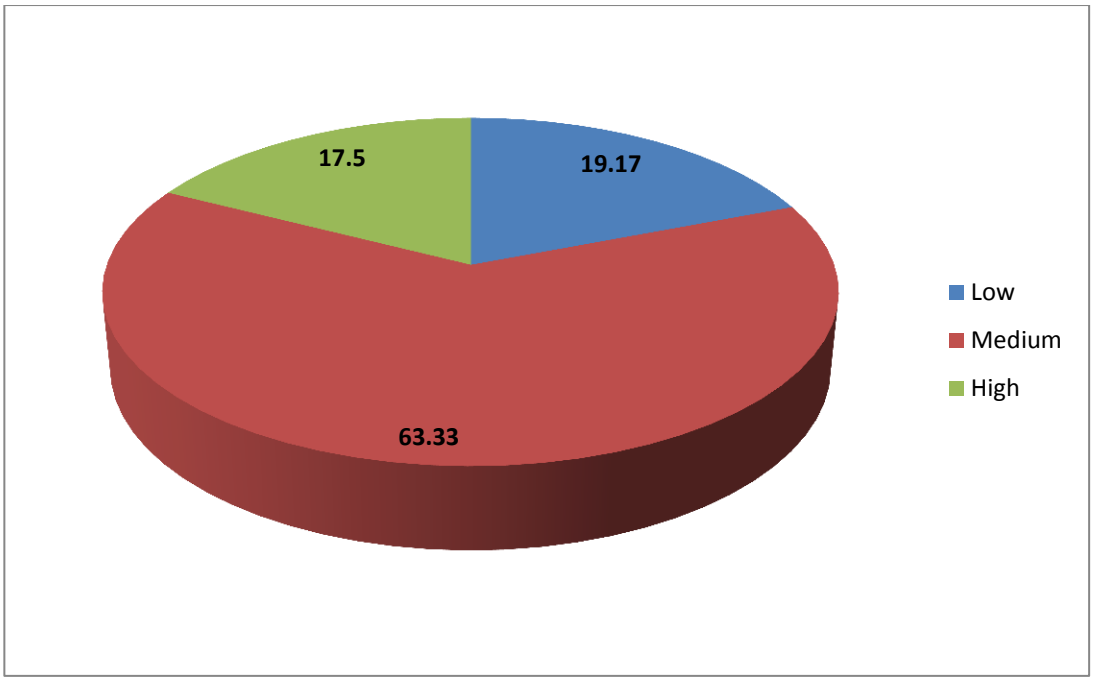


Fig. 4.13: Distribution of livestock farmers based on their experience in livestock farming

