International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2016; 1(1): 01-05

www.veterinarypaper.com
Received: 14-05-2016
Accepted: 23-06-2016

Ahmad Zia Ibrahimkhail
Ph.D., Research Scholar,
Bundelkhand University-Jhansi,
Uttar Pradesh, India

Corresponding Author:
Ahmad Zia Ibrahimkhail
Ph.D., Research Scholar,
Bundelkhand University-Jhansi,
Uttar Pradesh, India

ICT initiatives contributing to livestock development

Ahmad Zia Ibrahimkhail

Abstract
In the Indian economy, agriculture and related sectors account for 13.7% of GDP, of which 27% is contributed solely by the livestock sector. According to NSSO, only about 5.1% of households in India have some modern technology related to animal husbandry activities. Estimates indicate that 60% of farmers do not have access to any information sources on advanced agricultural technologies, which has led to a huge adoption gap. Major ICT initiative in India includes Akashganga, Dairy information service kiosk (DISK), ICT for livestock productivity- NANDINI, Kissan Kerala, Tele support project, Jan Mitra (e-Mitra), Iffco Kisan Sanchar limited (IKSL), Gayansanchar, Grameen sanchar society information center (ATICS), Asha, Agri-portal/Matir Katha, Soochana se samadhan, Vasundhar Vahini,Sustainable access in rural india (SARI) project through net Ikisan, Cpmputer on wheels, Information village center of mssrf, The livestock guru, Online integrated computerized systems (OICS)-SUMUL. ICT helps bridge the existing communication gap. Strengthened and smooth communication has promoted the overall development of the country's animal husbandry and has achieved success in acquiring information related to various aspect of livestock development.

Keywords: ICT, contributing, livestock, IKSL, Ikisan

Introduction
ICT (Information and Communication Technology) is an umbrella term that includes any communication equipment or applications, including radio, television, cellular phones, computer and network hardware and software, satellite systems, etc., as well as various services and related applications, Such as video conferencing and distance learning. ICTs are usually talked about in specific situations, such as education, healthcare, or ICT in libraries. This term is more common outside the United States.

According to the European Commission, the importance of ICT does not lie in the technology itself, but in its ability to provide more information and communication channels for people with lower levels of service. Many countries around the world have established organizations to promote ICT because people worry that unless technologically backward regions have a chance to catch up, the growing technological progress in developed countries will only exacerbate the existing economic gap between the two countries. Technology "owns" and "does not" domains. Internationally, the United Nations actively promotes information and communication technology for development to bridge the digital divide.

ICT in Livestock sector is an emerging field dedicated to strengthening Livestock and rural development in India. It involves applying innovative methods to use ICT in rural areas. It can provide farmers with the necessary accurate information to promote better Livestock output.

Despite the existence of "public-private partnerships", private initiatives and government programs, it is still in its infancy in India and is becoming an emerging trend. The benefits of information and communication technology have not yet benefited all farmers. Many farmers, especially marginal crops or farmers of crops, have not received this service, or, best said, they have not received this service due to poor economic conditions and social restrictions. Other factors include illiteracy, language barriers, and reluctance to adopt new technologies.

A key aspect of using ICT among farmers and their groups is the participation of human-computer interaction in the final stage, so it is important to understand the extent to which ICT pays dividends to farmers. A new paradigm of livestock development is rapidly emerging in both developing and developed countries.

The overall development of the rural sector is also moving in a new direction. On the one hand, the old methods of providing important services to citizens are being challenged. On the other hand, the traditional society is being transformed into a knowledge society around the world. Electronic connectivity is the key word in the new social order.

The report of "Task force on India as knowledge superpower" (GOI, 2001) emphasized that "capacities must be developed to generate, absorb, disseminate and protect knowledge, and use it as a powerful tool to promote social transformation." ICT It's regarded as an important means to achieve this transformation. When used as a broad means of providing scientific knowledge to local agricultural communities, ICT can initiate the formation of knowledge societies in rural areas of developing countries. However, this goal can only be achieved when knowledge and information are effectively collected for the entire agricultural and rural development.

