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# **INTERNET OF THINGS (IOT) FOR VETERINARY RESEARCH IN KASHMIR VALLEY OF J&K**

**T. A. Raja**

Central Computer Laboratory, Faculty of Veterinary Sciences and Animal Husbandry  
Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir,  
Shuhama, Alusteng, Srinagar, J&K,  
tariqaraja@rediffmail.com, tariqaraja@skuastkashmir.ac.in

**I A Najar**

Central Computer Laboratory, Faculty of Veterinary Sciences and Animal Husbandry  
Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir,  
Shuhama, Alusteng, Srinagar, J&K

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**Abstract:** Internet of Things (IoT) is growing in all spheres of activity. The present paper discusses the most basic, important and fundamental aspects of Internet of Things and its services in Veterinary. The IoT has rapidly grown according to our lifestyle. Lot of efforts have been put in to incorporate IoT in all endeavours of Life. All organizations and departments concerned and correlated with Veterinary Sciences and Animal Husbandry need to realize the potential of IoT for the speedy, accurate and reliable dissemination of information to the livestock rearers. The awareness among livestock rearers about the information and availability of IoT is the first step to be taken to increase livestock rearers' participation in IoT initiatives. Basic awareness about the "Internet of Things" is needed for livestock rearers development in Kashmir valley of Jammu and Kashmir.

**Keywords:** -Internet of Things (IoT), Veterinary Research and Animal Husbandry, Information Needs, IoT Tools.

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**Introduction:** The internet has been around for a while, but it has mostly been the product of people, all the data, recordings, books, e-commerce, games are created by the people for the people and about the people. The internet is the most important and transformative technologies ever invented. The internet is like a digital fabric that is woven into the lives of all of us into one way or another way. The concept of "Internet of Things" is not about people, it's about the inter communication of sensors within devices with each other.

In simple words, it is the concept of connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cellphones, fit band, pet collar, coffee makers, washing machines, headphones, lamps, wearable devices and almost everything else you can think of. This also applies to components of machines, for example a jet engine of an airplane or the drill of an oil rig. As mentioned, if it bears on and off switch then chances are it can be a part of the IoT. The Research and analyst firm Gartner (world's leading research and advisory company) says that by 2020 there will be over 26 billion connected devices. The IoT is a giant network of connected "things" (which also includes people). The relationship between is as: people-people, people-things, and things-things.

Mostly the number of changes that we see occurring in every sphere of life is the result of application of IoT and therefore Animal Husbandry is not an exception. IoT in Veterinary Research, Development and Extension are becoming an indispensable part of our society in Kashmir valley of J&K as well. The advances in IoT from last few years have created new opportunities and challenges for Veterinary professionals like Veterinary students, Veterinary technicians, Livestock farm managers, Livestock assistants and above all Livestock rearers(farmers).

Veterinary Sciences and Animal husbandry occupies an important place in the economy of our state. The share of Veterinary and allied sectors in the Gross state domestic product for the year 2013-2014

(preliminary) stands at 38% on the other hand nearly 70% of the population in the state derives its livelihood directly or indirectly from the agriculture and animal husbandry sectors (Anonymous 2014).

**IoT in Veterinary Sciences and Animal Husbandry:** Livestock census actually covers the census of livestock, poultry and machinery used for livestock rearing. India has largest livestock numbers in the world. Sound and on time availability of Big Data are the basic requirement for any planning and policymaking purposes, with the help of IoT implementation; it has become very reliable and powerful resource of processed information. The information across the farms with respect to lambing, body weight, sire and dam get updated in real-time. The conduct of livestock census is thus essential for making plans and policies for growth of livestock sector and also for overall growth of the economy. Livestock Census in our country started in the year 1919 and since then the process has been continuing on five year basis. Big data gets generated as a result of census needs to be tabulated analysed and interpreted. Use of IoT not only eases the mammoth exercise but helps in its better tabulation, analysis, interpretation and presentation.