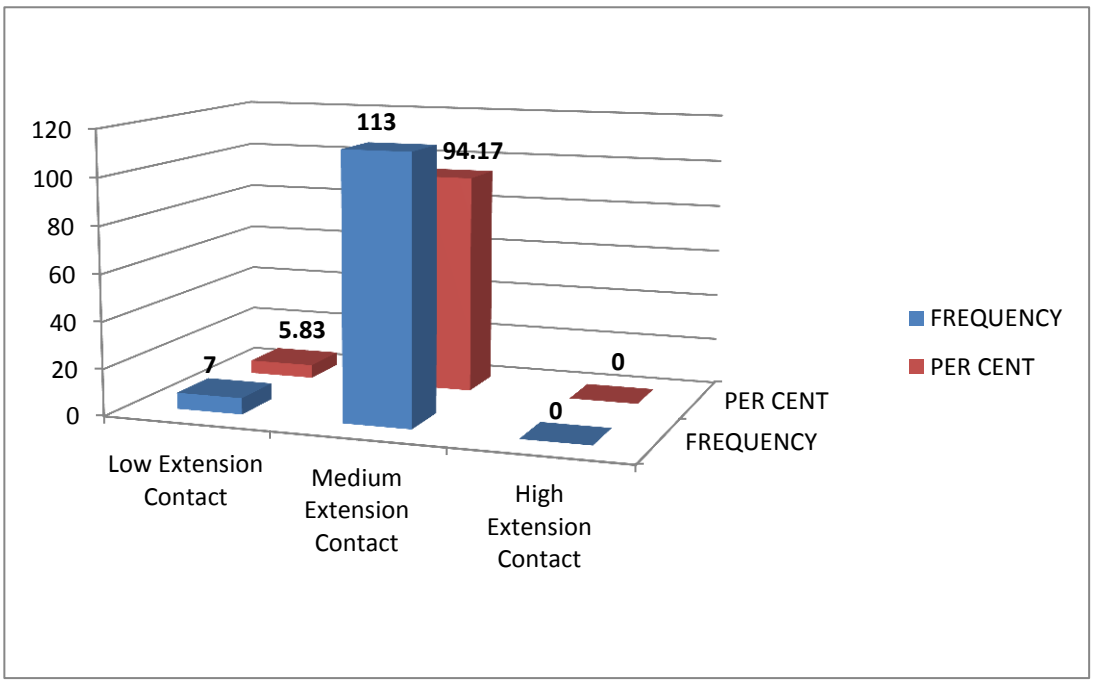


Fig. 4.14: Distribution of livestock farmers based on their extension contact

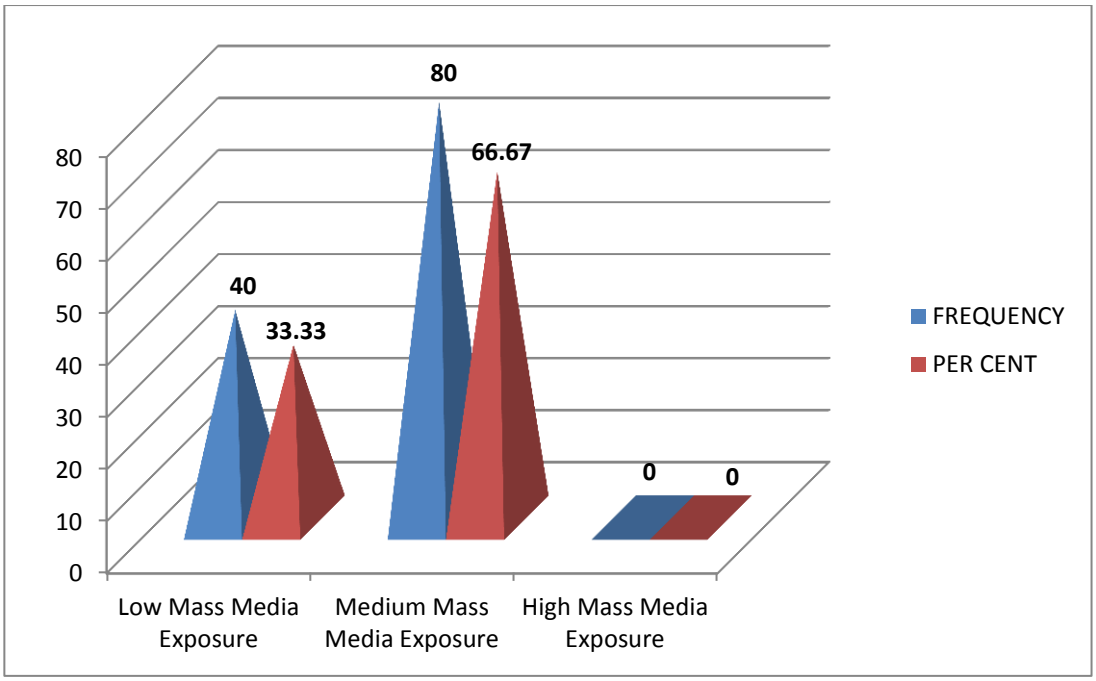


Fig. 4.15: Distribution of livestock farmers based on their mass media exposure

