



Review Article

INTERNET OF THINGS FOR AGRICULTURE-AN OUTLOOK IN LIVESTOCK POULTRY IN JAMMU AND KASHMIR

RAJA T.A.^{1*}, MAQBOOL S.¹, WANI F.J.¹ AND KHAN A.A.²

¹Division of Agricultural Statistics & Economics, Faculty of Agriculture, Wadura-Sopore, 193201, Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir, Shalimar, 190025, Jammu and Kashmir, India

²Associate Director Research, Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir, Shalimar, 190025, Jammu and Kashmir, India

*Corresponding Author: Email - tariqaraja@rediffmail.com

Received: July 15, 2022; Revised: September 22, 2022; Accepted: September 23, 2022; Published: September 30, 2022

Abstract: Sustainable agriculture goals, needs to incorporate Information and Communication Technology (ICT), in all endeavours related to agricultural development in Jammu and Kashmir. All organizations and departments concerned with agriculture and animal husbandry need to realize the potential of ICT for the speedy, reliable and timely dissemination of information modules to the farmers. The awareness among farmers and livestock rearers about the information and availability of ICT services is the first step to be taken to increase farmer's participation in ICT and IoT initiatives.

Keywords: ICT, IoT, Information Needs, Livestock rearers

Citation: Raja T.A., et al., (2022) Internet of Things for Agriculture-an Outlook in Livestock Poultry in Jammu and Kashmir. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 14, Issue 9, pp.- 11677-11680.

Copyright: Copyright©2022 Raja T.A., et al., This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Academic Editor / Reviewer: Er Prabhat Kumar Dhara, Dr Pramod Kumar Mishra

Introduction

Information and Communication Technology for agriculture also known as e-agriculture refers to the application of information and communication technologies, Internet of Things in the field of agriculture. The application of ICT and IoT in agriculture is highly recommended. Information and communication technology in agricultural research, development and extension are becoming an indispensable part of our society everywhere and as well as in Jammu and Kashmir. The Research and analyst firm Gartner (world's leading research and advisory company) says that by the end of 2020 there will be more than 26 billion connected devices. The IoT is a massive network of connected "things" (which also includes people). The relationship between is as: people-people, people-things, and things-things. The application of ICT and IoT in agriculture occupies an important place in the economy of our state. As per the land utilisation statistics for the year 2016-17, the UT has a cultivable area of 858 thousand hectares which is 9% of its geographical area. During the year 2017-18, the net area sown of the state was 752 thousand hectares constituting 7.42% of its geographical area and 31.33% of the reporting area. Boosting Agricultural growth is very essential for inclusive growth because this sector sustains livelihood of 70 percent of the population and contributes 14.85 percent to states Gross Domestic Product [1-4]. Agricultural research is gaining importance day by day and agricultural extensions system is playing an important role since decades in disseminating agricultural technology to the farmer's of the State. Information system will rejuvenate our agriculture system manifold by use of various Information Technology (IT) tools in technology dissemination and empowering agriculturists with the desired information. Information Technology (IT) use with right perception will provide information services to the farmers timely, logistic, efficient and effective. The main aim of Information Communication Technology is implementation of ICT equipment and tools in any process. Their use with right perspective will provide information services to the users timely, efficiently and effectively. Shaik *et al.* (2004) [5], Griffin *et al.* (2008) [6], Raja and Ahmad (2013) [7] and Songtao Guo *et al.* (2015) [8], Ghavifekr and Rosdy (2015) [9] Raja, *et al.*, (2020) [10], Rajeev and Housure (2020) [11] have Worked on applications of information and communication Technology in agriculture and veterinary and Internet of Things.

The present paper discusses various techniques of information compilation and broadcasting needed for farmers of the Jammu and Kashmir for the rejuvenation of agriculture. The advances in IoT from last two decades have created new challenges, breakthrough and opportunities for farmers and Livestock professionals.

