



ICT ROADMAP

Information & Communication
Technology (ICT)



INDIAN COUNCIL OF AGRICULTURAL RESEARCH

NEW DELHI

www.icar.org.in

ICT ROADMAP

Information & Communication
Technology (ICT)



INDIAN COUNCIL OF AGRICULTURAL RESEARCH

NEW DELHI

www.icar.org.in

Printed: October, 2021

© 2021 All rights reserved

Indian Council of Agricultural Research,
New Delhi

Compilation by:

Information & Communication Technology (ICT) Unit ICAR, New Delhi
Information Technology (IT) Unit, ICAR-IASRI, New Delhi

Guidance:

ICAR – ICT Steering Committee

ICAR – ICT Implementation & Operational Management Committee

Design & Production:

Punit Bhasin, Incharge, Production Unit, DKMA

Published by:

Dr. S. K. Singh, Project Director, Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research, New Delhi and printed at M/s. Royal Offset Printers, A-89/1, Naraina Industrial Area, Phase-I, New Delhi 110028.

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR



कृषि एवं किसान कल्याण,
ग्रामीण विकास तथा पंचायती राज मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली
MINISTER OF AGRICULTURE & FARMERS' WELFARE,
RURAL DEVELOPMENT AND PANCHAYATI RAJ
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI

संदेश


सूचना और संचार प्रौद्योगिकी (आई सी टी) की कृषि एवं भारतीय अर्थव्यवस्था में प्रमुख भूमिका है। कृषि उत्पादकता, लाभप्रदता और कृषि उत्पादों की गुणवत्ता में वृद्धि करने के लिए कृषि में आईसीटी का व्यापक उपयोग किया जाना चाहिए। इससे न केवल कृषि को उद्योग 4.0 के रूप में रूपान्तरित करने में अपितु अल्पावधि में किसानों की आय को दोगुना करने में भी मदद मिलेगी। भारत सरकार के “मेक इन इंडिया” और “डिजिटल इंडिया” कार्यक्रमों के अनुरूप कृषि उत्पादों की निर्यात संभावनाओं में वृद्धि करने और अर्थव्यवस्था को सुदृढ़ करने में भी यह सहयोगी होगा।

भारतीय कृषि अनुसंधान परिषद (आईसीएआर), नई दिल्ली को परिशुद्ध खेती के लिए आईसीटी चालित प्रौद्योगिकी के विकास के माध्यम से “स्मार्ट फार्मिंग – स्मार्ट फार्मर” की दिशा में कृषि को रूपान्तरित करने में अग्रणी भूमिका निभानी होगी। कृषि में कृत्रिम आसूचना (आर्टिफिशियल इंटेलीजेंस), मशीन लर्निंग, डीप लर्निंग, इंटरनेट ऑफ थिंग्स तथा बड़े डाटा विश्लेषण जैसी आईसीटी आधारित प्रौद्योगिकियों के उपयोग की आवश्यकता हैं। इससे मुख्यतः रसायनों और उर्वरकों का उपयोग कम करने और प्राकृतिक संसाधनों का इष्टतम उपयोग करने में भी मदद मिलेगी जिसके परिणामस्वरूप पर्यावरण और मानव स्वास्थ्य पर पड़ने वाले प्रभाव में व्यापक कमी आएगी। साथ ही, इससे उत्पादन लागत में काफी कमी आएगी जिससे किसानों की लाभप्रदता में वृद्धि होगी।

परिषद द्वारा विकसित अनेक सिद्ध प्रौद्योगिकियों का आईसीटी आधारित प्रचार-प्रसार प्रणाली के माध्यम से वास्तविक हितधारकों अर्थात किसानों, कृषि-उद्योगों के बीच किए जाने की आवश्यकता है। आई सी टी एक ऐसा उपकरण है जिसके माध्यम से हम न केवल विभिन्न हितधारकों तक अपनी पहुंच को बढ़ा सकते हैं अपितु उन्हें परस्पर

विचार-विमर्श और परिषद के विभिन्न संस्थानों की सेवाओं/उत्पादों का लाभ उठाने के लिए सुविधाजनक इन्टरफेस भी उपलब्ध करवा सकते हैं।

मैं, विभिन्न स्तरों पर ई-गवर्नेंस हेतु अनेक आईसीटी/आईटी प्लेटफार्म और पोर्टल विकसित करने की दिशा में किए गए प्रयासों के लिए परिषद को बधाई देता हूँ। प्रणाली में दक्षता, पारदर्शिता और जवाबदेही लाने में भाकृअप के सभी संस्थानों और इसके क्षेत्रीय केंद्रों में ई-ऑफिस का कार्यान्वयन एक महत्वपूर्ण कदम है। परिषद द्वारा विकसित मौजूदा आईसीटी रोडमैप, आईसीटी गतिविधियों को एक व्यवस्थित एवं चरण-बद्ध रूप में और अधिक व्यवस्थित करने की दिशा में सराहनीय प्रयास है। इससे कृषि उत्पादन और उत्पादकता को बढ़ाने में आईसीटी चालित, किसान हितैषी कुशल प्रौद्योगिकियों को विकसित करने के हमारे प्रयास और अधिक सुदृढ़ होंगे।


(नरेन्द्र सिंह तोमर)



कृषि एवं किसान कल्याण
राज्य मंत्री

भारत सरकार

MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVERNMENT OF INDIA

कैलाश चौधरी
KAILASH CHOUDHARY



संदेश

बड़ी हुई कृषि उत्पादकता एवं लाभप्रदता के माध्यम से किसानों की आजीविका में सुधार लाने के लिए उनकी सहायता करने हेतु कृषि में आईसीटी के अनुप्रयोग अर्थात् ई-कृषि का विश्वव्यापी विकास और परीक्षण किया गया है। यह मौसम तथा अन्य प्राकृतिक आपदाओं की अनिश्चितता के जोखिम को कम करने में भी किसानों की मदद करता है। इसके अतिरिक्त, यह उत्पादकों को बाजार मूल्य श्रृंखला के साथ जोड़कर अधिक प्रतिलाभ के साथ उनके उत्पादों की बिक्री करने में उत्पादकों की सहायता करता है। साथ ही, इसकी मूल्य श्रृंखला से उत्पादकों को जोड़ने सहित, कृषि के कुछ सफल आईसीटी अनुप्रयोगों का देश में प्रयोग और प्रसार किया है, परन्तु एक छोटे स्तर पर। इन आईसीटी अनुप्रयोगों की सफलता कृषि में इन अनुप्रयोगों के क्षितिज को सीधे (वर्टिकल) और समतल (होरिजेंटल) रूप से विस्तार देने के लिए दूरदृष्टि एवं प्रोत्साहन प्रदान करती है।