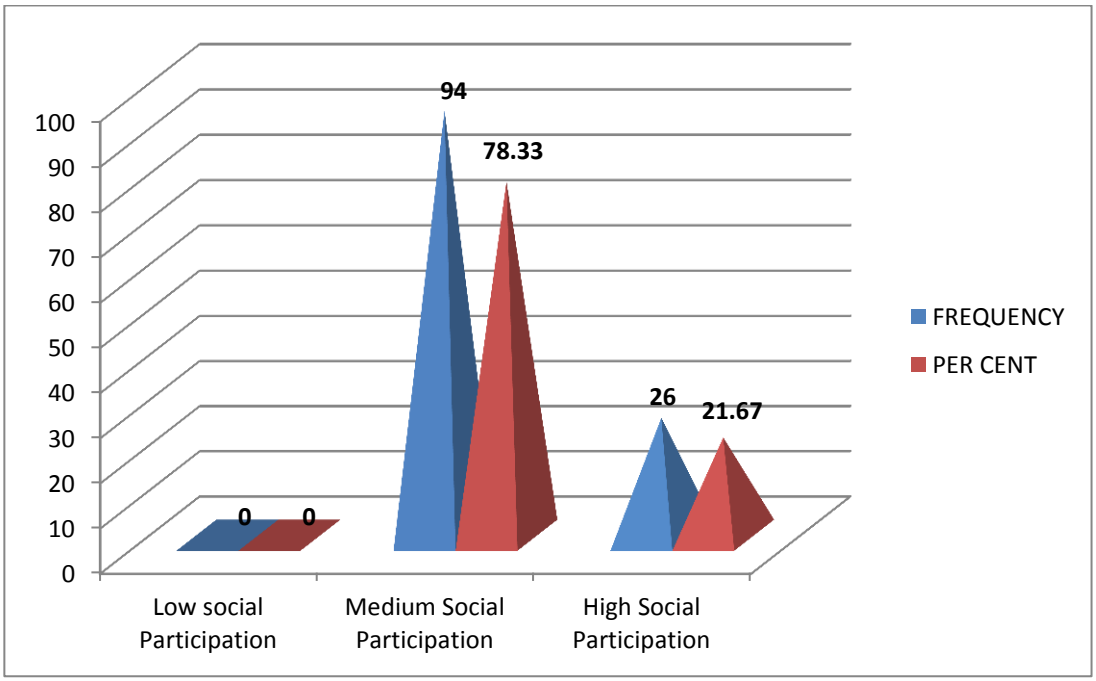


Fig. 4.16: Distribution of livestock farmers based on their social participation

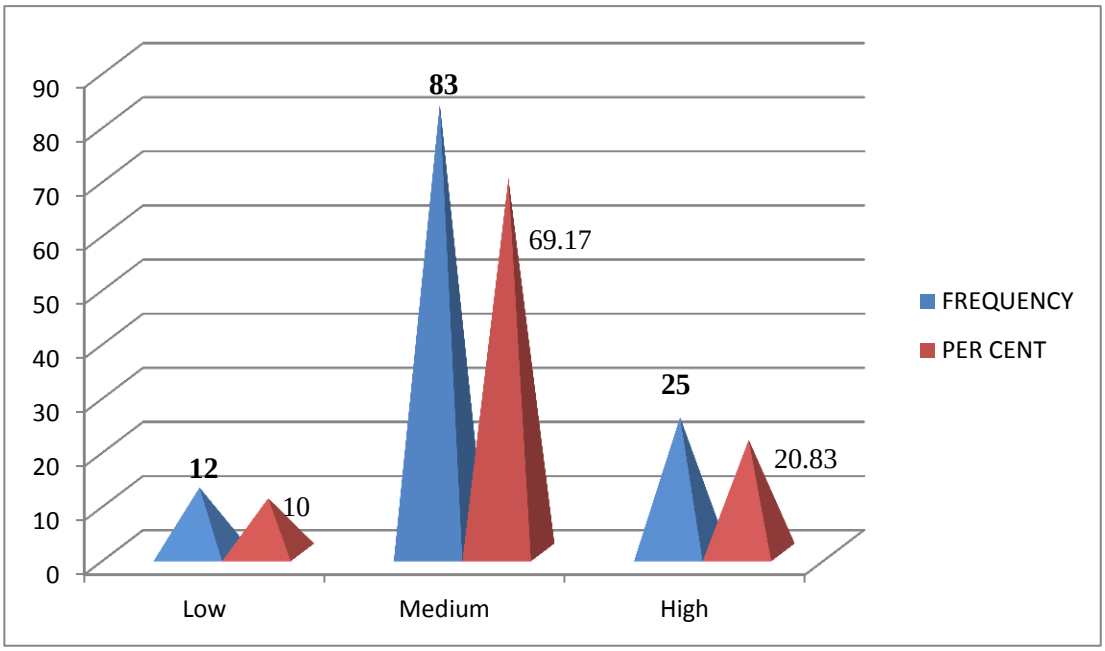


Fig. 4.17: Distribution of livestock farmers