Information Needed

The focus of information and communication technology in agriculture is to meet the farmer's information needs. Farming involves a set of activities at various levels namely preparation of land (ploughing, levelling, and manuring) planting, irrigation, nutrient management, disease management, drought management, harvesting and marketing. Entire cycle of agricultural production process requires multitude of information by the farmers. Information on cost, quality, and availability of inputs like implements, varieties, protection technologies, weather forecasting, demand and marketing et care required by farmers at various levels of farming. For more remunerative production of crops, correct, speedy and precise information should reach to the farmer at proper time as and when required. Agriculture extension system should augment the farmers with their information needs and help their problems in pragmatic ways. The information need of the farmer can be broadly categorized into following.

Input Procurements
Package of practices
Pre and Post harvest information
Past trends
Marketing Information
Farm Business and Management Information
Policy Decisions

Input Procurements

Information relating to availability of agricultural inputs and their cost is the first priority. Farmers frequently requires the information regarding various inputs for their farming such as equipment, varieties, seeds, manures, fertilizers, pesticides etc., in terms of cost, quality, availability and possible resources.

Package of Practices

The package of practices for various crops cultivated in the area is pre requisite. The farmers are always looking forward for disease resistant, drought resistant and tolerant varieties. The provision of information on proper agricultural practices about crops sown in the area is very valuable for the farmers. Such package of practices has been prepared by experts and freely circulated among the farmers.

Pre and Post-harvest information

At several stages farmers need information in the planning of crops and minimizing risk of loss. Information related to pre and post-harvest technologies such as varietal characteristics, optimum pest control methods, optimum irrigation schedule, planting and harvesting schedule, intercropping, value addition methods et care required by the farmers. Information about protection technologies and cold storage is required for optimum and sustainable agricultural production in the State.

Past trends

Information on past trends regarding fertility gradient, soil status, climatic conditions, production, consumption, utilization, pest attack, environmental factors are of immense use in decision making regarding sowing of crops. For example, pest attack in previous year may help the farmer in identifying the pesticide in advance for maximum production of the crop.

Marketing Information

Right from the day crop is sown upto its harvest there is always need for the timely information. 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 provision related to processing and grading, government identified central markets and legal agencies involved is must which may help farmers in making right decisions in selling their produce.

Farm Business and Management Information

Most farmers of the State hesitate to take any farm business, as they are unaware about the subject to gauge its significance. Information on farm business and management is very much required to boost the economic status of the farmers.

Policy Decisions

News about various agricultural events in the district and decisions related to crops and its products, labour laws, rural development programmes, government schemes etc., are also important in decision making, while selecting crops. 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, laptops, and number of other electronic gadgets are used to disseminate information and aware farmers about government policies, programmes, and welfare schemes.

Available IT tools

Presently numerous IT tools are available for sustainable development and operation and application of information technology. Recent development in electronics and communication technology and internet of things (IoT) have made it possible to quick collect, process, transmit and present the information in logical order. This will help to analyze and interpret the data using sophisticated computational tools and techniques such as machine learning, image processing, pattern recognition, probabilistic modelling, large scale simulation, data mining, text mining and graph algorithms. The possible information technology support developed for farmers of the state is as under:

Database system
Information Retrieval system
Group Support System
Expert Support System
Trend Analysis & Forecasting
Electronic Network and Messaging System.
Kisan Call Centre

Geographical Information System
Helpline

Database System (DBS)

Data base is to convert traditional knowledge into electronic knowledge base. Variety of data is generated in Agricultural production system related to crops and their characters, pests and diseases, climatic data, post-harvest input resources, marking resources. Data about data in the farm of meta data are data repositories. Database technologies play an important role in storing data in electronic form. Data in electronic form can be easily and quickly managed for addition, alteration and modification. Information from Database can be harnessed by Information Retrieval System, Expert System and Forecasting System, to produce information in farmer's understandable way. Database system is a group of hardware and software for addition, modification, compilation, processing, and reporting of data.