Important ICT initiative for livestock development in rural India

Akashganga

Akashganga (meaning 'The Milky Way') is being used at the Dairy Cooperative Society (DCS), which is a farmer-owned, grass-root level unit in the cooperative structure. It offers one shop stop for rural milk cooperative societies by complete automation of all functions using effective information technology. It is playing a crucial role in improving quality of milk produced by the members of Dairy Co-operatives by introducing innovative, low cost analyser. Basic milk collection transaction done by AKASHGANGA comprises of a) Measuring weight of milk with electronic weighing scale b) Fat testing using milk tester c) Capture of unique member ID by the Personal Computer software and d) Multilingual printing of payment slip. Akashganga has facilitated more than 1,000 villages in 34 districts spread over 8 states covering 2,00,000 rural families in Gujarat and other states by, 2010. At each and every location, it is being used 365 days in a year, and for more than 6 hours in a day. System makes the process of milk collection transparent which enables the other farmers who are not engaged in dairying to take up dairying as a primary livelihood means. It integrates all processes and functions of the dairy co-operatives with the use of appropriate information technology.

The project initiated 2001 in by Shree Kamdhenu Electronics Pvt. Ltd., Company in south Gujrat with the following objectives

- Speedier collection of milk and timely disbursement of payment
- Maintenance of Dairy Co-operative Society (DCS) accounts

Dairy information service kiosk (DISK)

'DISK' initiatives of National Dairy Development Board (NDDB), out of 70,000 dairy cooperative societies in the country, around 26000 are using Electronic Miliko-Testers (EMT) and around 2500 are using the PC connected electronic milko-tester machines (known as Automatic Milk Collection Systems - AMCS). These systems introduced very satisfactory milk collection methods and facilitated immediate payments to farmers based on the quality and quantity of milk delivered. The success of these systems coupled with inexpensive connectivity opportunity offered by internet, motivated the Centre for Electronic Governance at the Indian Institute of Management, Ahmedabad (CEG-IIMA) to enhance the PC at the Automatic Milk Collection Systems (AMCS) into a Dairy Information Services Kiosk (DISK) and offer an extensive knowledge and service delivery mechanism through a Dairy Portal.

The scheme initiated in 1996 by National Dairy Development Board, Anand with objective of to provide data analysis and decision support to help rural milk collection societies in improving their productivity and the yield of mulch cattle.

ICT for livestock productivity -Nandini

It is an innovative endeavour in livestock sector with ICT intervention carrying its splendid objective to enhance livestock productivity and ready to help the livestock farmers with timely information on reproductive life cycle of crossbred cows. It gives timely information on oestrous, artificial insemination, pregnancy diagnosis, parturition, milk yield, vaccination, de-worming and drying off of crossbred cows and areas of delayed sexual maturity, repeat breeding etc. The project envisages the reduction in calving interval and repeat breeding scenario in the livestock sector. The farmers get the basic information with advisory services which are vital for enhancement of productivity through web-based application, Common Service Centre.

(CSC) in Gram Panchayat and SMS alerts. The conceptualization, application, software development, implementation of the project has been done by Orissa e-Governance Services Limited (OeSL) in-house. The UNDP funded Project Nandini received the e-India Jury award-2010 as a unique project in the country in helping the livestock farmers by providing better advisory and monitoring services.

