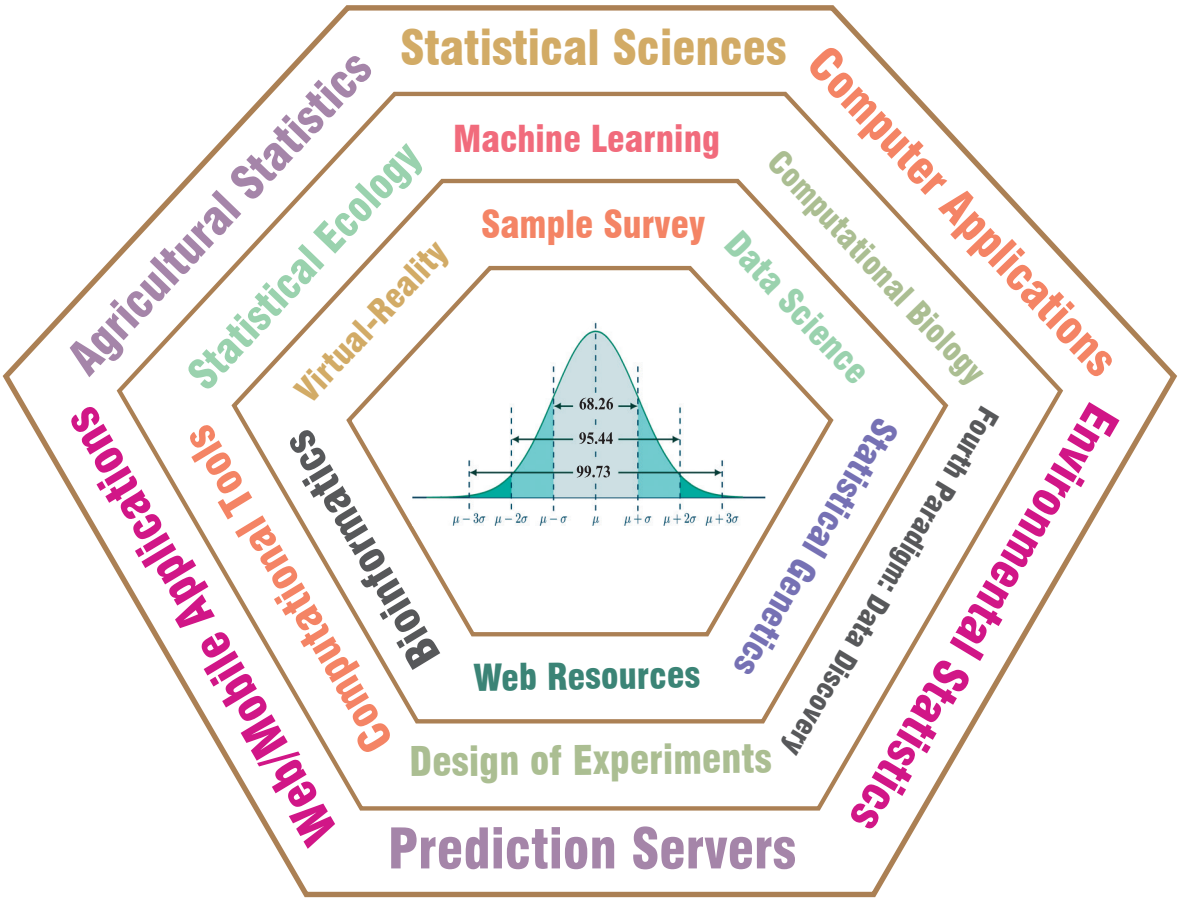
IASRI

Annual Report-2024



ICAR - Indian Agricultural Statistics Research Institute

Library Avenue, Pusa, New Delhi - 110012

ISO 9001:2015 Certified Institute

Annual Report
2024

भाकृअनुप
ICAR

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भा कृ सां अ सं
भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE

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Vision

Statistics and Informatics for enriching the quality of Agricultural Research

Mission

To undertake research, education and training in Agricultural Statistics, Computer Application and Bioinformatics for Agricultural Research

Mandate

- To undertake research, education and training in agricultural statistics, computer applications in agriculture and agricultural bioinformatics
- To provide advisory/consultancy services / methodological support / computational solutions to NARES/NASS (National Agricultural Research and Education System/ National Agricultural Statistics System)

Preface

It is a matter of immense pride and profound satisfaction to present the Annual Report 2024 of the ICAR-Indian Agricultural Statistics Research Institute (IASRI). This report highlights the Institute's unwavering commitment to advancing agricultural research and policy planning through the powerful synergy of Statistics and Informatics. The Institute has continued to make remarkable strides in diverse domains, including Experimental Designs, Sample Surveys, Statistical Genetics, Statistical Modelling, Statistical Computing, Computer Applications, and Agricultural Bioinformatics. The Institute holds a prominent position within the National Agricultural Research and Education System (NARES) and plays a pivotal role in advancing methodological frameworks for the National Agricultural Statistics System (NASS). It also leads in the development of robust Agricultural Knowledge Management Systems. The Institute remains at the forefront of innovation, driving data-informed decisions for resilient and productive agricultural sciences.

This publication presents key highlights of the Institute's research achievements, newly developed methodologies, information systems and portals, notable advisory services rendered, knowledge dissemination efforts, and initiatives in human resource development.

In alignment with objectives and mandate of the Institute, the research was carried out under 84 research projects (38 Institute funded, 41 outside funded and 05 consultancy Projects). This year 25 projects were completed and 16 new projects have been initiated. The Institute also has a Network Project on Agricultural Bioinformatics and Computational Biology with 22 ICAR Institutes as partners. Institute received several externally funded projects from Department of Agriculture and Farmers Welfare, Department of Biotechnology and Department of Science and Technology, Govt. of India.

Overall, 253 Research Papers with 3.70+ average papers per scientist, 21 R-packages and 34 biological webserver/databases have been published. The Institute received 27 Copyrights, one Patent (in collaboration with ICAR-CIRB, Hisar) and 05 Design Registered (in collaboration with SKUAST-Srinagar). Eighteen technologies/methodologies developed by the Institute received certificates on ICAR Foundation Day. For strengthening collaborations, signed 02 MoUs and Work Plan with Agricultural Scientists Recruitment Board (ASRB), New Delhi and Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-Jammu).

The Institute has strategically aligned its research to meet the evolving demands of agricultural research and policy planning through statistical innovations, digital systems, and field-integrated approaches. Efficient experimental designs like generalized extended triangular designs, semi-Latin rectangles, sliced orthogonal Latin hypercube designs, constant sum block designs and D-optimal mixture designs have been developed for various experimental scenario. Improved outlier detection approaches (new Andrews-Pregibon (AP) statistic and a modified Cook-Statistic) in incomplete multi-response experimental designs, statistical framework for analyzing neutrosophic data from various experimental designs, including unblocked, block, row-column, and crossover designed has added the statistical rigour for improving precision.

The Institute developed a Food Loss Index (FLI) using FAO guidelines, and it has been recommended to be the part of National Indicator Framework for SDGs. The eLISS platform, developed by the Institute was strengthened to provide end-to-end solutions for livestock statistics, while the geographically weighted spatially integrated estimator improved survey precision through spatial integration. Machine learning innovations such as PredPSP, AScirRNA, ASPTF, HPpred, ProkDBP, RBProkCNN, and ML-VS enhanced genomic and protein research. Key bioinformatics databases including HprotDB 2.0, MbGeR, TiGeR, Plant Circular RNA Database, KadakExpress, and BuffExDb have advanced functional genomics and stress biology.

Chatbot SWINE-SHRIA (Smart Heuristic Response based Intelligent Assistant) developed for swine farming, strengthened Artificial Intelligence based Disease Identification System for Crops (AI-DISC) identifies 67 diseases across 23 crops and 47 pests in 8 crops; Artificially Intelligence based Disease Identification System for Animals (AI-DISA) identifies 03 critical diseases in bovines and 05 diseases in canines.

For forecasting complex time series data with nonlinear, and nonstationary characteristics, developed Wavelet-based Fuzzy Long Short-Term Memory Model (WaveFLSTM). Particle Swarm Optimization-based Weighted Ensemble Volatility Model (P-WEV) has shown its ability to handle price fluctuations and volatility. Deep Learning technique with Response Surface Methodology (DL-RSM) has been introduced to identify the optimized levels of

environmental factors for district-wise wheat yields of the Indo-Gangetic plains of India

Looking ahead, the Institute is set to revolutionize data decision making in agricultural sciences by integrating AI-powered predictive modelling. This initiative will drive the development of next-gen machine learning algorithms custom-built for precision farming, enhancing precision of crop yield forecasts, disease management, and resource optimization. By leveraging big data analytics and sensor technologies, the Institute seeks to foster sustainable agricultural practices and build climate-resilient farming ecosystems. This visionary approach will equip farmers with real-time, and tech-savy solutions, reaffirming its role as a trailblazer in innovation-led agricultural research and development.

Human resource development in statistical sciences remains a core priority of the institute, aimed at equipping professionals to address emerging challenges in agricultural research. In 2024, the Institute organized 23 customized training programmes, benefiting 1,340 participants; 5 Hindi workshops with 114 participants; and 25 sensitization programmes with 3,856 attendees. A total of 39 students successfully completed their postgraduate degrees in Agricultural Statistics, Computer Application and Bioinformatics, while 27 students from various universities undertook internships for their graduate/postgraduate dissertation work.

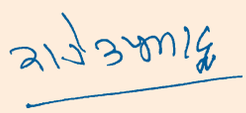
In response to the growing demand for Data Science, the Institute is designing customized human resource development programs focused on statistical computing using R, Python, and other advanced tools. Additionally, efforts began in edge computing using multimodal approaches with integrated spectral sensors and machine learning models in low-volume sprayers to manage black-rot infestation in cauliflower. Furthermore, the Institute has initiated the establishment of an IoT lab and acquired drones for developing smart sampling techniques for Crop Cutting Experiments (CCEs).

The Kritagya Hackathon, a National Level Agtech_ Hackathon platform developed by the Institute has been used to organize Hackathon on Digital Crop Survey by the Department of Agriculture & Farmers Welfare (DA&FW), Ministry of Agriculture and Farmers Welfare, Government of India. Honourable Union Minister of Agriculture and Farmers' Welfare launched ASEAN-INDIA Fellowship Portal. Krishi e-Nidanshala: an assisted service of KISAN SARATHI via Common services Centres (CSC), was launched at pilot scale.

I am happy to note that some of our colleagues/ alumni received academic distinctions from esteemed professional societies and Government organisations. The scientists of the Institute have also been contributing as experts in several national level committees.

I extend my sincere gratitude to all senior officers in ICAR Headquarters for their continued guidance, encouragement, inspiration and support. I also appreciate the help of all Heads of Divisions, scientists and staff of the Institute for their devotion, whole-hearted support and cooperation in carrying out various functions and activities of the Institute. Special thanks to the PME Cell team, particularly Dr. Ajit, for their commendable work in compiling and ensuring the timely publication of this Annual Report.

I trust that the information contained in this publication will serve as a valuable resource for all stakeholders and we welcome feedback and suggestions for enhancing future editions of this publication.



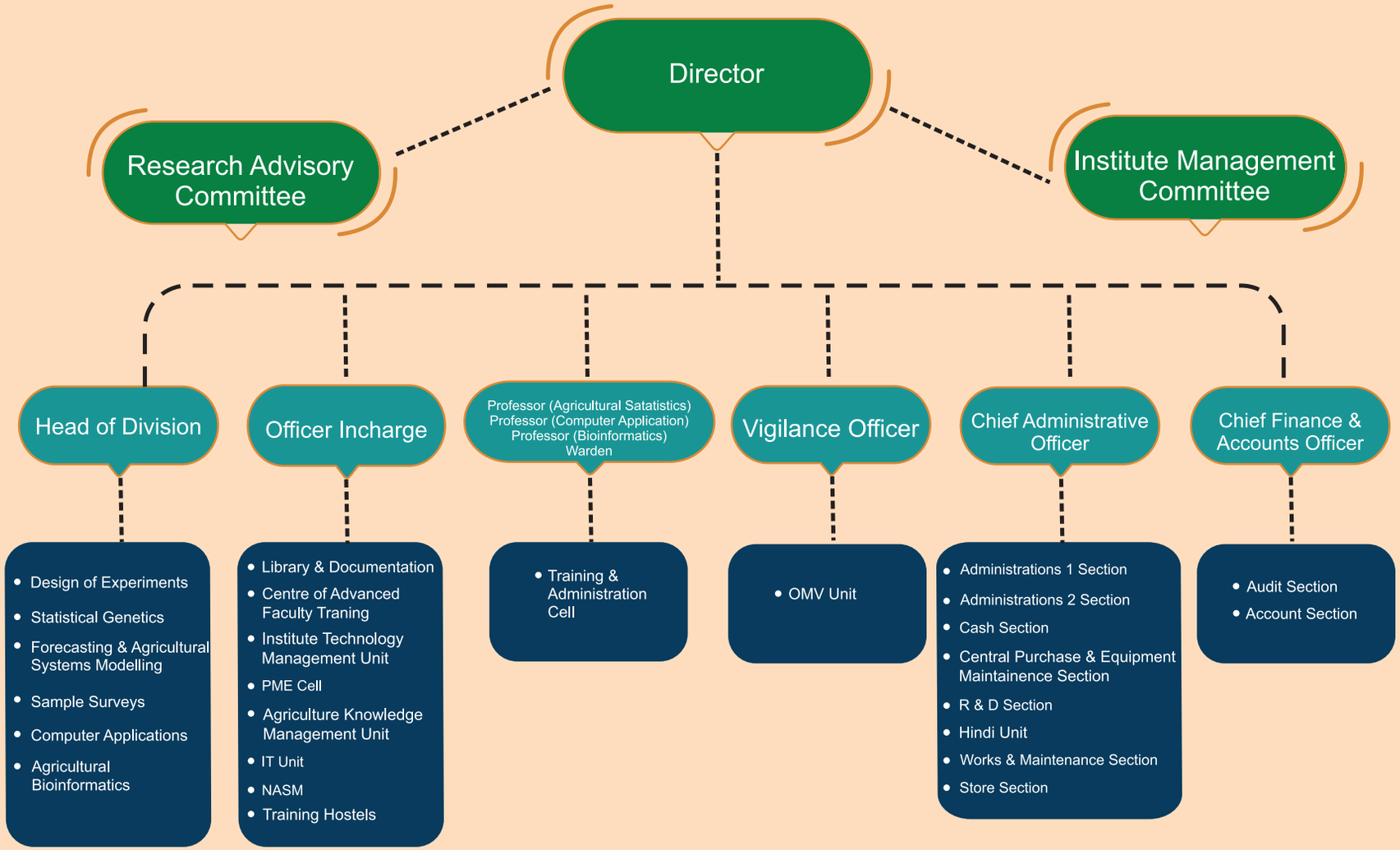
(Rajender Parsad)
Director

Milestones

1930	*	Statistical Section created under ICAR (then Imperial Council of Agricultural Research)
1940	*	Activities of the Section strengthened with the appointment of Dr. PV Sukhatme
1943	*	Research in developing techniques for crop yield estimation based on the methods of random sampling initiated
1945	*	Re-organisation of Statistical Section into Statistical Branch headed by a Statistical Advisor as a centre for research and training in the field of Agricultural Statistics and Junior Certificate Course and Senior Certificate Courses started
1949	*	Statistical Branch rechristened as Statistical Wing of ICAR
1952	*	Activities of Statistical Wing further expanded and diversified with the recommendations of FAO experts, Dr. Frank Yates and Dr. DJ Finney
1955	*	Statistical Wing moved to its present campus in own building (presently Sample Survey Block) and Hostel (presently Panse Hostel)
1956	*	Collaboration with AICRP initiated
1959	*	Re-designated as Institute of Agricultural Research Statistics (IARS)
1964	*	Installation of IBM 1620 Model-II Electronic Computer
	*	Panse Hostel for Students
	*	Signing of MOU with IARI, New Delhi to start M.Sc. and Ph.D. degree programmes in Agricultural Statistics
1970	*	Status of a full-fledged Institute in the ICAR system, headed by Director
	*	New Hostel for students (presently Sukhatme Hostel)
1977	*	Three storeyed Computer Centre Building inaugurated
	*	Installation of third generation computer system, Burroughs B-4700
1978	*	Re-named as Indian Agricultural Statistics Research Institute (IASRI)
1983	*	Identified as Centre of Advanced Studies in Agricultural Statistics and Computer Applications under the aegis of the United Nations Development Programme (UNDP)
1985-86	*	M.Sc. (Computer Application in Agriculture) degree programme initiated
1989	*	Statistical Package for Agricultural Research (SPAR 1.0)
1991	*	Burroughs B-4700 system replaced by a Super Mini COSMOS LAN Server
1992	*	Administration-cum-Training Block of the Institute inaugurated
1993-94	*	Nomenclature of M.Sc. (Computer Application in Agriculture) degree changed to M.Sc.(Computer Application)
1995	*	Centre of Advanced Studies in Agricultural Statistics & Computer Application established by Education Division, ICAR
1996	*	Establishment of Remote Sensing & GIS lab
1997	*	Senior Certificate Course in 'Agricultural Statistics and Computing' revived
	*	Establishment of modern computer laboratories
	*	First software in India for generation of design along with its randomised layout SPBD release 1.0
1998	*	Training programmes in Statistics for non-statisticians in National Agricultural Research System initiated
1999	*	Strengthening of LAN & Intranet with Fibre optics & UTP cabling
2001	*	Data Warehousing: INARIS project under NATP initiated
2002	*	Development of PIMSNET (Project Information Management System on Internet) for NATP
2003	*	Development of PERMISnet (A software for Online Information on Personnel Management in ICAR System)
	*	First indigenously developed software on windows platform Statistical Package for Factorial Experiments (SPFE) 1.0 released.
2004	*	National Information System on Agricultural Education (NISAGENET) Project launched
	*	Training Programme for private sector initiated and conducted training programme for E.I. DuPont India Private Limited.
2005	*	Statistical Package for Augmented Designs (SPAD) and Statistical Package for Agricultural Research (SPAR) 2.0 released
	*	Design Resources Server with an aim to provide E-advisory in NARES initiated
2007	*	Establishment of Agricultural Bioinformatics Laboratory (ABL)

2008	*	Software for Survey Data Analysis (SSDA) 1.0 released
2009	*	Golden Jubilee Celebration Year of the Institute
	*	Strengthening Statistical Computing for NARS initiated
	*	Expert System on Wheat Crop Management launched
	*	International Training Hostel inaugurated
2010	*	Establishment of National Agricultural Bioinformatics Grid (NABG) in ICAR and Centre for Agricultural Bioinformatics [CABin] initiated
2011	*	Indian NARS Statistical Computing Portal initiated
	*	M.Sc. degree in Bioinformatics initiated
2012	*	Software for Survey Data Analysis (SSDA) 2.0
	*	Development of Management Information System (MIS) including Financial Management System (FMS) in ICAR initiated
	*	Half-Yearly Progress Monitoring (HYPM) System in ICAR implemented
	*	Sample Survey Resources Server initiated
2013	*	Advanced Supercomputing Hub for OMICS Knowledge in Agriculture (ASHOKA) and National Biocomputing Portal inaugurated
	*	Ph.D. degree in Computer Application initiated
	*	ICAR-ERP system implemented
	*	Ph.D. degree in Bioinformatics initiated
	*	IASRI Campus Wi-Fi enabled
2014	*	FAO Sponsored Study under the Global Strategy for Improvement of Agricultural Statistics initiated
2015	*	KRISHI: Agricultural Knowledge Resources and Information System Hub for Innovations portal launched as ICAR centralized data repository system
	*	Declared as National Level Agency (NLA) under MIDH (Mission for Integrated Development of Horticulture).
	*	ICAR Data Centre, Unified Communication and Web Hosting Services for ICAR established with ISO/IEC 20000 and ISO/IEC 27001 certification
2016	*	KVK-Portal (Krishi Vigyan Kendra Knowledge Network) and Mobile Application (http://kvk.icar. gov.in/) developed and launched.
	*	Developed sampling methodologies for estimation of crop area and yield under mixed and continuous cropping for different situations and field tested in three countries identified by the FAO.
	*	Developed Personnel Management System, for managing the cadre strength and transfer of the scientific staff and implemented in ICAR.
2017	*	Developed guidelines for estimating post-harvest losses of horticultural crops (fruits and vegetables), livestock (meat and milk) and fish (capture and culture fisheries)/fish products
2018	*	Education Portal-ICAR (https://education.icar.gov.in) developed and launched.
2019	*	Webserver and Mobile App, VISTa (Variety Identification System of *Triticum aestivum*) developed
2020	*	Gold Icon Award in Open Data Championship Category from Ministry of Electronics and Information Technology, Govt. of India for ICAR Research Data Management Initiative
		KRISHI-MEGH: The Cloud Hardware Infrastructure and Software Services, as a step forward towards digital agriculture of the 'New India' has been commissioned and launched.
2021	*	KISAAN 2.0 (Krishi Integrated Solution for Agri Apps Navigation) App
	*	Established Virtual Classroom in 18 Agricultural Universities & Agri-Diksha Web Education Channel
	*	Kisan-SARATHI- System of Agri-information Resources Auto-transmission and Technology Hub Interface, initiated in collaboration with Digital India Corporation, MEITY, Govt. of India
	*	"eLISS Web Portal" and "eLISS Data Collection App" for Integrated Sample Survey Solutions of Major Livestock Products
2022	*	KCC-CHAKSHU (Kisan Call Centre Collated Historically Aggregated Knowledge-based System with Hypertext User-interface) launched
	*	AI-DISC (Artificial Intelligence based Disease Identification System for Crops) App developed
2023	*	E-Learning Portal and Blended Learning Platform (BLP) initiated
2024	*	AI-DISA (Artificial Intelligence based Disease Identification System in Animals)
	*	Conversational Virtual Agents 'Chatbots': Smart Heuristic Response based Intelligent Assistant

ORGANOGRAM


Director
Research Advisory Committee
Institute Management Committee
Head of Division
Officer Incharge
Professor (Agricultural Satatistics)
Professor (Computer Application)
Professor (Bioinformatics)
Warden
Vigilance Officer
Chief Administrative Officer
Chief Finance & Accounts Officer
Design of Experiments
Statistical Genetics
Forecasting & Agricultural Systems Modelling
Sample Surveys
Computer Applications
Agricultural Bioinformatics
Library & Documentation
Centre of Advanced Faculty Traning
Institute Technology Management Unit
PME Cell
Agriculture Knowledge Management Unit
IT Unit
NASM
Training Hostels
Training & Administration Cell
OMV Unit
Administrations 1 Section
Administrations 2 Section
Cash Section
Central Purchase & Equipment Maintainence Section
R & D Section
Hindi Unit
Works & Maintenance Section
Store Section
Audit Section
Account Section

प्रशासनिक एवं प्रशिक्षण खंड
ADMINISTRATIVE - cum - TRAINING BLOCK
भा.कृ.अनु.प.- भारतीय कृषि सांख्यिकी अनुसंधान
ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
SAMPLE SURVEY BLOCK

1. Executive Summary

ICAR-Indian Agricultural Statistics Research Institute (ICAR-IASRI) since its inception is mainly responsible for conducting research in Agricultural Statistics to bridge the gaps in the existing knowledge. The Institute has used the power of Statistics, as a science, blended judiciously with Informatics and has contributed significantly to improving the quality of Agricultural Research. The Institute has also been providing education/training in Agricultural Statistics and Informatics to develop trained manpower in the country. The research and education are being used in improving the quality and meeting the challenges of agricultural research in newer emerging areas.

To achieve its goal and mandate, research was carried out under 84 research projects in the Institute {38 Institute funded, 41 outside funded and 05 consultancy Projects} in various thrust areas. This year 25 projects were completed {13 Institute funded, 10 outside funded and 02 consultancy Projects}, and 16 new projects {04 Institute funded, 09 outside funded and 03 consultancy Projects} have been initiated.