भारत सरकार की डिजिटल इंडिया पहल और विभिन्न कार्यक्रमों तथा नीतियों की दृष्टि से, आईसीएआर के ई-गवर्नेंस/आईसीटी पहलों को सरकार के दिशा-निर्देशों के अनुरूप बनाने/पुनः समायोजित करने की अत्यधिक आवश्यकता है। इस संबंध में, भाकृअप ने केवीके पोर्टल, कृषि पोर्टल, शिक्षा पोर्टल और विभिन्न प्रबंधन सूचना प्रणालियों (एमआईएस), निर्णय में सहायक प्रणाली (डीएसएस), एक्सपर्ट सिस्टम (ईएस) आदि के विकास के माध्यम से किसानों/गांवों में पहुंचने के लिए अनेक पहले की है, जो प्रशंसनीय है। परिषद ने कृषि अनुसंधान, शिक्षा और विस्तार को सहायता प्रदान करने के लिए अपने प्रयासों को समेकित करने हेतु सुपर-कम्प्यूटिंग प्लेटफार्म अर्थात् अशोका और आईसीएआर डाटा केन्द्रों

की स्थापना भी की है। साथ ही, समर्पित ई-मेल सेवाएं, वीडियो कॉन्फ्रेंसिंग सुविधाएं, वेबसाइट, अनुप्रयोग और अन्य संबद्ध सेवाओं सहित एकीकृत संप्रेषण प्रणाली इस डाटा केन्द्र में उपलब्ध कराई जाती हैं। परिषद के संस्थानों ने कृत्रिम आसूचना/मशीन लर्निंग/सघन शिक्षण, बिग डाटा विश्लेषण आदि के क्षेत्र अनुसंधान को सघन बनाया है, जिसका कृषि अनुसंधान और विकास के क्षेत्र में सफलतापूर्वक प्रयोग किया जा सकता है। हाल ही में, भाकृअप के सभी संस्थानों और इसके क्षेत्रीय केन्द्रों में ई-ऑफिस को लागू किया गया है जो विशेष रूप से प्रशंसनीय है। परिषद का वर्तमान रोडमैप और आईसीटी/आईटी इकाई का सृजन/पुनर्गठन समन्वित ढंग से उनके आईसीटी/आईटी कार्यक्रमों को सुदृढ़ करने में परिषद की आगे और सहायता करेंगे। मैं इस प्रयास के लिए संपूर्ण टीम को अपनी शुभकामनाएं देता हूं।

(कैलाश चौधरी)



त्रिलोचन महापात्र, पीएच.डी.

सचिव एवं महानिदेशक

TRILOCHAN MOHAPATRA, Ph.D.
SECRETARY & DIRECTOR GENERAL



भारत सरकार

कृषि अनुसंधान और शिक्षा विभाग एवं

भारतीय कृषि अनुसंधान परिषद

कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली 110 001

GOVERNMENT OF INDIA

DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION
AND

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
KRISHI BHAVAN, NEW DELHI 110 001

FOREWORD

The Government of India has started a Digital India Mission with a view to transform India into a digitally empowered society and knowledge economy. It is envisaged to provide ICT based citizen centric services and efficient e-governance system to bring about transparency, accountability and efficiency in all sectors of economy. As a leader of one of largest and institutionally complex agriculture research systems in the world, the Indian Council of Agricultural Research (ICAR) is developing various ICT tools and systems to digitally empower agriculture researchers, policy makers, extension workers and farmers with a view to transform the entire eco-system of agricultural research and education in the country.

In view of 761 million internet users in the country, which are likely to grow up to 975 million by 2025 along with 469 million mobile users with internet connectivity, the development of web-based online system is the need of the hour. The ICT road map of ICAR has been prepared to develop online web enabled ICT tools/software/system for providing efficient e-governance. The road map has also a provision of development of ICT/IT system to support quality research output through data analytics, train human resources on latest emerging IT/ICT technologies and development of efficient and effective communication system for extension workers/farmers to disseminate agricultural technologies and knowledge generated from huge network of agricultural research institutions in the country. ICAR has already

a KVK portal on which 721 Krishi Vigyan Kendras (KVKs) across the country are connected. Besides, mapping of all KVKs to more than 3.5 lakhs Common Service Centers of the Ministry of Electronics and Information Technology, Government of India has been done for use in dissemination of latest agricultural technologies and various services offered by the ICAR Institutes. The present ICT road map developed by the Council will not only help in accelerating these processes and establishment of two-way communication system among different stakeholders with the Council but also support agricultural technology innovations based on disruptive ICT technologies such as Machine Learning (ML), Deep Learning (DL), Artificial Intelligence (AI), Blockchain; Internet of Things (IoTs) and Big Data Analytics.

I would like to congratulate the team responsible for preparing a comprehensive ICT road map. I do hope that the envisaged road map would be used as a guide for development of ICT tools and software in future for use in agriculture and allied sectors.

Dated the 13th July, 2021
New Delhi


(T. Mohapatra)



भारतीय कृषि अनुसंधान परिषद
(कृषि अनुसंधान एवं शिक्षा विभाग)
नई दिल्ली 110001

Indian Council of Agricultural Research
(Department of Agricultural Research & Education)
Krishi Bhawan, New Delhi 110001

PREFACE

The Indian Council of Agricultural Research (ICAR), New Delhi is one of the largest research, education and extension network of agriculture in the World. ICAR conducts, promotes, supports and coordinate research, education and extension across the country in the field of agriculture. In order to empower and support agricultural research and its e-Governance. ICAR developed various digital platforms. Recently, number of ICT initiatives has been taken by the Council in line with Digital India Mission, Government of India, with a vision to transform Indian agriculture in to digital empowered knowledge economy. In order to develop and implement various software and tools at the national level for agricultural research, education and extension, IT/ICT infrastructure has been created, such as, Advanced Super Computing Hub for Omics Knowledge in Agriculture (ASHOKA), ICAR Data Center, Krishi Megh etc. by the Council. In effort to consolidate and strengthen their ICT initiatives for improving efficiency, transparency, monitoring of various activities and optimization of IT/ICT resources, an ICT Roadmap of ICAR has been prepared by M/s. KPMG India in October, 2018. Most of the recommendation of this ICT Roadmap was generic in nature and needs further elaborations.

After detailed discussion on recommendations of this report, it was decided to further refine this ICT Roadmap by taking a holistic view of the requirement of the Council and available resource to cater specific needs in future. Also, there is a need to elaborate IT/ICT system requirements in view of short, medium and long-term goals with specific timeline. In this context, this ICT Roadmap of ICAR has been prepared taking into consideration

the recommendations of the above report and requirements of the Council, elaborating the need of structural re-organization for effective implementation of IT/ICT activities in the Council. This Roadmap also provides the direction of unification, coordination and monitoring of various existing system in the Council for their effective and optimum utilization.