Online integrated computerized systems (OICS): Sumul

Surat District Co-operative Milk Union Limited (SUMUL) award winning Online Integrated Computerized Systems (OICS) in Surat-Gujrat, has helped the dairy use data generated at 1004village level dairy cooperatives collecting milk from 2,14,415 members. The OICS acts as a network for procuring and providing all crucial information like weigh bridge data, all production/ stock data and cash collection details. Automatic Milk Collection System (AMCS) and Bulk Chilling Unit (BCU) modules are also integrated into the OICS at village cooperative societies. These are used by SUMUL members to procure information like receipt for milk sold, society credit/debit note, society ledger/pass book, information on pending loans etc. On the packing side, OICS maintains the data from milk Form Fill and Seal (FFS) pouch-filling machines to ensure packing of the right quantity. Apart from the OICS, SUMUL also avails of other technological advances to support day to day processes. In terms of ICT innovations, plans are afoot to further the reach of the OICS to ensure that milk producers receive all critical information at their fingertips and ensure that every single animal and milk producer is recorded and monitored.

The project initiated by Co-operative initiative, SUMUL in 1999 To provide guaranteed remunerative milk market round the year for surplus milk to milk producers in districts, maximum return to milk producers in districts, good quality milk and milk product to consumers and to increase milk productivity at most economic rate by providing technical input services to the producers.

The livestock guru

Livestock Guru in Orissa by Livestock development group, University of Reading (UK) in 2005 is multimedia learning programme for poor livestock keepers implemented in Cuttack, Khurda, Puri and Gangam districts in Orissa state in India to meet the unique needs of the poor livestock keepers

in Orissa state based on the priorities of the poor as expressed by them. There are four predefined processes of the software programmes like screen saver or welcoming the users, registration for recording users personal and livestock related data, animal navigation to choose the species of animal option according to their interest in information and then area of animal health, management or production then related to corresponding process disease navigation, feeding or housing. The software comprised of 18 modules on livestock production and 11 modules on feeding. Livestock Guru in India is distributed via two types of touch screen kiosks i.e. static and mobile kiosk. The cliental group of the Livestock Guru Software requires low level of literacy (Lin and Heffernan, 2010).

Information village centers of MSSRF

The M.S. Swami Nathan Research Foundation (MSSRF) is a non-profit organization founded by the noted Indian Food and Agricultural scientist, Dr. M.S. Swaminathan. Village knowledge Center (VKC) Project, conceived, developed and implemented by the M. S. Swaminathan Research Foundation (MSSRF), a Non-Governmental Organization (NGO) located in Chennai, India. MSSRF recommends that each Rural Knowledge Centre (RKC) should have 2-3 computers, a web camera, phone, printer and notice board. The state level hub, located at MSSRF is the knowledge resource that creates and maintains websites and databases for the local hubs – in close collaboration with national and international agencies. "All the centers regularly hold video conferences between the rural communities and experts, between farmers, between Self Help Groups (SHG) and between farmers and manufacturers. An information system establishes lab-to-lab, lab-to-land, land-to-lab and land-to land linkages.

Computer on wheels

Computer on Wheels (COW) is a mobile information delivery system. It includes equipment like laptop packed into a weather- and shock-proof solar-powered case that carries and recharges a printer, camera and accessories, as well as a portable tent. The entire system mounts on to the rear of a dirt bike, which is designed to enable access to villages without passable roads. The information providers demonstrate interactive software and content, which is stored on the laptop's hard-drive. Internet access is via the cell phone, mainly used for short uploads and downloads. If villagers make requests for particular kinds of information, the IPs can also return to the village after having connected to the internet elsewhere. COW model is explained best by Dr.A.P.J. Kalam when he delivered his national address on the 26th Jan 2005 on the uses of ICT for India. These are the fundamental ideas on which COW was built and is functioning currently in Mahbubnagar district of Andhra Pradesh. A data link is provided between villagers and experts in health and agriculture. Questions or problems are inputted by the information provider and uploaded to a server via a CDMA wireless link. From there, the relevant experts in health and agriculture accessed the data via the vidal.org.in internet site and reply to questions like pest infestation in agriculture and health problems for humans.