Some other salient research achievements are:

- Developed efficient statistical designs like Generalized Extended Triangular Designs based on m-class association scheme, Semi-Latin Rectangle layouts with a cell size of 3, Sliced Orthogonal Latin Hypercube Designs (SOLHD) for equal batch size and unequal batch size and modified D-optimal mixture designs for agricultural experiments. For dose-response studies in the case of animal experiments, Constant block-sum PBIB designs have been developed.
- For complex breeding experiments involving double crosses, developed four-way cross plans along with the parameters and canonical efficiency factor. Mating-Environmental (ME) designs involving partial double crosses have also been obtained using a resolvable incomplete block design with block size 4 and considering replications of the resolvable design as blocks, and forming crosses between the lines (treatments) within each block.
- A statistical framework has been developed for analyzing neutrosophic data from various experimental designs, including unblocked, block, row-column, and crossover setups.
- For identifying outliers in incomplete multi-response experimental designs, a new Andrews-Pregibon (AP) statistic and a modified Cook-statistic have been developed.
- Food Loss Index (FLI) for India, compiled at the Institute using FAO's methodology along with approach for year-wise food loss estimation, is based on three national post-harvest loss surveys. Assessment Report on Food Loss Index for including SDG indicator 12.3.1a in National Indicator Framework (NIF) of India has been accepted by FAO, Rome and its inclusion in National Indicator Framework is now recommended by Technical Advisory Committee (TAC) on SDG, Ministry of Statistics and Programme Implementation (MoSPI), Govt. of India.
- Strengthened eLISS end-to-end Solution developed for integrated livestock sample surveys by including real-time dashboards, improved app features, and enhanced supervisory tools, making it a central system for producing official Basic Animal Husbandry Statistics reports.
- For forecasting complex time series data having nonlinear, and nonstationary characteristics, developed Wavelet-based Fuzzy Long Short-Term Memory Model that integrates wavelets and fuzzy logic for price prediction.
- For forecasting prices of various agricultural commodities, Particle Swarm Optimization-based Weighted Ensemble Volatility Model has been developed by combining predictions from four different models to handle the price fluctuations and volatility. The performance of this model has been tested using data from 19 different commodities, including cereals, pulses, oilseeds, vegetables, and spices from various markets of India have been used.
- For pest forewarning, a dynamic ensemble modeling approach has been developed to enhance forecasting accuracy. This method integrates lagged pest incidence data with key weather variables such as minimum and

maximum temperature, rainfall, and morning and evening relative humidity. Its effectiveness has been demonstrated using Yellow Stem Borer (YSB) population data in rice cultivation

- Artificial Intelligence/Machine Learning (ML) models have been developed to forecast crop yields for rice, cotton, tur, and soybean at national and state-level. National level crop yield forecasts were generated within 10% deviation. For state-level yield forecasts, crop yield data is augmented with important weather parameters (Tmin, Tmax, Rainfall and RH) into ML models.
- Developed a geographically weighted spatially integrated (GWSI) estimator by integrating data from two different surveys using spatial information. To estimate the unbiased variance of the dual frame population total estimator, a method called Post-Stratified Rescaling Bootstrap with Unknown Domain Size has been developed.
- Deep Learning technique with Response Surface Methodology (DL-RSM) has been developed to identify the levels of environmental factors that affect wheat yield in India. It uses a 1D-Convolutional Neural Network (CNN) along with a numerical method to calculate partial derivatives. By applying a technique called the symmetric difference quotient, the method accurately estimates how changes in each factor affect the yield and helps in identification of optimal conditions for maximum wheat production.
- A suite of machine learning-based computational tools has been developed to address diverse biological challenges. *PredPSP* enables identification of pathway-specific photosynthetic proteins in C3 and C4 plants. *AScirRNA* and *ASPTF* predict abiotic stress-responsive circRNAs and transcription factors respectively, supporting stress-resilient crop development. *HPpred* identifies halophilic proteins using Random Forest. *ProkDBP* and *RBProkCNN* target accurately predicting prokaryotic nucleic acid binding proteins. A deep learning-based *ML-VS* framework predicts protein-ligand interactions, offering virtual screening tools for bioactive molecules. *GSCIT* facilitates genome sequence coverage analysis, while gene-specific GC content tools support viral genomics.
- To support computational biology and bioinformatics several webservers have been developed. DeepCFixEC predicts enzymes in carbon fixation; PhytoMicroBioPred assesses compound bioactivity for plant and microbial proteins. OpEnHiMR predicts histone modifications in rice, while MLDeCNV detects copy number variants. GPS identifies G4 motifs; IfProcQC ensures proteomics dataset quality. WebCoreR and WebCoreM offer core microbiome analysis. TaCircRNADb focuses on circular RNAs in wheat. These platforms provide accessible, interactive resources to enhance biological research and data interpretation in agricultural bioinformatics.
- Developed biological databases to advance functional genomics, stress biology and crop improvement. Notable platforms include HProtDB 2.0 for halophilic proteins, MbGeR for *Momordica balsamina*, TiGeR for *Tilletia indica* and the Plant Circular RNA Database. Other key resources like KadakExpress, GARUD, MustardFamilyExplorer, DPNP, BuffExDb, and FEAtl support species-specific genomics have also been developed. These tools enable genome annotation, gene expression profiling, marker discovery and comparative genomics greatly aiding agricultural research, breeding strategies, and bioinformatics infrastructure development.
- For evaluating projects, selecting suppliers, for multi-criteria decision making, developed an user-friendly software (OptiRanker) using the TOPSIS method. It can be used in various areas like choosing the best crop varieties, setting priorities in agriculture, managing pests, supporting precision farming, and planning agroecological zones.
- To assess the economic impact of agricultural technologies, a GUI-based application, AgriImpactSuite has been developed partnership with ICAR-NIAP. It includes modules for adoption rate estimation, economic surplus analysis, risk reduction benefit, and poverty reduction effects. Present-year Adoption Rate Calculator helps to estimate technology adoption trends using parameters like seed rate and crop area, aiding evidence-based agricultural policy and planning. Strengthened KRISHI Portal by adding a Technology Product Application for workflow-based submission/review.
- Conversational Virtual Agents CHATBOTS (SHRIA-Smart Heuristic Response based Intelligent Assistant) for Swine, named as

SWINE-SHRIA has been developed and made available as mobile App in 10 different languages. It is an AI-powered multilingual chatbot designed for personalized swine farming guidance.

- AI DISHA (Artificially Intelligence based Disease Identification System for Animals) identifies the Foot and Mouth Disease, Mastitis and Lumpy Skin Disease in Bovines and Canine Distemper, Canine Parvo Virus, Rickets, Mange and Mamary Tumor in Canines using infrared vision.
- Artificial Intelligent based Disease Identification System for Crops (AI-DISC) has been strengthened by adding models for identification of 67 diseases across 23 crops (up from 55 diseases in 20 crops) and 47 pests in 8 crops (previously 19 pests in 3 crops), using photographs captured in natural field backgrounds for accurate AI-based crop health diagnostics.
- The Institute also made a modest beginning in Edge computing using multi-modal approach with integrated spectral sensors and machine learning models in a device as low-volume sprayer to manage diseases in cauliflower at research farm level. It uses SVM model for accurate black rot detection (96.7% accuracy) and applies targeted spraying to diseased areas. This approach reduces chemical usage by 72.5% and saves 21% operational time compared to a standard sprayer for black rot-infested crops.
- Central Data Repository was created to securely store and manage experimental metadata and datasets for Network Project on Precision Agriculture. A deep learning-based nitrogen assessment model using wheat leaf images achieved high accuracy by integrating weather data and image preprocessing pipelines. The irrigation scheduling system based on Hargreaves method, recommends requirements for crop based coefficients of crop growth stages, last irrigation and current climatic conditions.
- Kisan Sarathi significantly enhanced its agricultural advisory outreach. It handled 1.22 lakh farmer calls and delivered over 5 crore SMS advisories on weather, pest management and government schemes in regional languages. With 2.48 crore registered farmers, including 75.6 lakh new users, the platform expanded rapidly. Krishi e-Nidanshala, an assisted service of Kisan Sarathi via Common Services Centers (CSC), was also launched at pilot scale across 14 KVKs, improving local query handling and service delivery.
- Fourteen AR/VR training sessions were conducted, engaging over 6,300 participants, including faculty and students. These sessions covered unboxing, equipment usage, content access, and in-house AR/VR content creation. Five new AR/VR modules were developed: (i) National Agricultural Science Museum (Pre-independence), (ii) Post-independence Period, (iii) Discovery Centre, IARI, (iv) Drone Flying Simulator, and (v) Cattle Anatomy.
- Strengthened Agricultural Education Portal with a redesigned Student-Ready module for better usability. The ASEAN-India Fellowship portal developed with application and admin modules, role-wise dashboards was launched by Union Minister of Agriculture and Farmers' Welfare on August 14, 2024.
- The National Pest Surveillance System (NPSS 2.0) developed as partner with ICAR-NCIPM, DPP&S (DA&FW) and Plantixd AI-Wadhwani was launched by the Union Minister of Agriculture and Farmers' Welfare on Independence Day.
- ICAR Accreditation System has been completely restructured for better performance and usability. Key enhancements include intuitive UI/UX across user roles, mandatory fields for applications, automated document submission to Registrars and multi-level resubmission for SSRs. Coordinators can submit notifications and select programs, while peer review team (PRT) orders and historical data are now dashboard-integrated. An automated email reminder system and a centralized accreditation dashboard further streamline tracking, compliance, and decision-making processes.
- Developed ASRB-Online Application System for Offline Examinations (OAS-OFLE), for streamlining offline recruitment exams through digital modules like online registration, admit card generation, document uploads, and result publishing. Used in ARS and ADOL exams, the system enhanced transparency and efficiency.
- Strengthened Foreign Visit Management System (FVMS) with a role-based workflow for ICAR and DARE approvals, customized forms and ERP ID alternatives, ensuring smooth user support and issue resolution.
- Eighteen technologies/methodologies developed

by the Institute were awarded certificates during ICAR Foundation and Technology Day. Two of these technologies *E-Learning Portal* and Multivariate *Adaptive Regression Spline based ANN and SVR Model for Crop Yield Prediction* were selected among the 5 best technologies of Agricultural Education Division, ICAR.

- During the reported period of 2024, 21 R-packages have been developed in different domains of Agricultural Statistics and Agricultural Bioinformatics.
- The Institute received twenty-seven Copyrights, one Patent (with ICAR-IASRI as collaborating Institute and ICAR-CIRB, Hissar as lead Institute) and Five Design Registered (with ICAR-IASRI as collaborating Institute and SKUAST-K, Srinagar as lead Institute). The Institute has published 253 research papers in national and international peer reviewed journals, 2 Edited Book/Proceedings, 21 book chapters,16 popular articles along with other publications. On an average each scientist published 3.72 research papers.
- During 2024, in the 62nd Convocation of Graduate School, ICAR-IARI, New Delhi, 39 (Ph.D. and M.Sc.) Students {08 and 08 students of M.Sc. and Ph.D. courses in Agricultural Statistics; 05 and 03 students of M.Sc. and Ph.D. courses in Computer Application; 09 and 06 students of M.Sc. and Ph.D. courses in Bioinformatics} received their degrees. Also 27 students of different Universities/Institutes worked in internship programmes as project trainees for their Graduation/Post Graduation dissertation work.
- A total of 23 training programmes have been organized in different area of Agricultural Statistics and Informatics which were attended by 1,340 participants. Besides this, 5 Hindi workshops (114 participants) and 25 sensitization programmes (3,856 participants) have also been organized by the Institute.
- Institute Annual Day was celebrated in gracious presence of Dr. Himanshu Pathak, Honourable Secretary, DARE and Director General, ICAR as Chief Guest; Dr. R.C. Agrawal, DDG (Agricultural Education), ICAR & ND (NAHEP) and Dr. SK Sharma, ADG(HRM), ICAR as Guest of Honour. Dr. Suresh Kumar Chaudhari, DDG (Natural Resource Management) was the distinguished speaker for 34th Nehru Memorial Lecture.
- Kritagya Hackathon Portal, a National Level Agtech Hackathon platform designed and developed by the Institute has been used to organize Hackathon on Digital Crop Survey by the Department of Agriculture & Farmers Welfare(DA&FW), Ministry of Agriculture and Farmers Welfare, Govt. of India. This nationwide Agtech initiative attracted participation from 173 teams across the country.
- Two drones have been procured to develop smart sampling technique for Crop Cutting Experiments (CCEs) using drone data and develop crop acreage and crop yield estimation methodologies for generating estimates using drone technology.
- Institute also celebrated Republic Day, National Science Day, International Women's Day, International Yoga Day, 18th National Statistics Day, Independence Day, Teachers Day, Hindi Pakhwada, Swachhata Campaign, एक पेड़ माँ के नाम, Vigilance Awareness Week, Constitution Day, Sadbhawana Diwas, National Integration Day, National Integration Day, Swachhata Pakhwada and Kisan Diwas. Under SC-Sub Plan, the students of several schools visited the Institute and explored the digital initiatives in agriculture.
- Organized a series of interactive sessions to connect students with alumni working in reputed multinational companies (MNCs), with the aim of helping students gain valuable insights into the professional world.
- Institute received externally funded projects that includes Cost of Cultivation Studies on Principal Crops and Minor Crops, Crop Yield Estimation from MoA&FW; Agri-Genomic Repository and Intelligent Analytical System from DBT and AI enabled models and web solutions for prediction of crop yield from DST, Govt. of India.
- The Institute has signed 02 MoUs (Memorandum of Understanding) and Work Plan with Agricultural Scientists Recruitment Board (ASRB), New Delhi for developing Application Form Module for the Offline Examinations and and Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J, Jammu) to promote teaching, research, training and exchange of information and technology, related to agriculture, engineering, statistics and allied sciences.

2. Introduction

ICAR Indian Agricultural Statistics Research Institute (ICAR-IASRI) started its journey as a Statistical Section in 1930 in then Imperial Council of Agricultural Research and has grown to a premier institute of relevance to conduct research, education and training in the field of Statistical Sciences (Statistics, Computer Applications, and Bioinformatics). The Institute is mainly responsible for conducting research in Agricultural Statistics and Informatics to bridge the gaps in the existing knowledge. The Institute is using the power of Statistics, as a science, blended with Informatics and their judicious fusion in agricultural sciences for enhancing quality agricultural research, to meet the challenges of agricultural research in newer emerging areas and evidence-based policy decision making. The Institute conducts M.Sc. and Ph.D. degree programmes in Agricultural Statistics, Computer Applications and Bioinformatics in collaboration with the Graduate School, ICAR-IARI, New Delhi. The Institute also conducts customized and sponsored training courses in Agricultural Statistics and Informatics at National and International level to be a leading Centre of excellence in Human Resource Development. The Institute provides advisory and consultancy services for strengthening the National Agricultural Research and Education System (NARES) and undertakes sponsored research and consultancy for National and International organizations. The methodological support is provided in strengthening National Agricultural Statistics System (NASS). The Institute has also been playing a leading role in development of robust Agricultural Knowledge Management Systems and artificial intelligence-based applications for NARES.

The present main thrust areas of the Institute is to conduct basic, applied, adaptive, strategic and anticipatory research in Agricultural Statistics and Informatics, to develop trained manpower and to disseminate knowledge and information produced to meet the methodological challenges of agricultural research in the country.

ICAR-IASRI has also become a leader in innovative data management by establishing Advanced Supercomputing Hub for Omics Knowledge in Agriculture (ASHOKA), ICAR-Data Center, Krishi Megh (National Agricultural Research & Education System-Cloud Infrastructure and Services). Setting up an advanced teaching-learning environment in Agricultural Higher Education through Academic Management System (AMS), Agri-Diksha Web Education Channel, Virtual Classrooms in all AUs, and AR/VR Experience Centers is providing new age educational technologies in NARES. ICAR received Gold Icon Award in Open Data Championship Category-2020 from Ministry of Electronics and Information Technology (MeitY), Govt. of India for ICAR Research Data Management (KRISHI Portal).

Food and Agriculture Organization (FAO) of the United Nations has given several research and/or consultancy projects to the Institute. Besides, many research projects of Government and Public Sector agencies like Department of Science and Technology; Directorate of Economics and Statistics; Department of Animal Husbandry and Dairying; Department of Biotechnology; Department of Agriculture and Farmers Welfare; Planning Commission; Network for Scientific Cooperation for Food Safety and Applied Nutrition (NetSCoFAN), Food Safety and Standards Authority of India (FSSAI); Mahalanobis National Crop Forecast Centre (MNCFC); Ministry of Statistics and Programme Implementation (MoSPI); Coconut Development Board; Protection of Plant Varieties and Farmers Right Authority (PPVFRA);Department of Food and Public Distribution (DFPD), Ministry of Consumer Affairs, Food Corporation of India (FCI); DES, Govt. of Meghalaya, and others have been undertaken by the Institute. Some of these projects were taken on request from several Government agencies and others were awarded through competitive bidding. The Institute works in close collaboration with all NARES organizations (All ICAR Institutes, SAUs, AICRPs and KVKs) and many projects are being run in collaboration with All India Co-ordinated Research Projects, ICAR Institutes and SAUs. Further linkages with the CGIAR organizations such as CIMMYT, IRRI, ICARDA, ICRAF and BMGF have been developed.

For further strengthening the collaborations, in last five years, the Institute has signed 12 MoUs (Memorandum of Understanding) and LoAs (Letter of Agreement) with various institutions which include University of Agricultural Sciences (UAS), GKVK Campus, Bengaluru and Punjab Agricultural University, Ludhiana for virtual reality modules; Association of Innovation Development for Entrepreneurship in Agriculture, Centre for Agri-Innovation (a-IDEA) ICAR-NAARM, Hyderabad;

CSIR-National Botanical Research Institute,Lucknow for genomic data analysis generated on cotton crop yield; Food and Agriculture Organization of the United Nations (FAO-India) to review food loss index estimates; Agricultural Scientists Recruitment Board for development of Online Application & Scorecard Information System and develop ASRB-Online Application System for Offline Examinations (OAS-OFLE); Department of Food and Public Distribution, New Delhi; National Bank for Agriculture and Rural Development (NABARD); Project on Climate Resillient Agriculture (POCRA) Nanaji Deshmukh Krishi Sanjivani Prakalp. Govt. of Maharastra, RLBCAU, Jhansi and BASU, Patna for FMS development; and Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-Jammu) to promote teaching, research, training and exchange of information and technology, related to agriculture, engineering, statistics and allied sciences.

The Institute organized VIII International Conference on Agricultural Statistics (ICAS) during 18-21 November 2019, in which 500+ delegates from 108 countries participated. The Conference was inaugurated by Mr. Bill Gates. The Institute also took a lead in organization of International Conference on Blended Learning Ecosystem for Higher Education in Agriculture during 2023 in which 3,400+ participants including 24 participants from 9 countries participated.

Significant Research Achievements and Impact

The Institute has made some outstanding and useful contributions to research in Agricultural Statistics (Design of Experiments, Statistical Genetics, Forecasting Techniques, Statistical Modelling, Sample Surveys), Computer Applications, and Agricultural Bioinformatics. The Institute conducted basic and original research on many topics of interest and published number of papers in national and international journals of repute. The Institute has been providing and continues to provide support to the NARES by way of analyzing voluminous data using advanced and appropriate analytical techniques. The Institute has also been very actively pursuing advisory services that have enabled the Institutes to enrich the quality of agricultural research in the NARES. Through its advisory, the Institute has made its presence visibly felt in NARES and now experimenters look to ICAR-IASRI for designing experiments and analysis of experimental data. The Registrar Copyrights Authority of India has granted copyrights to 103 publications/software's/information systems/web resources/portals/databases, etc. with the Institute as lead Centre and 41 as collaborator with other organizations as lead. The scientists of the Institute have also been co-developers for 04 wheat germplasms registered by Plant Germplasm Registration Committee, ICAR for drought tolerance with higher antioxidant (1.8 fold) activity; resistant to stripe rust pathotypes 46S119 and 47S103 for resistant to terminal heat tolerance respectively. The Institute has one patent as collaborating partner with ICAR-CIRB, Hisar and 05 Design Registrations as collaborating partner with SKUAST-K, Srinagar. The Institute is a partner in one Patent filed. Thirty-five (32 as Lead Institute and 3 as Partner) Technologies/Methodologies/Information Systems/ Portals received ICAR Certificate during 2023 and 2024.

A brief discussion on the research achievements of the Institute in different areas of Agricultural Statistics and Informatics are outlined below.

Design of Experiments

The Institute has made many notable contributions in both basic research and innovative applications of the theory of statistical designs and analysis of experimental data. Experimental designs have helped in navigating from varietal trials to varieties and package of practices, translating varieties into enhanced crop production, by harnessing and detecting technologies and identifying conditions that optimize the response. Some significant developments are

- Designs for Single Factor Experiments which include variance balanced; efficiency balanced block designs; alpha(α)-designs; designs for making test treatments-control comparison; designs with nested factors; structurally p-rep designs; incomplete row-column designs; row-column designs in two-rows; semi-latin squares; designs for multi-response experiments; designs for 2-line and 4-line crosses, crossover designs; neighbour balanced designs and optimality and robustness aspects of designs.
- Designs for Factorial Experiments which include confounded designs for symmetrical and asymmetrical factorials; block designs with orthogonal factorial structure and balance useful for crop sequence experiments; designs for incomplete factorial treatment structure and fractional factorial designs for scarce experimental resources; response surface designs; mixture experiments for single and multifactor experiments; space filling designs for

computer experiments; orthogonal main effect plans; orthogonal arrays; and supersaturated designs.

- Computers aided construction of efficient designs for various experimental settings.
- Designs for biological assays; designs for microarray experiments; designs for agroforestry experiments; order of addition experiments; designs for multistage trials and designs for integrated farming systems research.
- Diagnostics in designed field experiments led to improvement in statistical designing and data analytical techniques in NARES.
- Planning, designing and analysis of several AICRPs including IFS Research (both on station and on farm trials), Soil Test Crop Response, Long Term Fertilizer Experiments, Vegetable Crops, Sorghum, Small Millets, Maize, Oilseeds, Weed Management and others.
- Rigorous advisory and persuasion efforts have led to the adoption of modern efficient designs for experimentation and sophisticated analytics of the data generated by the researchers in the NARES, which has helped in improving the quality of agricultural experimentation. The bulletin on significance of statistical designs in agricultural research is a pocket diary for agricultural scientists as it defines the designs actually used. Following efficient designs and analytical techniques have been adopted by the researchers in NARES:
  - Resolvable Block Designs {alpha-(α-) designs, Rectangular Lattice designs, Reinforced Lattice designs} for varietal improvement programmes adopted in crop improvement trials and led to reduction in coefficient of variation of the initial varietal trials and enhanced precision on treatment comparisons.
  - Designs for crop sequence experiments (extended group divisible designs, balanced confounded factorial designs) have been helpful in estimation of the residual and direct effects of treatments applied in different seasons with more precision. Fractional factorial plans have also been used in experiments conducted to prepare super absorbent composites.
  - Modified and/or second order rotatable response surface designs with equispaced doses are being used in food processing experiments for determining optimum combination of input factors. Semi-latin square type response surface design is used by AICRP on STCR for obtaining fertilizer response relationship and obtaining contribution of organic manures in smaller number of experimental units.
  - Balanced incomplete block designs was adopted by then AICRP on Cropping Systems Research in On-Station Research Programmes, IIFSR (earlier Project Directorate of Cropping Systems Research), Modipuram.
  - Linear programming approach developed for estimating/projecting energy requirements in agricultural sector has been exploited for the analysis of countrywide data by then AICRP on Energy Requirement of Agricultural Sector.
  - Variance component estimation from unbalanced data has encouraged the experimenters in NARES in the usage of incomplete block designs.
  - Statistical analytical techniques of experimental data from experiments in which it is difficult to change the levels of one of the factors has helped in drawing statistically valid conclusions from post-harvest storage studies on fruits, vegetables, flowers, seed technology experiments and experiments with different water regimes.
  - Experiments with mixtures have been used for experiments with fixed quantity of inputs and ready to serve fruit beverage experiments, etc.
  - Analytical techniques based on mixed effects models and SREG biplot developed for the analysis of data generated from farmers participatory trials for resource conservation agriculture have been used by rice-wheat consortium for Indo-Gangetic plains for drawing statistically valid conclusions.

Sample Surveys

The subject of sampling techniques helps in providing the methodology for obtaining precise estimates of parameters of interest. The Institute is involved in evolving suitable sample survey techniques for estimation of various parameters of interest relating to crops, livestock, fishery, forestry, horticulture, perishable commodities like flowers, vegetables and allied fields.

- Significant contributions made in theoretical aspects of sample surveys include successive sampling; systematic sampling; cluster sampling; sampling with varying probabilities; controlled

selection; balanced sampling plans excluding contiguous units; distance balanced sampling plans; ranked set sampling; inclusion probability inversely proportional to size sampling; nested stratified sampling; non-sampling error; analysis of complex surveys; various methods of estimation such as ratio, regression and product methods of estimation; calibration based methods of estimation, use of combinatorics in sample surveys; innovative approaches for small area estimation in skewed data situations for agricultural, income and expenditure surveys; for spatial non-stationarity under area level model; other socio-economic and food insecurity parameters as well as use of calibration approach in developing improved estimators.

