

Status and scope of information and communication technology for livestock and poultry production in India– A review

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ABSTRACT

Much has been said about the potential use of Information and Communications Technology (ICT) by government agencies to boost relations with rural masses. Experience shows that the key challenge in building information society is securing institutional support at all levels. Government can stall or unleash new vision for development of ICTs. Though the ICT is diffusing in the rural area but until the costs of the “last mile”, of basic IT devices, and of local language software are brought down, the goal of “wiring India” will remain unachieved. The marketing competition between private players in the field of ICT is making favorable ground for diffusion of ICT in rural India. But, Low-cost technological solutions alone are of course not solutions to the problems of development, but they are prerequisites for diffusion of IT in rural India. The initiatives for e –literacy are laudable and have many implications for dissemination of ICT but the situation where we have yet to achieve 100% basic literacy and hence there is need to develop training programmes in rural areas to teach basic infrastructure maintenance skills required for ICT use. Despite of all constraints the ICT is spreading with its own pace and in future the process will speed up. It seems that in near future there will be sound platform for communication and service delivery in rural area through the ICT based devices and value added services. By that time the various sector associated with rural development; including 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.

Key words: Dairy herd management, ICT, ICT tools, ICT in livestock sector, Livestock production

Agriculture remained the major occupation of rural India but with the increasing population, per capita availability of land is declining. It was 0.89 ha/capita in 1950–51 and declined to 0.33 ha/capita in 1999–2000. On other side animal husbandry and dairying sector has undergone marked change over the years. While the share of agricultural output to the total GDP has been declining, the share of livestock output to agriculture has been increasing and now it accounts for 25% of agricultural out put and 4.36% of total national GDP (FAO 2007). In India the livestock are more equally distributed than the land and therefore it continues as subsidiary occupation of almost 100% rural inhabitants.

India has emerged as the largest producer of milk in the world with 110 mt milk production per year (NDDB 2009). Though the per capita availability of milk has increased from 112 g/head/day in 1970–71 to about 256 g per day now, but

it still remains 22 g below the world average of 278 g/head/day. Meat production in India increasing with an annual growth rate of 4.5% still there are about 5.74 million buffalo calves that need to be saved from early death, till they reach a productive stage. Condition of many of the urban slaughterhouses is far from satisfactory. The present availability of protein from animal products is just 10 g as against world average of 25 g.

The Indian poultry industry has come a long way, from a backyard activity to an organized scientific and vibrant industry. Today India ranks second in egg production and 10th in broiler production in the world, and is providing direct and indirect employment to about 1.6 million people in the country. Yet the per capita consumption remained low i.e. 42 eggs/head/year, which is also far below the recommended level of 180 eggs/head/year.

The fine wool production in the country is around 4 million kg and the demand from the industry is around 35 to 40 million kg of fine wool, which is mainly imported from countries like Australia.

Researcher and policy makers have given wide variety of recommendations for the development of livestock sector

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such as, breed improvement through appropriate breeding programme, institutional credit support, improvement in time sensitive livestock services like AI, vaccination, deworming etc. and making disease free zones, utilization of crop residue and fodder production, proper processing, storage and transportation of animal products, appropriate import and export policies of livestock products and besides these to address the information needs of various farming systems through broad based extension system with more reliance on the information and communication technology (ICT).

National Commission on Farmer (2004), National IT Task Force (1999), Planning Commission, Government of India, (January 2002), the United Nations, the group of G8 nations and the World Bank, among other leading organizations, hope that the use of ICT's could enable even the poorest of developing nations to "leapfrog" traditional problems of development like poverty, illiteracy, disease, unemployment, hunger, corruption, social inequalities and so on. The advancement in the new digital age depends on being given meaningful access to new information tools, such as the Internet. The potential for social and economic inequality due to lack of access is an issue of growing concern. The fear is that the global gap between the haves and have-nots, between the know and know-nots, will widen. This digital divide is a multi-dimensional challenge that will require an innovative blend of creativity, capital, and commitment.

The Millennium Summit in New York- 2005 has collectively recognized that for the achievement of Millennium Development Goals (MDG) with present pace and intensity in all regions, Information and Communication Technologies (ICT) has to play crucial role.