We would like to express our gratitude to Secretary, DARE & DG, ICAR for providing his guidance, critical inputs and support for development of this ICT Roadmap. The direction and support provided by Addl. Secretary, DARE & Secretary, ICAR, DDGs of the Council, ADGs, Director, ICAR-IASRI, New Delhi and PD, DKMA, New Delhi were very useful for development of this document. Thanks, were also due to the staff of ICT Unit of the Council and IT Unit of ICAR-IASRI, New Delhi for providing their support in publication of this document. This ICT Roadmap will be helpful in implementation, coordination, monitoring of various IT/ICT systems effectively in the Council.



(Anil Rai)

Assistant Director General (ICT)
ICAR, Krishi Bhawan
New Delhi 110001

CONTENTS

	Page No.
<i>Message of Hon'ble Minister of Agriculture & Farmers' Welfare</i>	iii
<i>Message of Hon'ble Minister of State for Agriculture & Farmers' Welfare</i>	v
<i>Foreword</i>	vii
<i>Preface</i>	ix
1. Introduction	1
2. e-Governance Policy of Government of India	3
3. ICT Roadmap of ICAR	6
4. Objective	9
5. Organization	11
5.1 ICT Functional Groups (FGs)	11
5.2 FG-1 Infrastructure	11
5.3 FG-2 Software Development	13
5.4 FG-3 Software Standards and Quality Assurance	14
5.5 FG-4 Implementation, Operational Maintenance and Support	15
5.6 FG-5 Data Management and Data Analytics	16
6. Implementation, Management and Monitoring	18
6.1 Standing Committee	19
6.2 ICT Steering Committee	19
6.3 Implementation and Operational Management Committee (IOMC)	20
6.4 Flow Chart of ICT: Levels of decisions making	22
7. ICT Targets / Milestones	25
8. Manpower	26
8.1 Permanent Staff	26
8.2 Contractual Manpower	27

ABBREVIATIONS

DARE	:	Department of Agricultural Research and Education
ICAR	:	Indian Council of Agricultural Research
IASRI	:	Indian Agricultural Statistics Research Institute
ICT	:	Information & Communication Technology
IT	:	Information Technology
MeITY	:	Ministry of Electronics and Information Technology
DST	:	Department of Science & Technology
RA	:	Research Associate
SRF	:	Senior Research Fellow
CAPS	:	Cyber Agro-physical System
LMS	:	Learning Management System
API	:	Application Programming Interface
UI	:	User Interface
EHRMS	:	Electronic Human Resource Management System
UX	:	User Experience
OLAP	:	Online Analytical Processing
ETL	:	Extract Transform and Load
AI	:	Artificial Intelligence
IOT	:	Internet of Things

1

INTRODUCTION

Indian Council of Agricultural Research (ICAR) is an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India. Formerly known as the Imperial Council of Agricultural Research, it was established on 16 July 1929 as a registered society under Societies Registration Act, 1860 in pursuance of the report of the Royal Commission on Agriculture. The Council is the apex body for co-ordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences in the entire country. The Indian Council of Agricultural Research (ICAR) has the largest network with 69 Institutes, 6 Bureaux, 23 Project Directorate and Agricultural Technology and Application Research Institutes (ATARI), 15 National Research Centres, 74 Agricultural Universities and Deemed Universities spread across the country. The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in the country through its research and technology development, which made visible impact on the national food and

ICAR Headquarter Krishi Bhawan New Delhi





Computer Centre, ICAR-IASRI, New Delhi

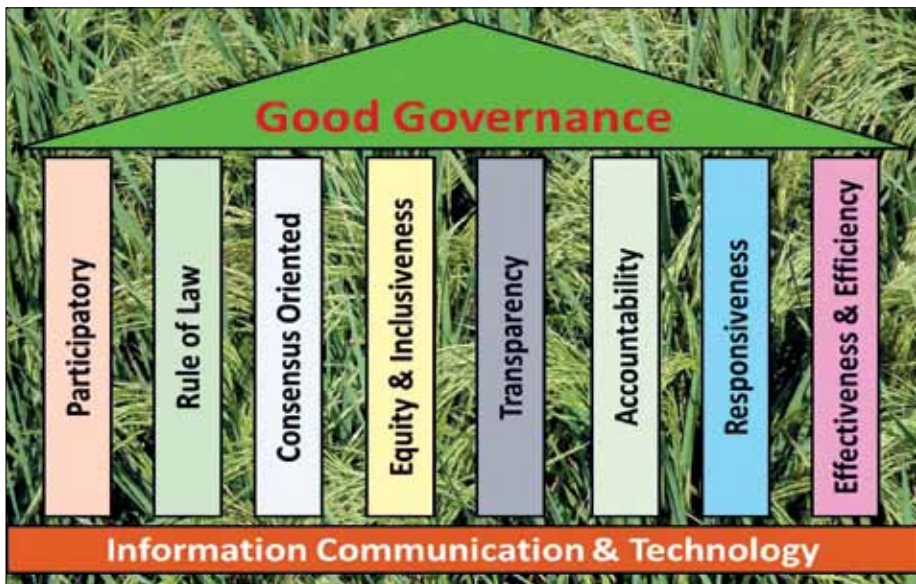
nutritional security. It is also playing a major role in promoting excellence in higher education in agriculture. Scientists of the Council are working in cutting edge areas of science and technology development. The Indian Council of Agricultural Research (ICAR) and the National Agricultural Research and Education System (NARES) at large, are determined to harness advances of science for the welfare of society. The Council is committed to transform itself into an organization engaged fully with the farmers, industry, entrepreneurs and consumers at large.

Information and communication technology has been playing vital role in Indian economy, accordingly emphasis has also been given to the usage of information and communication technology in the evolution of agricultural research in India. Government of India has started and visualized Digital India Mission with a vision to transform India into a digitally empowered society and knowledge economy. In order to transform the entire ecosystem of agriculture research, education and extension through the use of information technology, the ICAR has launched number of agricultural research and digital programs in the country with a vision to transform and enable digitally empowered services.

2

E-GOVERNANCE POLICY OF GOVERNMENT OF INDIA

Ministry of Electronics and Information Technology (Meity) has taken several policy initiatives in e-Governance domain that are crucial for achieving the vision and objectives of the Digital India programme. Effective implementation of e-Governance is a key component of the Digital India programme. This cover number of important areas such as open source software, open APIs, e-mail policy, use of IT resources, collaborative application development and application development & re-engineering for cloud ready applications. These policies are envisaged to provide necessary support to all Central Ministries / Departments / autonomous bodies as well as all States / UTs in leveraging the emerging technologies, making use of the newer business models. The existing projects were revamped so as to deliver services electronically to citizens in an efficient, transparent and affordable manner. These policies draw their strength from national and international best practices in the respective domain as well as inputs from subject matter experts from Government departments, industry



Eight Pillars of Good Governance



Training Centre, ICAR-NAARM Hyderabad

and academia. The basic aim of these initiatives is (i) easy governance, (ii) effective governance and (iii) good governance. It also provides the key principles for revamping the existing projects and also for new and ongoing e-Governance projects. The “Policy on adoption of open source software for Government of India” will encourage the formal adoption and use of Open Source Software (OSS) in Government organizations. The compliance to this policy will ensure that strategic control of e-Governance assets that would remain with the Government and would ensure business continuity for the projects in future from a technical perspective.