Ikisan

iKisan is an agricultural website developed by the Nagarjuna Group which provides online information on knowledge and business requirements to workers and traders in the agricultural sector. iKisan is being developed as a comprehensive agri-portal in Andhra Pradesh and Tamil Nadu in 2000, to address the information, knowledge and business requirements of various players in the agri arena including farmers, trade channel partners and agri input/output companies. The portal is also an e-marketplace where trade activities can take place online. This portal provides all kinds of agri-information, crop diagnostics, local information at the sub-district level and other related information for the use of farmers. Farmers are able to become members by paying Rs. 100 per year or Rs. 20 per month. Project services are available only to member farmer. The operators of the iKisan technical centres are agricultural graduates who act as the interface between the computer networks and the farmers. They are there to provide both on- and off-line information services and able to diagnose, analyse and advise about diseases and pests. With their knowledge of both agriculture and ICT, they probably constitute the best part of this project.

Sustainable access in rural India (SARI) project through net

The Sustainable Access in Rural India (SARI) project aimed at rural social, economic, and political development by providing comprehensive information and communication services through computer and internet kiosks in rural communities. By June 2004, it had established 78 such kiosks in rural communities in Melur Taluka, an administrative subunit of Madurai district in Tamil Nadu. Thirty-six of the 78 kiosks were run by rural self-employed entrepreneurs, while the remaining 42 were run by a local non-government organization (NGO) called the DHAN Foundation. Technical support for all the kiosks is provided by n-Logue Communications. These internet kiosks offered a number of services, including basic computer education, e-mail, web browsing, e-government, health, and agricultural and veterinary services, mostly on a fee-for service basis ranging from Rs. 10 (approx. US $0.22) for sending an email to Rs. 100 (approx. US $2.2) for one hour of basic computer education every day for one month. It has also developed partnerships with different agencies to provide various services to community members. These included tie-ups with the Tamil Nadu Agricultural and Veterinary University for providing remote agricultural and veterinary services.

Vasundhara Vahini (Community Radio in Agriculture)

The 90.4 FM 'Vasundhara vahini' is dedicated and devoted community radio station that caters to farmers in 35-km radius in and around Baramati by Vidya Praishthan Institute of Information Technology Baramati to improve agricultural techniques such as implementation of best and improved seeds; improve the farming practices, use of advanced technology in sugarcane, dairy and animal husbandry farming and the use of organic pest and herbs instead of chemical pesticides.This radio station has started on 4th March, 2005 in Vidya Prathisthan's Institute of Information Technology (VIIT). Infrastructure included one transmission room, one recording room and large waiting area. This radio station gives recent information from all over world related to agriculture. Most of the farmers have adequate knowledge to access the internet and telephone. Due to radio station (Vasundhara Vahini) now farmers are getting information regarding horticulture, floriculture, animal husbandry etc.

Soochana se Samadhan

It is an initiative to use the power of voice as the primary means of information dissemination. It facilitates exchange of information among the marginalized communities such that it helps in improving their quality of life in Haryana, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh states in 2005. It

aims to provide connectivity, content and capability via a phone-based service. Life Line is an agri information service leverages a mix of internet and telephone technologies - to provide essential and demand-based information, advice and guidance to remote and rural communities in India through the medium of "voice, in the local language and within 24 hours." information services in Agriculture and Education, catering to rural north and central India. It used to provide advice and guidance to farmers through critical agri advisory ranging from crop failure and animal illness to ineptness and livelihood information. The information is available on more than 50 different fields of agriculture and animal husbandry allied activities covering a complete chain of information from production to consumption. The service is being implemented on the ground in partnership with Indian Society of Agri-Business Professionals (ISAP), TARAhaat, Datamation Foundation,

Agri-portal/Matir Katha

The project initiated in North Eastern Space Applications Centre, Umiam, Meghalaya by Public, Department of Information Technology, Government of West Bengal in the year 2005 To get the information in different agricultural sectors (Agriculture, Agricultural marketing, Animal Husbandry, Fisheries and Horticulture) available to serve the citizens in West Bengal at grass root level.