Status of use of ICT in India

The new information and communication technology (ICT) is the most powerful tool among the driving forces of globalization. ICT through internet and CDs have become a powerful tool to contribute in the development process. Similarly ICT has brought enormous changes in the service delivery in many sector saving resources, time and money. Through internal computerization of small and medium businesses on-line buying has already begun in the larger cities, with notable gains in efficiency. E-learning has paved the way to share the knowledge across the country through educational satellite such as EDUSAT. Similarly Telemedicine is an emerging sector where ICT have provided the urban medical facilities to remote rural areas in cost-effective manner. ICT has repeatedly demonstrated its potential for alleviating poverty in developing countries. In many instances, poor people have experienced benefits in the form of increased income; better health care; improved education and training; access to job opportunities; engagement with government services; contacts with family and friends; enterprise development opportunities; increased agricultural productivity, and so on.

Use of ICT for livestock development in abroad

ICT has been used in abroad widely for the study and improvement of various aspects of livestock production, research and education. Mainly the ICT is playing a greater role in livestock disease control, dairy herd management, livestock production and for marketing of livestock and livestock produce.

Livestock disease control

Ryan and Wilson (1991) reported that, the 'National Disease Control Information System' (NDCIS) of New Zealand, consists of a set of independent computers database on animal diseases such as tuberculosis and brucellosis, which is a good example of possible applications of ICT in improving the animal health.

A decision support system for managing a foot-and-mouth disease epidemic is being developed at Massey University on behalf of the New Zealand Ministry of Agriculture and Fisheries. The system will comprise a database management system, a geographic information system, a spatial simulation model of foot-and-mouth disease and a number of expert systems (Sanson *et al.* 1991).

Jalvingh *et al.* (1995) and Sanson *et al.* (1999) reported that, because of their economic importance, contagious animal disease outbreaks require rapid identification and elimination of all virus sources. For managing the vast amount of data and for help in setting the correct priorities, the use of computerized decision support systems (DSS) seems to be promising. EpiMAN of New Zealand is the first decision support system for controlling of foot-and-mouth disease (FMD) outbreaks. The system was initially developed to control FMD but now has been progressively expanded to manage other exotic and endemic diseases.

Santos (2002) reported that, the National FMD Task Force of Philippines uses an information system in managing data regarding disease situation, vaccination, and animal movement, which gives accurate information on the animal disease situation of an area at the quickest possible time. In Italy to control the blue tongue disease in cattle effectively, a surveillance system was established that included clinical, entomological and serological surveillance elements. The National Reference Centre for Veterinary Epidemiology developed a Web-based National Information System (NIS) and a Geographical Information System (GIS) to collect and manage data from Veterinary Services across Italy. Surveillance data are displayed to the user in different ways: reports, tables and interactive maps (Conte *et al.* 2005).

Garner *et al.* (2005) reported that Department of Agriculture, Fisheries and Forestry, Australia, developed a sophisticated spatial model (AusSpread) for foot-and-mouth disease control, that operates within a geographic information system framework. The model allows for interactions between herds or flocks of different animal species and production type, and considers the role that such interactions

are likely to play in the epidemiology of a regional outbreak of foot-and-mouth disease. The user can choose mitigations and eradication strategies from those that are currently described in Australia's Veterinary Emergency Plan. The model also allows the user to evaluate the impact of constraints on the availability of resources for mitigations or eradication measures. Outputs include a range of maps and tabulated outbreak statistics describing the geographic extent of the outbreak and its duration, the numbers of affected, slaughtered, and, as relevant, vaccinated herds or flocks, and the cost of control and eradication.

To get rid of various animal diseases in Tanzania, a strategic approach is proposed that involves the collection of animal health information using active surveillance techniques and the introduction of a geographic information system. Assessment of the Tanzanian animal health information system revealed two major problems: firstly, the absence of disease information that accurately reflects the health status of the source population, and secondly, an inefficient information management system, which is unable to provide useful information on the spatial component of animal health (Kivaria and Kapaga 2005).