Information Retrieval System

Collection, compilation, and retrieval of information in lucid and user-friendly manner is the vary basic objective of information system. Such systems use search engines, user friendly clickable icons/ menus, 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.

Group Support System

Project team face challenges of effectively storing and sharing information among members. Team often includes division of project responsibilities while maintaining interdependence of the work of the team members, without careful planning information collected by a team member may be inaccessible to other team member at a critical time or even lost if an individual leaves the team. Group Support System (GSS) is a term used to describe a collective work space intended to maximize idea generation and information sharing within a group or team.

Expert Support System

An Expert system is an intelligent computer programming with 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 problem using the knowledge base. It is an efficient IT tool and is referred as a tool of Transfer of Technology (TOT) from scientist to farmer. This disables 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 farmers. Expert system may be developed to suggest under present conditions suitable variety, method of field preparation, time of flowering and time of harvest. Such systems may help in scheduling of irrigation and fertilizers applications, identification of a particular crop pest and disease based on symptoms given by the farmers. It can also suggest control measures based on symptoms.

Trend Analysis and Forecasting

Forecasting and trend analysis are purely statistical techniques. Study of statistical trends regarding crops, weather data, utilization, consumption patterns, pest attacks, fertilization, etc. may be executed with IT tools. Trend analysis supports farmers in decision making during entire process of crop production, farming and marketing. Graphical or pictorial diagrams make the process clearer and more lucid. Analysis of trends enables the forecasting and prediction in agricultural production system. For example, forecasting weather is a useful endeavour in deciding the various field operations. IT has many tools to develop such forecasting system.

Electronic Network and Messaging System

Internet has made the world in a global village and enables information transfer and exchange quickly.

Readily available online modules are available to farmers for quick disposal of their problems. Websites can be developed to provide information to farmers in their own regional languages. E-mails, chatting and conferencing will help farmers in getting discussions with experts and other farmers 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 farmers. 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 farmers. It provides a gamut of information through online sources of information regarding different crops and thus in turn will shape the future of Agricultural development in the State.

Kisan Call Centre

The purpose of kisan call centre is to respond to issues raised by farmers instantly in the farm of local language. Queries related to agriculture and allied sectors are being addressed through these centres. A kisan Call Centre is to implementation of ICT in agriculture and allied sectors. It uses a backend data support system, generally known as Management Information System (MIS). It consists of telecommunication infrastructure, computer support and human resources organized to manage effectively and efficiently the queries raised by farmers instantly in the local language as well as in basic understandable manner. Mainly, Scientists, Experts and Subject Matter Specialists (SMSs) using telephone and computer, interact with farmers to understand the problem effectively and provide the solution directly.

Kisan Call Centres are functional 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 farmers. Usually, it refers to a audio operations centre that provides a full range of inbound or outbound call handling services including customer help, customer support, direct assistance, multi-lingual customer support and other basic and informative services. This is important and vital existing extension mechanisms, which find it otherwise difficult to reach the farmers quickly. This enables close and quick linkages and communication mechanism among the Agricultural Scientists, Subject Matter Specialists, Extension Activists, Communication Centres, Consultancy Agencies, Farmers and Other Development Departments involved in the process.

Geographical Information System

One of the key characteristics of agriculture is that it is a major user of land and other natural resources, particularly water. Monitoring and policy evaluation in the key areas of land use and the environmental effects of agriculture require information that is location specific. Advances in technology, particularly geographical information systems (GIS) using IoT via satellite services have made it possible and increasingly very effective and up to the mark to obtain and process Geographical orientation data for policy making. A major application is the preparation of Geo-spatial sequences and catalogues of land use. Using GIS technology land use patterns can be examined, verified, and prepared accordingly. Environmental issues can be addressed well in time via geo-referenced data for the betterment of farmers.