The “Framework for Adoption of Open Source Software in e-Governance Systems” suggests a set of recommendations and procedures for promoting, managing and enhancing the adoption of OSS in e-Governance Systems in India. It highlights the impact of adoption of OSS in Government, influencing factors, the mutual impact of Open Standards and OSS, establishing enterprise security with OSS, unified software development for all major devices using standards-based web browser and use of localization. The Framework suggests neutral guidelines to select software and the process for induction of OSS solution. The ecosystem suggested to promote the adoption of OSS describes required institutional mechanism, collaboration with key stakeholders like industry, OSS communities, academia, collaborative mechanism, offering of services based on OSS, provisioning of support services on OSS and integration with on-going initiatives. The “Policy on Open Application Programming Interfaces (APIs) for the Government of India” sets out the Government’s approach on the use of “Open APIs” to promote software interoperability for all e-Governance applications & systems and provide access to data & services for promoting participation of all stakeholders including citizens. This policy initiative will

encourage the formal use of Open APIs in Government organizations. The world-wide initiatives on “Open Government” also focus on open APIs to easily access the information collected by Government organizations. The “E-mail Policy of Government of India” lays down the guidelines with respect to use of e-mail services by the Government departments and organizations.

The policy initiative aims to ensure the secure access and usage of Government of India e-mail services by its users and is applicable to all employees of the Government of India (GoI) and employees of those State/ UT Governments that use the e-mail services of GoI. The “Policy on Use of IT Resources of Government of India” provides the guidelines to ensure proper access to and usage of Government’s IT resources and prevent their misuse by the users. This policy initiative covers all IT resources, including desktop devices, portable and mobile devices, networks including wireless networks, Internet connectivity, external storage devices and peripherals like printers and scanners and the software associated therewith.

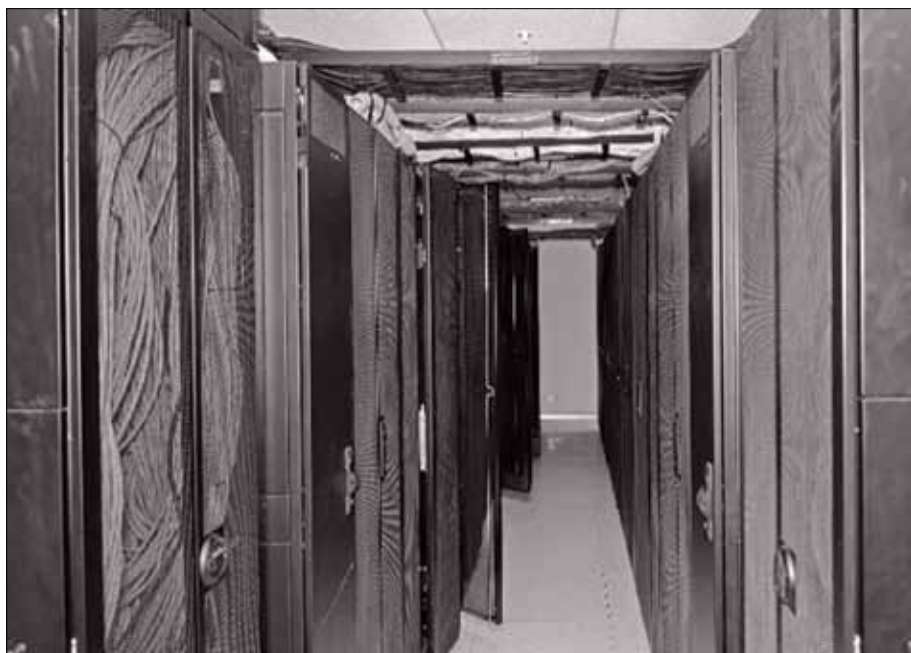
The “Policy on Collaborative Application Development by Opening the Source Code of Government Applications” intends to increase the pace of e-Governance application development and rapid rollout/implementation by adopting an open-source based development model. The Government of India wants to promote re-use of existing developed applications. By opening the source code, the Government wants successful, scalable, high quality e-governance applications to be developed in a collaborative manner. It also wants new applications to be developed to encourage creativity both inside and outside the Government by encouraging collaborative development between Government departments / agencies and private organizations, citizens and developers to create innovative e-Governance applications and solutions.

The “Application Development & Re-Engineering Guidelines for Cloud Ready Applications” aims to address one of the major concerns in the e-Governance domain, that is lack of process reengineering and leveraging of the latest emerging technology i.e. Cloud. This guideline intends to ensure development of Common Application Software (CAS) which can be configured as per different States / departments requirements without need of modifying the core code of the application for a faster deployment so that time, effort and cost in developing applications are saved and to avoid duplication of efforts. It is therefore imperative that applications are developed in conformity to guidelines that makes them standardized and compatible for hosting and running across states.

3

ICT ROADMAP OF ICAR

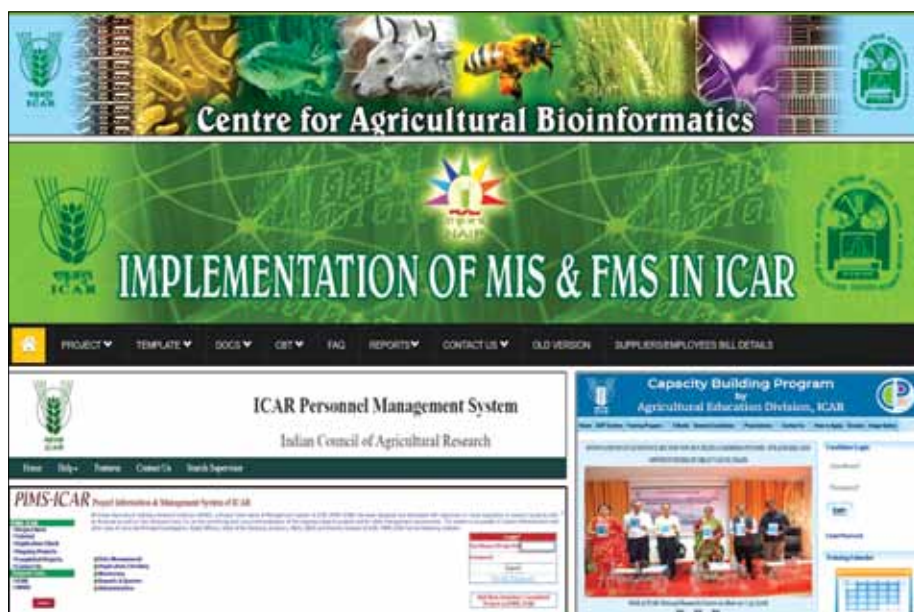
In view of the Digital India initiative and various policies of Government of India, there is strong need to align / re-adjust ICAR e-governance / ICT initiatives in line of Government guidelines. In this regard, ICAR initiatives to reach out the farmers / villages is gaining momentum through the development of KRISHI portal, KVK portal, Management Information Systems (MIS), Decision Support Systems (DSS), Expert Systems (ES) etc. Further, development and implementation of Artificial Intelligence / Machine Learning (AI / ML) based approach, several digital applications such as web application, web sites, web portals, mobile apps etc. are helpful to the farmers through integrating scientific inputs to improve their farming practices. The Council has also established supercomputing platform, ASHOKA and ICAR data Centre to support agricultural research, education and extension. It also