Teaching and Learning of Veterinary Sciences is greatly enhanced by use of IoT technology. With growing animal welfare concerns more of videos, animations and simulations are being used in teaching and learning process in place of animal experimentation. The IoT provides new pedagogical models for Veterinary professionals. Similarly Veterinary and Animal Science Research that is gaining importance day by day is greatly benefited through use of bioinformatics tools and statistical programs.

Veterinary and Animal Husbandry extension system is playing an important role in disseminating technology to stakeholders of the State. IoT strengthens our extension system manifold by use of various information technology (IT) tools in technology dissemination and empowering Veterinarians with the desired information. Their use with right perspective will provide information services to the veterinarians timely, logistically and effectively. Shaiket *et al.* (2004), Griffin *et al.* (2008), Raja *et al.* (2013) and Songtao Guo *et al.* (2015) have worked on applications of information and communication Technology in Agriculture and Internet of Things respectively.

The present paper discusses various techniques of information simulation and dissemination needed for livestock rearers of the Kashmir Valley of Jammu and Kashmir for the upliftment of Veterinary and Animal husbandry sector.

**Information Needed:** The focus of IoT in Veterinary Science and Animal Husbandry is to meet the modern advances in research and extension technologies. A Veterinary practice at a Veterinary centre or a Veterinary clinic or an Animal hospital is in most cases a small business offering a range of services to clients and livestock owners. Many people are involved in delivering the service and ensuring that you as the client get the best care for your animal, in the most efficient manner. The delivering of services and efficiency is taken care by use of IoT. Information on cost, quality of treatment, availability of medicines and inputs like history of animals, species, breed, are required by veterinary professionals at various levels of practice. Similarly for more remunerative production of farms (dairy, sheep, goat, poultry etc.) accurate, reliable, timely and precise information should reach to the investors at proper time as and when required. The information needed by the investors in veterinary field can be broadly categorized into following.

- Input Procurement
- Package of practices
- Disease forecasting and forewarning
- Preservation and Value addition
- Past trends
- Marketing Information and intelligence
- Policy Decisions

**Input Procurement:** Information relating to availability of various inputs and their cost is the first priority. Livestock rearers frequently require the information regarding various inputs such as breed, feed, medicine etc in terms of cost, quality, availability and possible sources.

Proper planning of an enterprise goes a long way in running a successful enterprise. Entrepreneurs desirous of taking up livestock rearing require expert advice in drafting viable project proposals. Livestock business proposals tailored to specific conditions, specific areas and specific regions are required.

**Package of Practices:** The area specific package of practices for various livestock species is pre-requisite. Preparation of package of practices its continuous updating with changing times and its timely dissemination among livestock rearers is essential. The package of practices includes breeding, feeding, housing and management practices of livestock.

**Disease Forecasting and Fore-Warning:** Diseases take a heavy toll of livestock enterprise on account of morbidity and mortality. Availability of timely disease forecast can help farmer to take prophylactic measures well in advance and prevent losses which is very important for farmers and business enterprises.

**Preservation and Value Addition:** Livestock products being of perishable nature their preservation is very essential. Methods that enhance shelf life of various livestock products are required by the livestock owners. At the same time methods of value addition and product development are also required.

**Past Trends:** Information on past trends regarding production,consumption,utilization,environmental factors and climatic conditions are of immense use in decision making regarding rearing and management of livestock.