- Following sampling methodologies have been developed and widely used for
  - crop yield estimation using crop cutting experiments (CCE) has been adopted in general crop estimation surveys in India and is also being widely adopted in African and Latin American Countries.
  - cost of cultivation studies for major crops is being used in 19 states of the country.
  - integrated sample surveys (ISS) for livestock products estimation is being used throughout the country by Department of Animal Husbandry and Dairying, Govt. of India.
  - estimation of harvest and post-harvest losses of major crops and commodities have been successfully adopted in AICRP on Post Harvest Technology, Ministry of Food Processing, Govt. of India in 3 National Level Surveys.
  - estimation of post-harvest losses of horticultural crops (fruits and vegetables), livestock (meat and milk) and fish, field tested in Mexico, Zambia, Nepal and Thailand and accepted by FAO and UN member countries.
  - estimation of crop area, yield and production under mixed, repeated and continuous cropping, field tested in Indonesia, Rwanda and Jamaica and accepted by FAO.
  - agriculture census and generating estimates for parameters of interests for Lao, PDR has been implemented.
  - Integrated methodology for estimation of multiple crop area of different crops in north-eastern hilly regions using remote sensing data has been used in Meghalaya, Tripura and North-Eastern States.
  - estimation of cotton production using double sampling approach has been used in nine major cotton growing states.
  - alternative methodology for estimation of area and production of horticultural crops has been used by Haryana.
- The sample survey methodology for imported fertilizer quality assessment, estimation of private food grains stock at farmers level, estimation of fish catches from marine and inland resources, flower production estimation, fruits and vegetable survey, estimation of seed, feed and wastage ratios of major food grains, etc. has been developed and passed on to the user agencies.
- Reappraisal of sampling methodologies, evaluation and impact assessment studies like studies to make an assessment of integrated area development programmes, sampling methodologies for identifying constraints of adoption in high yielding varieties and evaluating the impact of Green Revolution, dairy improvement programmes, evaluation of cotton production estimation methodology etc. have been undertaken. Most of the methodologies developed are being adopted for estimation of respective commodities by the concerned state departments.
- The Institute is regularly publishing the Agricultural Research Data Book since 1996. It contains information pertaining to agricultural research, education and other related aspects compiled from different sources.
- The methodologies developed have potential applications in (a) AICRP on (i) Residues; (ii) Ergonomics; (iii) Energy in Agriculture and Agro-based industries and (b) integration of technologies and CCEs for providing estimates at GP (Gram-Panchayat) level for PMFBY (Pradhan Mantri Fasal Bima Yojna).

Statistical Genetics, Computational Biology and Bioinformatics

The Institute has made very significant contributions in statistical genetics/bioinformatics/genomics for improved and precise estimation of genetic parameters, classificatory analysis, genetic divergence and computational biology, etc.

- Developed procedures for estimation of genetic parameters from military dairy farm data; construction of selection indices; studying G×E interactions; progeny testing and sire evaluations; detection of QTLs, classification of genotypes using molecular marker data

and QTL environments interactions etc. These procedures are being used in crop and animal improvement programmes.

- The modification in the procedure of estimation of genetic parameters has been suggested for incorporating the effect of unbalancedness, presence of outliers, aberrant observations and non-normality of data sets.
- The Institute has initiated research in the newer emerging area of statistical genomics such as rice genome functional elements information system; comparative genomics and whole genome association analysis.
- Supercomputing facility (Advanced super -computing Hub for OMICS Knowledge in Agriculture) for high performance computing in the field of agricultural bioinformatics and computational biology has been established. Developed National Agricultural Biocomputing Portal for a single point of access to High Performance Computing (HPC) resources for all NARES users. It has given a big leap in terms of computational biology and developed 180+ biological databases/ analytical tools, web servers, prediction tools which include 24 transcriptome databases; 18 microsatellite databases; 31 genomic and proteomic database resources; 3 SSR marker database; 5 SNP marker database; 79 Software tools and web servers and 29 Algorithms and Methodologies. Also developed synthetic peptides and antibodies specifically targeting the bovine MX2 protein with ICAR-CIRB as lead organization. Identified biodegrading enzymes utilising metagenomics data provided by ICAR-CIFRI, Barrackpore collected from Yamuna River capable of breaking down significant pollutants such as dyes, hydrocarbons, and plastics. These beneficial microbes, present abundantly in our ecosystem, hold great potential for application in bioremediation efforts.
- A network project on Agricultural Bioinformatics and Computational Biology with 22 ICAR Institutes as partner is also being implemented for generation of lab data and also validation of results based on in-silico analysis. The Institute has also been established Centre for Bioinformatics and Computational Biology in Agriculture-BIC (Funded by Department of Biotechnology).

Statistical Modelling and Forecasting

Forecasting of crop yields, prices, production and forewarning of pests and diseases is carried out using linear and non-linear models, discriminant function approach, markov chain approach, Bayesian approach, within year growth models, non-parametric regression, structural time series, fuzzy regression, neural network and machine learning approaches, hybrid models namely ARIMA-ANN, ARIMA-SVR, Wavelet-MLR and Wavelet-ANN, Bayesian beta regression, etc. Pre-harvest forecasting models of crop yields have been developed using data on weather parameters, agricultural inputs, plant biometric characters and farmers' appraisal. Following have been widely adopted.

- Weather Indices based models have been used for forecasting agricultural output using space, agrometeorology and land based observations (FASAL) by Indian Meteorological Department and Mahalanobis National Crop Forecast Centre. This model has also been integrated in Weather Indices based Automated Yield Forecasting System (WIAYFS). The Institute is now a knowledge partner in FASAL 2.0.
- Methodologies for forewarning important pests and diseases of different crops have been developed which can enable the farmers to use plant protection measures judiciously and save cost on unnecessary sprays. Forewarning models for aphid (mustard) have been used by Directorate of Rapeseed and Mustard Research, Bharatpur to provide forewarning to farmers consecutively for three years. Forewarning models for Powdery mildew (Mango crop) have been used by ICAR-CISH, Lucknow.
- Developed models have potential applications in long term projections of food grain production, aphid population, marine fish production etc.
- Technology forecasting methods such as scenario creation, Delphi survey and cross impact analysis, technology road-mapping, analytic hierarchy process (AHP) etc. have been employed in various sub-domains of agriculture.

The Institute has also made significant contributions in understanding the complex economic relationship of the factors like transportation, marketing, storage, processing facilities; constraints in the transfer of new farm technology to the farmers' field under different agroclimatic conditions of the country. Some of the important contributions of the Institute are measurement of indemnity and premium rates

under crop revenue insurance, production efficiency and resource use, impact of micro-irrigation, technological dualism/ technological change, return to investment in fisheries research and technical efficiency of fishery farms, the impact of technological interventions, price spread and market integration, price volatility and the dietary pattern of rural households.

Information Communication Technology: Infrastructure and Applications

The Institute has a rich legacy of computing starting from 1964 with IBM-1620 Model-II Electronic Computer in Data Processing System to a third-generation computer Burroughs B4700 Mainframe Computer in 1977. It was upgraded to Burroughs B4700 Mainframe Computer with 14 Terminals in 1983. Personal computers were introduced in 1991 with Pentium in 1997. In 2002, RISC servers were introduced. The Institute developed a blue print of KRISHI-NET-a nation wide agricultural research and education information system in 1989 (later known as ARIS, AKMU etc).

In 1960s and 1970s, when the computing facilities were not or scarcely available elsewhere, the entire NARES depended on the computing facilities of the Institute and many agricultural researchers used this facility for advancement of new technologies. This has been further enhanced by creating a healthy Strengthening Statistical Computing Environment for NARES in 2010, Web Resources such as Design Resources Server, Sample Survey Resources Server for e-advisory and e-learning and Indian NARS Statistical Computing Portal for providing service-oriented computing.

A National Agricultural Bioinformatics Grid (NABG), the first supercomputing hub for Indian Agriculture i.e. Advanced Supercomputing Hub for OMICS Knowledge in Agriculture (ASHOKA) built in a state-of-art Data-Centre for high performance computing in the field of agricultural bioinformatics and computational biology was established in 2013. Out of nine super-computers of this grid, two super-computers were then ranked at 11 and 24 in the then list of top super-computers of India. At present ASHOKA has: 30 Nodes/1200 cores ~92 TF), 16 Nodes/192 cores as Big Data; 03 GP-GPU Nodes (~34 TF); 144 cores with 3.0 TB RAM as SMP (~10TF); 128 cores with 1.0 TB Ram as SMP; 64 cores with 1.5 TB RAM as SMP and Storage Capacity: 700 TB + 100 TB. GP-GPU and SMP Clusters are being upgraded with enhanced capacity.

ICAR Data-Centre is operational since September 10, 2014 and was inaugurated on December 21, 2016. ICAR Data Centre is certified as ISO/IEC 27001:2013 for Information Security Management System and ISO/IEC 20000:2011 for IT Service Management System. The facilities are built in a state-of-art Data Centre, currently equipped with industry standard 3165 Core Computer, 26798 GB RAM, 6872 TB Storage, 351 devices, Software, Application, Tools and other related technologies. Out of this 1362 Core, 7726 GB RAM, 400 TB Storage is for traditional computing; and 1563 Core,17792 GB RAM, 6451 TB storage for hyperconverged infrastructure (HCI) computing. To keep pace with the emerging technologies and to provide computational solutions to NARES, Artificial Intelligence (AI) resources have been built in ICAR-DC at the institute having 240 Core, 17 Tesla V100 GPU, 84070 CUDA Core, 10880 Tensor Cores, 21 TB SSD, 1280 GB RAM having buddle of latest AI/ Deep learning software/tools kits.

ICAR DC has been continuously providing the unified communication (and webhosting service to ICAR and its Institutes. For unified icar.gov. in domain email ID, there are 24,000+ users. The listed DNS, Portals, Websites, Modules, Systems and Applications are being maintained and hosted at ICAR-DC. At present 400+ applications are hosted on DC. ICAR email is being used as 'Single Sign on' using LDAP authentications in various applications like KRISHI Portal, PMS, FVMS, TMIS ARMS and others hosted on ICAR-DC.

In the continued expansion of ICAR DC, Cloud Computing (KRISHI Megh) at ICAR-IASRI alongwith Disaster Recovery Centre (DRC) at NAARM, Hyderabad was established in August 2020. For providing transparency in day-to-day work of the ICAR/Institute, ICAR-ERP (Enterprises Resources Planning) system has been implemented with the MIS-FMS (Financial Management, Project Management, Material Management, Human Resource Management and Payroll System modules). The Institute has developed/implemented/maintains critical ICT applications of the Council through ICAR DC, Disaster Recovery Centre and ASHOKA which includes e-Governance services {e-Office, SPARROW, e-HRMS (now shifted to cloud), ICAR-ERP/FMS/MIS (now decommissioned)}, etc. During Covid period, for smooth functioning of academic activities, MS Teams services were provided through Enterprise- wide complementary license.

Notable contributions have been made in introducing computer culture in agricultural research and human resource development in information technology

in the ICAR. The Institute has the capability of development of Information Systems, Decision Support Systems, Expert Systems, Portals, Mobile Apps and Artificially-Intelligence-based applications. The Institute has so far developed 65+ web applications including 28 Mobile apps with 15 million+ page views. These systems are helpful in taking the technologies developed to the doorsteps of the farmers. The stakeholders for these applications are students, scientists, government officials, farmers, etc. Some important among these are:

Web-based Knowledge Resources, Statistical Packages and Service Oriented Computing

- For dissemination, e-learning and e-advisory for scientists in NARES, developed Design Resources Server and other web solutions for generation of experimental designs and online analysis of experimental data for different experimental settings which are being viewed across the globe and have helped in changing the status of experimentation/survey in NARES.
- Indian NARS Statistical Computing Portal for service-oriented data analysis which is available to NARES researchers through their Campus/ Institute network
- Statistical Packages developed by the Institute include Statistical Package for Balanced Incomplete Block Designs (SPBD); Statistical Package for Factorial Experiments (SPFE); Statistical Package for Augmented Designs (SPAD); Software for Survey Data Analysis (SSDA); Statistical Package for Animal Breeding (SPAB) and Statistical Package for Agricultural Research (SPAR). Besides the above SAS macros have also been developed.
- Developed 87 R-Packages with 4,68,000+ downloads consisting of (i) 47 for different techniques of forecasting, statistical modelling, time series data analysis and sample surveys; (ii) 22 for generation of several series of efficient statistical designs and analysis of experimental data and (iii) 18 for computational biology/ bioinformatics/computer applications.
- Other web resources include estimation of compound growth rate, Fuzzy C-means clustering and GRAPES: General R-shiny based Analysis Platform Empowered by Statistics (With KAU, Vellayani); Online Analysis of Block Designs, Web Generation and Analysis of Partial Diallel Crosses, Web Generation of Designs Balanced for Indirect Effects of Treatments, etc.

Knowledge and Data Management Portals

- **Artificial Intelligence Based Applications and Initiatives**
  - Artificial Intelligence based Disease Identification System for Crops (AI-DISC App): Identifies 67 diseases of 23 crops (Rice, Wheat, Maize, Tomato, Mustard, Cotton, Brinjal, Apple, Peach, Kinnow, Mandarin, Assam Lemon, Chickpea, Green gram, Cluster bean, Moth bean, Cucurbits, Chilli, Coriander, Soybean, Potato, Grapes, Mango) 39 insects of 8 crops once the image in natural background is uploaded.
  - AI DISHA (Artificially Intelligence based Disease Identification System for Animals): identifies the Foot and Mouth Disease, Mastitis and Lumpy Skin Disease in Bovines and Canine Distemper, Canine Parvo Virus, Rickets, Mange and Mamary Tumour in Canines using RGB vision.
  - Conversational Virtual Agents CHATBOTS (SHRIA-Smart Heuristic Response based Intelligent Assistant) for Cattle, Buffalo, Sheep & Goat and Swine (Collaboration with ICAR-IVRI). Also available as mobile App in 10 different languages.
  - Based on Kisan Call Centre Data developed AgriResponse: Query-Response Generation System; AgriMine: Deep Learning-based query-count forecasting; AgrIntel: Query Hotspot Identification.
  - Multi-modal approach with integrated spectral sensors and machine learning models in a device as low-volume sprayer to manage diseases in cauliflower crop.
  - Image Analysis (Plant Phenomics): Spike segmentation and counting in wheat plant from visual imaging, Yield prediction of wheat using high-throughput plant phenotyping integrated with computer vision.
- **Strengthening Digital Agricultural Education**
  - Education Portal: is a single window platform for providing vital education information/ announcements/event schedules/e-learning resources from Agricultural Universities (AUs) across the country. It has 54,22,268 views.
  - Academic Management System is a web enabled system for management of all academic activities of the university. The system caters to the needs of different users: Dean, Registrar, Professor, Head, Guide, Faculty, Teacher, Student, Administrators and Officials. At present implemented in 60+ Agricultural Universities

- Virtual Classroom and Agri-DIKSHA Web Channel: Established 75 integrated Virtual classrooms at AUs with state-of-the-art equipment to capture videos of classes, broadcast, video editing, and AI search capabilities. Agri-DIKSHA Web Channel has 4369 Videos of 360011 minutes duration with 326835 views.
- E-Learning Portal, an online collaborative platform for developing UG/PG E-Courses (86 PG Courses, 171 UG Courses with 2,67,000+ downloads).
- E-Krishi Shikha provides access to UG Level interactive & multimedia e-Courseware contents in seven disciplines viz. Agricultural Science; Fisheries Science; Dairy Science; Veterinary and Animal Husbandry; Horticulture; Home Science and Agricultural Engineering. 325+ online courses available on this resource.
- Virtual Reality Experience Labs have been operationalized in all AUs with 14 Virtual Reality Modules to enhance learning experience for students.
- Also developed NAHEP- Grievance Redressal Mechanism System (GRMS); Training Management Information System (TMIS); Agricultural Expert Information System (AEIS); Accreditation Portal; Agriculture University Ranking System (AURS); Clean and Green Award Portal; Plant Trees Portal; Research Leadership Building System (RLBS); Krishi Vishwavidyalaya Chhatra-Alumni Network(KVC-ALNET); Student READY; Capacity Building Portal (CBP); Direct Benefit Transfer (DBT DARE MIS).

- **Extension and E-governance**
  - KRISHI Portal: Agricultural Knowledge Resources and Information System Hub for Innovations Empowering Knowledge Management as Centralized data repository system of ICAR consisting of Technology, Publications, Video, Audio, Intellectual Property Assets, Variety Information System, Mobile Apps, Data generated through Experiments/Observational studies, Geo-spatial data, etc. The available information on publications, technologies, videos etc. is being shared with Open Government Data Platform through API and ICAR Video Gallery is being used in VISTAAR (Virtually Integrated System to Access Agricultural Resources) of DA&FW. ICAR received the Gold Icon Award in OPEN DATA CHAMPIONSHIP Category from MEITY, GOI in 2020 for ICAR Research Data Management Initiative. Data Governance Quality Index 2.0 DMEO NITI AAYOG referred it as Good Practice for ICAR/DARE as Central Data Repository; Total Score: 4.43 out of 5.0.
  - KCC-CHAKSHU: Kisan Call Centre-Collated Historically Aggregated Knowledge-based System with Hypertext User-interface: 38 million+ queries from KCC data ((available through APIs on the open data platform) on 11 attributes: Generated Nationwide Insights and Alerts.
  - KVK Portal and KVK App: provides basic information and facilities of KVK, District Agricultural Contingency Plan, Upcoming, Ongoing and Past Events organized by KVKs, Package of Practices related to Crop, Horticulture and other enterprises, access to Agrometeorological advisory and Agricultural Commodity Market prices to farming community. Information also shared with Kisan Suvidha App.
  - Kisan Sarathi (System of Agri-information Resources Auto-transmission and Technology Hub Interface): intended to provide a seamless, multimedia, multi-ways connectivity to the farmers with the latest agricultural technologies, knowledge base and the pool of large number of subject matter experts. As on December 31, 2024 the Kishan Sarthi Portal had 2.47+Crore registered Farmers, 740+ registered Institutions and 3.18+Lakh villages covered.
  - eLISS Web portal and mobile app for an end-to-end solution for Integrated Sample Survey (ISS) Solutions for estimation of major livestock products (Milk, Meat, Egg and Wool) having 3 modules viz., sample selection module, data entry and analysis module and GIS map module. It is being used by Department of Animal Husbandry, Pan India 36 States/UTs: 2.31 crore+ households/ enterprises surveyed in 1.5 lakh+ villages/ urban wards 27,000 enumerators, 8,900+ supervisors and 27,000 active enumerators
  - Information Systems for 14 AICRPs for single crops, multi-crop and observational studies, have been developed, which resulted in use of efficient design of experiments, saving of manpower time and resources and creating Research Data Repository and standardization of analysis of experimental data.
  - ASRB-Online Application & Scorecard Information System (OASIS): for streamlining the recruitment process for agricultural

scientists while providing easy access to application submission and scorecard information and is used for Recruitment of RMP and Non-RMP Positions in ICAR.

- ASRB – Online Application System for Offline Examinations (OAS-OFLE): used for receiving online applications for ARS and other non-scientific positions in ICAR.
- KRITYGAYA Portal: Conducted 04 Hackathons (03 by ICAR and 01 by DA& FW)
- Web-Based Knowledge Management System for DUS Characteristics: Workflow-based system developed in collaboration with PPV&FRA enables real-time management of crop DUS features, facilitating the comparison of new and existing varieties before trials. It supports data entry by DUS centres during different trial phases and includes dashboards and MIS reports to aid decision-making for DUS centres, managers, and policy planners.
- Developed and strengthened other portals such as Farmer First Program (FFP) Portal; Personnel Management System (PMS); DARE-ICAR Foreign Visit Management System (FVMS); Agricultural Research Management System (ARMS) 2.0; Agricultural Universities-Project Information Management System (AU-PIMS); Student READY Portal; Accreditation Portal for accreditation of Higher Agricultural Educational Institutions (HAEIs), Krishi Vishwavidyalaya Chhatr Alumni Network (KVC-ALNET); Agricultural University Ranking System (AURS); ICAR-AU-Grievance Redressal & Monitoring System(GRMS); Green and clean Campus portal; Plant Trees Portal; Capacity Building Portal(CBP Portal); Training Management Information System(TMIS); Research Leadership Building System(RLBS); Direct Benefit Transfer Management Information System(DBT DARE MIS); BRICS Agricultural Research Platform (BARP); Management Information System for Plan Implementation and Monitoring in ICAR (MIS-PIMI); Financial Assistance for Conference and Journals (FACJ); ICAR-Land Records Management System (LRMS); Agriculture Experts Information System (AEIS); Agricultural Nutrition Information System(ANIS); Project Monitoring and Tracking System(PMTS); E-Platform for Seed Spices, etc.; Expert Systems on Wheat, Maize, Tomato, Mushroom, Tobacco, Seed spices; Phenomics Pipeline- for Analysis of High Throughput Image Analysis.NAAS Fellowship Online Scorecard Information System(NFOSIS); Portal for NASF Research and Corpus Fund Project Proposals

- Other mobile Apps developed include IVRI-Research Methods Tutorial App; IVRI-Disease Control App; IVRI-Extension Methods Tutorial Quiz App; KVK App; KISAAN 2.0; ICAR Technologies; Phytochemical Management App; IVRI-Veterinary Clinical Care App; IVRI-Biosecurity and Biosafety (Jaiv Suraksha) App; CARI-Backyard Poultry Farming App; IVRI-Antimicrobial Resistance App; IVRI-Veterinary Clinical Care App; IVRI - Pig Ration App; IVRI-Pig Farming App; IVRI-Technologies & Services App; IVRI-Dairy Manager App; Sabji-Gyan; IVRI- Waste Management Guide App; IVRI-Artificial Insemination App; IVRI-Animal Reproduction App; IVRI - Landlly Pig App; IVRI-Zoonoses App; IVRI-Vaccination Guide App; FAW Recorder App; e-LISS data collection app; NIBPP(National Image Base for Plant Protection); NIBLD (National Image Base for Livestock Disease); FFP Mobile App.

Human Resource Development

One of the major thrust areas of the Institute is to develop trained manpower in the country in Statistical sciences for meeting the challenges of agricultural research in the newer emerging areas. A humble beginning in the area of development of trained manpower was made in 1945 with the initiation of two regular certificate courses, one course of six-month duration, called Junior Certificate Course (JCC) and the other course of one year duration called Senior Certificate Course (SCC). Besides, there was another course of one-year duration known as Professional Statisticians' Certificate Course (PSCC) that was introduced to train professional statisticians. Subsequently, a Diploma course involving a research project of one year duration, in addition to PSCC consisting of one year course work in agricultural statistics, was also introduced. These certificate courses helped in strengthening the linkages of the Institute with the State Departments of Agriculture and Animal Husbandry. The certificate courses started in 1945 were discontinued by the Indian Council of Agricultural Research (ICAR) in 1985-86. However, during 1997, the Senior Certificate Course in Agricultural Statistics and Computing was revived. This course is now of six-month duration and lays more emphasis on statistical computing using statistical software. The course is divided into two modules viz. (i) Statistical Methods and Official Agricultural Statistics, and (ii) Use of Computers in

Agricultural Research, of three-month duration each. Since 1997, 102 participants have completed both the modules, 44 have completed module-I only and 24 have completed module-II only.

The year 1964 witnessed tremendous changes in the activities of the Institute when a Memorandum of Understanding (MOU) was signed with the Post Graduate School, Indian Agricultural Research Institute (IARI), New Delhi to start new degree courses leading to M.Sc. and Ph.D. in Agricultural Statistics. In 1981, a two-year Diploma Course in Advanced Computer Programming was introduced. On the recommendations of UNDP, this course was soon discontinued and in 1985 another new course leading to M.Sc. degree in Computer Applications in Agriculture was initiated in collaboration with IARI, New Delhi. This course was re-designated as M.Sc. degree in Computer Application during 1993-94. A new degree course M.Sc. in Agricultural Bioinformatics has been initiated from academic year 2011-12. Ph.D. degree course in Computer Application and Bioinformatics were initiated in 2013-14 and 2014-15 respectively.

The Institute has so far produced 236 Ph.D. and 391 M.Sc. students in Agricultural Statistics; 12 Ph.D. and 166 M.Sc. students in Computer Application; 22 Ph.D. and 46 M.Sc. students in Bioinformatics. The alumni are well placed in NARES, academia, Government, Corporate sector and occupying very high positions globally. It includes Member, National Statistical Commission; Director General (Secretary Level, Govt. of India), Defense Estate Services; Director General, NSSO & CSO at MoSPI; Secretary General, Association of Indian Universities; Deputy Director General (Agricultural Education), ICAR; Vice Chancellors; Additional Director General, ICMR; Additional Director General, CSO, MoSPI; Additional Secretary, University Grants Commission (UGC); National Director, National Agricultural Higher Education Project; Registrar General, Protection of Plant Varieties and Farmers' Rights Authority; Pro-Vice Chancellor, University of Akron, USA; Chief of the Biostatistics and Bioinformatics Branch, National Institute of Child Health and Human Development, US; Professor and Chair of the University of Pittsburgh's Department of Biostatistics in the Graduate School of Public Health; Fellow of American Statistical Association; Professor, Department of Biomedical Informatics, Stony Brook Cancer Centre; Distinguished Professor State University of New York; Senior Biometrician/ Consultant Biometrician, CG Centers (ICARDA, ICRISAT, Excellence in Breeding (CIMMYT); Assistant Director General, ICAR, etc. IASRI provides unique opportunities to the aspiring post graduate students to learn the cutting edge and new technologies by offering them an ambient academic environment, practical exposure, professional learning and analytical skills.