Asha

ASHA initiative has taken by Assam Small Farmers' Agribusiness Consortium (ASFAC)is extending the benefits of the agro-information through two prongs, internet ASFAC's online agri-portal (assamagribusiness.nic.in), and a state-wide kiosk network providing information to over 6,000 farmers in the state through community information centres (CIC). Services related to agriculture, animal husbandry and veterinary, fishery and sericulture are available to farmers in various packages starting from Rs 50 for a quarter to Rs 100, Rs 250 and Rs 500 per annum. Special offers are available for self-help groups, voluntary organizations and farmer's associations. Rs 100 package, offer 10 telephonic responses every month to queries from farmers, 12 hours of free internet surfing, and even a 25 per cent rebate on printing services. 'ASHA' possessed all the ingredients for successful use of ICT in agriculture such as collective ownership and coordination between government, farmers, institutions, civil society and the private sector.

Agriculture technology information center (ATICS)

The Agricultural Technology Information Center (ATIC) is a "single window" support system that connects various departments of research institutions with intermediate users and end users (farmers) to make decisions and solve problems initiated by Indian Council of Agriculture Research (ICAR) in ICAR Research Complex for NEH Region, Umiam (Meghalaya) in 2001 to Building confidence and strengthening of linkages between institute and the farmers, Provide diagnostic and advisory services such as soil testing, plant health clinic, and disease identification and veterinary services etc., Sale and distribution of improved products emerging as a result of research being done at the institute like seed, plants, livestock, breeds, fish seeds, poultry strains and processed products etc., providing an overview of improved technology through published literatures and other communication materials and overcoming of technology dissemination loss and to provide direct access to farmers to improve expertise as well as products of technology.

Grameen Sanchar society public call office (PCO) project

Grameen Sanchar Society PCO, commonly known as GRASSO, is a non-profit NGO, working in rural West Bengal, India. Its mission is to transform the resourceful employ and enthusiastic rural youth into a successful network through many innovative and uniquely thought out self-employment schemes. In Kolkata, on the Feb 10, 2003, Grameen Sanchar Society, in association with Bharat Sanchar Nigam Ltd (BSNL) launched the GRASSO, Wireless in Local Loop (WLL)-based PCOs in rural Areas. This is the first time in the country that such a scheme, was inaugurated where an NGO in support with the central government behemoth like BSNL, & the state governments departments aimed at improving connectivity in the rural areas by an IT enabled Integrated Rural Development Project (IRDP) on the plank of existing self-employment & poverty alleviation scheme.

Gyansanchar

Gyansanchar collaborative ICT project is launched by Bharat Sanchar Nigam Limited(BSNL) and Canadian International Development Agency (CIDA) in 40 villages of Hoshangabad and Itarsi districts in Madhya Pradesh. These rural kiosks are run by Village Level Entrepreneurs (VLEs) and backed by a service provider, had access to BSNL broadband connectivity, both for data as well as for voice. Out of the total project outlay of CAD (Canada Dollar) 5 million, CAD 2 million was spent on broadband connectivity alone. However, a number of factors included lack of innovative services and educational services not being fully launched forced to the closure of a large number of Gyansanchar kiosks. Currently only 14 kiosks are functioning in four different Panchayats and are fighting for their survival.

IFFCO Kisan Sanchar limited (IKSL)

IFFCO Kisan Sanchar Limited is joint venture initiative of corporate sector of Indian Farmers Fertiliser Cooperative Limited (IFFCO), together with Telecom Giant Bharti Airtel and Star Mobitel, has promoted IKSL has been formed with the objective of bringing cost effective communication and other add on informational Value Added Services (VAS) to rural communities. Communication services are provided by Airtel while IFFCO utilizes its vast network for marketing and distribution of services. VAS is provided through the Green SIM Card of IKSL and Airtel's mobile information helpline service (534351 from Green SIM Card) which includes five free voice messages every day. Each voice message is of one-minute duration and cover diverse areas including weather forecast, real time mandi prices, farming tips etc. to farmers. These information help farmers in taking their farming decisions resulting in crop yield. Narula *et al*. (2010), IKSL has a vision of empowering the farmer, strengthening the cooperative society and creating a most visible impact of communication and information technology on rural landscape.