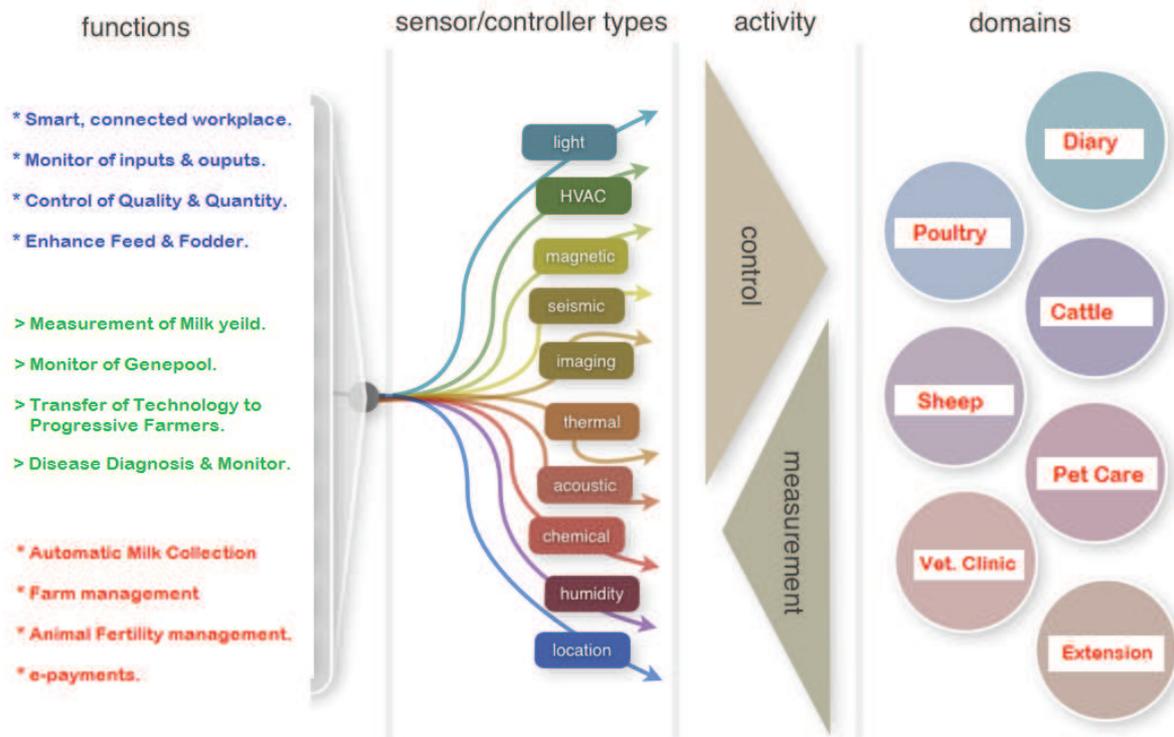
**Marketing Information and Intelligence:** After the harvest, the most important query is about its marketing, so that the farmer may not fall prey to middle man and hoarders. At this very time, information related to processing and grading, any government interventions like support price, identified central markets and legal agencies involved is must which may help livestock rearers in making right decisions in selling their produce.

**Policy Decisions:** News about various Animal Husbandry events and decisions related to livestock and its products, labour laws, rural development programmes, government schemes etc are also important in decision making, All such information,must be available to the farmer to take right decision and get maximum returns.

Many communication tools,Such as radio, television, mobile phones, video chatting etc. are used in information dissemination and making livestock rearers aware about government policies Programmes and support system.

**IT Tools:** A variety of IT tools are available for development and implementation of information technology and decision support systems. Recent development in Electronics and communication technology has made it possible to gather data, process, transmit and disseminate information in meaningful order with click of a button. This helps to analyse and interpret the data using sophisticated computational tools and techniques such as artificial intelligence,machine learning, image processing,pattern recognition, Probabilisticmodelling,large scale simulation, data mining, text mining and graph algorithms and decision support system.

## Internet of Things In Veterinary Research



The support of “Internet of Things” required for Veterinary Research is as under:-

- Database management system
- Information Retrieval system
- Decision Support System
- Expert Support System
- Trend Analysis and Forecasting
- Electronic Network and Messaging System
- Helpline.
- Geographical Information System

**Database System (DBS):** Database Management System or DBMS in short refers to the technology of storing and retrieving data with utmost efficiency along with security measures. Aim of building database is to convert traditional knowledge into electronic knowledge base, so that the data can be filtered along x and y axis which means rows and columns respectively. Huge and metadata is generated in Veterinary research related to animal breeding, genetic disorders and disease, their characters, and control. Database technologies play an important role in storing data in electronic form. Database operations like Insert, Append, Update and Delete are used to quickly manage data for addition, alteration and modification. Information from Database can be harnessed by Information Retrieval System, Expert System and Forecasting System, to produce information in desirable way. Database system is a group of hardware and software for addition, modification, compilation, processing and reporting of data.