The functioning of the Institute as a Centre of Advanced Studies in Agricultural Statistics and Computer Application during October 1983 to March 1992 under the aegis of United Nations Development Programme was another landmark in the history of the Institute. The purpose of this programme was to develop the Institute as a Centre of Excellence with adequate infrastructure and facilities to undertake advanced training programmes and to carry out research in various emerging areas of Agricultural Statistics and Computer Applications. Under this programme, a number of illustrious statisticians and computer scientists from abroad visited the Institute with a view to interact with the scientists, giving seminars/ lectures and suggested gaps in the research programmes of the Institute. Under the programme some scientists of the Institute received training for capacity building from abroad. Another singular development in the growth of the Institute was the Centre of Advanced Studies Programme in Agricultural Statistics and Computer Applications established during the VIII Five Year Plan in 1995. Under this programme the Institute organized training programmes on various topics of current interest for the benefit of scientists of NARES. These training programmes covered specialized topics of current interest in statistics and agricultural sciences. The Centre of Advanced Studies (CAS) was renamed as Centre of Advanced Faculty Training (CAFT). So far 93 training programmes have been organized under the aegis of CAS/CAFT. In all a total of 1869 participants have been benefited. A total of 30 Summer/Winter Schools/Short courses have been organized which were attended by 705 participants.

There is yet another form of training courses, which are tailor–made courses and are demand driven. The coverage in these courses is need based and the courses are organized for specific organizations from where the demand is received. Such training programmes on various aspects of Statistical and Computation Techniques and ICT Tools impart necessary skills not only to researchers in NARES but also to Indian Statistical Service professionals. FAO, Afro-Asian Rural Development Organization, World Bank for Government officials of Afghanistan, Ministry of Statistics and Programme Implementation, Indian Council of Forestry Research and Education, State Department of Agriculture, other national and

international developmental agencies look at the Institute as a valuable partner and organize several national/international training programmes to the developing world. The Institute has broadened the horizon of capacity building by opening its doors to agro-based private sector, CGIAR organizations such as ICARDA, Rice-Wheat Consortium for Indo-Gangetic plains etc. Only few Institutes in ICAR have this distinction. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also, a number of statisticians and students of the Institute are at present occupying high positions in universities and other academic and research institutions of USA, Canada and other countries.

It is a matter of great pride for the Institute that 05 of its scientist/alumni have received the most prestigious National Award in Statistics in memory of Late Dr. PV Sukhatme, for outstanding life time achievements in Statistics and 02 received National Award in Statistics in Honour of Professor CR Rao from Ministry of Statistics and Programme Implementation, Govt. of India. ICAR Rafi Ahmad Kidwai Award has been received by 03 of its faculty/ alumni. One scientist occupied the prestigious ICAR National Professor Chair, three scientists have been the National Fellow of the ICAR, 02 of faculty/alumni received (Indian National Science Academy (INSA) Fellowship and 17 faculty/alumni elected as National Academy of Agricultural Sciences (NAAS) Fellows. One scientist received the GP Chatterjee Memorial Lecture award from Indian National Science Academy (INSA); one scientist received the Shri Om Prakash Bhasin award for science and technology in the field of agriculture and allied sciences; one alumni received MS Randhawa Award from NAAS, 03 scientists received NAAS Recognition Award and 02 scientist/alumni received Cochran-Hansen Prize 2009 by International Association of Survey Statisticians. Eight scientists have been adjudged as the 'Best Teacher' of the PG School of IARI, New Delhi and 03 received Bharat Ratna Dr. C. Subramaniam Award for Outstanding Teacher from ICAR. Six students received Jawahar Lal Nehru Award on Ph.D. Dissertation. Several of its scientists have received 'Young Scientist Award' from National Academy of Agricultural Sciences, Indian Council of Agricultural Research and many other scientific societies / associations. Several scientists have been the elected members and one scientist had been the Council member of the International Statistical Institute. Scientists are also Editors, Associate Editors and Members of the Editorial Board of many National and International Journals. International Association of Survey Statisticians has initiated Hukum Chandra Memorial Prize for mid-career researchers.

Other Infrastructural Development

There are various labs in the Institute for dedicated services like AKMU lab, Statistical computing lab for training, and Centre of Advanced Study lab or student lab. Business Intelligence Server has also been installed for statistical computing for NARES. A laboratory on Remote Sensing (RS) and Geographic Information System (GIS) was created in the Institute. The laboratories are equipped with latest state-of-art technologies like computer hardware and peripherals. Two smart/virtual class rooms have been setup to facilitate for online/ blended form of teaching. Auditorium, and committee room have been setup to facilitate videoconferencing.

The Library of the Institute is considered as a well-known and specialized library in the whole country in terms of its resources in the form of print and electronic format in the field of agricultural statistics, computer applications, bioinformatics and allied sciences. It is recognized as one of the regional libraries under NARES. It has strengthened the resource base in terms of core foreign journals. With procurement of online and CD-ROM bibliographical databases, the awareness for the use of databases has increased and users are able to access scientific information in the field of their interest quickly by clicking of a button. Recently, all housekeeping activities of the library have been computerized and barcoded with hybrid-RFID system and all bonafide library users have been issued RFID-electronic membership cards. All M.Sc. and Ph.D. students thesis have been digitized and given access to users through LAN. The Library is equipped with hybrid-RFID Self- Checkout/Check-in System for the ease of users. Library of the Institute is associated with CeRA (now One Nation One Subscription) in terms of electronic document delivery services and Inter-Library Loan services are also available to all users through DELNET. The library reading room has been renovated with air conditioners to provide congenial environment for readers. All library users have been given training to access on-line services available in the library.

There are three well-furnished hostels, viz. Panse Hostel, Sukhatme Hostel and International Training Hostel to cater to the residential requirements of the students and trainees.

Organizational Set-up

The Institute is having six Divisions, two Units and three Cells to undertake research, training, consultancy, documentation and dissemination of scientific output.

Divisions	Design of Experiments
	Sample Surveys
	Forecasting and Agricultural Systems Modeling
	Statistical Genetics
	Computer Applications
	Agricultural Bioinformatics
Units	IT-Unit
	Institute Technology Management Unit (ITMU)
Cells	Prioritization, Monitoring and Evaluation Cell (PME)
	Training Administration Cell (TAC)
	Consultancy Processing Cell (CPC)

Financial Statement 2024-25

The Institute was able to ensure optimal utilization of funds available in the budget. The actual utilization of the budget is furnished as:

Budget Allocation vis-à-vis Utilization (2024–25)

(in Lakh)

	HEAD	RE 2024-25*	Expenditure up to 31.03.2025	Closing Balance w.r.t. RE
Institute + CABin	Salary	3113.62000	3113.62000	0.00000
	Pension	952.91000	952.91000	0.00000
	Capital	270.00000	269.87959	0.12041
	General	1560.00000	1559.95315	0.04685
SCSP	Capital	18.00000	17.94600	0.05400
	General	60.00000	59.97841	0.02159
	TOTAL	**5974.53000**	**5974.28715**	**0.24285**

*after Rs. 230.00000 lakh refund.

Resource Generation 2024-25 (Rupees in Lakhs)	
Target	**Achieved**
50.00	49.79

Staff Position during 2024

Staff Strength							
S.No.	**Cadre**	**01-01-2024**			**31-12-2024**		
		Sanctioned Posts	**In Position**	**Vacant Posts**	**Sanctioned Posts**	**In Position**	**Vacant Posts**
1	Scientist	121	68	53	121	67	54
2	Administration	87	44	44	87	52	35
3	Technical	138	28	110	138	20	118
4	SSS	25	16	09	25	13	12
5	Auxiliary Staff*	14	03	11	14	02	12
	Total	385	159	227	385	154	231

*Auxiliary Staff is dying cadre.

3.
RESEARCH ACHIEVEMENTS

The research targets set by the Institute were implemented by six Divisions of the Institute, viz. Design of Experiments, Sample Surveys, Statistical Genetics, Forecasting & Agricultural Systems Modelling, Computer Applications and Agricultural Bioinformatics. The basic, applied, adaptive and strategic research in Statistical Sciences (Agricultural Statistics, Computer Applications and Bioinformatics) is carried out under six broad programmes that cut across the boundaries of the Divisions and encourage interdisciplinary research. The six programmes are as under:

1. Development and analysis of experimental designs for agricultural system research
2. Forecasting and remote sensing techniques and statistical applications of GIS in agricultural systems
3. Development of techniques for planning and execution of surveys and analysis of data including economic problems of current interest
4. Modelling and simulation techniques in biological systems
5. Development of informatics in agricultural research
6. Teaching and training in Agricultural Statistics, Computer Application and Bioinformatics

Programme 1: DEVELOPMENT AND ANALYSIS OF EXPERIMENTAL DESIGNS FOR AGRICULTURAL SYSTEM RESEARCH

Efficient Statistical Designs

- Efficient designs for double cross experiments under fixed/mixed effects model: Various types of breeding techniques are used as a tool for the development of commercial hybrids with potential phenotype for which a major objective of plant and animal breeders is to improve the genetic potential. Breeding experiments are conducted for acquiring information regarding the general combining ability (gca) effects of the individual lines involved as parents and the specific combining ability (sca) effects of the crosses based on these individual lines. There are many cases of plant and animal breeding where double crosses are the commonly used techniques for producing commercial hybrids. A Catalogue consisting of list of partial double crosses designs under blocked set up along with the parameters and canonical efficiency factor has been developed. Also a catalogue consisting of list of Augmented Four-way cross plans along with the parameters and canonical efficiency factor has been developed. The robustness of double cross designs against a missing observation was studied based on connectedness and efficiency criteria. Using a resolvable incomplete block design with block size 4 and considering replications of the resolvable design as blocks, and forming crosses between the lines (treatments) within each block, ME designs involving partial double cross have been obtained. Few demonstrations trials for partial double cross include: (i) Field Demonstration Trial, Division of Genetics, ICAR-IARI, New Delhi: Two environment (Stress and Control) data was collected for various qualitative and quantitative traits from the maize field trial at ICAR-IARI, New Delhi via experimental designs for double cross conducted under blocked set up under two environmental conditions, each replicated twice; (ii) Experimental Trial at ICAR-DPR, Hyderabad: The body weight data of different layer crosses of poultry was collected and compiled in excel. It comprised of WB NO: Wing Band number/ Identification Number, Date of hatch, Body weight at 4, 8, 16, 20, 40, 52, 64 and 72 weeks of age, for two-way cross of PD-2 Line X IWH Line, two-way cross of PD-1 Line X IWH Line, two-way cross of Kadaknath X IWH Line, two-way cross of PD-3 Line X IWH Line and DKH: Three-way cross of PD-3 Line X (KXH).
- Generalized Extended Triangular Designs ('GETdesigns'): A new m-class ($m \geq 2$) association scheme, named as Generalized Extended Triangular (GET) association scheme, is defined. Method of constructing useful series of m-associate class partially balanced incomplete block (PBIB) designs, named as GET designs, in m replications has been obtained along with an outline of analytical procedure. To avoid the complexity involved in the construction procedure and to save time, an R-package named "GETdesigns" is developed for the generation of these designs by including the underlying association scheme, for any given for 'n' and 'm'. The package also generates the information matrix, Average Variance Factor

(AVF) and Canonical efficiency Factor (CEF) of the generated design.

- Developed (i) methods for obtaining Semi-Latin-Rectangles (SLR) layouts with a cell size of 3 with an application of SLR designs in maize experiments; (ii) methods of constructing Sliced Orthogonal Latin Hypercube Designs (SOLHD) for equal batch size and unequal batch size and (iii) two methods for constructing Constant block-sum PBIB designs which have more importance in dose-response studies in the case of animal experiments.
- D-optimal Saturated Designs for Mixture Experiments: Fedorov algorithm has been modified and a two-stage algorithm is used where the basic intuition is to generate a smaller solution space to find a near optimal solution and then a new solution space is generated in the vicinity of solution found in first stage to find the final solution. The algorithm iterates and terminates at the point at which no further gain in the solution optimality is achieved. The advantage of using the algorithm is that it enhanced flexibility, allowing users to choose from a wider range of models and determine the appropriate number of runs needed for the experimental design.
- Deep Learning-based approach called DL-RSM (Deep Learning with Response Surface Methodology) has been developed to find the best levels of environmental factors that affect wheat yields in India. It uses a 1D Convolutional Neural Network (CNN) along with a numerical method to calculate partial derivatives. By applying a technique called the symmetric difference quotient, the method accurately estimates how changes in each factor affect the yield and helps identify the optimal conditions for maximum wheat production.

Outliers in Block Designs for Incomplete Multi-Response Experiments

- AP Statistic and Robust Block Designs: Developed a new Andrews-Pregibon (AP) statistic to identify outliers in linear models specifically for incomplete multi-response experiment designs. This statistic is evaluated using data from an incomplete multi-response design, offering a robust approach for detecting outliers within complex experimental setups. Additionally, a novel criterion for evaluating the robustness of incomplete multi-response experimental designs against a single outlier has been proposed. This criterion is based on the average Cook-statistic, offering a fresh approach to assessing the stability of these designs. Furthermore, a series of one-way elimination of heterogeneity designs are explored, highlighting their robustness in the presence of a single outlier.
- Cook-Statistic for Detection of Outliers: Incomplete multi-response experiments arise when some response variables are missing or could not be measured for certain experimental units typically due to limitations in resources, time, or budget. This leads to variations in the number of responses across units. Outliers in the data can further complicate analysis, resulting in biased estimates and misleading conclusions if not properly addressed. To resolve this, developed a Modified Cook-statistic for detecting outliers in incomplete multi-response experiments, where experimental units have varying numbers of response variables. The proposed method adjusts for differences in the design matrix, variance-covariance matrix, and normal equation in such complex experimental setups.

Statistical Analysis and Online Solution for Neutrosophic Data Derived from Designed Experiments

Observations recorded in designed experiments may be neutrosophic in nature and analytical procedures are not available for most of the statistical designs for different experimental setting. Due to methodological developments in handling neutrosophic data, it is now possible to analyse the interval data arising from all types of designed experiments. An ANOVA framework has been developed to facilitate the analysis of neutrosophic data for the following experimental designs: (i) unblocked designs, (ii) both complete and incomplete block designs, (iii) row-column designs including both complete row-complete column and complete row-incomplete column configurations, and (iv) crossover designs. Additionally, an ANCOVA procedure has also been formulated for analyzing neutrosophic data under a complete block design setup.

Designing and Analysis of On-Farm and On-Station Research Experiments Planned under AICRP on IFS

Crop and livestock cannot be separated for small holder agriculture in India as it is the pre-dominant farming system practiced in the country and

On-Farm Experiment 1 from all NARP zones.

Crops	Years for which data was available	States for which data was available
Paddy	2010-21	AP, Assam, Bihar, Chattisgarh, Gujarat, Haryana, HP, J&K, Jharkhand, Karnataka, Kerala, MP, Maharashtra, Odisha, Punjab, TN, Telangana, UP, Uttarakhand, WB
Maize	2011-20	Gujarat, HP, J&K, Jharkhand, Karnataka, Maharashtra, Rajasthan, TN
Gram/ Bengal Gram/ Chickpea	2012-20	Chattisgarh, Gujarat, Karnataka, Maharashtra
Wheat	2010-20	Bihar, Chattisgarh, Gujarat, Haryana, HP, J&K, Jharkhand, MP, Maharashtra, Punjab, Rajasthan, UP, Uttarakhand

livelihood of several millions of marginal and small farm holders revolves around this system. Small categories of farms are often subjected to weather vagaries like flood, drought and other natural calamities and farming remains risky. Vertical expansion in small farms is possible by integrating synergistic farming system components requiring less space and time and can ensure periodic income to the farmers. Integrated Farming System (IFS) meets the sustainable development goals through multiple uses of natural resources such as land, water, nutrients and energy in a complimentary way thus giving scope for round the year income from various enterprises of the system. In addition to our ever-growing population, the consumption pattern in rural and urban areas is fast changing owing to the raising income and economic liberalization. The requirement of non-grain crops and animal products are increasing. Hence, IFS plays critical role in doubling the income of farmers besides production of multiple commodities within available resources and farmer's management ability.

The response of nutrients to treatments over 11 consecutive year's data (paddy-paddy) was compiled and studied for the state of Kerala. Modified Mann-Kendall test was used to study whether the computed Fertilizer response ratios (FRRs) have a monotonic upward or downward trend. In Kharif season, P over N, P over NK, K over N and K over NP showed decreasing significant trend and in Rabi season K over N and K over NP and in Kharif season P over N and P over NK did not show any significant trend.

FRRs were computed for the N, NP, NK and NPK over control, P over N and NK and K over N and NP pertaining to four crops have been computed, for each centre and each season, by calculating the weighted average over years with number of trials as weights. Overall, a high FRR was observed.

Planning, Designing and Analysis of Data Relating to Experiments for AICRP on Long Term Fertilizer Experiments

- Fertilizer response ratio from long term fertilizer

Kharif						
Centers	**Year**	**N**	**P over N**	**K over NP**	**NP over control**	**NPK over control**
Jagtial	14	10.48	44.54	1.82	16.54	13.83
Bhubaneswar	11	11.64	25.03	4.08	14.05	10.67
Pantnagar	48	16.34	11.99	1.64	15.57	12.62
Pattambi	21	4.51	13.03	5.32	6.06	5.87
Raipur	21	13.45	23.38	-28.18	21.69	11.34

Rabi						
Centers	**Year**	**N**	**P over N**	**K over NP**	**NP over control**	**NPK over control**
Barrackpore	39	9.30	9.61	2.04	9.35	7.49
Jagtial	13	6.64	64.55	4.87	16.95	14.72
Bhubaneswar	7	12.89	27.40	5.13	15.50	11.98
Pattambi	20	6.18	12.37	4.78	7.31	6.67

experiments 05 centres for Kharif and 4 Centres for Rabi has been computed for paddy crop as per details in following Table.

- The fertilizer response ratios for paddy crop across multiple centres during Kharif and Rabi seasons exhibit considerable variability, indicating differing nutrient efficiencies under different soil. During Kharif, nitrogen (N) response ranged from 4.51 (Pattambi) to 16.34 (Pantnagar), while phosphorus over nitrogen (P over N) was highest at Jagtial (44.54), suggesting high P responsiveness there. Interestingly, negative values for K over NP at Raipur (-28.18) indicate a possible antagonistic effect or data inconsistency, warranting further investigation. NP over control responses were generally positive across centers, with Raipur (21.69) and Jagtial (16.54) showing superior combined N and P effects, while NPK over control followed a similar trend but with slightly reduced magnitude. In Rabi, nitrogen response was relatively lower overall, ranging from 6.18 (Pattambi) to 12.89 (Bhubaneswar), while Jagtial again exhibited a very high P over N (64.55), indicating continued P sensitivity. Potassium (K over NP) showed consistent positive response across most Rabi centers, suggesting synergistic nutrient effects, except for variability in magnitude.
- Combined analysis of Ludhiana centre (Rabi season) for wheat crops was performed for those characters for which more than 8 years data was available. It was observed that T8 (100% NPK + FYM) gives highest grain yield (48.04 q/ha) followed by T3 (100% NPK) which gives 47.65 q/ha and T8 and T3 are statistically significantly different from each other. For N content in grain, T8 (100% NPK + FYM) have highest mean (1.35 kg/ha) followed by T3 (100% NPK) with 1.29 kg/ha and these were different. For P content in grain, T10 (control) gives the highest mean (23.25 kg/ha). For N uptake by grain, T8 (100% NPK + FYM) have highest mean (88.15 kg/ha) followed by T3 (100% NPK) with 86.02 kg/ha and were significantly different. For P uptake by grain, T8 (100% NPK + FYM) have highest mean (16.48 kg/ha) followed by T3 (100% NPK) with 15.74 kg/ha and these were significantly different. Similarly for K uptake by grain again T8 (100% NPK + FYM) gave highest mean (20.04 kg/ha) followed by T3 (100% NPK) with 19.38 kg/ha and were significantly different. For ph, T10 (control) have the highest mean (6.54). For OC, T8 (100% NPK + FYM) have highest mean (0.44%) and follwed by T4 (100% NPK+hand weeding) with mean 0.33% and were significantly different. For available N, T8 (100% NPK + FYM) have highest mean (115.07 kg/ha) followed by T3 (100% NPK) with 110.05 kg/ha and were statistically significant. For available P, T8 (100% NPK + FYM) have highest mean (112.82 kg/ha) followed by T3 (100% NPK) with 102.02 kg/ha and were significantly different. For available Zn, T5 (100% NPK+Zinc or Lime) have the highest mean 3.31ppm(mg/kg). For available Fe T8 (100% NPK + FYM) gave highest mean (1.90 ppm) followed by T3 (100% NPK) with 1.78 ppm and were statistically significant.

Programme 2: FORECASTING AND REMOTE SENSING TECHNIQUES AND STATISTICAL APPLICATIONS OF GIS IN AGRICULTURAL SYSTEMS

WaveFLSTM: Wavelet-based Fuzzy LSTM Model for Forecasting Complex Time Series Data

The forecasting of time series continues to be a prominent area of interest among researchers exploring advanced learning techniques. In recent times, deep recurrent neural networks, particularly long short-term memory (LSTM) models, have demonstrated exceptional forecasting capabilities compared to other neural network architectures. To tackle the fuzzy datasets, fuzzy LSTM (FLSTM) model was developed by incorporating the advantage of the intuitionistic fuzzy logic (IFL). Most of the time series data generated from different fields including agriculture are not only fuzzy, but also exhibit nonlinear and non-stationary characteristics. A novel approach for forecasting complex time series data has been proposed as wavelet-based fuzzy LSTM (WaveFLSTM) model, specifically addressing the challenges posed by fuzzy, nonlinear, and non-stationary characteristics of time series. This model has advantage of denoising through maximal overlap discrete wavelet transform (MODWT) and integrating the advantage of fuzzy logic by means of IFL. The fuzzy relations with LSTM networks are applied to each of the denoised series by using membership and non-membership values through intuitionistic fuzzy c-means technique. The prediction accuracy of proposed WaveFLSTM model is compared with that of LSTM, FLSTM and WaveLSTM models using monthly wholesale price data of different pulse crops from various markets in India. The percentage gain in accuracy of the proposed model, as compared to

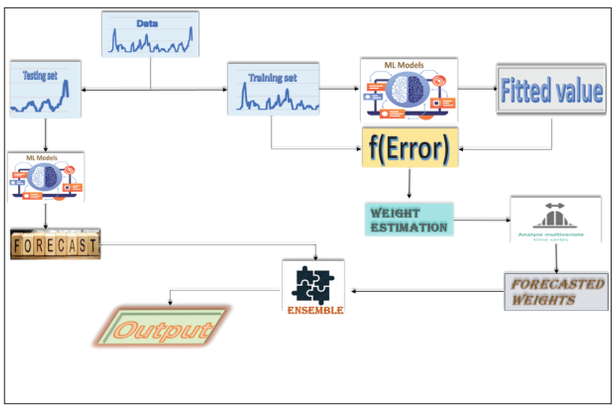
LSTM, WaveLSTM, and FLSTM, is found out to be 29%, 20%, and 14% respectively.

P-WEV: PSO based Weighted Ensemble Technique

Price volatility in agricultural commodities adds uncertainty for farmers, traders, and other stakeholders in the agricultural supply chain. Sudden price changes can disrupt income predictions, making it difficult to plan and access financing. This affects not only the farming community but also rural economies and livelihood of people involved in agriculture. An important aspect of agricultural economic stability i.e. modelling and prediction of food price volatility has been carried out. Volatility models, viz., the Generalized Autoregressive Conditional Heteroscedastic (GARCH) model, Glosten, Jagannatan, Runkle-GARCH (GJR-GARCH) model, Exponentially Weighted Moving Average (EWMA) model and Multiplicative Error Model (MEM), have been explored. In recent time, as the data becomes more complex and varied, it is difficult to fully understand price fluctuations with just one model. To tackle this, a novel approach called the Particle Swarm Optimization-based Weighted Ensemble Volatility Model (P-WEV) has been developed by combining predictions from four different models. To investigate the supremacy of the proposed model, data from 19 different commodities, including cereals, pulses, oilseeds, vegetables, and spices, from various markets of India have been used. Interestingly, it has been found that the proposed model outperformed the other benchmark models and proved precise estimate of volatility.