ASHOKA - The First Super Computing Hub in Agriculture

provides unified communication system including dedicated email services, website, application etc. Apart from this, Council is in the process of initiation of various major initiatives on innovative science-led approaches in achieving the goal of Doubling Farmers' Income by 2022 such as Precision Agriculture, Cyber Agro-physical System (CAPS) development and National Mission on Artificial Intelligence (AI) etc.

ICAR adopted an open access policy and there are various e-initiatives across institutes along with digital collection of resources such as collection of books, journals, thesis, research articles, popular articles, monographs, catalogues, conference proceedings, success stories, case studies, annual reports, newsletters, pamphlets, brochures, bulletins and other grey literatures from various ICAR institutions and State Agricultural Universities (SAUs). Apart from this, ICAR has implemented number of digital solutions for office automation, reporting and management systems for effective e-governance in the organization. Some of the major systems in this regard are e-office NISAGENet, PIMS, PermisNet, ICAR-ERP, HYPM, FVMS, PMS, PGS, CBP etc. In view of changes in technology and information requirement not only by the Council but also from the Government, these systems need to be revisited and integrated. Also, consolidated effort is needed to create a central repository of all analytical tools and software(s) for better management and utilization in



Digital Systems of ICAR



e-Governance in ICAR

line of Government of India Digital policy. This will help researchers and other stakeholders to have easy accessibility and availability of accurate information from a single platform. Further, there is a need to have the manpower of the desired skill set, trained through specialized capacity building programmes in specific and latest areas such as data science, block-chain technology, cloud computing, parallel programming, big data analytics and management, web / mobile computing, advance computing etc. These programs will enable the Council to handle the future upcoming requirement of ICT.

It is desired to create and strengthen core IT cadre for identifying the changes required in adopting ICT initiatives for developing, upgrading, updating, monitoring and managing various ICT enables programmes through regular meetings with Subject Matter Divisions (SMDs) at Council level to ensure the delivery of precise and accurate information to the end users. In order to improve the organization and implementation of ICT in ICAR, there is a need to reorganize and strengthening ICT activities in the Council.

4

OBJECTIVE

The objective of this roadmap is to establish the ICT Unit at ICAR HQ for development, implementation, monitoring, management and coordination of ICT services and digital platforms as per IT / ICT guidelines / policies of Govt. of India. This unit will also be responsible for providing all technical and logistic support required in major ICT research and development projects in different ICAR institutions. Further, there is need to create an IT Unit in ICAR-IASRI, New Delhi under direct supervision of Director, ICAR-IASRI, New Delhi.



ICAR-IASRI, New Delhi

The Information and Communication Technology (ICT) Unit has been set up through renaming the e-governance cell of the Council. This will improve the coordination and implementation of digital resource management and advisory service platform in line with Government of India, instead of working in isolation. Some of the digital e-governance solutions developed by the Government are to be rollout by the Council with required customization, such as e-office, eHRMS, Learning Management System (LMS), Digital

Locker etc. This requires strong collaboration with Meity and NIC apart from providing training and skill development of the staff in the Council for uniform implementation of these systems across different institutions. The ICT unit will also guide ICAR institutes to enrich their digital platforms as well as repositories through dedicated five Functional Groups led by respective Group Leaders. These groups are being created by the Council at IT Unit at ICAR-IASRI, New Delhi. The Group Leaders of these functional groups are to directly report to Director, ICAR-IASRI New Delhi and reviewed by ADG (ICT) of ICT Unit in ICAR HQ. These groups were formed by leveraging existing officials in ICAR, hiring contractual staff and outsourcing routine services.



5

ORGANIZATION

All ICT related work of development, implementation and operational management in the Council will be divided into following groups / categories. These groups are proposed as per common standard practices of ICT followed globally. A separate IT Unit will be created in ICAR-IASRI, New Delhi, under which these functional group will be made operational. The In-charge of this IT unit will directly report to Director, ICAR-IASRI, New Delhi and reviewed by ADG (ICT), ICAR New Delhi.

5.1 ICT Functional Groups (FGs)

Each group will be headed by a Group Leader. These functional groups will be further sub-divided into sub-groups based on functional requirement. In each of these sub-groups project staff may be hired on adhoc basis as per requirements for a particular time period.

5.2 FG1 - Infrastructure

The infrastructure functional group will look after all requirements related to the establishment, implementation, operations and day to day maintenance of all equipment/hardware system, software, storage including cyber security. The group will also be responsible to ensure the connectivity of the internet to all ICAR institutes. This group will monitor, manage and maintain all Non-IT resources to run these IT infrastructures. The ICAR data centre and ASHOKA will be maintained and managed by ICAR-IASRI, New Delhi and upcoming Disaster Recovery Data Centre will be managed by ICAR-NAARM, Hyderabad. The maintenance and operational management services of these major infrastructures of the Council will be outsourced. These institutes will ensure the availability



ICAR Date Centre at ICAR-IASRI, New Delhi



Krishi Megh, ICAR-NAARM, Hyderabad

of IT resources to the ICT / IT Unit as per requirement and coordinate with the ICT Unit for smooth functioning of the systems. All Web services hosted in the Data Centre need to be duly approved by the Council / ICT unit, as this will ensure quality of the desired information which will be Reaching to the end users / stakeholders.

5.2.1 Role and Responsibilities

- Requirement specification of equipment / hardware and system software.
- Establishment / Implementation, Monitoring and Operational management of IT and Non-IT systems and sub-systems for their smooth functioning.

SG1 - Network Management

- Responsible for smooth functioning of network.
- Internet connectivity and bandwidth management.

