Review Article

Potential of Information Communication Technology (ICT) in Livestock Development: A Review

ABSTRACT

In most developing nations, including India, agricultural extension services are mostly focused on crop husbandry, but public sector animal husbandry activities are frequently dominated by animal breeding and health services. ICT has been widely employed in the study and enhancement of numerous elements of livestock production, research, and education in the United States and worldwide. Specifically, ICT is becoming more important in livestock disease control, dairy herd management, livestock production, and livestock and livestock product marketing. However, the success of ICT in livestock promotion or related areas is dependent on a number of factors, including farmer adoption of ICT, the political and policy environment, farmer education, ICT penetration rate, ICT infrastructure (such as connectivity), and the Rural Information Model etc. So, this paper throws light on the points of such capabilities of ICT for Livestock Development.

Keywords: Information Communication Technology (ICT), livestock product marketing, ICT penetration rate, Livestock Development.

INTRODUCTION

Animal husbandry is an integral part of the Indian system, which plays an important role in the development of millions of rural households and socio-economic system as well as in the national economy (Singh *et al*., 2018). In the olden times, the reason for various and many obstacles in the animal husbandry sector was poor decision making and poor policy or governance (Chilimo, 2009). The sources of information in the livestock development sector were limited in less developed countries (Gakuru *et al.,* 2009). Cattle farmers were not getting the deprived produce from their cattle farm as lack of communication pattern and information were major problems in the animal husbandry sector (CIRAD, 2009). Also, dissemination of information on livestock rearing has never been a priority for centralized extension services in developing countries (Morton and Matthewman, 1996). Veterinary services in India have been largely driven by the public sector, but emerging financial constraints added to the difficulties of state governments, making expansion and quality improvement of livestock services a bit of a struggle (Ahuja *et al*. 2003). Here in the Animal Husbandry Department, the employees are not made aware of the role of the consultant and the farmer looks towards the Animal Husbandry Department to get the information (Ravikumar and Chander, 2011). The farmer is dependent on the Animal Husbandry Department for his maintenance; he considers the private institutions of animal husbandry expensive (Kathiravan *et al*. 2011). If we talk about the animal husbandry departments of the state, they have to face the limited budg*et al*location along with inadequate infrastructure and human resources (Sasidhar and Chandel, 2003; Bhat and Das, 2002).

Extension systems have contributed significantly to the growth and capacity development of animal husbandry in India (Ponnusamy and Pachaiyappan, 2017), whereas

theState Animal Husbandry Department spends less than 1-3 per cent of its budget on extension activities (Chander *et al*., 2010). The number of farmers is thousand times more than that of extension workers (Kumar, 2005). Extension systems approaches, models, mechanisms range from the empowerment of livestock farmers to the development of livestock products by working collectively (Ponnusamy and Pachaiyappan, 2017). The diverse needs of farmers go far beyond the potential of the extension systems at the grassroots which can be met with knowledge alone (Singh *et al*., 2018). The potential for bringing about social change lies through increasing access to services, information and other technologies (Dutton *et al*., 2004). Modern techniques and practices have been considered in many researches as a better alternative in the agriculture sector including animal husbandry (Agwu and Anyanwu, 1996). Information and knowledge has become instrumental in effective decision making in the changing environment of agriculture and animal husbandry sector (Birkhaeuser *et al*. 1991; Cash, 2001; Galloway and Mochrie 2005; Adhiguru *et al*. 2009). Today the farmer seeks various information sources not only for his production and marketing activities but also to ensure safe and high quality products reach the consumers (Adhiguru *et al*. 2009). Today the major sources of livestock information are smart cell phones, electronic and printed media (URT, 2003).

For all these reasons accurate data field for livestock information is essential (Brodnig and Mayer-Schönberger, 2000). In this scenario ICT has emerged as an alternative whose application is helpful in improving the building of livestock services and enhancing the knowledge and decision making of farming communities (Gulati *et al*., 2007). A study reveals that livestock farmers have adopted ICTs and enhanced their farm productivity extensively. Mobile phones, computers, and radios & televisions are the most frequently used and utilized (Mdoda and Mdiya, 2022).