Help Line

The Purpose of help line is to respond to issues raised by farmers and livestock rearers instantly in the farm of local language. Queries related to agriculture, livestock and allied sectors are being addressed through these centres. Experts and Subject Matter Specialists (SMSs) using telephone and computer, interact with livestock rearers to understand the problem effectively and provide the solution directly. This is the vital existing extension mechanisms and enables close and quick linkages and communication mechanism among the subject matter specialists, extension activists, communication centres, consultancy agencies with rearers.

IOT based Model for Poultry

Proposed model for IoT based tools may be developed for advancement in poultry production both in terms of 1. Egg production, 2. Poultry meat production [10]

Conclusion

Information Technology can offer solutions in order to improve the agricultural production in J&K state. Use of IT techniques using regional languages in dissemination of farming technologies will certainly enhance the decision-making capabilities of farmers. This will further improve economic status of the farmers involved in agriculture production in J&K. For sustainable crop production, it is must to understand the information need of farmers and develop such information systems that supports the operational aspects of farmers. Latest IT tools and IoT for information dissemination offer enormous potential in transfer technology. Systematic and co-ordinated approach is required to identify, organize make available information on time to the farmers and in a user-friendly manner. Maximum potential of internet technologies should be used in information dissemination to farmers. All efforts should be made to incorporate ICT and IoT in all endeavours related to agricultural development.

All organizations including concerned departments need to realize the potential of ICT and IoT for speedy dissemination of information to farmers. Government at State and central level must reorient agricultural policies so that a strategy is formed to harness ICT'S potential for overall agricultural development. All initiatives related to agriculture should make full use of ICT and IoT for sustainable agriculture and livestock production; it is must to understand the information need of farmers and livestock rearers and develop such information systems that supports the operational aspects of livestock rearers.

Application of research: An illustration of the IOT in livestock Poultry has been proposed and other sectors can follow the suit. Application of information communication technology is very need of the hour in almost in every field of daily life.

Research Category: Agricultural Statistics & Economics

Abbreviations:

MIS-Management Information System

SMSs-Subject Matter Specialists

ATIC-Agricultural Technology Information Centre

ACC-Agricultural Consultation Cell

GIS-Geographical Information Systems

Acknowledgement / Funding: Authors are thankful to Division of Agricultural Statistics & Economics, Faculty of Agriculture, Wadura-Sopore, 193201, Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir, Shalimar, 190025, Jammu and Kashmir, India

****Principal Investigator or Chairperson of research:** Dr Tariq A Raja

University: Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir, Shalimar, 190025, Jammu and Kashmir, India

Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Faculty of Agriculture, Wadura-Sopore, 193201

Cultivar / Variety / Breed name: Nil

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

References

- [1] Digest of Statistics (2018) *Directorate of Economics & Statistics, Government of Jammu and Kashmir, India.*
- [2] 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).*
- [3] Graffin C., Watson D.G. and Harrion T.V. (2008) *Journal of information Technology in Agriculture*, 3(1).
- [4] Havskov J., Alexandersen S., Strup P.A., Christensen K.E., Stenortensen T.M., Pedersen T.S., Nielsen S.T. (2008) *eAnimal Diseases, Part of the series NATO Science for Peace and Security Series Series C: Environmental Security*, 199-207.
- [5] Shaik N.M., Jhamtani A. 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 (AGREN).*
- [6] Griffin C., Watson D.G. and Tony V.H. (2008) *Journal of Information Technology in Agriculture*, 3(1).
- [7] Raja T.A. and Ahmad B. (2013) *International Journal of Science, Technology and Management*, 3, 65-7.
- [8] Songtao G., Min Q., Xiaorui L. (2015) *Integrative Zoology*, 10(6), 1749-4877.
- [9] Ghavifekr S., Rosdy W.A.W. (2015) *Int.J Res. Edu. Sci*, 175-191.
- [10] Raja T.A., Khan A.A. and Najar I.A.(2020) *The Pharma Innovation Journal*, SP-9(4), 42-46..
- [11] Rajeev T.S. and Hosure S. (2020) *The Pharma Innovation Journal*, 9(2), 37-39.