Dynamic Ensemble based Machine Learning Models

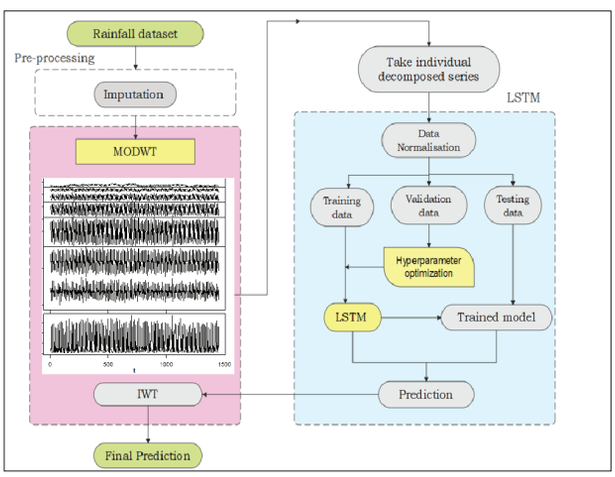
Efficient pest forewarning model has the potential to reduce costs and environmental impacts on farming. With the development of machine learning algorithms, it becomes feasible to develop efficient pest warning systems that incorporate lagged observations on pest incidence as well as the weather information. This study introduced a dynamic ensemble model with the absolute log error (ALE) and logistic error function by using four machine learning models *viz.* Artificial Neural Networks (ANN), Support Vector Regression (SVR), k-Nearest Neighbours (kNN), and Random Forest (RF). In order to capture the effect of different abiotic factors e.g. minimum and maximum temperature, rainfall, morning and evening relative humidity, the historical information on these variables have been incorporated into the model. The developed algorithms have been empirically compared with fixed weighted and unweighted ensemble methods, as well as candidate machine learning models, using pest population data of Yellow Stem Borer (YSB) in rice from two regions of India. Three performance metrics along with the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) algorithms have been employed for evaluation of predictive accuracy of proposed algorithm vis-a-vis other benchmark models. This study inferred that the proposed dynamic ensemble algorithm exhibited superior predictive accuracy for forecasting YSB infestations in rice crops.



Time dependent weighting scheme ensemble forecast approach.

MODWT- LSTM model

The proposed model combines Maximal Overlap Discrete Wavelet Transform (MODWT) with Long short Term memory (LSTM) for forecasting time series date. MODWT offers advantages over traditional preprocessing methods, such as Discrete Wavelet Transform (DWT), by providing a more flexible and efficient denoising technique. Additionally, the study focuses on optimizing hyperparameters to fine-tune the LSTM model, which further helps in fine-tuning the model. The culmination of proposed algorithm involves applying the inverse wavelet transform to the final predictions, ensuring the restoration of



Step involved in MODWT- LSTM model

the original data format. The implementation of the MODWT-LSTM model involves a systematic approach that combines wavelet decomposition and LSTM modeling as illustrated in the Figure.

Time Series Forecasting of Demand and Supply of Foodgrains in India

Developed an alternative approach to demand equation to forecast long term demand of foodgrain commodities using time series methods and their hybrid counterparts using machine learning techniques on the basis of yield data and per capita availability of calories. It doesn't require information on per capita consumption (PCC), elasticity of demand of commodity and per capita income growth rate unlike demand equation. Proposed approach to forecast supply is a novel approach which is based on forecasted yield and estimated average % loss of a commodity. Eventually supply-demand gap has been estimated, the findings may ease the policy planners in decision making. There is still a future scope to enhance forecast accuracy of yield to enhance accuracy of supply demand gap of the commodity. This work can be extended to the vegetable and fruit crops too to have a complete comprehensive knowledge about calories from agriculture field at state/ district level.

Artificial Intelligence /Machine Learning Models for Generating Yield Estimates of Crops Covered under Forecasting Agricultural output using Space, Agro-meteorology and Land based Observations (FASAL 2.0)

- Database of Crop Yield, Area and Production: A database has been designed and developed for the yield-related information of four crops: Rice, Cotton, Tur and Soybean. The database contains information regarding the yearly yields, area and production of the four crops district wise from 1997 to 2024. The relevant information has been acquired from the directorate of economics and Statistics, Govt. of India. The database has been developed using the Microsoft SQL Server technology.
- National and State-level Crop Yield Forecast: National and state-level yield forecasts were generated for the four crops using different machine learning techniques. While generating the national level yield forecasts several statistical models and machine learning models such as (ARIMA, TDNN, SVM, ARIMA-ANN-PSO (Hybrid), ARIMA-ANN-GA (Hybrid), ARIMA-ANN-ABC (Hybrid) were used on the yearly crop yield data. In this case yield forecasts were generated with <10% deviation. In case of state-level crop yield forecast, crop yield data is augmented with important weather parameters (such as Tmin, Tmax, Rainfall and RH) and trained the machine learning models.

Programme 3: DEVELOPMENT OF TECHNIQUES FOR PLANNING AND EXECUTION OF SURVEYS AND ANALYSIS OF DATA INCLUDING ECONOMIC PROBLEMS OF CURRENT INTEREST

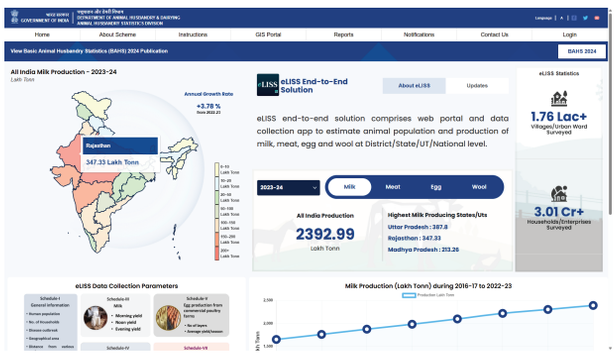
Food Loss Index (FLI) for India for inclusion of the SDG indicator 12.3.1 in the National Indicator Framework of India

Food Loss Index (FLI) for India is compiled using the methodology developed by Food and Agriculture Organization of the United Nations (FAO) and methodology for year wise estimation of food loss developed by ICAR-IASRI. The compilation of FLI for India is based on three national level post-harvest losses (PHL) surveys conducted using the methodology for estimation of quantitative harvest and post-harvest losses of major crops/commodities developed by ICAR-IASRI in collaboration with ICAR-CIPHET, Ludhiana. Assessment Report on FLI for including SDG indicator 12.3.1a in National Indicator Framework (NIF) of India was accepted by FAO, Rome and its inclusion in NIF is now recommended by Technical Advisory Committee (TAC) on SDG, Ministry of Statistics and Programme Implementation (MoSPI), Govt. of India.

Strengthened eLISS End-to-End Solution for major livestock products in India

The eLISS End-to-End Solution is a comprehensive digital platform (web portal + mobile app) designed to generate accurate livestock statistics (animal numbers, yield, production) for India at National, State/UT, and District levels. It employs a robust three-stage random sampling methodology and integrates all processes: real-time sample allocation, field data collection via extensive workforce (over 29,000 enumerators, 9,200 supervisors, 757 DNOs), three-tier supervision, real-time monitoring, automated validation, analysis, and estimation.

The platform currently supports surveys covering 3.01+ crore households/enterprises across 1,76,000 villages/urban wards, 900 slaughterhouses, and 33,000 commercial poultry farms. For effective implementation, extensive zone-wise training has



New Dashboard of eLISS Portal

equipped over 1,143 officials, supplemented by ongoing WhatsApp/email support.

Continuous enhancements include a new home dashboard with visualizations for production/growth rates (milk, meat, egg, wool), a report download module (commodity/animal/group-wise), and major app updates (v2.1 & v2.2). Recent innovations feature a real-time animal number suggestion model at the village/ward level to aid supervisors/DNOs during active surveys and an enhanced Automated Query Module with 4-stage tracking for all users.

Dedicated training includes a Leh workshop (850+ officials) and a national online session (1003+ officials) demonstrating new features. The system facilitates continuous zonal progress monitoring and has published an activity pamphlet.

Crucially, the eLISS analysis module generates seasonal estimates (summer, rainy, winter) for milk, meat, egg, and wool at granular levels across all 36 States/UTs, compiling these into the official Basic Animal Husbandry Statistics (BAHS) reports.

Geographically Weighted Spatially Integrated (GWSI) Estimator

A key objective of survey sampling is to make inferences about a finite population. However, large-scale surveys now face challenges such as rising data collection costs, increasing non-response rates, demand for detailed statistics, and the need for timely estimates. Data integration offers a solution by combining information from multiple surveys to provide more precise estimates. Developed a framework for integrating data from various surveys, addressing the challenge of spatial non-stationarity, where relationships between variables and covariates vary across locations. This study introduced a Geographically Weighted Spatially Integrated (GWSI) estimator for finite population totals by merging data from two independent surveys using spatial information. The statistical properties of the estimator were tested through spatial simulations, showing it outperforms traditional design-based estimators across different spatial populations. Additionally, a Spatial Proportionate Bootstrap (SPB) method was developed for variance estimation of the GWSI estimator.

Estimation of Unbiased Variance in Dual Frame Surveys

Dual frame (DF) surveys represent a specialized category within multiple frame (MF) surveys, involving two frames that collectively encompass the entire population. These surveys are particularly useful when one frame covers the entire population but is prohibitively expensive to sample, prompting the utilization of an alternative frame may not comprehensive, but more readily accessible. Estimating unbiased variance in dual frame surveys poses greater challenges compared to estimators in single frame surveys. The variance of the dual frame estimator incorporates population variances of distinct domains, typically unknown, further complicating the task of obtaining an unbiased variance estimate. To address this complexity, a method known as Post-stratified Rescaling Bootstrap with Unknown Domain size has been developed specifically for variance estimation of the dual frame estimator of population total. Through simulation analysis, the method has shown to offer an unbiased estimation of the variance of the dual frame estimator, outperforming standard bootstrap methods.

Calibration Estimator in Dual Frame Surveys under Two Stage Sampling

Calibration estimator of population total in dual frame surveys under two stage sampling framework was developed when auxiliary information is available at secondary stage unit level. The variance of proposed estimators has been derived using Taylor series expansion. The performance of proposed estimator was evaluated through simulation study. Simulation study demonstrated that the proposed estimator outperformed existing estimator.

Detection of Outliers in Survey-Weighted Linear Regression

Detecting outliers in complex survey data, which involves stratification, clustering, and unequal probability sampling, is particularly challenging due to the masking effect, where one outlier can obscure the detection of others. To address this issue, a masking factor has been introduced for survey-weighted linear regression, facilitating the identification of influential data points in such datasets. This methodology was applied to the Household Consumer Expenditure

dataset from the 68th round of the National Sample Survey Organization (NSSO), survey of India. Regression parameters were computed before and after detecting and removing outliers. The results demonstrated a reduction in the standard error of regression parameters for survey-weighted least squares models, showing that the presence of outliers in the context of masking can significantly impact the performance of both ordinary least squares (OLS) and survey-weighted least squares (SWLS) models.

Biomass and Carbon Mapping Across Altitudinal Gradient of Major Darjeeling and Sikkim Himalayan Land Uses: Implications for Carbon Sink Management and Mitigation

To map biomass and carbon levels across the altitudinal gradient of major land uses in the Darjeeling and Sikkim Himalayas, the data has been acquired, classifying Sentinel-2A satellite images using Random Forest and SVM algorithms on Google Earth Engine for land use and land cover identification. Additionally, surveys were conducted in Darjeeling, Kalimpong, and Sikkim using a random quadrat sampling method across 102 quadrats, where tree parameters were measured to estimate biomass and carbon levels. A regression model was developed to correlate estimated carbon with NDVI values, enabling tree carbon density classification into five categories through a pixel counting method.

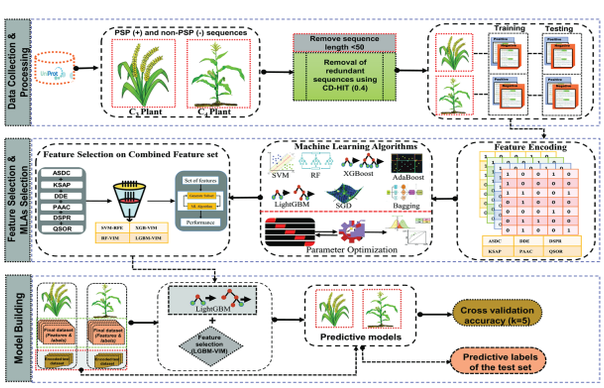
Global Challenge Research Fund (GCRF) South Asian Nitrogen Hub (SANH)

The dataset on paddy farmers from the 77th round of the National Sample Survey (NSSO), titled *"Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India"* (conducted from July 2018 to June 2019), was examined using models such as Multivariate Probit, Ordered Probit, Seemingly Unrelated Regression, Regression Adjustment, and the Stochastic Frontier approach. The analysis indicated that factors like the age and education of the household head, family size, and access to extension services significantly influence both the adoption and extent of sustainable input usage. Use of sustainable inputs was positively linked to higher harvest values. However, existing advisory services were found inadequate in promoting these practices. Technical efficiency analysis revealed considerable scope for improvement, reinforcing the importance of optimal input use and supporting wider promotion of sustainable practices in paddy cultivation.

Programme 4: MODELING AND SIMULATION TECHNIQUES IN BIOLOGICAL SYSTEMS

PredPSP: A Novel Computational Framework to Discover Pathway-Specific Photosynthetic Proteins in Plant

Photosynthetic proteins are essential for plant growth and agricultural productivity, particularly through their roles in C_3 and C_4 photosynthetic pathways. Despite their importance, current computational tools lack pathway-specific, plant-focused models for identifying these proteins. This study presents a novel sequence-based approach for predicting plant-specific photosynthetic proteins using an extensive dataset spanning diverse C_3 and C_4 plant species. We employed six deep learning and seven shallow learning algorithms along with six types of sequence-derived features. Feature selection using LightGBM-VIM identified optimal subsets for model training. The LightGBM model outperformed others, achieving



Graphical representation of the proposed computational model

auROC scores of 91.78% (C3) and 99.05% (C4) in cross-validation, and 87.23% (C3) and 92.83% (C4) on an independent validation set. Our approach demonstrated superior accuracy compared to existing methods. To support broader application, developed a web-based prediction tool, PredPSP (https://iasri-sg.icar.gov.in/predpsp/),enabling researchers to identify photosynthetic proteins in C3 and C4 plants. This is the first comprehensive computational framework specifically designed for this purpose and holds significant implications for plant functional genomics and crop improvement.

AScirRNA: A Novel Computational Approach to Discover Abiotic Stress-Responsive Circular Rnas in Plant Genome

Understanding stress-responsive regulatory mechanisms in plants is critical for developing climate-resilient crops. Circular RNAs (circRNAs),

recently recognized as important gene regulators, are emerging as key players in abiotic stress adaptation. This study introduces a machine learning-based framework for predicting abiotic stress-responsive circRNAs in plants. K-tuple nucleotide composition (KNC) and Pseudo-KNC (PKNC) features were used to represent circRNA sequences numerically. Three feature selection methods and twelve

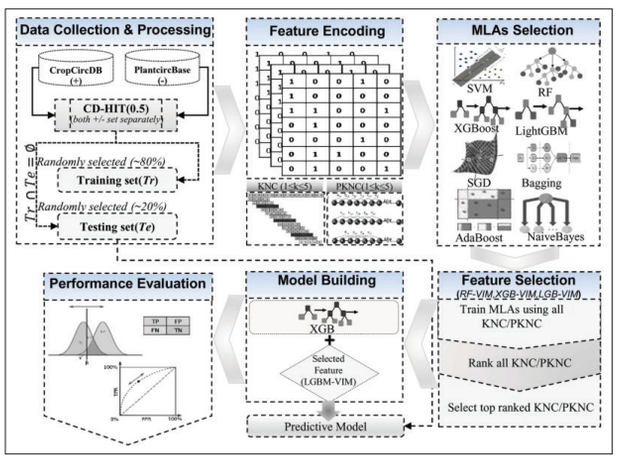


Illustration of the flow diagram depicting brief outline of the proposed computational approach

machine learning algorithms (eight shallow, four deep) were evaluated. The XGBoost model using 260 LightGBM-selected KNC features achieved the highest performance (Accuracy: 74.55%, auROC: 81.23%, auPRC: 76.52%). Similarly, for PKNC, the best model achieved 74.32% accuracy. Independent validation confirmed the robustness of the models. An online prediction tool, AScirRNA (https://iasri-sg.icar.gov.in/ascirna/), was developed to facilitate user access. This study presents a novel and practical computational resource for identifying stress-responsive circRNAs, aiding molecular breeding for stress-tolerant plant varieties.

Identification of Genes/ Genomic Regions Associated with Fusarium Head Blight Resistance in Wheat

Fusarium Head Blight (FHB)-resistant wheat lines were introgressed for breeding use. SNPs identified via GWAS were validated through genomic selection for prediction accuracy and can aid in MAS. Superior haplotypes were identified for haplotype-based breeding. Additionally, a comprehensive Fusarium Head Blight database was developed to support future research and breeding efforts.

Exploring the Molecular Regulatory Networks of Nutrient Use Efficiency and Grain Quality in Wheat

The study focused on understanding molecular regulatory networks related to nutrient use efficiency and grain quality in wheat under elevated CO_2 and heat stress to support climate-resilient wheat development. A total of 554 and 32 differentially expressed (DE) miRNAs were identified in HD2985 and HD2329, respectively, under nitrogen starvation. miR172 and miR166 were abundant across thermo-tolerant and susceptible cultivars. Twenty-five and thirteen novel miRNAs were discovered in HD2985 and HD2329 under heat stress. Key genes like can_6633 and can_5319 were cloned. De novo transcriptome and whole methylome sequencing were performed, identifying glutamine synthetase-related transcripts. Additionally, a potassium use efficiency database, TAPUeDb, was developed.

Meta-Analysis to Identify Core Transcriptomic Responses in *Penaeus vannamei* Under Biotic and Abiotic Stresses

This study aimed to identify the core transcriptomic responses in *Penaeus vannamei* subjected to various abiotic (temperature, salinity, pH, ammonia, nitrite) and biotic stress conditions (Vibrio, white spot syndrome virus, shrimp hemocyte iridescent virus) and to understand their functional significance. A total of 21 RNA-Seq datasets, including twelve abiotic and nine biotic stress conditions, were retrieved from NCBI database. The meta-analysis identified 961 DEGs under abiotic stress and 517 DEGs under biotic stress. A set of 19 core genes were upregulated under both abiotic and biotic stress conditions. Motif discovery using DREME software identified 61 motifs under abiotic stress and 56 motifs under biotic stress, with 17 motifs linked to both stress response. The identified metabolic pathways and regulatory motifs provide valuable insights into stress response mechanisms in *P. vannamei* and could aid in developing targeted stress management strategies in shrimp aquaculture.

Computational Profiling of Wheat Rhizosphere Core Microbiome for Nutrient and Disease Dynamics in Indo-Gangetic Plains (IGP)

Rhizospheric and bulk soil samples from wheat fields across eight locations in the Lower Indo-Gangetic Plains (IGP) were subjected to whole metagenome sequencing. Taxonomic annotation and relative abundance analyses were conducted using total reads per sample. Alpha and beta diversity assessments revealed that bulk soils exhibited higher microbial diversity than rhizospheric soils, except in Midnapore. Environmental factors such as EC, pH, and nutrients (N, Fe, K, P, S, OC%) showed significant correlations with Shannon diversity. The

dominant bacterial phyla included Actinobacteria, Proteobacteria, Bacillota, Bacteroidetes, and others in both soil types. Core rhizospheric microbiota was defined as taxa present across all sites, identifying 161 genera (8.9% of total taxa). Key genera with >0.5% relative abundance included *Streptomyces*, *Nocardioides*, *Sphingomonas*, and *Pseudomonas*, with *Streptomyces* being most dominant. Comparative analysis with middle and trans IGP revealed region-specific microbiota patterns, such as *Mycobacterium* in Middle IGP and *Pseudomonas* in Trans IGP.

HPpred: An Artificial Intelligence based Halophile Protein Prediction Server

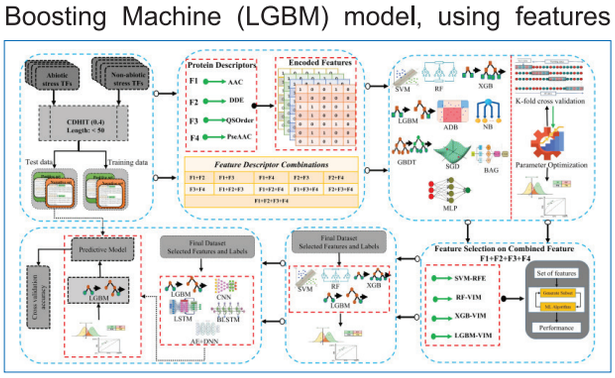
Halophiles are organisms that thrive in high-salt environments, playing crucial roles in various biotechnological applications, including bioremediation, salt-tolerant enzymes production, and the study of extremophiles. The ability to accurately identify halophilic proteins is essential for exploring these applications. Traditional methods of identification can be time-consuming and less accurate, necessitating the development of efficient predictive tools. The HPpred (Halophiles Protein Prediction) server is an innovative Artificial Intelligence (AI) based tool designed to determine whether a given protein sequence belongs to halophiles or non-halophiles. This work leverages the power of Natural Language Processing (NLP) through Term Frequency Inverse Document Frequency (TFIDF) vectorization and Machine Learning (ML) with Random Forest (RF) models, excelling in precise classification. HPpred offers flexibility by accepting both single protein sequences and CSV files, catering to various research needs. By generating TFIDF vectorizer embeddings, the server captures the intrinsic properties of sequences, enhancing prediction accuracy. It also allows users to download prediction results, facilitating further analysis and boosting research productivity.

Halophile Protein Database 2.0

Halophile Protein Database 2.0 (HProtDB 2.0) has been developed as a comprehensive resource of chemical and physical properties of halophilic proteins. The earlier version of database "HProtDB" contained the information related to 59897 protein sequences from 21 strains of halophilic archaea/bacteria. The three-tier web architecture has been used to develop the database. The web technologies used are HTML, CSS, and JavaScript for the front-end client-side user interface, PHP for server-side scripting and database connection, and MySQL as the back-end database. The database is accessible at http://webapp.cabgrid.res.in/proteindb2.0/index.php.

ASPTF: A Computational Tool to Predict Abiotic Stress-Responsive Transcription Factors in Plants by Employing Machine Learning Algorithms

Abiotic stresses significantly impact crop growth and yield, making the identification of stress-responsive transcription factors (TFs) critical for developing tolerant cultivars. This study presents a machine learning-based framework to predict TFs associated with abiotic stress response in plants. Four sequence-derived features were used to encode TF sequences numerically. The model was trained using ten shallow and four deep learning algorithms, along with feature selection techniques to identify informative inputs. The Light Gradient Boosting Machine (LGBM) model, using features



The diagram depicts the overall design of the entire computational approach

selected by the LGBM-Variable Importance Measure (LGBM-VIM), achieved the highest cross-validation accuracy (86.81%), auROC (92.98%), and auPRC (94.03%). Independent test set evaluation confirmed its robustness (accuracy: 81.98%, auROC: 90.65%, auPRC: 91.30%). To support broader application, the approach was deployed as an online prediction server named ASPTF (https://iasri-sg.icar.gov.in/asptf/). This tool is expected to complement experimental methods in identifying abiotic stress-responsive TFs in plants, aiding molecular breeding efforts.

National Network Project: Agri-Genomic Repository and Intelligent Analytical Systems

This study introduced an innovative binning approach for metagenomics data that combines Natural Language Processing (NLP) with a Deep Contrastive Convolutional Autoencoder (DCAE). NLP has been used for feature extraction, specifically focusing on Tetra-nucleotide frequency (TNF) through Count to Vec and Term Frequency-Inverse Document

Frequency (TF-IDF), further enriched by integrating GC-Content into their respective feature matrices. The DCAE, equipped with advanced convolutional layers and a contrastive loss function, excels at capturing intricate patterns in the data, providing a sophisticated representation for binning. By applying k-means clustering to the latent representations obtained from the DCAE, the proposed approach consistently achieves impressive results. To assess the performance of proposed method, three gold standard metagenomics benchmark datasets (10s, 25s, and Sharon datasets) have been utilized. Across all datasets, it has been observed that Silhouette Indices exceeding 0.6 and Rand Indices surpassing 0.8, demonstrating the superior performance of proposed method. Compared to existing methodologies, proposed approach not only surpasses the Rand Index and Silhouette Index of current unsupervised methods but also performs on par with semi-supervised methods across datasets. This underscores the effectiveness and versatility of our approach in metagenomics analysis.

Identification and Functional Characterization of Key Resistance/Susceptible Determinants for Sclerotinia Stem Rot Disease in Oilseed Brassica

High-quality RNA was extracted from ESR-01 inoculated and mock-inoculated stem tissues of both susceptible (NRCHB101) and tolerant (RH1222-28) plants, confirmed by A230/280 ratios (~1.83–2.1) and intact 28S and 18S rRNA bands. From transcriptome data, 33 DEGs (BT1) and 37 DEGs (BT2) related to defence response, including uncharacterized genes, were selected. Their in silico expression largely matched qRT-PCR results, showing time-dependent differential expression. Several genes, such as those encoding cellulose synthase, calmodulin-like protein, and subtilisin-like protease, were highly expressed in the tolerant line. Selected DEGs are now being prioritized for full-length cloning to develop overexpression constructs for Sclerotinia resistance.