Jan Mitra (e-Mitra)

Jan Mitra is participative Public Private Partnership (PPP) project having various stakeholders like District Administration, State government departments, Government of India organizations like BSNL and financial institutions etc. launched in March 2002. An integrated e-platform was implemented in the Jhalawar district Rajasthan and is replicated in the state of Uttaranchal. All sections and departments of collectorate are connected through Local Area Network (LAN).The main objective of the Jan Mitra project is to provide a single-window facility to citizens to access

government work, various government procedures through computerization and use of information and communication, direct communication between the administration and the people to ensure transparent, accountable and responsive governance and make the right to information an effective tool in the hands of the rural masses (Anonymous, 2011)

Kisan call center

Kisan Call Centre (KCC) has been launched in January 21, 2004 by Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, functioning across the country to provide an easy access point to the farmers, all over the country, and in their 22 local languages. They have been set up by the Telecommunications Consultants India Ltd. (TCIL), a Government of India enterprise. All KCC locations are accessible for answering farmers' queries in from 6 A.M. to 10 P.M. on all 7 days a week in 365 days nationwide by dialling single toll free number1551 and 1800-180-1551 (from 13th Feb. 2009). Since the inception of the scheme, over 39.65 lakh calls have been received. During the current year, around 6.89 lakh calls have been received up to 31 October 2009 The farmers call enquire about the various queries/ problems related to the crops, seeds, fertilizers, agriculture commodity prices, pesticides, horticulture, veterinary etc. at free of cost.

Tele support project

Tele Support project focuses on Good Practices (GPs) Technologies or methods that contribute to sustainable agriculture. Specific GPs cover topics such as methods of pest control of various crops, methods to improve animal health- or production, soil fertility improvement through composting or vermin-culture. Integrated use of the web-based tools that facilitate communication and make information systematically accessible on-line was seen as a strong underpinning point. The decentralized management of the information platform is innovative and allows rapid on-line availability of resources like videos, experts, and manuals in local language. Group consists of NGOs, KVKs, farmer organizations and other community-based organizations that play a key role in supporting local communities through identifying questions of farmer groups, scout for relevant information in the Tele Support database and other web resources, contact experts and assure that the information on options reaches local communities timely. The project initiated by European commission in Nadia district in West Bengal in 2006.

Kissan Kerala

Karshaka Information Systems Services and Networking (KISSAN) is an integrated, multi-modal delivery of agricultural information system, which provides several dynamic and useful information and advisory services for the farming community across Kerala in 2003. The project was conceived, developed and managed by the Indian Institute of Information Technology and Management (IIITM) - Kerala for the Department of Agriculture, Govt. of Kerala. The project solves the problem of content gaps by providing the authentic agricultural information. It is one of the leading citizen-centric e-governance projects of the Department of Agriculture. The project has also launched the country's first online video channel on agriculture in collaboration with Google with objective of To provide "Right Information to the Right Person(s) at the Right Time in the Right Place(s) and in the Right Context" dynamically using a combination of advanced technology like web technology, television based mass media programs, telephone based advisory, mobile Short Message Service (SMS) based advisory and broadcast service and dedicated online Agri video channel provides video on demand service to enhance the livestock production, improved crop protection and new avenues for value addition.