Dairy herd management

The dairy herd management information system operated by the Associated Herd Improvement Cooperative is a computer network to store and process data on milk production and fertility. An Automatic Data Capture System is available for any centre with a milk testing laboratory to input data to the network via magnetic tapes. It is envisaged that the system will ultimately offer production data analysis, breeding data analysis for mating management, mastitis monitoring, herd improvement statistics and semen stock control (Stubbs *et al.* 1985).

Hayes *et al.* (1998) has assessed the benefits of on-farm use of a computerized management information system 'DairyMAN'. This study revealed that, the herds using DairyMAN had superior reproductive outcomes, as higher percentage of calving occurred during the desired seasonal period. The superior performance was associated with the accurate and timely information of commonly used reproductive indices (estrus detection, time of insemination and pregnancy diagnosis) DairyMAN had more information on breeding aspect and data on natural breeding were recorded for a longer period. With cows of equivalent genetic merit, herds using DairyMAN produced more milk (+1.2 litre/day per cow) indicating that users achieved better management of the herd through improved attention to managerial details.

Livestock production

Jain *et al.* (1995) reported that 'Spatial Decision Support System' (SDSS) was developed to facilitate planning and management of environmentally sound livestock production.

Spatial decision support systems (SDSS) are used to plan production systems and direct the implementation management strategies that are compatible with environmental protection goals. They enable resource managers to select appropriate production technologies that minimize environmental damage, and evaluate alternative management practices.

Paterson *et al.* (2000) reported the application of GIS and remote sensing based modeling techniques in classifying livestock farming systems. The approach demonstrates a cost-effective solution for augmenting existing, conventionally gathered field data, using techniques appropriate to the needs and resources of developing countries. The role of the technique is seen as that of a planning tool, to allow the evaluation of animal health and production interventions on a large geographic scale, from sub-national to regional level. To develop a multipurpose livestock information system for decision support an accurate analysis of information needs of stakeholders must be taken into account and the system should be able to generate a number of key indicators useful for decision-making processes and during the phases of planning, monitoring and control of the activities (Giovannini *et al.* 2003).

Japie van der Westhuizen (2003) reported that in Africa, ICTs have become important tools for recording livestock performance and production levels. Many commercial farmers run PC-based recording and management software that turns raw performance data into information that can be used immediately at the local farm level. In many countries ICTs do not go beyond this level, but in South Africa most local livestock data is fed into the centralized Integrated Registration and Genetic Information System (INTERGIS). INTERGIS is managed by the ARC-AII as part of the National Recording and Improvement Schemes. The system sets national livestock productivity benchmarks, enables comparisons of all animals in terms of genetic potential, and provides policymakers and farmers with a reliable source of reference. INTERGIS therefore plays a pivotal role in keeping South Africa's livestock producers globally competitive. INTERGIS contains productivity and performance data for beef cattle, dairy animals, small stock, pigs and poultry. Farmers or ARC-AII personnel record the data electronically at farm level using a PC or Palmtop and free software that allows them to directly transfer the data to INTERGIS (<http://ictupdate.cta.int/en/Regulars/Q-A/Q-A-ICTs-and-livestock-performance>).

Livestock and livestock product marketing

Livestock information network knowledge system (LINKS): It is a project led at the Texas AM University. It collects information regarding market reports, livestock availability forecasts and food shortage trends in Ethiopia, Kenya, Djibouti, Somalia, Tanzania and Uganda. The project includes the development of a livestock early warning system.

Its main goal is to monitor and improve food security (<http://mmd4d.org/ict4d-marketplace-projects/>).