ProkDBP: A Computational Tool for Prokaryotic DNA Binding Protein Prediction

Prokaryotic DNA-binding proteins (DBPs) are essential for gene regulation, DNA replication, and numerous cellular functions. Accurate identification of these proteins is critical for advancing microbial genomics and developing therapeutics. Existing generic prediction models often fall short in accurately predicting prokaryotic DBPs. To bridge this gap, we developed *ProkDBP*, a machine learning-based model tailored specifically for prokaryotic DBP prediction. The study employed nine shallow and five deep learning algorithms, with shallow models outperforming deep models. The Light Gradient Boosting Machine (LGBM), combined with evolutionarily relevant features selected through Random Forest Variable Importance Measure (RF-VIM), achieved the best results, with an auROC of 0.9534 and auPRC of 0.9575 in cross-validation. Independent validation also confirmed strong performance (auROC: 0.9332; auPRC: 0.9371). *ProkDBP* outperformed several state-of-the-art models and is freely accessible via an online webserver (https://iasri-sg.icar.gov.in/prokdbp/), providing a robust tool for researchers studying prokaryotic gene regulation and protein function.

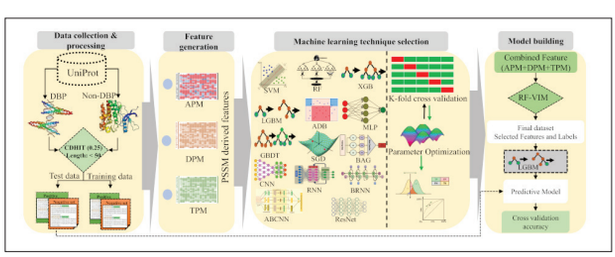


Illustration of the brief outline of the proposed approach

Development of Artificial Intelligence and Big Data Analytics based Framework for Predicting Protein-Ligand Interaction.

A dataset of 10,987 positive protein-ligand interactions was collected from the Protein Data Bank (PDB). Two negative datasets were generated: ND1 by excluding positive interactions from all possible combinations of 2,429 unique proteins and 800 ligands, and another using a network-based approach. Protein and ligand features were extracted using ProtFeat and RDKit python module, respectively, to train interaction prediction models. A transformer-based model achieved the highest accuracy of 90% on the ND1 dataset. Additionally, a Machine Learning-based Virtual Screening (ML-VS) web server was developed to efficiently identify bioactive natural compounds for drug discovery and agriculture. The web server allows user to input molecular structures (protein), which are then screened against a curated natural products database. The web server is user-friendly and is developed using Python Flask Framework. A Plant-derived Natural Products Database (DPNP) has also been developed.

Report on Genomic Insights into *Momordica balsamina*

This study presents the first high-quality chromosome-level genome assembly of *Momordica balsamina*, with a total genome size of 384.90 Mb and an N50 value of 30.96 Mb, generated using 10x Genomics,

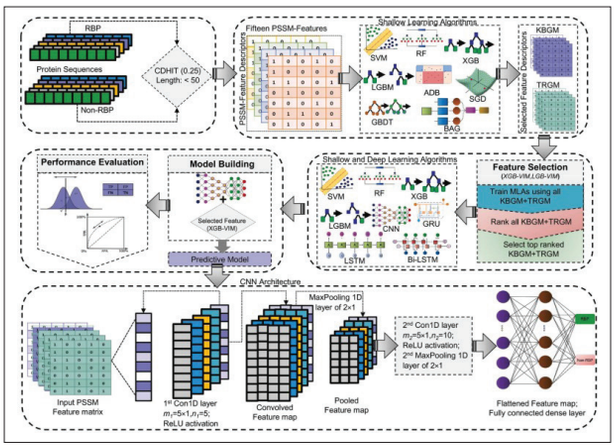
Nanopore, and Hi-C sequencing platforms. The genome annotation identified 6,32,098 transposable elements, 2,15,379 SSRs, 5,67,483 transcription factor binding sites, 3,376 noncoding RNAs, and 41,652 protein-coding genes. Key genes related to disease resistance, heat and salt stress, carotenoids, cucurbitacins, terpenes, antioxidants, and sex determination were characterized. This genomic resource, accessible at http://webtom.cabgrid.res.in/mbger/, provides critical insights for comparative genomics, genome evolution, and future breeding strategies aimed at improving bitter gourd under climate stress and growing medicinal demand.

Mapping QTLs and Uncovering Candidate Genes Controlling Shelf-Life Traits in Cucumber

Cucumber, a highly perishable vegetable, suffers from limited shelf-life, making genetic improvement for post-harvest longevity essential. A naturally long-lasting variant, DC-48, was used to investigate the genetic basis of extended shelf-life and identify associated genomic regions. Structural differences in the epicarp, detected through scanning electron microscopy, along with signs of programmed cell death (PCD) and senescence-related dark spots (SRDS), were observed in short-lived fruits. Traits such as colour retention, firmness, absence of shrinkage, and stable endocarp pH were associated with longer shelf-life. Colour retention followed a single recessive gene, while other traits showed polygenic inheritance. QTL-seq identified a major QTL on chromosome 4 (5.01 Mb), linked to colour retention, and validated through PCR-based mapping in F_2 populations. Transcriptome analysis revealed two candidate genes: Csa_4G000860 and Csa_4G016490. Two closely linked markers, InDel 861 and InDel 016, were developed for marker-assisted selection. This study offers critical insights for improving cucumber shelf-life through molecular breeding.

RBProkCNN: Deep Learning on Appropriate Contextual Evolutionary Information for Rna Binding Protein Discovery in Prokaryotes

RNA-binding proteins (RBPs) play vital roles in post-transcriptional regulation, mRNA stability, and environmental adaptation in prokaryotes. While most studies have focused on eukaryotic RBPs, emerging evidence highlights the significance of prokaryotic RBPs. However, current computational tools often lack specificity for prokaryotes, limiting prediction accuracy. To address this, we developed *RBProkCNN*, a novel deep learning-based model specifically designed to predict prokaryotic RBPs.



Flow diagram depicts the different steps followed to develop the proposed approach

The model integrates evolutionary features derived from Position-Specific Scoring Matrices (PSSM) and applies a Convolutional Neural Network (CNN) with feature selection via extreme gradient boosting variable importance (XGB-VIM). *RBProkCNN* outperformed existing models, achieving an auROC of 98.04% and auPRC of 98.19% in five-fold cross-validation, and maintained strong performance on an independent dataset (auROC: 95.77%, auPRC: 95.78%). The model is deployed as a freely accessible online tool at https://iasri-sg.icar.gov.in/rbprokcnn/, providing researchers with an efficient and accurate resource for prokaryotic RBP prediction.

Physio-chemical and Molecular Modulation Reveals Underlying Drought Resilience Mechanisms In Cucumber (*Cucumis Sativus* L.)

Despite its role as a model plant, cucumber's resilience to drought has been underexplored. Researchers assessed core cucumber genotypes and identified both tolerant and susceptible lines. Under drought stress, tolerant genotypes maintained robust root systems for deeper water uptake and showed higher photosynthetic and water use efficiency, membrane stability, and consistent yield. These lines also exhibited reduced pollen viability loss and stomatal conductance. Biochemically, they showed increased expression and activity of ROS-scavenging enzymes (SOD, CAT, APX), higher soluble protein levels, and proline accumulation. Molecular analysis identified key drought-responsive genes such as LEA4, HSP70, NAC, AP2/ERF, MBF, and MybTF as critical to stress adaptation. Tolerant genotypes also had greater canopy temperature depression and minimal decline in Fv/Fm ratios. This comprehensive study provides a valuable foundation for developing climate-resilient cucumber cultivars via molecular breeding and genomics.

NPStability: A Non-Parametric Stability Analysis Framework for Unequal Replication

Genotype-by-environment interactions (G×E) play a crucial role in agricultural research, influencing the identification of stable genotypes. This study evaluates the stability of genotypes using non-parametric measures, incorporating Kang's rank-based method, Shukla's variance, Rank-Based Stability Index (RSI), and PCA biplot analysis. The proposed framework accommodates datasets with unequal replication, providing robust insights into genotype performance across diverse environments. Python implementations were developed for seamless analysis, enabling data-driven decision-making in crop improvement programs. This computational approach was also integrated into an online prediction tool, NPStability (http://sgd_iasri.icar.gov.in/NPStability/) for find the rank of stable genotype by the users. Both the proposed model and the developed tool are poised to augment ongoing efforts in identifying stable genotypes among the environment.

Whole Genome-based Identification of Bahd Acyltransferase Gene Involved in Piperine Biosynthetic Pathway in Black Pepper

Genomic analysis of black pepper (*Piper nigrum*) revealed six BAHD acyltransferase (BAHD-AT) isoforms, a critical enzyme in the final step of piperine biosynthesis, each located on a distinct chromosome. Isoform-specific qPCR was performed across multiple tissues and berry developmental stages. The isoform on chromosome 6 showed a strong expression correlation with piperine levels, indicating its likely role in biosynthesis. Promoter analysis identified MYB transcription factor binding sites. In-silico docking and molecular dynamics simulations confirmed the chromosome 6 isoform had the strongest ligand affinity, supporting its functional relevance.

Comparative Genome and Transcriptome Analysis of *Tilletia indica* to Identify Causal Genes of Pathogenicity in Karnal Bunt of Wheat

This study reports the first draft genomes of *Tilletia indica* (PSWKBGD-3 dikaryon and two monosporidial lines PSWKBGH-1 and PSWKBGH-2), sequenced using Illumina and PacBio platforms. Genome annotation and comparative analyses were conducted to extract polymorphic SSR markers. Transcriptomic profiling of infected grains of wheat cultivar WL711 at 24 hours, 48 hours, and 7 days post-inoculation revealed dikaryon-specific gene expression patterns. The dikaryon showed distinct upregulation of 54, 529, and 87 genes, while wheat exhibited 23, 17, and 52 host genes upregulated during these time points, indicating key plant-pathogen interactions. This data is compiled in TiGeR (http://backlin.cabgrid.res.in/tiger/), the first genomic resource for *T. indica*. Additionally, transcriptome analysis of resistant (CS-319) and susceptible (JAL-42) groundnut genotypes infected with *Sclerotium rolfsii* revealed 7,796 DEGs. Resistance was associated with early induction of defence genes, especially WRKY transcription factors, and secondary metabolism pathways. A regulatory network of 59 hub genes and 88,424 markers was developed, supporting breeding strategies for disease resistance.

Genome Assembly and Functional Annotation of Multicapsid Nucleopolyhedro Virus Infecting *Spilosoma Obliqua*, A Major Agricultural Pest

Spilosoma obliqua nucleopolyhedrovirus (SpobNPV) is an effective biocontrol agent targeting the polyphagous pest *Spilosoma obliqua*. In this study, the genome of a North Indian isolate, SpobMNPV, was sequenced, revealing a length of 136,141 base pairs with 139 putative open reading frames (ORFs) distributed across both DNA strands. SpobMNPV shares 97.91% nucleotide identity with *Hyphantria cunea* NPV (HycuNPV). All 38 core baculovirus genes were identified, with notable differences compared to the Manipur isolate of SpobNPV. Seven homologous regions (hrs), each containing repeated 67-bp units and central 30-bp palindromes, were identified. These sequences showed conserved motifs matching those in other Group I alphabaculoviruses. Phylogenetic analysis grouped SpobMNPV closely with HycuNPV. This is the first complete genome report of SpobMNPV from North India, contributing valuable genomic data to the baculovirus database and supporting its application in integrated pest management of *S. obliqua*, which threatens several important crops.

Characterization of Rice (*Oryza Sativa* L.) Landraces from Majuli and Surrounding Riverine Ecologies in Assam

Rice landraces from the fragile riverine zones around Majuli Island in Assam play a vital role in local farming and offer valuable traits for breeding flood-tolerant rice. In collaboration with ICAR-NRRI, 87 landraces from Majuli, Dhemaji, and North Lakhimpur were evaluated for 36 agro-morphological traits, submergence tolerance, and SSR marker diversity. Multivariate analysis highlighted plant

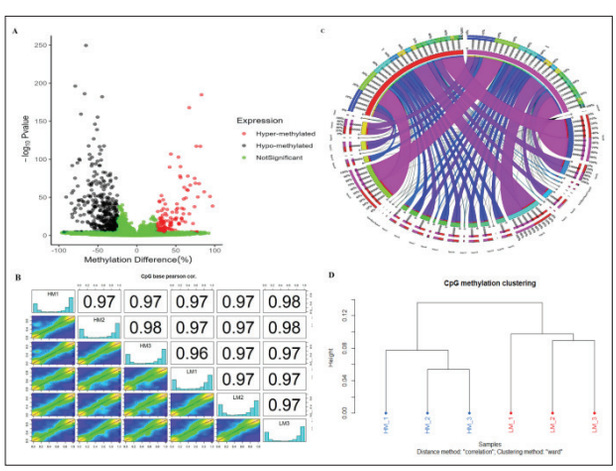
height, grain and leaf features, and tillering as key differentiators. Sixty-six SSR markers identified 271 alleles, forming two genetic clusters. Deep-water Bao landraces showed the greatest diversity, linking to aus and wild types, while Sali and Bora grouped with indica. Nearly 47% of the accessions tolerated two-week submergence, with 64% and 57% carrying the SUB1A-1 and SNORKEL genes. This study highlights the genetic and phenotypic richness of these landraces and their potential for breeding flood-resilient rice, contributing to sustainable cultivation in flood-prone areas.

Characterization of Genetic Diversity in *Sclerotium Rolfsii* Isolates Through Mycelial Compatibility Group Mapping and Multilocus Sequence Analysis

Sclerotium rolfsii, a plant pathogenic fungus, explores its genetic diversity and population structure to aid in disease management. Fifty isolates from different regions and host plants, using two genes, TEF1α and RPB2 has been analysed, to assess genetic diversity. The results revealed 10 distinct mycelial compatibility groups (MCGs), which were characterized by genetic sequencing. Combining data from both TEF1α and RPB2 allowed for precise differentiation of MCGs, even those that appeared similar when analyzed separately. The study also highlights the importance of understanding the virulence characteristics of the fungus, categorizing isolates based on disease severity. Geographic patterns in virulence suggest regional factors influence disease behavior, which could inform targeted disease control strategies.

Exploring Epigenetic Regulation of Growth and Development in *Clarias Magur* (Hamilton, 1822) Through DNA Methylation Profiling

This study investigated DNA methylation patterns in genetically selected *Clarias magur* stocks using reduced representation bisulfite sequencing (RRBS), generating 249.22 million reads and identifying 4,90,120 methylation sites across exonic, intronic, and intergenic regions. A total of 896 differentially methylated regions (DMRs) were found with356 hypermethylated and 540 hypomethylated linked to 895 genes. Gene enrichment analysis revealed roles in RNA biosynthesis, nervous system development, and growth factor responses. Key differentially methylated genes (e.g., *myrip*, *mylk3*, *mafb*, *egr3*) were linked to growth and confirmed via real-time PCR.



Emerging Trends in Wheat Research: A Scientometric Analysis of Ploidy and Its Impact on Scientific Landscapes

Wheat, a key global staple, is poised to meet rising demand due to its nutritional value. Modern wheat has evolved through hybridization with ancestral species like Einkorn, Emmer, and Aegilops, each contributing distinct genetic traits. This study analyzed PubMed data to assess research trends in wheat domestication across different ploidy levels. Over the past three decades, wheat research has grown exponentially, with China leading in publications. However, research on ancient wheat species like Einkorn and Aegilops lags significantly behind common wheat, highlighting a need for increased focus. Key research themes include climate stress, genetic resistance, and molecular breeding, with a particular emphasis on Einkorn's potential to improve wheat adaptability. Research on Emmer centers on pasta production, while Aegilops is studied for its genetic resistance and contribution to wheat breeding. Emerging topics like bio-control and celiac disease indicate future directions for wheat research, focusing on sustainability and health.

Identifying Novel SNPs for Root Nodulation and Agronomic Traits in Chickpea Through Genome-Wide Association Mapping

Chickpea (*Cicer arietinum* L.) is recognized for its climate adaptability and nitrogen-fixing ability via symbiosis with *Mesorhizobium ciceri*, offering a sustainable alternative amid rising fertilizer demands. This study investigated the genetic basis of nodulation using a panel of 271 globally sourced genotypes. Phenotypic data for nodulation and 12 yield-related traits were collected from four locations. Genome-wide association studies (GWAS) using 6,02,344 SNPs from whole-genome resequencing revealed considerable genetic diversity. Linkage disequilibrium decay was 37.3 Mb, indicating defined inheritance blocks. BLINK and FarmCPU models identified 450 and 632 marker-trait associations (MTAs), respectively, with 75 stable MTAs linked to nodulation, involving auxin and nod factor transporter genesoffering key targets for marker-assisted breeding.

Genome-wide Association Study Identified Qtls and Genes Underlying Early Seedling Vigour in Aus Rice (*Oryza sativa* L.)

Early seedling vigour (ESV) plays a crucial role in establishing strong early growth, improving stress resilience, and boosting yield, particularly in direct-seeded rice (DSR) systems. This study evaluated 181 aus rice accessions under field conditions for seven ESV-related traits, flowering time, and yield. Significant trait variation was found, with vegetative vigour showing strong correlations with yield and growth, emphasizing its breeding value. A subpopulation of early-maturing, drought-tolerant accessions exhibited superior ESV. Genome-wide association studies (GWAS) using 918,863 SNPs revealed 14 QTLs, including seven novel loci. Candidate genes such as *OsPDR1*, *NCKAP1*, and *OsSAUR10* were linked to hormonal pathways regulating seedling vigour. This work highlights valuable targets for improving DSR-adapted rice varieties.

Identification of Hub Genes Associated with Stripe Rust Disease in Wheat Through Integrative Transcriptome and Gene-Based Association Study

Stripe rust is a major threat to global wheat production, with resistance genes offering a key control strategy. However, the molecular basis of many *Yr* genes remains unclear. This study used transcriptome analysis to investigate resistance in two wheat cultivars susceptible PBW343 and resistant FLW30 challenged with *Puccinia striiformis* pathotype 46S119. Leaf samples collected at 12, 48, and 72 hours post-inoculation revealed 18,482 differentially expressed genes (DEGs). A set of 159 genes showed significant GWAS association ($P \leq 0.05$). Weighted Gene Co-expression Network Analysis (WGCNA) identified key gene modules, including 924 DEGs and 79 GWAS-linked genes. Four potential defence-related genes, including two hub genes, were functionally validated.

Comprehensive study of genetic diversity, population structure and Haplotype blocks of an ancient hexaploid wheat species *Triticum sphaerococcum* using SNP markers.

Understanding genetic diversity and population structure is essential for improving breeding strategies and ensuring crop resilience. Wheat is a key global staple, and addressing challenges like climate variability, stagnant yields, and reduced genetic diversity requires the development of novel germplasms. *Triticum sphaerococcum*, an underutilized hexaploid wheat species, offers untapped alleles for genetic improvement. This study is the first to assess the genetic diversity of 116 *T. sphaerococcum* accessions using a 35K SNP array. The accessions clustered into four subpopulations, supported by PCoA. Subgenome B showed the highest diversity. AMOVA indicated 35% variation among groups. SP4 had the most genetic richness, and the D subgenome exhibited the fastest LD decay.

Identification of Meta QTL for Powdery Mildew Resistance in Wheat

Powdery mildew (PM), caused by *Blumeria graminis* f. sp. *tritici*, remains a serious challenge for wheat cultivation, necessitating the development of genetically resistant varieties. Understanding the genetic basis of PM resistance is critical for durable control. This study applied meta-QTL (MQTL) analysis to identify consistent genomic regions associated with PM resistance. A total of 222 QTLs from 33 studies were integrated using a consensus map with 54,672 markers, resulting in 39 MQTLs, including 9 high-confidence MQTLs (hcMQTLs). Eighteen MQTLs overlapped with known PM resistance genes, and 256 candidate genes were identified within hcMQTLs. These findings offer valuable resources for marker-assisted breeding and functional genomics to develop resistant wheat varieties.

Plant Circular RNA Database

Developed a Plant Circular RNA Database, which

include the circRNA from Arabidopsis, rice and tomato. In this study, we conducted a comprehensive genome-wide analysis to identify and annotate circRNAs from three significant crop species, *Arabidopsis thailiana*, *Oryza sativa* and *Solanum lycopersicum* using Ribominus RNA-seq data.

MbGeR: *Momordica balsamina* Genomic Resource

A comprehensive web-genome resource named MbGeR has been developed for *Momordica balsamina*,. This three-tier database, built using PHP, MySQL, HTML, and Apache, catalogs 6,00,803 transposable elements, 3,096 noncoding RNA genes, and 51,867 protein-coding genes. It includes genes related to disease resistance (4,421), heat (70), salt (15) stress, cucurbitacin (237), terpenes (20), antioxidants (37), and sex determination (6). This resource aids marker discovery and supports interspecific introgression breeding and genomic research.

CoreDECAP: Core Development Evaluation Comparative Analysis Platform

CoreDECAP is a user-friendly Shiny application developed in R for efficient core sampling and comparative analysis of datasets. It allows users to extract representative core samples and perform insightful comparisons with the complete dataset, helping to identify key patterns and trends. Designed with a focus on simplicity and scientific rigor, CoreDECAP streamlines data exploration through interactive visualizations and advanced analytical features. Built using R's Shiny framework, the platform ensures robust functionality and ease of use, making it an essential tool for researchers and analysts seeking to derive meaningful insights from large or complex datasets.

KadakExpress: A Comprehensive Tissue-Specific Gene Expression Atlas of Unique Black Meat Indian Chicken Breed

KadakExpress is a transcriptomic atlas database covering 16 tissues from common domestic animals like pigs, sheep, goats, donkeys, chickens, and water buffalo. It enables identification of tissue-specific and broadly expressed genes, supporting studies on economically important traits and domestication. The integrated BLAST tool aids in annotating unknown genes, and a developed pipeline allows cross-species gene mining, facilitating genetic improvement and understanding of gene–environment interactions.

Development of Artificial Intelligence Based Model and Tool for Genomic Studies.

Developed AI-based models and tools to support genomic studies, focusing on genome sequence coverage and gene-wise analysis. Introduced GSCIT, a smart hash table-based method for efficient genome sequence coverage inspection. Developed a novel graphical tool for gene-specific GC content analysis across viral genomes, enhancing visualization and trend analysis. Enabled faster and more accurate genomic computations, contributing to advancements in plant and viral genome research.

Other Developed Webservers/ Databases:

1. **GARUD** (Genetically Aggregated Rice User-interface Database): A comprehensive online repository dedicated to Indian rice varieties, providing essential information on released rice (1,200+ varieties) types along with extensive genomic data available at https://rice-garud.icar-web.com/.
2. **MustardFamilyExplorer** (Varietal and Molecular Information Bank for the Indian Mustard Family): Developed in association with ICAR-NIPB, New Delhi, an online repository offering extensive genetic and varietal information on rapeseed (canola) and mustard crops available at https://mustardfamilyexplorer.icar-web.com/index.html.
3. **DeepCFixEC**: Online server for prediction of enzymes involved in Carbon Fixation pathways is available at http://iasri-bird.icar.gov.in/DeepCFixEC
4. **PhytoMicroBioPred:** A machine learning-based web application, for predicting compound bioactivity against plant and microbial target proteins accessible at http://login1.cabgrid.res.in:5260/.
5. **MgSatDB:** A Marigold Microsatellite Marker database offers various customized search options to support future marigold breeding and improvement programs and is accessible at http://backlin.cabgrid.res.in/mgsatdb/.
6. **DPNP (Database of Plant-derived Natural Products):** Database of Plants-derived Natural Products (DPNP) reported in scientific literature. The database contains 262 plant species of 5,281 compounds, collected through text mining approaches available at http://login1.cabgrid.res.in:5310/
7. **OpEnHiMR:** Optimization Based Ensemble Model for Prediction of Histone Modifications in Rice available at http://cabgrid.res.in:5169/
8. **MoringaGDb:** Moringa Genome database available at http://webapp.cabgrid.res.in/moringadb/index.php
9. **Tribulus Database:** Tribulus Database, developed from the transcriptome analysis

conducted in this study of *T. terrestris*, offers a significant resource for plant breeders available at http://webapp.cabgrid.res.in/tribulusdb/.