Conclusion

In recent years, information and communication technology has become increasingly important in India. Currently, both the central and state government policies support the use of ICT as a tool for agricultural extension activities. The spread of information centers based on information and communication technologies and the quality of rural connectivity are improving. Indian tobacco companies, HLL, Tata Chemicals and other Indian and multinational corporations, as well as development agencies such as non-governmental organizations, production cooperatives and government departments, are promoting ICT to rural areas to consolidate the rural market and promote contract agriculture and other services. The Indian government has been working hard to coordinate various stakeholders involved in rural ICT programs through its "Vision 2007" policy (Mission 2007: Each village is a knowledge center), with the goal of covering 600,000 villages through an ICT-based village information center. The continuous computerization of government departments, the establishment of IT-based rural information centers in the public and private sectors, and the penetration of mobile technology are likely to provide a platform for IT-supported extended delivery systems that can complement existing extended delivery systems. Therefore, ICT has shown great promise as a channel to deliver extended services.

However, the successful application of ICT in livestock promotion or related sectors depends on various issues, such as farmers' adoption of ICT, political and policy environment, farmers' education status, ICT penetration rate, ICT infrastructure (such as connectivity), and rural information Model etc. In addition, there is a huge gap between the ICT tools developed by various institutions and the needs of the agricultural community, as well as factors such as the shortage of quality and quantity content in agriculture, which are also obstacles to large-scale production expansion. If the above limitations are resolved, the potential of ICT can be used to provide extended services. But this can only be a supplement to the existing public expansion system, and it cannot be assumed that ICT will bridge the emerging gap in the public expansion system in the context of privatization.

References

1. Akashganga- Using Simple and appropriate ICTs to facilitate timely collection of milk and thereby generating higher revenues to rural milk producing farmers in India. Available: http://www.unhabitat.org/bestpractices/2006/mainview.asp?BPID=357
2. ICT, Update. Information is Changing Things in the Market Place. ICT Update, A Current Awareness Bulletin For ACP Agric 2004;18:4-5.
3. Anonymous. State of Indian Agriculture 2012-13. Performance and Challenges. Ministry of Agriculture, Department of Agriculture and Cooperation, Directorate of Economics and Statistics, New Delhi. 2012-13. 1-221. http://www.icar.org.in/files/NAEPProjec-document.pdf
4. Das P. Information and communication technology (ICT) initiatives in agricultural research and extension system in India. Regional workshop on "Role of ICT for Poverty Alleviation through Agricultural Development in

SAARC Countries. 22nd– 23rd Oct. at Dhaka Bangladesh. Proceedings 2003, 39-66.
5. Heffernan C. The Livestock Guru: Transmitting demand-led information to decision-makers and the poor. ICTD 2006 conference program Keynote lecture Available 2006. http://www.sims.berkeley.edu/ictd2006/pro.html
6. Hosman L, Fife E. Improving the prospects for sustainable ICT projects in the developing world. International Journal of Media and Cultural Politics 2008;4(1):51-69.
7. ICT for Livestock Productivity(NANDINI).Available: http://www.eindia.net.in/2010/awards/details/eGov-G Details.asp?PNo=54
8. IFFCO Kisan Sanchar Limited. Available: http://www.iffco.nic.in/iksl/ikslweb.nsf/ ef05d07df0ecee65652575040037b375/cba18de8cdc66cf8 652577 a600389765?OpenDocument iKisan. Available: www.ikisan.com
9. Information and Communication Technologies (ICTs) in Agriculture - Indian Private Sector Perspective. Available: http://info.worldbank.org/etools/docs/library/51025/
10. ZipAgExtension1/ag_extension1/Materials/May6Session 2/ITapplications-Agriwatch.pdfInformation Village Center of MSSRF. Available: http://www.mssrf.org/
11. Kisan Call Centre. Available: http://agricoop.nic.in/PolicyIncentives/kisanCallfirst.htm
12. Kisan Kerala. Available: www.kissankerala.net
13. Kumar A. Communication effectiveness of agriculture officer in Kerala. State department of agriculture: A psycho-personal analysis. Unpublished PhD Thesis IARI New Delhi 1997.