STATUS AND SCOPE OF USE OF ICT IN LIVESTOCK SECTOR IN INDIA

ICT for improving the veterinary education system in the country

For enhancing efficiency at Undergraduate and Postgraduate teaching: Use of computer aided educational aids in college teaching programmes, computer based learning (CBL), utilising artificial intelligence software's, animal experiment simulation software's, computer assisted clinical diagnosis software's must be introduced at the UG and PG teaching. Development of distance and on-line education for the field Veterinarians and teachers in the Veterinary colleges is necessary to refresh their skills and knowledge. The initiation of e-learning, tele-veterinary-medicine, virtual laboratories, virtual class rooms and on-line courses can ensure higher standards of veterinary education. Further use of video conferencing to deliver and receive entire courses, virtual rounds, seminars, and small meetings can effectively enhance the veterinary education in the country. In the present era due to limited funding animal experimentation regulations and such related issues, a big threat is looming large over the veterinary education. This scenario makes alternate teaching a mandatory element. Hence, computer based learning (CBL) utilising artificial intelligence softwares, animal experiment simulation softwares, and computer assisted clinical diagnosis softwares must be introduced. Since, the modern computers provide the speed and interactivity they reduce the burden of teachers besides making learning self-paced and self motivated (Thangaraju 2007). The undergraduate veterinary curriculum needs a major change so as to incorporate the various features of the information technology to make the learning experience for the students more effective and interesting. Incorporation of CAI (computer assisted instruction) and use of CD ROMs for class room teaching will be effective tools. Further use of the IT tools for teaching the various difficult treatment procedures and surgery can help in refining the skills of the students.

Distance learning programmes using ICT for field veterinary officers: Most of the veterinary graduate students in our country, after attaining their degree and reaching the field to serve the community as per their available knowledge do not get the chance to refresh their knowledge. There is no permanent provision in the state department of animal husbandry for regular updating of the knowledge of these Veterinarians (Tiwari *et al.* 2009). Sporadic trainings are sometimes conducted but these are not sufficient. An urgent attention needs to be focused towards this aspect and regular trainings at 6 months interval should be made mandatory for the field veterinarians to keep them abreast with the latest technological development. Continuing education plays a

pivotal role in keeping veterinary professional up to date with the new scientific knowledge and technical skills. In USA, approximately half of the states require Veterinarians to attend continuing education courses to maintain their licenses. The courses can be offered by campus based faculty in form of refresher courses of short durations, distance education and on-line education. Though refresher course exists but its ability to fulfill the needed knowledge and skill enhancement of all the veterinarians at regular intervals faces financial constraints. The development of distance and on-line education can solve this purpose in an economic manner. Continuous updating of the knowledge of the veterinary professional in technical aspects can easily be achieved with provision of CD-ROMs, distance education through the networking of universities and libraries using the internet portal. The initiation of e-learning, tele-veterinary-medicine, virtual laboratories, virtual class rooms and on-line courses can ensure higher standards of veterinary education. Tele-veterinary-medicine if developed and implemented successfully can overcome the scarcity of veterinarians, especially in remote areas. Introduction of PG diploma courses on various subjects in e-learning module can be effective and beneficial for the practicing veterinarians.

Use of ICT tools to combat faculty, financial and infrastructural shortage: The veterinary profession is currently facing many educational challenges, including an insufficient capacity to train and educate veterinarians for the multiple disciplines within the profession, a shortage of veterinarians in private and public practice, a shortage of faculty, a lack of human and professional diversity, and a rising cost of education resulting in extreme student debt loads. As a methodology for teaching, distance education (DE) has the potential to address many of these issues. By its very nature, DE can increase the capacity of current facilities and faculty. In addition, DE can allow students to acquire the necessary knowledge at less cost. Murray and Sisco (2007) have described a model for the distance education by incorporating DE in the form of interactive Web-based courses, in conjunction with short, intensive residential programs, for the lecture portions of courses taught in the pre-veterinary, veterinary, and post-veterinary educational periods. In this model, the web-based courses will be used to convey the necessary core knowledge required at each step of the educational process. The residential portions are used to apply the knowledge in such a way as to combine clinical applications with research in basic and applied sciences. Distance education can provide increased flexibility, high-quality educational experiences, and a less costly alternative for students while maximizing the reach of current faculty efforts and the capacity of existing physical structures. Distance learning is hardly a recent phenomenon. The recent growth of distance-education courses and programs, particularly those offered online, has been dramatic. Distance education (DE) has started in various areas

of educational curriculum and continues to grow as an effective means of education which complements more traditional education modes. Developing strong support services for both groups is of the greatest concern. The effectiveness of DE in veterinary curriculum will require that the instructors have a detailed understanding of what creates optimal learning for participants. Because DE is a newer mode, the roles and functions that the veterinary faculty will play to make it effective will have to be subjected to greater scrutiny.