Concept and Need of ICTs

According to MANAGE, ICT or Information and Communications Technology in simple terms, can be defined as the basket of technologies, which assist or support in storage, processing of Data/ Information, or in dissemination/ communication of Data/ Information, or both.

According to Greenberg, 2005, ICT has emerged as an alternative electronic resource that not only captures data but also stores, process and communicates to farmers.

Livestock development in India and the potential to transform the economy is possible through the use of information and communication technology (Sasidhar and Sharma, 2006). The need for increase in ICT is due to increase in livelihood of rural population in livestock sector (Stienen *et al*., 2007). In addition, there is a need for information and communication technology in the form of providing proper information to the extension workers (Sasidhar and Sharma, 2006). ICT is essential for effective, competitive and efficient organization as it enhances the knowledge level of the users and motivates them to make better decisions (Fink and Disterer, 2006). Need of ICTs increasing day by day, a research on farmers attitude towards ICTs revealed that most of the livestock farmers had a positive attitude toward information distribution in the livestock sector using various ICT methods(Rajoria *et al*., 2022). Television, use of computing devices, cellular telephony, community radio, Internet and wide area networking, mixed media, WiFi, digital imaging etc. are modern ICTs that are useful in storing, transmitting information and are low cost, smart, compact and convenient (Fink and Disterer, 2006). For the ongoing revolution in ICT, a lot of measures have been taken by ICAR for scientists, extension workers, departmental people, farmers and students (Rai, 2003).

Table 1 : Situation before and after ICTs introduction with examples

Points	Before ICT Introduction	After ICT Introduction
Communication	Business collaborations required extensive travel or lengthy exchange of physical documents, leading to delays and higher costs.	Businesses can now communicate effortlessly with partners' worldwide, conducting virtual meetings and sharing documents in real-time, regardless of geographical distance.
Information Access	Students and researchers had limited access to up-to-date information, and acquiring specific data or facts required significant effort and time.	Students and researchers can now access a wealth of information online, conduct comprehensive searches within seconds, and retrieve relevant sources for their studies with greater efficiency.

Overall Impact:

Efficiency and Productivity: ICT significantly enhanced efficiency and productivity in various sectors. Tasks that were once time-consuming and labor-intensive can now be accomplished swiftly, streamlining processes and optimizing resource utilization. Example: Online project management tools and collaborative platforms enable teams to work together seamlessly, increasing productivity and reducing project timelines.

Global Connectivity: ICT has fostered global connectivity, transcending geographical boundaries and facilitating cross-cultural interactions. People from different parts of the world can connect, share knowledge, and collaborate on a scale never seen before. Example: Social media platforms allow individuals to engage in discussions, share ideas, and collaborate across borders, promoting cultural exchange and global understanding.

Information Sharing and Dissemination: With ICT, information sharing and dissemination have become faster, more accessible, and cost-effective. News, research findings, and educational resources can reach a broader audience instantaneously. Example: Online publishing platforms and open-access journals have made scholarly research more accessible, enabling researchers to disseminate their work globally without significant financial barriers.

The introduction of ICT has revolutionized various aspects of communication, information access, and societal dynamics, transforming the way we live, work, and interact. Its impact continues to evolve as technology advances and new possibilities emerge.

ICT Tools

Any device capable of storing, processing and disseminating information can be an ICT tool. Some of the main ICT tools are as follows:-

Table 2: Major types of ICT tools

S. No.	ICT tools	Uses of ICT tools

1	Word processing applications	For preparing text documents
2	Presentation software	For preparing presentations
3	Spreadsheets	For calculation and preparing tabular data with calculations
4	Databases	To store the information in the form of records and retrieving information using query mechanism.
5	Multimedia	To organize the information more meaningful manner with the help of text, images, animation, audio and videos
6	Web browsers and E-mail	To search information and send or receive mail using internet

Role ICTs in Animal husbandry development in India

The agriculture and animal husbandry sector is also affected by the ICT revolution, although the share of IT in agriculture is between 1 and 3 per cent (Chargotra, 2006). In the country, ICT is being used in a variety of ways for animal health management, disease prevention, livestock nutrition, herd management, and milk marketing (Meena and Singh, 2013).