**Information Retrieval System:** Store and retrieval of information in user friendly manner is ultimate objective of an information system. Such systems uses search engines, user friendly interface and other controls to mine the data from database and present the same in the form of reports, graphs, images, tables, etc. On the same line information retrieval system is developed to retrieve information as and when required.

**Decision Support System:** A veterinary meteorological decision-support system, VetMet developed by Danish Meteorological and Veterinary Research Institutes and authorities firstly implemented it at the Danish Meteorological Institute and it was used by the Danish Veterinary and Food Administration, which has the responsibility for prevention and control of animal diseases. By estimating the risk of atmospheric spread of airborne animal diseases, including first of all foot-and-mouth disease, VetMet improved the preparedness and the disease eradication. The Internet-based system is being used for decision support regarding establishment of surveillance and eradication zones. VetMet can describe both local spread of infectious airborne diseases between neighbouring farms and long-range dispersion, including disease spread to or from other countries.

**Expert Support System:** An Expert system is a computer programme with artificial intelligence, knowledge base and inference engine to solve problems that are difficult enough to require significant human expertise for their solution. A knowledge base is the repository of facts and rules about the specific problem. An inference engine is the software for solving the particular problem using the knowledge base. It is an efficient IT tool and is referred to as a tool for Transfer of Technology (TOT) from scientist to farmer. This prevents dilution of contents by reducing the number of agencies involved in technology transfer process.

Such IT system can provide instant solution to problems faced by livestock rearers. Expert system can be developed to help and guide the veterinarian under various situations such as feed and fodder, health check-ups, disease control and vaccine scheduling. It can also suggest control measures on the basis of symptoms.

**Trend Analysis and Forecasting:** Forecasting and trend analysis are purely statistical techniques. Study of statistical trends regarding livestock, weather data, utilization, consumption patterns, disease attacks, fertilization, etc. may be executed with IT tools. Trend analysis assists livestock rearers in decision making during entire process of livestock production and marketing. Graphical or pictorial trends may be generated using the database of specific parameters.

Analysis of trends enables the forecasting and prediction in live stock production system. For example, forecasting weather is a useful endeavour in deciding the various Livestock operations. IT has many tools to develop such forecasting system.

**Electronic Network and Messaging System:** Internet has made the world a global community and enables information transfer and exchange quickly. Ready available online modules are available to livestock rearers for quick disposal of their problems. Websites can be developed to provide information to livestock rearers in their own regional languages. E-mails, Chatting and conferencing will help livestock rearers in getting discussions with experts and other livestock rearers to exchange views and information and find solutions to problems. Mobile phones are widely being used and have facilitated in addressing the day to day issues of the livestock rearers. Internet and its application are highly involved in planning, weather forecast, post-harvest management, marketing, disaster management, extension management and thus a very powerful source to disseminate knowledge to the livestock rearers. It provides a gamut of information through online sources of information regarding different crops and thus in turn will shape the future of veterinary and animal husbandry development in the State.

**Kisan Call Centre:** The Purpose of Kisan Call Centre is to respond to issues raised by livestock rearers instantly in the farm of local language. Queries related to Veterinary and allied sectors are being addressed through these centres. A Kisan Call Centre is a combination of IoT and agricultural technology. It uses a backend data support system, which is inbuilt in Management Information System (MIS). It consists of a complex telecommunication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by livestock rearers instantly in the local language. Mainly, Scientists, Experts and Subject Matter Specialists (SMSs) using telephone

and computer, interact with livestock rearers to understand the problem effectively and provide the solution directly.