Use of video conferencing for veterinary education: Video-conferencing incorporates real-time video and audio into connections with distant sites and, when combined with simultaneous internet transmission of high-resolution images, enables veterinary educators to expand the classroom to include students and faculty from remote sites. Sims *et al.* (2007) reported that the University of Tennessee College of Veterinary Medicine (UTCVM) used videoconferencing to deliver and receive entire courses, virtual rounds, seminars, journal clubs, and small meetings and for in-house transmission from one area of the campus to another. They further reported that responses from faculty and students at UTCVM indicate that videoconferencing technology will be a permanent part of the academic mission of the college for years to come.

Use of ICT in veterinary and animal science research

Deemed Universities i.e Indian Veterinary Research Institute, National Dairy Research Institute, besides many other species specific institutes under the ICAR are involved in research. There are eight Veterinary and Animal Sciences Universities and 44 Veterinary colleges in India, out of which 2 are in private sector, and rest are under the State Agricultural Universities (SAUs) and Animal Sciences Universities including one under Central agricultural University (CAU) at Aizawl.

The livestock and animal husbandry development in India largely depends on the research activities taken by these institutes and therefore communication and coordination among them is a crucial factor for deciding goals and objectives. The lack of communication and coordination results in to duplication of efforts leading to wastage of time, money and resources. Online data base, website network and CD-ROMs facilities can empower these institute to exchange the information rapidly which will be helpful for decision making.

Use of simulation models: Animal welfare has emerged as a significant international public policy issue. The 'Animal Welfare Board of India' functions as a watchdog for all abuses/cruelty to animals and strictly enforcing a ban on cow slaughter and experimentation on animals etc. On other side researchers need live animal for experiment and innovation. The computer based simulation models of various animals can be used as an alternative to live animal where the

researcher can see the possible outcome of experiment before application on live animal.

Use of ICT for livestock production

The ICT is being used in the country in many ways for animal health management, disease control, feeding of livestock, herd management, and for marketing of milk.

Animal health management and disease control using ICT

Livestock are an asset for the landless farmers in India. Improvement in the health of the cattle goes a long way in exploiting their production potential helping cattle owners in coming out of the poverty. In the post-WTO global scenario and World Trade Organization's SPS Agreement, the country is facing several constraints in international trade owing to the presence of various contagious and infectious diseases of livestock like FMD in animals, which acts as a non-tariff barrier.

Chaouhan (1994) collected data from 100 farmers of Kangra district of Himachal Pradesh and reported that economic losses due to various diseases per year/farm by small, medium, large farmer and overall calculated to be ₹ 2652, ₹ 2195, ₹ 2172 and ₹ 2509 respectively. Economic losses due to morbidity were ₹ 1192 and mortality was ₹ 1317. Saxena (1994) reported that nearly 3508 million liters milk is lost due to foot- and-mouth disease (FMD) in buffaloes and cattle in India, a direct loss of milk due to reduction in yield, reduction in milk due to delayed conception and reduction owing to abortions in pregnant animals. Similarly Singh *et al.* (1997) estimated an economic loss in dairy cattle due to mastitis was ₹ 1607.2 crore which included ₹ 889.51 crore for cows and ₹ 717.69 crore for buffaloes. The reasons are poor health facilities, lack of awareness and inadequate vaccination cover etc. ITC can play important role for awareness. The exiting information kiosks and SMS service of mobile phone network can be used for the information dissemination. Similarly with the help of computer based Information system and Expert system such as "Animal Health Information System" (AHIS) and 'Poultry Expert System' (PES) farmers can be enabled for tentative diagnosis of animal diseases at their level so that they can understand the seriousness of the situation and seek veterinarian help as early as possible. They can also try appropriate first-aid measures with the help of such software. For the easy access of computer, to these cattle owners the existing network of computerized milk collection center can play important role. Since such software are being developed in India the same can be made available to these centers.