Animal health management and disease control using ICT

ICT tools can help raise awareness in a big way. Information can be disseminated through current information kiosks and SMS services provided by mobile phone networks. Farmers can also be enabled to make tentative diagnoses of animal diseases at their level with the help of computer-based information systems and expert systems such as “Animal Health Information System” (AHIS) and “Poultry Expert System” (PES), so that they can understand the severity of the situation and seek veterinarian help as soon as possible (Meena and Singh, 2013).

IT required for veterinary research

IT (Information Technology) is used in facilitating veterinary research, in which the results of research are used for the development of animals and all the problems related to animals of the animal owners are passed on to the veterinary scientists, so that research can be done to solve the problems. ICT tools are also plays crucial role for transferring knowledge in veterinary teaching and learning procedure (Anwar and Dhara, 2022). Some important IT that are being used globally for Veterinary Research are given in Table 3.

Table 3: Various IT in veterinary research

S. No.	Information Technology	Uses of Informational Technology
1	Database management system	Database Management System, or DBMS for short, is a system for efficiently storing and retrieving data while maintaining security. Veterinary research generates a lot of data and metadata about animal breeding, genetic abnormalities and

		diseases, their characteristics, and control.
2	Information Retrieval system	The ultimate goal of an information system is to store and retrieve data in a user-friendly manner.
3	Decision Support System	A veterinary meteorological decision-support system, Local spread of infectious airborne diseases between neighbouring farms and long-range dispersion, including disease dissemination to or from other nations, are both described by VetMet.
4	Expert Support System	It's a useful IT tool for transferring technology from scientists to farmers, and it's known as a TOT tool. In scenarios such as feed and fodder, health check-ups, disease control, and vaccine scheduling, an expert system can be designed to assist and guide the veterinarian. It can also recommend control actions based on the symptoms.
5	Trend Analysis and Forecasting	Forecasting and trend analysis are purely statistical techniques. Trend analysis aids cattle producers in making decisions across the full production and selling process. In the livestock production system, trend analysis allows for forecasting and prediction.
6	Electronic Network and Messaging System	The Internet has transformed the world into a global society, allowing for rapid information transfer and sharing. Websites can be created to give livestock farmers with information in their own regional languages. E-mails, chat rooms, and conferencing will assist livestock producers in having talks with specialists and other livestock producers in order to exchange information and discover answers to problems. Mobile phones are extensively utilized and have made it easier for livestock farmers to deal with day-to-day challenges.
7	Helpline	The goal of the Helpline is to answer to livestock rearing difficulties quickly and in the local language. These Helpline provide answers to questions in the veterinary and related fields
8	Geographical Information System	Livestock is a user of land and other natural resources, primarily water, fodder, and pastures, which is one

		of its most distinguishing traits. Monitoring and policy evaluation in the important areas of land use and livestock's environmental effects necessitate location-specific data.

Suggested Ideal framework of ICTs in India

ICT framework is not fully organized in India. As compared to other developed countries along with lack of experts and internet, irregularity of information system and declining trend of farmers affects animal husbandry development. For this ideal form of ICT channels and programs has been described in various researches.