Kisan Call Centres are functional in areas like Agricultural Technology Information Centre (ATIC), Krishi Vigyan Kendra (KVK), Agricultural Consultation Cell (ACC), or any outsourced Wing, where separate facilities exist solely to answer inbound calls or make outbound telephone calls or to resolve the queries of pending calls of information needy livestock rearers. Usually it refers to a sophisticated voice operations centre that provides a full range of inbound or outbound call handling services including customer support, direct assistance, multi-lingual customer support and other services.

This is important and vital existing extension mechanisms, which find it otherwise difficult to reach the livestock rearers quickly. This enables close and quick linkages and communication mechanism among the veterinary scientists, subject matter specialists, extension activists, communication centres, consultancy agencies, Livestock rearers and other development departments involved in the process.

**Geographical Information System (GIS):** One of the key characteristics of Livestock is that it is a user of land and other natural resources, particularly water, fodder and pastures. Monitoring and policy evaluation in the key areas of land use and the environmental effects of livestock require information that is location specific. Advances in technology, particularly remote sensing using satellites, have made it technically feasible and increasingly cost effective to obtain and process geo-referenced data for policy analysis. A major application is the preparation of spatial inventories of land use. Through the use of geographical information systems (GIS) technology changes in land use patterns can be examined. Geo-referenced data can also be an important management tool for livestock rearers in dealing with environmental issues.

**Conclusion:** Internet of Things (IoT) can offer solutions in order to improve the livestock production in Kashmir valley of J&K state. Latest IT tools for information dissemination offer enormous potential in transfer technology. Systematic and co-ordinated approach is required to identify, organize and make available information on time to the livestock rearers when it is required by them and in a user friendly manner. Use of IT techniques using regional languages in dissemination of livestock rearing technologies will certainly enhance the decision-making capabilities of livestock rearers. This will further improve economic status of the livestock rearers involved in livestock production in J&K. For sustainable livestock production, it is must to understand the information need of livestock rearers and develop such information systems that supports the operational aspects of livestock rearers. All organizations including concerned departments need to realize the potential of ICT for speedy dissemination of information to livestock rearers. Government at State and central level has to reorient Veterinary and a Animal husbandry policies so that a strategy is farmed to harness IoT potential for over all live stock development.

#### References:

1. Anonymous (2014) Digest of Statistics 2013-2014, Directorate of Economics & Statistics, Government of J&K (India).
2. Gartner, <https://www.gartner.com/newsroom/id/3165317>
3. Griffin C, Dennis G. Watson and Tony V. H. (2008) Integrated information system for group collaboration. *Journal of Information Technology in Agriculture* 3(1)
4. Guo Songtao, Qiang Min, Luan Xiaorui (2015) Application of Internet of Things (IOT) to Animal Ecology. *Integrative Zoology* 10 (6) 1749-4877.
5. Jens Havskov, Soren Alexandersen, Poul Astrup, Knud Erik Christensen, Torben Mikkelsen, Stenortensen, Torben Strunge Pedersen, Soren Thykier-Nielsen (2008) The VetMet Veterinary Decision Support System for Airborne Animal Diseases, Part of the series NATO Science for Peace and Security Series C: Environmental Security pp 199-207

6. Raja, T. A and Ahmad Bashir (2013) Information and Communication Technologies For agricultural System In Jammu And Kashmir. *International Journal of Science, Technology and Management*, 3: 65-7
7. Babbu, S. C., Glendening, C. J., Seno-Okyere K. A. and Govindrajan, S. K. 2012 Farmer's information needs and search behaviours: Case study in Tamil Nadu, India. (IFPRI, Discussion paper 01165)
8. Shaik N. Meera, Jhamtani Anita and Rao, D. U. M. (2004) Information and communication technology in agricultural development: A comparative analysis of three projects from India. *Network Paper No:-135*

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