Two interactive softwares, one for the Para Veterinarians and stockman entitled "Animal Health Information System" (AHIS) in English and another for the farmers of Maharashtra entitled "Health information system for dairy animals" in Marathi, have been developed at the Indian Veterinary Research Institute, Izatnagar, for animal health management

particularly for animal disease diagnosis (Phand *et al.* 2009)

An information technology enabled 'Poultry Expert System' (PES) was developed using Visual Basic 6.0 and MS Access on selected dimensions of poultry farming. A total 29 items were considered for the measurement of applicability of PES, which were categorized into seven criteria utility, complexity, compatibility, technicality, feasibility, design and user attributes. Raju and Rao (2006) reported that PES had greater utility, less complexity and moderate compatibility. And PES had good technicality, feasibility and user friendly design and also brought improvement in the user attributes.

Ramkumar *et al.* (2003) reported that, demand-led information deliveries through the Touch Screen Information kiosk installed in Veterinary institution of Pondicherry helped farmers in preventing diseases and improving health of animals, saving time, labour and money for this disadvantaged group. They further reported changes in adoption practices including different steps in clean milk production especially washing of udder with dilute potassium permanganate solution and washing of hands by the milker after obtaining information through Touch Screen Information kiosk at Puducherry.

The ICT has already proven its worth for animal health care systems and for disseminating its information to the livestock owners in an effective manner. Various other such information system softwares and expert system could be developed based on the needs of different clients and locale. Further these may be made language specific for the clientele to cater in a more effective and precise manner. Researches, are in the way to develop such systems in the various parts of the country.

Animal/poultry feeding management using ICT: The improper management of available fodder, both dry and green fodder has been one of the major problems in development of animal husbandry and dairying sector. The three major sources of fodder supply are crop residues (paddy straw, wheat straw), cultivated fodder and fodder from common property resources like forests, permanent pastures and grazing land. India produces 500 million tonnes of crop residues but this has not been properly used to feed 400 million livestock. With the help of computer based software such as 'MakeFeed' the cattle owners can formulate balanced feed for layers, broiler chickens, quails, guinea fowls and dairy animals according to their physiological condition with the available resources.

'MakeFeed', is a windows based software developed by the scientist of Central Avian Research Institute for formulation of balanced feed for maximum production performance. It provides information on nutritive values for wide range of feed ingredients along with the maximum inclusion level for each ingredient. It is user friendly and persons having little computer knowledge can utilize it effectively (Nath *et al.* 2002).

Complete dairy farm management: Similarly, computerized dairy management system can be adopted at commercial dairy farm for feeding, breeding and milking of dairy animals.

A commercial dairy farm of worth Rs 150 crore, located near Sangli district in Maharashtra, handles about 60 million liters of milk per annum with computer based management system. Electronic chip tag and muzzle print is being used as an identification mark of animal. The orange tag is a simple numbering of the buffalo for keeping track of the number of buffaloes. And the number is electronically associated with the electronic ID, which is stored in the computer. The blue tag is the metallic cover under which the smart card has been locked for safety purposes. Since buffaloes cannot be expected to maintain any kind of discipline, the blue metallic cover ensures that there is no damage to the card inside. At the time of allocating the electronic ID, a link is created with the physical ID. The card stores a host of information on the buffalo mainly on following three counts.

Feeding: The farm has a unique feeding system that feeds the buffaloes correctly. The buffalo can never eat more than a certain programmed portion of daily ration at one time. The total ration is fed over 24 h in small amounts from half kg to two kg.

Milking: Every time the buffalo enters the parlor, the transponder in the strap (blue tag) is identified. On the milking point controller (MPC), a warning lamp lights up at the appointed symbol if the buffalo is not milked or if the milk is not directed to the tank. If the buffalo has not produced as much as expected, the warning lights will glow.

Breeding: This contains information on the genetic stock of the animal and all aspects related to animal rearing related to pregnancies, vaccinations, diseases (if any).

This has resulted in 15 to 20% improvement in total milk yield. The national average of buffalo milk yield in the country is 800–1000 litres in 300 days. At this dairy farm, they are able to achieve 2500 litres in 300 days (http://dqindia.ciol.com/content/top_stories/104033103.asp)

Goat management: The Central Institute for Research on Goats (CIRG) has developed e-mail conference system for goat outreach on its goat-nic.in server using free software called 'majordoma' which is available on www.greatcircle.com on a free Linux operating system. Three e-mail conferencing systems, viz., goat-net@cirg.nic.in., livestock-net@cirg.nic.in and fishnet@cirg.nic.in, have been launched by the institute to help information inflow among technologists, farmers, development officers and planners (Singh and Radhika 2002).