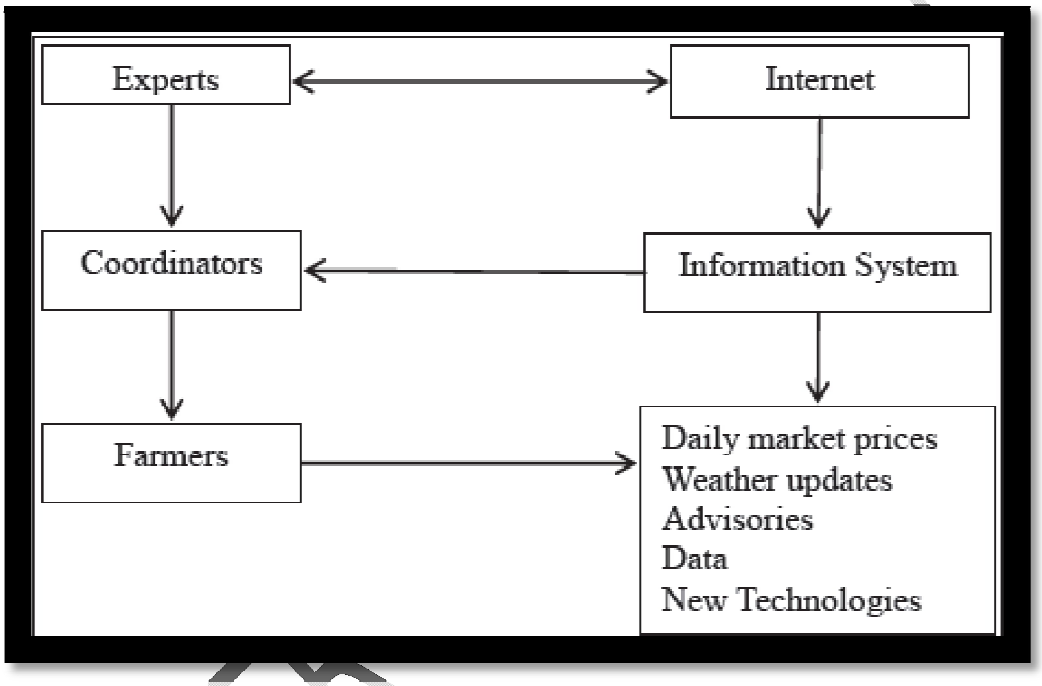

Fig. 1: Ideal framework of ICTs channels in INDIA. (Source: Singh *et al.,* 2017)