10. **ArecaSatDB-** A comprehensive microsatellite database of genus Areca containing microsatellite markers mined from shallow sequencing data of three Areca species: *A. catechu, A. concinna* and *A. triandra* available at http://webapp.cabgrid.res.in/Arecacatechu//
11. **BuffExDb:** Web-based tissue-specific gene expression resource for breeding and conservation programs in *Bubalus bubalis* available at http://46.202.167.198/buffex/
12. **FEAtl:** A Comprehensive web-based Expression Atlas for functional genomics in Tropical and Subtropical Fruit Crops available at http://backlin.cabgrid.res.in/FEAtl/
13. **CyExpDB:** Cyprinidae Expression Database and its Genome Browser available at http://backlin.cabgrid.res.in/cyexpdb/
14. **MLDeCNV:** A machine-learning approach for accurate detection of copy number variants from whole genome sequencing available at http://login1.cabgrid.res.in:5106
15. **BgDb:** Bitter Gourd Resource Database available at http://backlin.cabgrid.res.in/bgdb/
16. **GPS:** A Computational Intelligence based Tool for the Discovery of G4 Motifs with their Folding Status from G4Seq data available at http://login1.cabgrid.res.in:5055
17. **IfProcQC:** A Shiny-based interactive application developed for quality control in label-free proteomics datasets available at http://dabinshiny.shinyapps.io/IfproQC
18. **WebCoreR:** R Shiny application designed for comprehensive core microbiome analysis, offering an interactive platform to identify, test, and visualize groups of microorganisms consistently present across multiple samples or conditions available at http://omics.icargov.in/WebCoreR
19. **TaCircRNADb**: A valuable resource for the identification and analysis of genes, pathways, miRNA targets and circular RNAs in wheat available at http://webapp.cabgrid.res.in/Tacircrnadb/index.php
20. **WebCoreM**: A Web Application for Core Microbiome Identification in Metagenomics Data available at http://omics.icar.gov.in/WebCoreM/

Programme 5: DEVELOPMENT OF INFORMATICS IN AGRICULTURAL RESEARCH

ICAR Research Data Repository for Knowledge Management

Strengthened all central data repositories including repository for publications, technologies, unit level data, video, audio, mobile apps, IP resources (patents, copyrights, variety registration), varieties developed, image, geo-portal, MasterVocab, Infographics Dashboard including Institute and Scientist Profile, single window access to ICT initiatives. Following new modules/applications/repositories/facility have been developed:

- Technology Product: Developed workflow based Spring boot with CAS enabled 'Technology product application' for uploading and review of the technology, products, process, concept, methodology, model, protocol policy developed by the ICAR Institutes and is available at https://krishi.icar.gov.in/technologyproduct/. It has been approved in ICT Steering Committee meeting. Henceforth, all proposals of technology certification will be submitted through this application after approval of ITMC.
- Unit Level Data Repository: Developed the website of IARI Assam and made live on server.

Lightweight DenseNet Model for Plant Disease Diagnosis

Plant disease diagnosis holds significant economic importance worldwide. To tackle this issue, advanced agricultural technologies are being developed to help farmers implement preventive measures and enhance crop production. With the advancement of deep learning, convolutional neural networks (CNNs) have proven highly effective in detecting plant leaf diseases. However, traditional CNN models demand substantial computational power and processing costs. To address this, a lightweight deep convolutional neural network, Lightweight DenseNet (LWDN), has been designed for plant leaf disease detection. Based on DenseNet121, LWDN features a pruned and concatenated architecture. It was trained on the Plant Village dataset using partial layer freezing, transfer learning, and feature fusion techniques. The model achieved 99.37% accuracy, with a compact 13.8 Mb size and 1.5M parameters, significantly reducing computational requirements compared to InceptionV3, Xception, VGG16, and MobileNetV2. Due to its efficiency and accuracy, LWDN is ideal for real-time plant disease diagnosis on mobile and portable devices.

Knowledge Management System for Agriculture Extension Services in Indian NARES (KVK Portal)

- E-Governance of Activities: In a workflow based

application, monthly progress report (MPR) is entered by KVKs and the information is vetted by ATARI. Developed a functionality to view the ATARIs and KVKs wise MPR report at Monthly, Quarterly and Yearly level and Export to Excel information in the reports.

- Data Exchange with API with Other Portals: Following Month wise KVK KPIs data of Farmer Training, Mobile Agro Advisories and Agriculture Extension Activities have been submitted to the DARPAN dashboard. Following new APIs have been developed:

  (a) Monthly Data Exchange on Darpan Dashboard based on number of planting materials produced (in thousand);

  (b) Six Monthly Data Exchange on Darpan Dashboard based on KPIs on (i) number of vocational training for youth and number of participants; (ii) number of trainings and number of extension personnel trained; (iii) number of skill development trainings conducted and number of participants; (iv) farm area (in ha), livestock (in number), number of oft conducted and number of farmer benefitted in on-farm trials; (v) farm area (in ha), livestock (in number), number of trials conducted and number of farmer benefitted through front line demonstration and (vi) number of soil sample tested, number of water sample tested, number of plant sample tested, number of manure sample tested

  (c) Annual Data Exchange on Darpan Dashboard based on KPIs: Quantity of Seed Produced (In Quintals)

Machine Learning Model for Prediction of Grassland Productivity in Amrit Mahal Grassland

A comprehensive grassland survey was conducted in the Amrit Mahal grasslands across six Karnataka districts such as Davangere, Chitradurga, Tumkur, Mandya, Hassan, and Chikkamagaluru from 27 November to 10 December 2024. Soil sampling and vegetation surveys were carried out at 220 locations. Comparative analysis of biophysical parameters between 2014 and 2024 revealed a notable rise in land surface temperature and a 5-23% decline in grassland area. While grassland productivity improved in Mandya, Hassan, and Chikkamagaluru, it declined in Tumkur and Davangere. Using nine machine learning algorithms for biomass prediction, Random Forest (RF) and eXtreme Gradient Boosting (XGBoost) emerged as the best performers. Biomass productivity ranged between 1.61 and 4.25 tons per hectare. Soil parameters such as organic carbon, nitrogen, and phosphorus showed varied influence on productivity, while elevation and slope were found to significantly impact biomass yield.

Landscape Diagnostic Survey of Cotton Production Practices and Crop Performance in Maharashtra

A Landscape Diagnostic Survey (LDS) proforma was developed to assess cotton crop performance across 10 districts of Maharashtra. Data collection was carried out using KoboCollect, an Android-based app linked to KoboToolbox. Statistical analysis, including multiple linear regression, was performed to identify key variables influencing cotton yield. For the combined data, significant yield-determining factors included irrigation status, soil type, intercropping, hybrid variety count, sowing method and date, ploughing type and method, sowing bed type, hand weeding frequency, and pesticide spray count. District-wise analysis also identified critical yield variables. The model's R^2 values ranged from 50% to 80%, indicating moderate to strong predictive accuracy.

SWINE-SHRIA (Smart Heuristic Response based Intelligent Assistant)

The SWINE-SHRIA chatbot, is a cutting-edge educational platform for effective swine management. It has been designed to provide personalized swine farming guidance, innovative solutions, and expert advice, to unlock new realms of productivity and profitability. The chatbot has been developed using

advanced Natural Language Processing (NLP) algorithms to carry out a real-time conversation with its users. It can understand and communicate in 10 different Indian languages, ensuring accessibility and inclusivity for a diverse range of stakeholders. A web-based dashboard to monitor the usage statistics of this bot has been developed and is freely available at https://swineshria.icar.gov.in. The chatbot is available as a mobile application in Google play store at https://play.google.com/store/apps/details?id=com.ivriapp.ivri_chatbot.ivrichatbotswine&pli=1

Digital Initiatives for Agricultural Education

- Strengthened Artificial Intelligence based Disease Identification System for Crops (AI-DISC): Now identifies a total of 67 diseases of 23 different crops (55 diseases of 20 crops reported earlier) and 47 pests across 8 crops (19 insects of 3 crops reported earlier) using photograph in natural background. The details of the crops, diseases and insects covered is given in the following table.

Crop	Diseases
Rice	Bacterial Leaf Blight, Brown Spot, False Smut, Blast, Sheath Blight, Narrow Brown Leaf Spot, Tungro, Sheath Rot
Wheat	Brown Rust, Black Rust, Yellow Rust
Maize	Maydis Leaf Blight (Mlb), Turcicum Leaf Blight (Tlb), Common Rust, Brown Stripe Downy Mildew, Curvularia Leaf Spot, Banded Leaf & Sheath Blight, Sorghum Downy Mildew
Tomato	Early Blight, Late Blight, Leaf Curl, Target Leaf Spot
Mustard	Alternaria Blight, Powdery Mildew, White Rust
Cotton	Fusarium Wilt, Bacterial Blight, Bacterial Blight, Alternaria Leaf Spot
Brinjal	Early Blight, Phomopsis Leaf Blight, Little Leaf, Phomopsis Leaf Blight
Apple	Alternaria Leaf Blotch, Apple Mosaic Virus, Apple Scab, Marssonina Leaf Blotch
Peach	Leaf Curl, Shot Hole
Kinnow	Citrus Canker, Fruit Rot, Greening
Mandarin	Dieback, Sooty Mold
Assam Lemon	Citrus Greening, Citrus Tristeza Virus
Chickpea	Collar Rot, Root Rot, Wilt
Green Gram	Powdery Mildew, Yellow Mosaic
Cluster Bean	Bacterial Blight, Powdery Mildew
Moth Bean	Crinkle Virus, Yellow Vein Mosaic
Cucurbits	Alternaria Leaf Spot
Chilli	Anthracnose, Leaf Curl Virus
Coriander	Powdery Mildew, Stem Gall
Soybean	Cercospora Spot,Powdery Mildew
Potato	Bacterial_Wilt, Early_Blight, Late_Blight, Phoma_Leaf_Roll, Potato_Mosaic
Grapes	Anthracnose, Downy_Mildew, Powdery_Mildew
Mango	Anthracnose, Powdery_Mildew

Crop	Insect-pests
Rice	Rice leaf folder, Rice Grasshopper, Rice horned caterpillar, Rice skipper, Rice stem borer, White stem borer, Yellow stem borer (YSB)
Cotton	Aphid, Jassid, Cotton Leaf Roller, Leafhopper, Mealybug, Thrips, Whitefly, Dusky Cotton Bug, Pink bollworm, Red cotton bug
Maize	Aphid, Fall Army Worm, Stem Borer, Pink stem borer
Chilli	Aphid, Fruit borer, Fruit borer, Thrips, Whitefly, Lady bird beetle, Tobacco caterpillar
Wheat	Thrips, Aphid, Whitefly, Lady bird beetle, Tobacco caterpillar
Mustard, Cabbage, Cauliflower	Bee, Cabbage Looper, Cabbage Head Borer or Cabbage Webworm, Coccinellid Beetle, Crucifer Flea Beetle, Crucifer Leaf Webber, Diamond Back Moth, Flea Beetle, Mirid Bug, Mustard Aphid, Mustard Dolycoris Bug or Hairy Shield Bug, Mustard Sawfly, Painted Bug, Striped Flea Beetle, Syrphid Fly, Tobacco Caterpillar

- AR/VR Experience Labs and Content: 14 training sessions on AR/VR were organised and attended by more than 6300 participants including both faculty and students. These sessions included sensitizing users about various aspects to drive adoption steps like unboxing of kits, usage of equipment, access content and mechanisms for in house creation of AV/VR modules by faculty. Developed following 05 new AR/VR modules: (i) National Agricultural Science Museum Module 1: Pre-independence Period; (ii) National Agricultural Science Museum Module II: Post-independence Period; (iii) Discovery Center, IARI; (iv) Drone Flying Simulator and (v) Cattle Anatomy
- E-Learning Portal Dashboard: Dashboard provides insights about diverse parameters

including usage data categorized by month, user demographics (Students, Faculty, others), monthly download statistics, download purposes, and month-wise user registrations, among others. The E-Learning portal has witnessed more than 2 lakh downloads and over 2 lakhs page views and contains 171 UG and 86 PG courses.

- Academic Management System: During the period under report AMS was implemented in RLBCAU Jhansi, and UAHS, Shivamogga. Faculty and students were also sensitized about new and improved AMS functionalities in offline and online mode.

MIS-PIMI(Management Information system for Plan Implementation and Monitoring in ICAR)

The MIS-PIMI portal (https://pimi.icar.gov.in/) has undergone a frontend redesign, adopting a new theme to improve user interface and experience. Out of the nine planned modules, five namely DARE/ICAR Schemes, Cabinet Notes/EFC/SFC, Documents, SDG/DDG/Annual Reports, SCSP/TSP/NEH, and Archives are currently live on the server and are being updated regularly based on evolving user requirements.

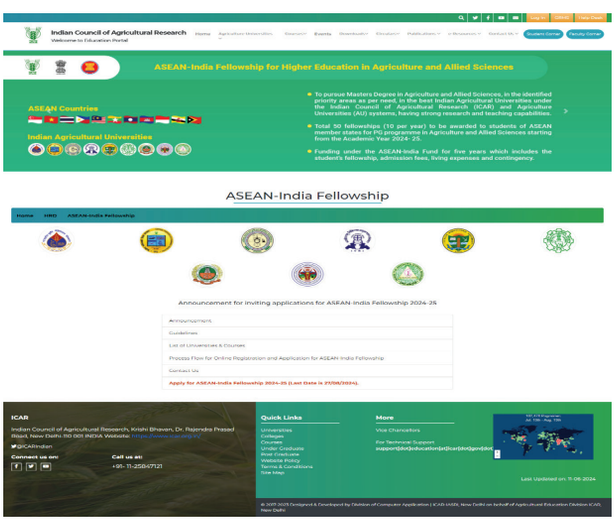
Online Portal for Research Pre-proposal Management & Information System for National Agricultural Science Fund (ORPIMS-NASF)

Online portal for Research Pre-proposal Management & Information System for National Agricultural Science Fund (ORPIMS-NASF). The Online portal for Research Pre-proposal Management & Information System for National Agricultural Science Fund (ORPIMS-NASF) has successfully designed, developed and tested. The system was live to take research pre-proposal for NASF call XI.

National Information System on Agricultural Education Network in India: Strengthening of Agricultural Education Portal

New System/ Functionality/Module Developed

- New online templates for generating letters to capture Caste-wise data to ensure better understanding of the fund utilization.
- Student-Ready Module: Redesigned the student-ready JavaScript module according to the requirements, to improve user experience.
- ASEAN-India Fellowship for Higher Education in Agriculture and Allied Sciences: (i) Designed fellowship application forms; (ii) Admin Module has been added. Role-wise dashboard has been provided for monitoring of applications and reports for status of applications; (ii) ASEAN-India Fellowship for Higher Education in Agriculture and Allied Sciences was successfully launched in this year by the Honourable Minister of Agriculture and Farmers Welfare on August 14, 2025; (iv) Received 9 applications from different ASEAN countries, indicating early interest and engagement in the program.



ICAR Accreditation System

- The entire system has been restructured with a new design and backend logic to support robust performance and scalability.
- The UI/UX has been optimized for intuitive navigation across all roles—Coordinator, Registrar, DDG/ADG, and NAHEB Committee.
- All application processes now include mandatory fields that must be filled by the universities.
- Document uploads have been enforced where necessary to ensure compliance and completeness.
- A module for automation of File Submission to Registrar was developed. In this module, for SSR letter generation, four critical documents are now automatically sent to the Registrar. These include: Minimum Requirements for Colleges, Model Act 2023 Chapter 6 Guidelines, Online Payment Proforma

- Enhanced SSR Resubmission Process: The Registrar can now send back the SSR for revisions multiple times until it is approved by the NAHEB Committee. In case of errors in the application, institutions are allowed to resubmit their applications after making necessary corrections.
- Notification Submission by Coordinator: Coordinators can now directly submit Accreditation Notifications to the Registrar once the entire process is completed.
- Program Selection and Dashboard Integration: Coordinators can now select and add specific colleges, degrees, or programs for which accreditation is sought. These details are instantly reflected on the dashboards of relevant stakeholders.
- Peer Review Team (PRT) Functionality: Once a PRT order is prepared, it is now automatically visible on the dashboards of: Deputy Director General (DDG), Additional Director General (ADG) and Coordinator
- Historical Data Integration: New webpages have been developed to store and display historical accreditation data. Old data is now visible and accessible via user dashboards for better decision-making and audit readiness.
- Automated Email Reminders: A new email notification system has been deployed. Universities are alerted via auto-generated emails if their accreditation is nearing expiry (within 6 months), ensuring timely renewal actions.
- Accreditation Dashboard: A centralized dashboard now displays: Total number of accredited colleges and universities, Accreditation status per program, degree, and institution and Real-time updates on application progress and status

VIKAS-Venture for Interaction of Kisan & Agri-Students

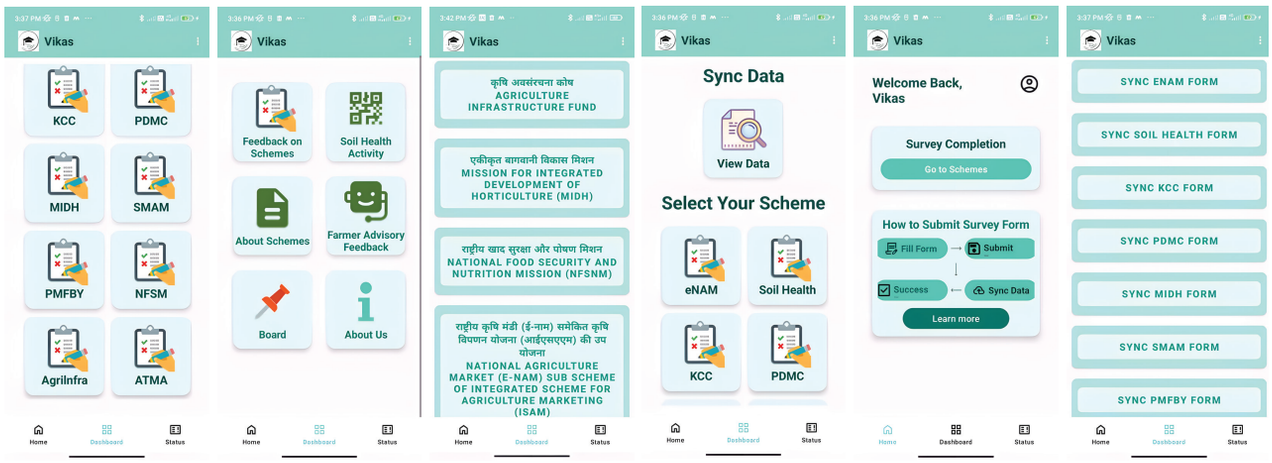
Student READY module of the Ag. Education portal has been strengthened and a mobile Application is developed for Integration of Framework of RAWE in Student READY portal. This initiative is under taken on the directions of Ag. Education division and Department of Agriculture and Farmer Welfare to get the feedback from across the country about the implementation of Govt. Schemes and their impact at the ground level. Following are some of the features of the integrated Student READY module with the VIKAS mobile application:

- Comprehensive Integration with the Student READY Module: The app now incorporates all essential forms for data collection related to major Government initiatives such as the Soil Health Card scheme, Farmer Producer Organizations (FPOs), Natural Farming, and Extension Activities etc.
- Enhanced User Interface (UI) and User Experience (UX): The mobile application has undergone a complete redesign to improve usability and engagement. It now features an intuitive interface that simplifies data entry and navigation.
- Student Dashboard: A newly added dashboard allows students to monitor their progress, track completed tasks, and manage pending assignments, ensuring better time and task management throughout the RAWE programme.
- Seamless Integration with External Systems: The app is integrated with the Farmer. Chat AI Assistant and Soil Health Card mobile application and other digital platforms, ensuring interoperability.
- Secure Login for RAWE-Enrolled Students: Access to the application is restricted to students officially enrolled in the RAWE programme. Secure login is facilitated through APIs developed to fetch credentials and related data from the central Education Portal.

ASRB-Online Application System for Offline Examination

The Agricultural Scientists Recruitment Board (ASRB) launched the Online Application System for Offline Examinations (OAS-OFLE) developed by ICAR-IASRI to streamline and digitize the application and administration process of its offline recruitment examinations. The platform was developed with a purpose to minimize manual intervention and ensuring transparency. Core Modules of ASRB-OAS-OFLE are:

- Online Registration: User-friendly interface for candidates to register and apply online.
- Help Desk Support Services: Dedicated module to assist candidates with queries and technical issues.
- Admission Card Generation: Automated generation of admit cards for eligible candidates.



VIKAS-Venture for Interaction of Kisan & Agri-Students Mobile Application

- Attendance Sheet Generation: Provision to generate attendance sheets for examination centres.
- Document Upload & Notifications: Facility to upload necessary documents and notify candidates via Email/SMS.
- Result Analysis & MIS Reports: Tools to analyze examination data and generate Management Information System reports.
- Custom Reports: Reports based on category, gender, location, test centre, and other parameters as specified by ASRB.
- Result Publishing Assistance: Support in publishing detailed marks through the ASRB website in the desired format.

Examinations Conducted via ASRB – OAS-OFLE: (i) ASRB-ARS: A total of 5,426 candidates successfully registered and appeared for the examination through the platform and (ii) ASRB ADOL: A total of 626 candidates applied and took the examination via the system.This digital solution has significantly improved the operational efficiency, transparency, and candidate experience in the offline examination processes conducted by ASRB.

RVSKVV-Recruitment Management System

The RVSKVV-RMS Recruitment System was developed by the ICAR-Indian Agricultural Statistics Research Institute (IASRI) for Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKVV), Gwalior to digitize and streamline faculty and non-faculty recruitment processes. The portal aims to replace manual procedures with an efficient online system and automate scorecard calculation and eligibility screening. It promote fairness, transparency, and auditability in selection and provide a user-friendly interface for all stakeholders. It also support eco-friendly, paperless recruitment while ensuring secure handling of applicant data. Key Features of the system are:

- Online Registration & Profile Management: Applicants can securely register, log-in, and upload verified documents.
- Automated Scorecard Calculation: Calculation of eligibility scores based on predefined criteria.
- Online Screening: Includes both administrative and technical filtering and eligibility checks.
- Application Tracking: Applicants and administrators can monitor and manage applications throughout the process.
- Role-Based Dashboards: Dedicated dashboards for applicants, reviewers, and committees with secure access controls.
- Notifications: SMS and email alerts on recruitment stages.
- Data Security: Robust encryption and regulatory compliance for information protection.

OptiRanker: Software for Multi-Criteria Decision Making Using TOPSIS

It is a powerful user-friendly software that helps you rank options based on multiple criteria using the TOPSIS method (https://icar-tech.github.io/optiranker). For evaluating projects, selecting suppliers, or making other decisions, it provides accurate and reliable results quickly and efficiently. Some of the aapplication areas and case studies are

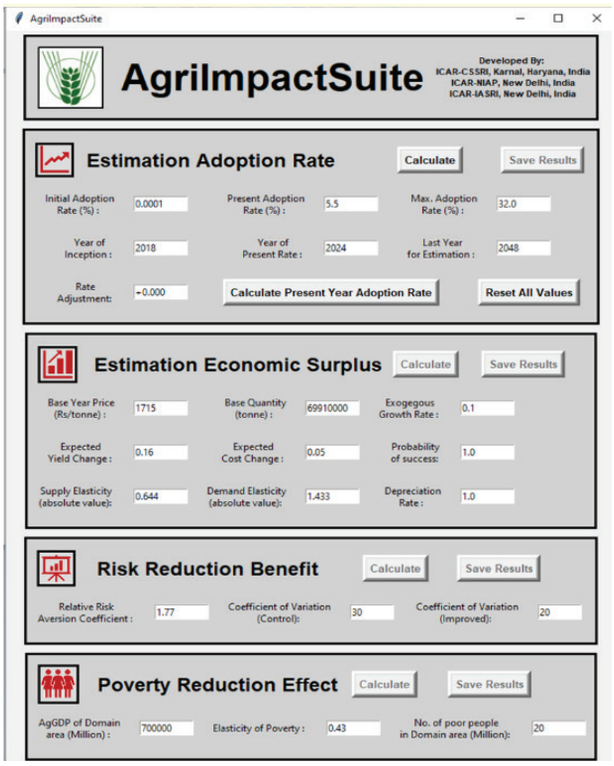
- Genotype Selection for Crop Breeding: help in selecting the best genotypes based on multiple

traits such as yield, resistance to pests, and tolerance to environmental stress.

- Crop Selection for Optimal Yield: The software can rank different crops based on various factors such as soil type, climate, and water availability, aiding in the decision-making process for optimal crop selection.
- Precision Agriculture: By evaluating various criteria like soil health, water usage, and environmental factors, it supports precision agriculture to make informed decisions on crop management.
- Pest and Disease Management: assist in identifying the best pest or disease management strategies based on their effectiveness, cost, and environmental impact.
- Agroecological Zone Identification: The software helps in identifying suitable agroecological zones for specific crops based on environmental and climatic conditions, ensuring better crop adaptation and improved yields.
- Case Study 1 - Genotype Selection in Rice: used to evaluate multiple rice genotypes based on their drought resistance, yield, and disease resistance. This allowed for the identification of the most suitable genotype for drought-prone areas.
- Case Study 2 - Crop Selection for Climate Change Adaptation: In areas affected by climate change, it helps farmers select crops based on climate resilience, soil fertility, and water requirements, ensuring better crop productivity and sustainability.
- Case Study 3 - Multi-Criteria Decision Making for Fertilizer Use: used to rank different fertilizer options based on their effectiveness, cost, environmental impact, and ease of use, providing farmers with optimal choices for improving crop growth.