SG2 - System Management (Web server/database/cloud etc.)

- Manage and maintain web hosting, web server management, virtualization.
- Installation, upgradation and upscaling of Database(s).
- Deployment of cloud and other upcoming solutions to implement and provide infrastructure, platform and system software to the end users.

SG3 - Cyber Security

- Maintain and monitor firewall and other security services.
- Monitor and implement the antivirus and resolve all issues of cyber threats.

SG4 - Storage Management

- Maintain and monitor the storage requirement and its health.
- Manage and upgrade the storage as per the requirement.
- Update and upgrade the storage quota and allocation.

SG5 - Non-IT Resource Management

- Management of Non-IT resources of the infrastructure.
- Ensure the proper supply and maintenance of infrastructure.
- Any other requirement for smooth operation of data centre environment.

5.3 FG2 - Software Development

This group will collect requirements for the development of software and other related services, which is to be approved by the ICT Steering committee. This group will be also responsible to undertake all software development activities, including preparation of Software Requirement Specification (SRS) document, which will help in the development of application software, portal, mobile apps., API and web services development including UI / UX design. This group will ensure that the development will follow the Government of India as well as software engineering guidelines, principles and standards. These standards will be useful during the integration of various data sources and ensure the interoperability. This will have bigger network of various human resources. If required, a platform for software development will be created cutting across ICAR Institutes. This network may use IT human resources and services of other ICAR Institutes.

5.3.1 Roles and Responsibilities

- All projects meet overall planning objectives and specific key performance indicators as determined by the Council.
- The group will design and develop systems in the development environment by ensuring the quality standards and interoperability of the product and responsible to get certification from quality assurance and testing group for its release. This group will also develop the SRS for requirement analysis.

SG1 - UI / UX Design

- Design of responsive web design interface, screen, layout etc.
- Design of logos, images, header etc.

SG2 - Application Development

- Design and development of the standalone and web-based software.
- Manage, maintain and monitor the source code repository / library.
- Maintain the interoperability across various applications.
- Standardization through API and web services development.

SG3 - Web Portal Development

- Development of web portal.
- Technology specific and cross platform development.

SG4 - Mobile App Development

- Mobile app development.
- Upgradation of mobile apps.

SG5 - API and Web Service Development

- Compliance of standards and ensure inter-operability.
- API development.
- Web services development.

5.4 FG3 - Software Standards and Quality Assurance

The role of this group is to prepare data standards, metadata, architecture blueprint, strategies, policies and its upgradation. The group will also be responsible for testing of the developed product by following testing standards earlier mentioned to meet the quality of the product. The group will be responsible for design, develop and upgrade the architecture based on the upcoming technologies and development.

5.4.1 Roles and Responsibilities

- Development of ICT guidelines, policy and procedures.
- Data standards and metadata management.
- Quality control and testing.
- Software evaluation of IT products.
- Promoting the adoption of new technologies.
- Capacity building and training.

SG1 - Standardization of Data and Meta Data Management

- Define and develop the data standards.
- Primary data management.
- Development of coding standard and master data management.
- Develop and maintain the meta data repository.
- Meta data schema design, development and maintenance.
- Meta Data acquisition and catalogue management.

SG2 - Technical, Solution and Enterprise Architects

- Design the product specific technical architecture.
- Design and proposed the overall solution architecture, including hardware.
- Design the enterprise architecture and maintain uniformity.

SG3 - Quality Assurance and Testing

- To test the developed application.
- Prepare the testing report and quality checks.
- Checking the standard procedure and master data management, including naming conventions.

SG4 - Capacity Building and Training

- To develop the plan for capacity building.
- To train the human resource and sensitize the users.
- To organize and conduct in-house as well as off-shore trainings.

5.5 FG4 - Implementation, Operational Maintenance and Support

The Implementation, operational maintenance and support group will be responsible for end-to-end project implementation activities for the completed software product related to ICT initiatives taken up by the Council. The group will work towards the adoption of change management strategy. The project implementation will be done in terms of the current requirement and use of IT related projects to be implemented in ICAR and various other institutes of the Council.

5.5.1 Roles & Responsibilities

- After compliance of a digital product from quality assurance and testing group, the system will be delivered to implementation, operational management and support group. Minor bugs will be fixed by this group. The deployment of the new feature or major improvement will be implemented by this software development group.
- Ensure that all projects meet overall planning objectives and specific key performance indicators as determined by the Council.
- The co-ordination of regular progress meetings at local level and representing the Council at the national progress meetings.
- The associated project management and administration will be taken over by this group after completing testing and quality assurance. The product will be implemented at the required level as specified in the project document.
- The activities will also include:
 - ◆ Hosting institute's website and developed solutions and applications
 - ◆ Content management of the websites and web portals
 - ◆ Technical and operational support to the end users
 - ◆ Act as change management catalysts at the centres

SG1 - Implementation

- Implement the software and application at institute level
- Content management and other social media platform updates
- User creation, management and maintenance

SG2 - Operations and Support

- To provide all support in the ICAR with dedicated helpdesk.
- Responsible for efficient daily and routine IT operations of organization & institutes.

SG3 - Maintenance, Upgrade and Services

- Responsible for preventive maintenance and corrective maintenance
- Upgrading of ICT infrastructure.
- Maintenance and smooth operations of the services
- Updates the services with respect to software, hardware at various level

SG4 - Change Management

- Ensure adaptability and implement change management
- Take the corrective actions for implementation of these changes

5.6 FG5 - Data Management and Data Analytics

The data analytics and data management group will be responsible to keep an eye of emerging technologies of ICT which can be leveraged in agriculture sector. This group will also integrate various data sources, generate scenario using OLAP, perform analytics, data modelling and visualization of data through exploration.

5.6.1 Roles and Responsibilities:

- Discovery, analysis, adoption and implementation of emerging technologies in the organization and institutes.



Kisan-Sarathi Portal

- Introducing and implementing an innovative idea / project to meet stakeholders' requirement.
- Bringing perceptible improvement in processes or systems through analytics.
- Preparedness / performance / operations continuity in emergent situations like disaster.

SG1 - Database Management and Administration

- Database design and management.
- Database backup and restore.
- Query management and maintenance.

SG2 - Data Integration

- Standards for data integration.
- Interoperability for data exchange.
- Cross domain integration and analysis.
- Scenario Building.

SG3 - Data Warehousing and visualization

- Schema design.
- Design and Development of ETL tools.
- Design and development of dashboards.
- Agricultural Intelligence.

SG4 - Statistical Computing and Data Science

- Statistical Computing.
- Machine Learning and AI.
- Big Data Analytics.
- Cloud Computing.
- Internet of Things (IoTs).
- Modelling and Simulation.