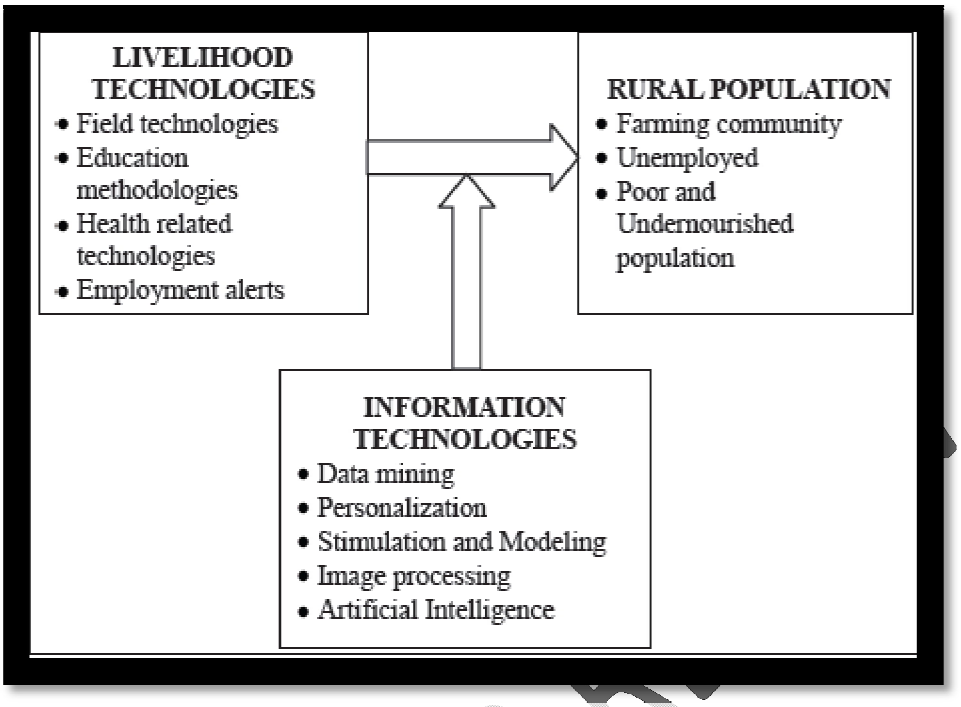

Fig. 2: Ideal framework of ICTs programs in INDIA. (Source: Singh *et al.,* 2017)

Constraints Encountered in the Utilization of ICT Tools in India

In India, Information and Communication Technology (ICT) tools are being widely used by many different Animal Husbandry organizations. Inadequate technically competent personnel in using ICT tools, problems with ICT tool maintenance, Interruptions in Internet connectivity, insufficient budg*et al*location for ICT tools, lack of up gradations of ICT equipment, and the problem of viruses and junk mails were the major constraints faced in the use of ICT tools (Sireesha *et al*., 2014).

ICT initiatives related to animal husbandry in India

Table 4: ICT initiatives developed by various institutes and their target groups

S. No.	Name of ICT Initiative	Developers	End users/target groups
1	Dairy tool box	ILRI-ICRISAT – Available as free download from www. dairytoolbox.net	Front line extension agents of public sector, NGO workers and progressive farmers
2	Drastic	Available on cost basis from https:// stirlingthorne.com/	Front line extension agents, NGO workers

3	Talking Pictures	Available as a part of dairy toolbox or Separately available on cost basis from the web https://stirlingthorne.com/	Front line extension agents, NGO workers
4	Interactive touch screen Information Kiosk	RAGACOVAS, Pondicherry	Farmers
5	Information Kiosks	TANUVAS, Tamil Nadu	Extension centers and constituent colleges
6	Poultry Expert System	COVS, Hyderabad	Organized poultry farmers
7	DISK	NDDB-Amul-IIMA	Operates across the dairy chain (Farmers, Societies, Unions and Federations)
8	AHPC	CABI International	Various stakeholders ranging from Professionals to farmers
9	AHIS	IVRI, Izatnagar	Para Veterinarians, stockman and farmers
10	Majordoma	CIRG and directly available on mailto: goat-net@cirg.nic.in.	Technologists, farmers, development officers and planners
11	Warna Wired Village Project	Prime Minister's Office Information Technology	Farmers
12	Nandini	Orissa e-Governance Services Limited (OeSL)	Livestock farmers
13	OICS	SUMUL, Surat	SUMUL members
14	The livestock guru	Livestock development group, University of Reading (UK) in Orissa	Poor livestock keepers
15	Kisan Call Centre (KCC)	Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India	Farmers
16.	Akashganga	NDDB	Dairy Cooperative Society (DCS)

			members

CONCLUSION

Information and communication technology (ICT) has been increasingly essential in India in recent years. The use of ICT as a tool for agricultural extension is currently supported by both the federal and state governments' programmes. Continuous computerization of government departments, the establishment of IT-based rural information centres in the public and private sectors, and mobile technology penetration are likely to provide a platform for IT-enabled extended distribution systems to complement existing extended distribution systems. As a result, ICT has shown significant potential as a medium for delivering expanded services. However, the success of ICT in livestock promotion or related areas is dependent on a number of factors, including farmer adoption of ICT, the political and policy environment, farmer education, ICT penetration rate, ICT infrastructure (such as connectivity), and the Rural Information Model etc. So it is necessary to evaluate the effectiveness of existing strategies for undertaking sustainable projects in animal husbandry based on feedback from grassroots level functionaries or officials working directly with farmers in rural areas. Apart from this the animal husbandry sector has to be transformed into modern digital animal husbandry to further improve the social and economic benefits.

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