Marketing of livestock product: In National Dairy Development Board, ICT brings real benefits to more than 60,000 farmers daily who are involved in the milk collection project spread over 600 milk collection centers. Using relatively simple technology (PC, Weighing machine with PC interface) and online milk tester to measure milk fat and

promptly make the payment to the farmers. It has resulted in the removal of incentives to those who adulterate milk, reduced the time for payments from 10 days to less than 5 minutes and instilled the confidence in farmers on cooperative set up. All these factors have helped the milk market to expand to greater dimension (Sharma 2000). In India nearly 2,500 computerized milk centers are functional today (Kenneth Keniston 2001).

“Warana Wired Village” project of Maharashtra is using existing computer network for milk marketing of dairy cooperatives (<http://www.generation5.org>).

Dissemination of livestock related information: Fast and efficient dissemination of suitable technological information from the Agricultural Research System to the farmers in the field and reporting of farmers’ feedback to the research system is one of the critical inputs in Transfer of Agricultural Technology. The extension personnel have been disseminating the technological messages to the farmers manually. This approach has not been able to reach majority of the farmers who are spread across the whole country due to scarcity of expert human resource, especially in terms of manpower. This gap remains a challenge for the extension system even today. To reach over 110 million farmers, spread over 500 districts and over 6000 blocks is an uphill task. The diversity of agro-ecological situations adds to this challenge further.

Modern communication technologies can apply to conditions in rural areas, which will help improve communication, increase participation, and disseminate information and share knowledge and skills. It is being said that “Cyber Extension” would be the major form of technology dissemination in the near future. However it is observed that the rural population still has difficulty in accessing crucial information in order to make timely decisions. It is essential that information availability is demand driven rather than supply driven. The challenge is not only to improve the accessibility of communication technology to the rural population but also to improve its relevance to local development.

Next to the radio and television the mobile phone users are increasing rapidly in India particularly in rural areas, creating platform for information dissemination through value added services like Short Message Service (SMS). At the end of 2008 there were 347 million mobile subscribers of which rural India contributed around 92 million i.e 26%. The overall teledensity as of end of December 2008 was 33.23%. The mobile phone looks like tomorrow’s most likely access device for information dissemination. The livestock related information such as vaccination alert can be delivered through mobile service provider before monsoon.

Internet possibly a very effective and low cost medium for reaching the masses, these community information centers can motivate the local people into starting entrepreneurial ventures. According to I-Cube 2008, a survey conducted

jointly by IMRB International and Internet and Mobile Association of India (IAMAI), regarding internet users in India, there are 45.3 million “active” internet users (who have used the internet at least once in the last one month) and 62.2 million “claimed” internet users (who have used the internet sometime but not in the last one month). Among them urban users continue to dominate internet use contributing to 42 million. Moreover the recent report by LiveMint and Komli estimates that India will have 80 million internet users by 2010.

(http://www.iamai.in/PRelease_Detail.aspx?nid=1801&NMonth=1&NYear=2009)

Documentation and dissemination of ITKs in livestock sector: Modern veterinary health delivery is facing many constraints such as high treatment cost, inaccessibility and presence of antibiotic and hormonal residues in the milk and other animal products. Veterinary services have a crucial role in controlling highly contagious diseases and zoonotic infections, which have implications for human health as well as that of livestock. The Indian subcontinent has rich ethno veterinary health traditions which are the products of decades of experiences. Traditional methods of animal production and treatment have been found to be very effective at certain conditions, though they often lack technical validation. These traditional medicines can be used for the animal health care that can cut down the cost considerably. Moreover they are readily accessible to the ordinary farmer. The key challenges are to find out the effectiveness and contemporary relevance of these practices. Hence such efficient ITKs should be identified and documented as computer database which can be disseminate through appropriate mechanism.

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