based on their economic motivation

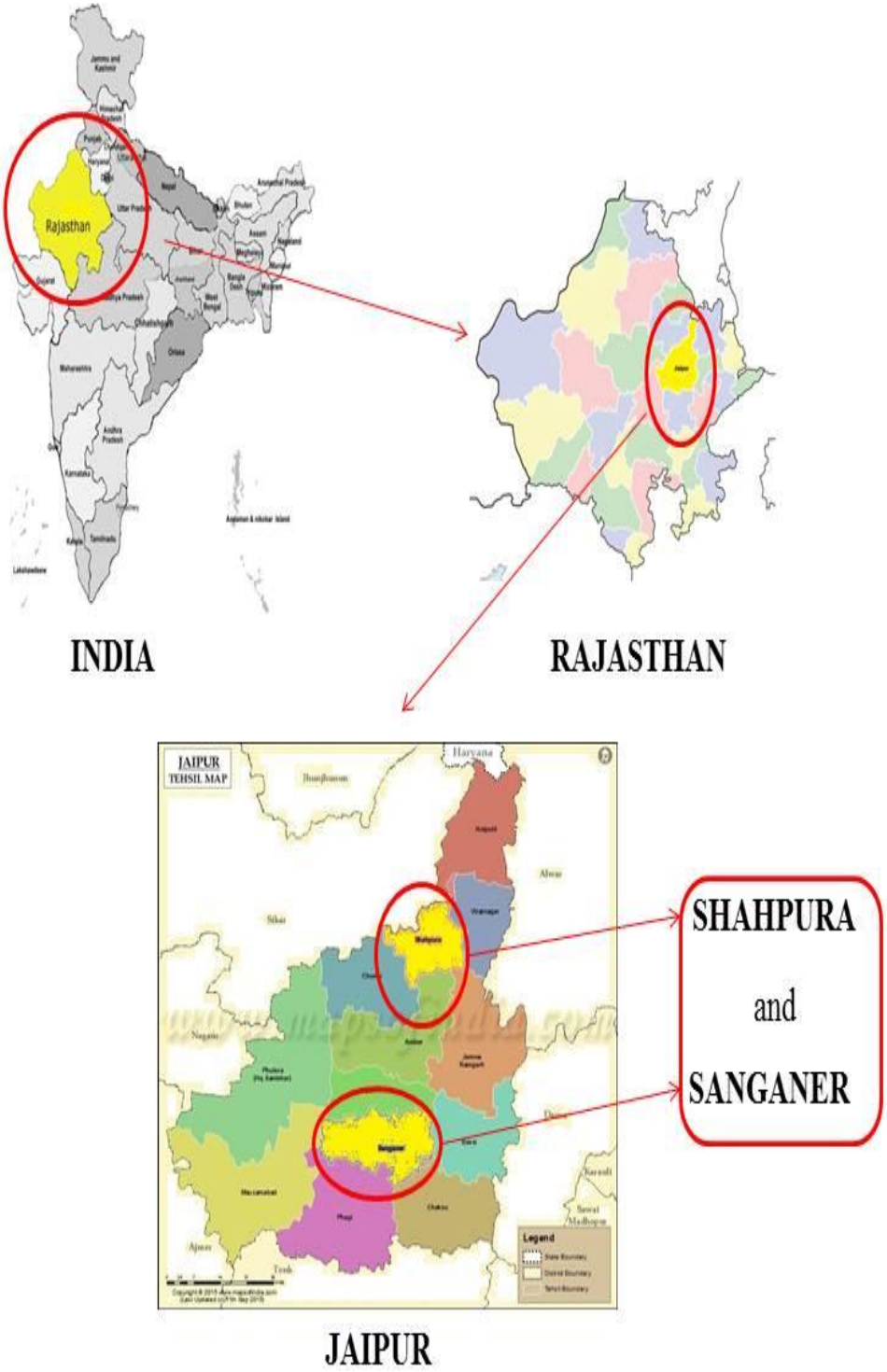
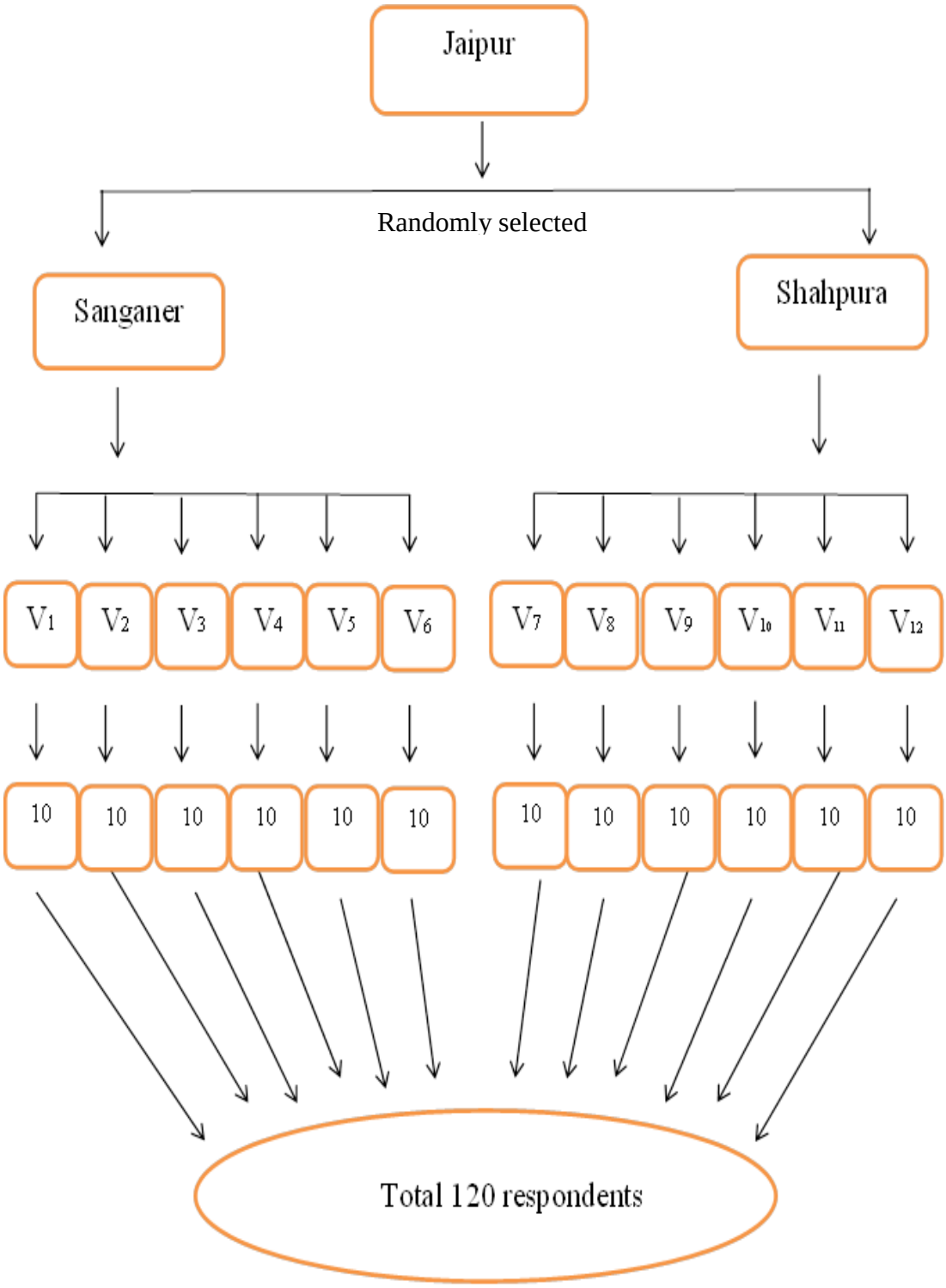


Fig 3.1: Locale of study area



(V stands for Village)

Fig. 3.2: Sampling plan of the study

Fig. 4.18: Interaction with respondent during data collection

Fig. 4.19: Interaction with respondent during data collection

Fig. 4.20: Interaction with respondent during data collection

Fig. 4.21: Use of mobile phone by the respondent