6

IMPLEMENTATION, MANAGEMENT AND MONITORING

A Standing Committee of ICT and Emerging IT Technologies in ICAR, New Delhi will be created under ICAR By Laws. This will be apex committee which be responsible for formulations of ICT policies, roadmap and provide directive to align / re-adjust IT research and development as per requirements of agricultural research priorities along with development of management, monitoring and evaluation system of agriculture research in ICAR to make it more relevant, effective, transparent and accountable in line of national priorities. The objectives of this committee will be:

- To provide policies, roadmap and directives for applications of ICT and emerging / disruptive IT technologies in ICAR.
- To provide directive to align / re-adjust IT research / tools / software / systems with agricultural research priorities to make it more relevant and effective in line of national priorities.
- To monitor implementation of ICT / IT services, tools, software and systems for management, monitoring and evaluation of agriculture research in ICAR to make it transparent and accountable.



6.1 Standing Committee

Chairman: Director General (DG), ICAR, New Delhi.

Members:

- Secretary, ICAR.
- Three Deputy Director Generals of ICAR nominated by DG ICAR, New Delhi with term period of three years.
- Two Directors of other ICAR Institutes on rotation basis with term period of two years.
- One IT Expert not below Joint Secretary nominated by DG National Informatics Centre, New Delhi or one IT Expert not below Joint Secretary from Ministry of Electronics and IT, Govt. of India, New Delhi nominated by Secretary of the Department.
- Two Experts from body of registered Association / Society / Trust of Government / IT Industry, National Public / Private Institution, Private IT Firms etc. nominated by DG ICAR, New Delhi .
- Other invited Members invited from academia / industries / NGOs / as per requirement.
- Member Secretary, ADG (ICT).

A Steering Committee will be constituted which will ensure implementation, monitoring and evaluation of ICT policies, roadmap and directives of the Standing Committee. The role and responsibilities of this committee are to implement policy decisions, monitoring of all ICT activities in the Council as well as in Institutes. The committee will meet twice in a year to discuss issues and latest developments including new initiatives.

6.2 ICT Steering Committee

Chairman: Secretary DARE and DG, ICAR

Members:

- Secretary, ICAR.
- All DDGs of the council.
- ADG (PIM, IR, TC, IP&TM).
- Director, ICAR-IASRI, New Delhi.
- Director, ICAR-NAARM, Hyderabad.
- Project Director, DKMA, New Delhi.
- Three Directors of other ICAR Institutes on rotation basis with term period of two years.
- Member Secretary, ADG (ICT).
- Other Invited Members.

6.2.1 Role and Functions

- Identification and approval of new ICT initiatives to be taken up by the Council as per directives of Standing Committee.
- Identification and approval of research program for development ICT / IT tools / software / systems in areas to support agricultural research and development in the Council in the field of emerging and disruptive technologies.
- Coordination and guidance among different ICT / IT programs and programs based on emerging / disruptive IT technologies across different SMDs of the Council.
- Monitoring different ICT programs / initiatives and programs on emerging/ disruptive IT technologies at national level from time to time.
- Providing guidelines and directives for collaboration with different national and international Institutions / Organizations working in the field of ICT and disruptive technologies in IT.
- Identify and ensure resources required for implementation of national level programs in the field of emerging / disruptive technologies in IT.
- Identify and approve relevant area for capacity building in the field of IT / ICT in the Council.

Powers

- Assigning role and functions to different ICAR institutes to work in a national program of importance in the field of ICT and disruptive technologies of IT.
- Allocations and monitoring of funds / budget to different projects and programs in the field of ICT and disruptive technologies in IT.
- Initiation of new programs / projects or dis-continue currents program / project as per directives of Standing Committee

Frequency of Meeting

- Normally twice in a year. However, meeting shall be called any time as per requirement.

6.3 Implementation and Operational Management Committee (IOMC)

Implementation and Operational Management Committee will be set up, which will provide overall support of ICT initiatives at Council / SMD / Institute levels. The preparation of IT related project would be responsibility of the IOMC. It is suggested that the IOMC doesn't change frequently as it will bring stability and standardization in ICT practices at ICAR. This committee

will have members representing all functional groups, including representatives from other related Government Departments or Ministries as per requirements. The composition of the committee will be as follow:

Chairman: ADG (ICT).

Co-Chairman: Director, ICAR-IASRI, New Delhi.

Members:

- Leaders of all Functional Groups.
- Director (Finance).
- Director (Administration).
- Head (Computer Application), ICAR-IASRI, New Delhi.
- Invited members as per requirement.
- Under Secretary, ICT Unit, Member Secretary.

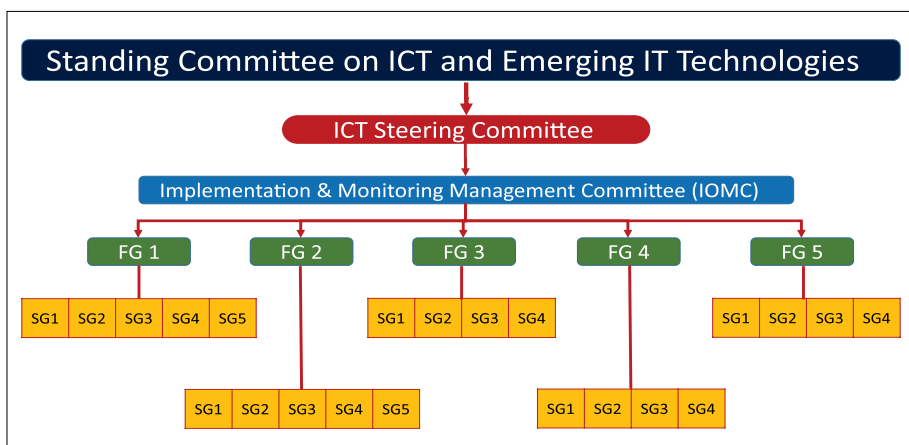
6.3.1 Roles & responsibilities

- This committee will be implementing ICT initiatives which is duly approved by Steering Committee in the Council and manages its operations.
- The committee shall plan, design, implement, maintain and support the overall IT operations by implementing the IT framework to achieve the ICAR vision, mission and strategic goals.
- This committee's goal is to raise IT awareness and understanding among organizations & institutes, provide tools and guidance so that institutes would be able to meet IT requirements, expectations and IT risks could be mitigated.
- The committee will formulate and assign a change management plan, whenever necessary. The committee will devise a plan to sensitize, educate and train the users to ensure utmost adaptability of a system within ICAR.
- The committee will formulate the plan for overall sustainability, maintenance and upgradation of ICT infrastructure & framework.
- The committee will invoke necessary guidelines, procedures, directions and measures in case of a fall back, disaster to ensure organizational continuity (Organization Continuity Program).
- This committee will undertake regular (monthly) meetings to assess the health of all the IT initiatives taken place and provide relevant guidance to proceed.
- Liaison and collaborate with industry experts on emerging technologies.
- This committee will oversee all technology operations and evaluating them according to established goals.



Data Centre at ICAR-IASRI, New Delhi

6.4 Flow Chart of ICT: Levels of decisions making



FG = Functional Group, SG=Sub-Group

- The implementation plan of ICT activities in ICAR will be taken up in phased manner. The basic IT and non-IT infrastructure required to run various services will be maintained and managed by respective institutes i.e. ICAR-IASRI, New Delhi and ICAR-NAARM, Hyderabad.
- A separate IT Unit will be created in ICAR-IASRI, New Delhi that will work directly under Director, ICAR-IASRI, New Delhi, work in coordination with ADG (ICT).

- The IT Unit at ICAR- IASRI, New Delhi will have five scientists working at pay level 13 and above, 5 technical staff and one Assistant / UDC / LDC.
- Five ICT Functional Groups, which were proposed above, will be created in the IT Unit of ICAR-IASRI, New Delhi. The Scientist working in each group will be the Leader of the group. The senior most group leader will be In- Charge of the IT Unit. The In-charge of IT Unit will report to Director, ICAR-IASRI, New Delhi and will be reviewed by ADG (ICT). The ICT sub-groups under each Functional Group will be created as per the requirement as proposed in the ICT Roadmap and these sub-groups will work under the supervision of Group Leader of respective Functional Group.
- The Group Leader (GL) of each functional group will report to Director, ICAR-IASRI, New Delhi. ADG (ICT), ICAR will be the reviewing authority of these GLs of Functional Groups. Each sub groups will work under supervision of GL of respective Functional Group.
- The Group Leader of each Functional Group will be Scientists working at pay level 13 or above.
- An ICT Unit of ICAR, New Delhi will help in implementation, coordination and monitoring of IT services to the Council and its institutes. This unit will have a separate budget allocation through EFC.
- The IT / ICT and Non-IT infrastructural facilities located in ICAR-IASRI, New Delhi and ICAR-NAARM, Hyderabad will be managed and maintained by outsourcing under supervision of a Principal / Senior Scientist who will Lead the Infrastructural Functional Group with the help of a team of scientists / technical identified by the Director of the respective institute. The budget provision for the same will be made in the EFC of ICT Unit.
- ICAR-IASRI and ICAR-NAARM will assist the ICT Unit of the Council for development, implementation, capacity building, management and monitoring various IT / ICT activities in different ICAR institutes. The contractual manpower for the same will be provided separately by ICT Unit.
- In order to ensure smooth functioning of the services, mainly emergency services, there is a need to provide limited financial and administrative power to Group Leaders of each Functional Group, which may be equivalent to the Project Leaders / Principal Investigators of the externally funded projects in the Council.
- If needed be, IT based short duration project may be identified and approved by the Steering Committee for its funding to different ICAR institutes by the ICT Unit for fulfilling the requirement of the Council.

- The IT products developed by following the standard procedure and guidelines specified by IOMC through different plan / project / scheme of ICAR institutes may be considered for its implementation in service mode as per the requirement of the Council.
- A centralized 24×7 Helpdesk service center will be created at ICAR-IASRI, New Delhi for all ICT services. This will work under Functional Group – 4 i.e., Implementation, Operational, Maintenance and Support.
- ICAR may provide separate additional funds for maintenance and management of IT based services to different institutes / centers for smooth functioning for local IT based solutions / services required in the institute / centers.

7

ICT TARGETS / MILESTONES

The next 10 years' tentative targets / milestones of the proposed ICT unit in Phase-I (first two years), Phase-II (3 years after Phase-I) and Phase-III (5 years after Phase-II) are as follows:

S. No.	Activities	Phase I (2 years)	Phase II (3 years)	Phase III (5 years)
1.	Development of Data standards and ICT policies			
2.	Standardization of ICAR institutes website and digital systems			
3.	Development of Dashboards			
4.	Implementation of e-office in ICAR			
5.	Implementation of e-HRMS			
6.	Development of FMS			
7.	Agricultural Research Management System			
8.	Integration of existing systems (FVMS, PMS, etc.) in ICAR Portal			
9.	Cyber Security Management			
10.	Maintenance of ICT infrastructure and digital systems			
11.	Data Management and Data Analytics			
12.	Need based software and solution development			
13.	Developing and integrating Digital Information Network for Farmers			
14.	ICT action plan of Inter-Ministerial committee on doubling farmers income			
15.	Coordination of digital agricultural platforms			
16.	Precision Agriculture			

8

MANPOWER

The proposed ICT Unit at ICAR Hqrs., requires minimal Permanent Scientific, Technical, Administrative / Financial and supporting manpower. The IT Unit created at ICAR-IASRI, New Delhi, will have Scientists above Pay Level 13 leading different proposed Functional Groups. These scientists will be supported by technical staff. This IT Unit will majorly require contractual staff with different level of expertise and experience, depending on IT / ICT technological needs from time to time. In the field of IT / ICT, technological changes are quite rapid and diversified, so it is not possible to recruit permanent staff in each of these fields. Therefore, hiring contractual staff having different expertise as per requirement will not only help the Council to develop digital solutions on latest technologies, but also provide flexibility and efficiency in the development of the different digital solution. The permanent staff will be re-deployed in this Unit from already existing respective cadre of the Council and there is no need for new recruitment.

8.1 Permanent Staff

The following table provides details of permanent staff requirement in ICT Unit of ICAR, New Delhi and IT Unit of ICAR-IASRI, New Delhi.

S.No.	Post	Number
Permanent Staff at ICT Unit at ICAR Hqrs, New Delhi		
1.	Scientists working at pay level 13 or above	03
2.	Technical	03
3.	Under Secretary	01
4.	FAO	01
5.	Section Officer	01
6.	Assistant / UDC / LDC	05

S.No.	Post	Number
Permanent Staff at IT Unit at ICAR-IASRI, New Delhi		
7.	Scientists working at pay level 13 or above	05
8.	Technical	05
9.	Assistant / UDC / LDC	01

The capacity building of the permanent staff needs to be done regularly to make them productive, effective and competitive in the latest ICT / IT development.

8.2 Contractual Manpower

Functional Group wise Scientific and Technical contractual manpower will be hired based on requirement from time to time. It has been contemplated that maximum 50 contractual manpower of various category may be required at present. These Functional Group may form network of available human resources available in ICAR.

The hiring of contractual staff i.e. RA / SRF / Young Professional / IT professionals on contract / ad-hoc basis will be done as per guidelines of the Council and requirements. The qualification and experience of these professionals may be modified based on requirements from time to time. The contractual staff is to be hired by following ICAR/DST/GoI procedure as per requirement and approval of the Competent Authority.



हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agri⁺search with a human touch