AIS: AgriImpactSuite for Evaluation of the Economic Impact of Agricultural Technologies (Crop Varieties)

AIS: AgriImpactSuite (https://icar-tech.github.io/AgriImpactSuite/), a GUI application in association with ICAR-NIAP, for performing complex agricultural or economic calculations related to adoption rates, economic surplus, risk reduction benefits, and the impact of technology adoption on poverty reduction. Different modules of this software are



- Estimation of Adoption Rate: Calculates the adoption rate of a particular agricultural practice or technology over time, based on factors like the initial adoption rate, present adoption rate, maximum adoption rate, and year of inception of the technology.
- Estimation of Economic Surplus: Computes economic benefits (surplus) based on factors such as base year price & quantity, yield change, cost change, and elasticity of supply and demand. It provides the option to estimate the consumer surplus, producer surplus, and total economic surplus generated from technology adoption.
- Risk Reduction Benefit: Assesses how implementing certain agricultural practices could reduce risk, using parameters like the relative risk aversion coefficient and coefficients of variation under control and improved conditions.
- Poverty Reduction Effect: Estimates the impact of agricultural improvements on poverty reduction in a specific area. It factors in parameters such as the agricultural GDP (AgGDP), elasticity of poverty, and the number of poor people in the domain area.

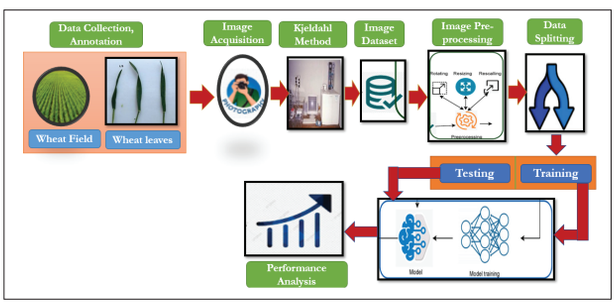
Another important sub-module of AgrImpactSuite software is PARC (Present-year Adoption Rate) Calculator which is designed to calculate the

adoption rate of a specific agricultural technology or intervention for the present year. It helps in estimating how agricultural technologies (such as improved seed varieties) are adopted in a given region over time. It also calculates the present-year adoption rate of agricultural technology based on various inputs like seed rate, multiplication factor, and crop area. It allows users to input data, calculate the rate, and save results for analysis.

Intelligent Decision Support System for Precision Agriculture

- Central Data Repository under NePPA Project: A Central Data Repository has been developed to systematically archive data generated under the NePPA project. This digital portal is designed to facilitate data storage, retrieval, sharing, and analysis among partner institutions during and after the project's duration. The repository is structured into two components: metadata and detailed data. Metadata captures essential experiment details such as location, season, domain, commodity, research focus, and duration used for efficient data search and retrieval. Users can enter a 150-word experiment summary and upload a detailed PDF description along with datasets in specified formats. Access rights can be customized to control data visibility and sharing. The user interface supports registered NePPA project investigators using ICAR credentials and provides three key sections: DASHBOARD, DEPOSIT, and RETRIEVAL. The DASHBOARD displays previously submitted records; users can update unsaved entries but cannot modify data once officially submitted. New data can be added as sub-projects. The RETRIEVAL tab enables keyword- and criteria-based search of submitted experiments and associated metadata. This repository enhances collaborative research, ensuring secure, structured, and accessible data management across the NePPA network.

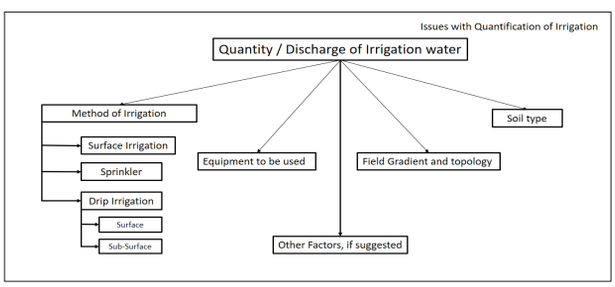
- Nitrogen Assessment in Wheat Crop Using Leaf Images: A total of 2,736 wheat leaf images were collected from ICAR-IIWBR, Karnal under varying nitrogen treatments and analyzed using AI-based techniques integrating additional dimensions such as weather data from ICAR-CSSRI, Karnal. The images were pre-processed through two approaches: (i) background removal and normalization using U²-Net, and (ii) a standard pipeline involving thresholding, edge detection, contrast enhancement, sharpening, and HSV-based green region extraction. Two deep learning models, Xception and DenseNet121, were trained on these pre-processed images with and without including weather parameters. Inputs included image metadata such as days after sowing, ambient and soil temperature, nitrogen level (0–210 kg), and nitrogen content status (2–5%). Image inputs were normalized and resized to 299×299 pixels. The dataset was split into training (80%), validation (10%), and test (10%) subsets. Transfer learning was applied using pretrained Xception and DenseNet121 models as frozen feature extractors. Hyperparameters—learning rate (1e-2 to 1e-4), dense units (32–256), dropout (0.1–0.5), optimizers (Adam, SGD, RMSprop), and activations (ReLU, Mish, Leaky ReLU, Swish)—were tuned using Random Search from Keras Tuner with early stopping. A total of 20 trials with 2 executions each were evaluated based on validation loss. This approach aimed to identify optimal configurations for predicting nitrogen status in wheat leaves. The architecture of the process is shown below.



Architecture for N assessment in wheat crop using leaf images

- Decision Support System for Irrigation Scheduling and Management: To promote water conservation, a decision support system for irrigation scheduling and management has been developed to guide users on the optimal timing and quantity of water application for various crops. The system was designed with inputs from ICAR-Indian Institute of Water Management (IIWM) and ICAR-Indian Agricultural Research Institute (IARI), with additional data sourced from institutes like NRC Banana, ICAR-IIVR Varanasi, ICAR-CICR Coimbatore, and ICAR-NRRI Cuttack. The system's workflow comprises five core modules: crop, location, weather, soil, and irrigation. These modules integrate inputs from farmers, system-generated values, and validated secondary sources. The crop module requires details such as crop type, variety,

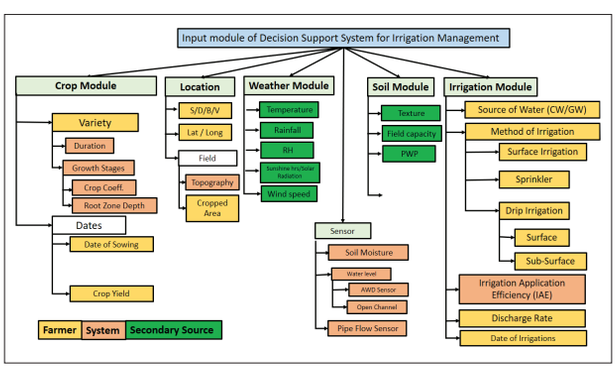
duration, growth stages, coefficients, and yield. The location module includes geographic identifiers, coordinates, topography, and cropped area. The weather module incorporates daily and forecasted data (temperature, humidity, sunshine, wind speed, rainfall) via IMD web services. The irrigation module covers water source, method, efficiency, discharge rate, and last irrigation date. This integrated system enables precise irrigation planning by calculating irrigation requirements based on crop, soil, and real-time weather conditions, ultimately helping to improve water-use efficiency and optimize crop yield. The structured workflow ensures dynamic, location-specific, and crop-sensitive recommendations for sustainable water management in agriculture.



Determination of amount and discharge Rate of Water

The required values will be automatically calculated by the system based on the input available in the system otherwise, the user can also provide some of these input, if they are having with them for more accurate values .

If the end user does not have any input in their hand except the crop, variety, location, date of sowing and last date of irrigation including method of irrigation, then the system will suggest the requirement and amount of irrigation based on the Hargreaves method. This method calculates the amount of water required to irrigate is solely based on evapotranspiration value in the area and crop coefficients of the respective crop growth stages. The web based system is being developed and under testing.

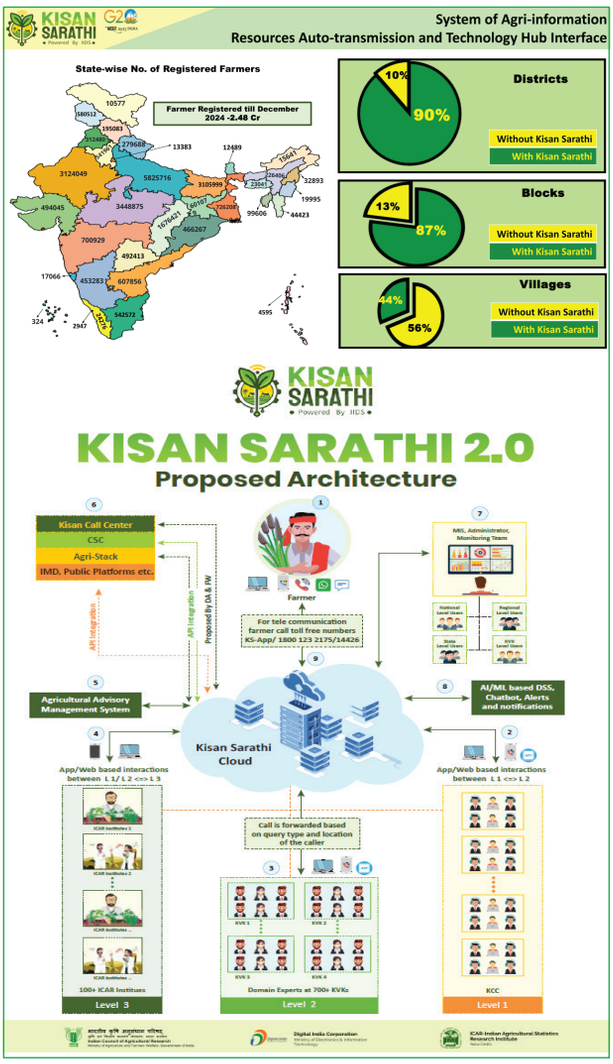


- Artificial Intelligence Based Classification of Estrus and Non-Estrus Cattle through thermal Images: The accurate identification of estrus in cattle is critical for timely and effective insemination. To address this, a dataset comprising 11,300 thermal images of cattleclassified as either Estrus or Non-Estruswas collected under expert supervision. These images were preprocessed through resizing, normalization, and augmentation, and then split into training, validation, and test sets. A convolutional neural network (CNN) was designed with a sequential architecture containing four convolutional and pooling layers, followed by dense layers. The model input was an RGB image (256×256×3), and the architecture had 262,309 trainable parameters. The model was trained using early stopping and checkpointing to avoid overfitting, with performance monitored using accuracy, loss, and confusion matrix metrics. Evaluation on a test dataset of 2,260 images yielded a high classification accuracy of 91.4%. The confusion matrix showed near-balanced performance across both classes, with minor misclassifications. Precision and recall values of 91.49% and 91.42%, respectively, confirmed the model's robustness in differentiating estrus states in cattle. This approach offers a reliable AI-based tool for estrus detection.

Kisan Sarathi: System of Agri-information Resources Auto-transmission and Technology Hub Interface

During the calendar year 2024, *Kisan Sarathi* made significant strides in enhancing its agricultural advisory services and expanding its outreach to farmers across the country. The platform demonstrated robust growth in user engagement, technological innovation, and institutional collaboration.

- Call Handling and Advisory Services: Kisan Sarathi managed a total of 1.22 lakh calls during the year. This reflects an ongoing improvement in service responsiveness and resolution efficiency.
- SMS Advisory: The platform delivered over 5 crore SMS advisories on critical agricultural topics, including: Crop-specific recommendations, Weather alerts, Pest and disease management, Government schemes and updates etc. These advisories were translated into regional languages, enhancing accessibility and relevance for farmers across diverse linguistic regions.



- Farmer Registration: The farmer base on Kisan Sarathi grew to 2.48 crore registered users by December 2024, with 75.6 lakh new registrations added during the year. This expansion was driven by targeted awareness campaigns.
- Strategic Collaborations: Kisan Sarathi initiated a pilot integration with Common Services Centers (CSCs) through the Kisan Sarathi Krishi e-Nidanshala initiative. This program is operational in 14 selected KVKs—with representation from each ATARI zone and supports: Farmer registration, Query escalation from CSC VLEs and Localized service delivery by KVK SMEs. This collaboration has notably enhanced the platform's reach in rural and under-served areas.

Management and Impact Assessment of Farmer FIRST Project

Dashboard functionality has been enhanced to include annual project report and publication details ATARI wise. This functionality has been added at all levels i.e. ICAR HQ, ATARI and PI Centre for monitoring. The web pages code and data information encrypted to secure access. Regular updating and modification of the portal have been done based on the requirements of users of different levels. Management of application and database server of FFP Projects. Support is being provided to PIs for uploading the information on the portal and technical issues have been resolved over email. The progress of the project was presented in Zonal Review meeting of FFP Programme on 29 July, 2024. During the 2024, 108 interventions, 151 events, 134 images and 18 videos related to FFP have been uploaded. The details of 1728 interventions, 1499 events, 3954 images, 163 videos and 517 publications related to FFP are available on the portal. The portal has been visited by 117672 users since February 2018; in the year 2024, 13079 visitors have been visited.

Strengthened Foreign Visit Management System (FVMS)

The workflow process has been designed for different approval hierarchy in FVMS. The new workflow module has been developed and implemented. There are two module (i) Proposal need to be approval at ICAR, (ii) Proposal need to be approved at DARE. Various form has been customized. An alternate solution has been created in place of ERP id for FVMS login verification. Day to day support is being provided to users and many issues have been resolved.

Technology/Methodologies Certified

Following **Eighteen** technologies/methodologies developed by the Institute were awarded certificates during ICAR Foundation and Technology Day.

ICAR-IASRI as Lead Institute

1. ICAR-AED-IASRI-Methodology-2024-042: Sampling methodology of calibration estimation of infinite population parameters under two stage sampling and adaptive cluster sampling design (Methodology). {Ankur Biswas, Kaustav Aditya, Raju Kumar, Deepak Singh and Pradip Basak}.
2. ICAR-AED-IASRI-Methodology-2024-022: AIGenIBD: Algorithmic generation of some useful families of Incomplete Block Designs (Methodology). {Cini Varghese, Mohd. Harun, Seema Jaggi, Ashutosh Dalal, L.N. Vinaykumar, Sayantani Karmakar and Nehatai Agashe}
3. ICAR-AED-IASRI-Methodology-2024-038: Survey weighted composite index for complex survey data (Methodology). {Deepak Singh, Pradip Basak, Raju Kumar and Tauqueer Ahmad}

4. ICAR-AED-IASRI-Methodology-2024-025: OptisembleForecasting: Optimization based ensemble forecasting using MCS algorithm and PCA based error index (Methodology). {Md. Yeasin and Ranjit Kumar Paul}
5. ICAR-AED-IASRI-Methodology-2024-023: Software for identification of herbicide and insecticide resistant genes (Product). {Prabina Kumar Meher, Tanmay Kumar Sahu and Atmakuri Ramakrishna Rao}
6. ICAR-AED-IASRI-Methodology-2024-026: Software for identification of splice sites (Methodology). {Prabina Kumar Meher, Tanmay Kumar Sahu and Atmakuri Ramakrishna Rao}
7. ICAR-AED-IASRI-Methodology-2024-041: Integrated sampling methodology for crop acreage estimation using remote sensing, GIS and ground survey in Meghalaya (Methodology). { Prachi Misra Sahoo, Anil Rai, Tauqueer Ahmad and Md. Samir Farooqi}
8. ICAR-AED-IASRI-Methodology-2024-030: WaveML: Wavelet based machine learning techniques for time series forecasting (Model). {Ranjit Kumar Paul, Md. Yeasin, Sandip Garai and Amrit Kumar Paul}
9. ICAR-AED-IASRI-Methodology-2024-043: Tools for evaluating impact of pandemics on agricultural prices (Methodology). {Ranjit Kumar Paul, Md. Yeasin, PS Birthal, AK Paul, Himadri Shekhar Roy and Prakash Kumar}
10. ICAR-AED-IASRI-Methodology-2024-040: TSEnsemble: Ensemble algorithm for time series forecasting (Methodology). {Ranjit Kumar Paul, Md. Yeasin, PS Birthal, AK Paul, Himadri Shekhar Roy and Prakash Kumar}.
11. ICAR-AED-IASRI-Methodology-2024-028: Web application for land record management system in ICAR institutes (Product). {Shashi Bhushan Lal, Krishna Kumar Chaturvedi, Mukesh Kumar and Avanaksh Singh Sambyal}
12. ICAR-AED-IASRI-Methodology-2024-024: PlantMicroboProinteract: A web application to predict the protein-ligand interaction in plants and microbes (Product). { Sneha Murmu, Sunil Archak, Himanshu Shekhar Chaurasia, Atmakuri Ramakrishna Rao, Anil Rai, Soumya Sharma, Ritwika Das, Md. Samir Farooqi and Girish Kumar Jha}
13. ICAR-AED-IASRI-Methodology-2024-027: Modified sampling methodology for estimation of area and production of horticultural crops (Methodology). {Tauqueer Ahmad, Prachi Misra Sahoo, Ankur Biswas, Kausav Adityam, Deepak Singh and Raju Kumar}
14. ICAR-AED-IASRI-Methodology-2024-039: Sampling methodology for estimation of cotton production using double sampling approach (Methodology). {Tauqueer Ahmad, Anil Rai and Prachi Misra Sahoo}
15. ICAR-AED-IASRI-Methodology-2024-029: Multivariate adaptive regression spline based ANN and SVR model for crop yield prediction (Methodology). {Pankaj Das, Achal Lama, Girish Kumar Jha and Rajender Parsad}
16. ICAR-AED-IASRI-Methodology-2024-021: E-Learning Portal for agricultural education (Product). {Sudeep Marwaha, Shashi Dahiya, Anshi Bharadwaj, Rajender Parsad, Anuradha Agrawal and RC Agrawal}.

ICAR-IASRI as Partner

17. ICAR-AED-NIAP-Policy-2024-009: India's food demand and supply to 2047. {Shivendra k. Srivastava, N. Sivaramane, Pratap S. Birthal, Ranjit K. Paul and Raka Saxena}.
18. ICAR-AED-NIAP-Policy-2024-010: India's agricultural exports during the Covid-19 pandemic (Policy). {Ranjit K. Paul, Balaji S.J. and Rohit Kumar}

Two of these technologies *E-Learning Portal* and *Multivariate adaptive regression spline based ANN and SVR model for crop yield prediction* were selected among the 5 best technologies of Agricultural Education Division, ICAR.

Developed R-packages/GitHub repository: 21

1. **PerMat**: Performance Metrics in Predictive Modeling that provides different performance measures like mean squared error, root mean square error, mean absolute deviation, mean absolute percentage error etc. of a fitted model available at http://krishi.icar.gov.in/jspui/handle/123456789/44138
2. **ICompELM**: Independent Component Analysis Based Extreme Learning Machine is available at https://cran.r-project.org/web/packages/ICompELM/index.html
3. **DNAmotif**: DNA Sequence Motifs identification and is available at https://cran.r-project.org/web/packages/DNAmotif/index.html
4. **OpEnHiMR**: Optimization Based Ensemble Model for Prediction of Histone Modifications in Rice is available at https://cran.r-project.org/web/packages/OpEnHiMR/index.html
5. **EEML**: Ensemble Explainable Machine Learning Models is available at https://cran.r-project.org/web/packages/EEML/index.html
6. **Doofa:** Designs for Order-of-Addition Experiments is available at https://cran.r-project.org/web/packages/doofa/index.html Using this,

a web application has also developed.

7. **AdIsMF:** Adsorption Isotherm Model Fitting is available at https://cran.r-project.org/web//packages/AdIsMF/index.html
8. **CompExpDes:** To generate efficient Latin hypercube designs (LHDs) and Uniform Designs (UDs) is available at https://CRAN.R-project.org/package=CompExpDes
9. **InterNL:** This package introduced algorithm for time series intervention analysis employing ARIMA and ANN models with a non-linear intervention functionn and is available at https://cran.r-project.org/web/packages/InterNL/index.html
10. **MinFactorial**: Generates all possible minimally changed factorial run orders is available at https://cran.r-project.org/web/packages/minFactorial/index.html.
11. **hrtlFMC**: Generates the minimally changed run sequences of Half Replicate of Two-Level Factorial Run Order the Trend Factor value of the run order is available at https://cran.r-project.org/web/packages/hrtlFMC/index.html.
12. **GenomicSig**: Computation of Genomic Signatures is available at https://cran.r-project.org/package=GenomicSig. Using this, a web application has also been developed.
13. **OPTeCD**: Optimal Partial Tetra-Allele Cross Designs. version 1.0.0 is available at https://CRAN.R-project.org/package=OPTeCD
14. **SudokuDesigns**: Sudoku as an Experimental Design. Version 1.1.0 is available at https://CRAN.R-project.org/package=SudokuDesigns
15. **HTSeed:** Version 1.0 for fitting of Hydrotime Model for Seed Germination Time Course available at https://cran.r-project.org/web/packages/HTSeed/index.html
16. **CoreMicrobiomeR:** Designed to facilitate the identification, statistical testing, and visualization of microorganisms available at https://CRAN.R-project.org/package=CoreMicrobiomeR
17. **GB5mCPred**: An in-silico pipeline for predicting DNA sequences containing the 5-methylcytosine (5mC) sites in crop plants using machine learning approach available at https://cran.r-project.org/web/packages/GB5mcPred/index.html
18. **TDSTNN**: R package for fitting of Time Delay Spatio-Temporal Neural Networks, to capture e complex nonlinear dynamics efficiently available at https://cran.r-project.org/package=TDSTNN
19. **GRCdesigns:** Generation of Generalized Row-Column (GRC) designs is available at https://cran.r-project.org/package=GRCdesigns
20. **ARMA-LSTM:** Fitting of Hybrid ARMA-LSTM Models on time series dataset and is available at https://CRAN.R-project.org/package=ARMALSTM
21. **slr:** Semi-Latin Rectangles package designed to generate balanced and partially balanced semi-Latin rectangles with cell size two available at https://CRAN.R-project.org/package=slr Using this, a web application has also been developed.

4. Education and Training

The Institute conducts post graduate teaching and in-service courses in Agricultural Statistics, Computer Application and Bioinformatics for human resource development. Institute is conducting M.Sc. and Ph.D. programmes in Agricultural Statistics since 1964, M.Sc. in Computer Application since 1985-86, Ph.D. in Computer Application since 2013-14, M.Sc. in Bioinformatics since 2011-12 and Ph.D. in Bioinformatics since 2014-15. The Institute continued to conduct the following degree courses in collaboration with The Graduate School of ICAR-Indian Agricultural Research Institute (ICAR-IARI), New Delhi that has the status of a Deemed University. Both Ph.D. and M.Sc. students are required to study courses not only in Agricultural Statistics but also in Agricultural Sciences like Genetics, Agronomy, Agricultural Economics, etc. The Courses in Mathematics, Agricultural Statistics, Computer Application and Bioinformatics, are offered at this Institute while the courses in Agricultural Sciences are offered at ICAR-IARI.

Number of students admitted / completed various courses during the period under report are:

S. No.	Course	No. of Students	
		Admitted *	Passed Out**
1	Ph.D. (Agricultural Statistics)	07	08
2	M.Sc. (Agricultural Statistics)	04	08
3	Ph.D. (Computer Application)	03	03
4	M.Sc. (Computer Application)	04	05
5	Ph.D. (Bioinformatics)	06	09
6	M.Sc. (Bioinformatics)	03	06

*Students admitted during 2024-25; **Students who received degrees in 2024 convocation

FACULTY MEMBERS OF THE GRADUATE SCHOOL, ICAR-IARI

(i) Discipline of AGRICULTURAL STATISTICS

S.No.	Name of faculty	Year of Induction
1	Dr. Rajender Parsad, Director	1995
2	Dr. Cini Varghese, Professor (Agricultural Statistics)	2000
3	Dr. Tauqueer Ahmad, Head (Sample Survey)	1998
4	Dr. Amrit Kumar Paul, Acting Head (Statistical Genetics)	1998
5	Dr. Girish Kumar Jha, Head (Agricultural Bioinformatics)	1999
6	Dr. Prachi Misra Sahoo, Principal Scientist	2002
7	Dr. Prawin Arya, Principal Scientist	2003
8	Dr. Wasi Alam, Principal Scientist	2003
9	Dr. Amrender Kumar, Principal Scientist (at ICAR-IARI)	2003
10	Dr. Himadri Ghosh, Principal Scientist	2004
11	Dr. K.N. Singh, Head (F&ASM)	2011
12	Dr. Ranjit Kumar Paul, Senior Scientist	2011
13	Dr. Mir Asif Iquebal, Principal Scientist	2011
14	Dr. Susheel Kumar Sarkar, Senior Scientist	2011
15	Dr. Kaustav Aditya, Senior Scientist	2012
16	Dr. Sukanta Dash, Senior Scientist	2013
17	Dr. Ajit, Principal Scientist	2015
18	Dr. Ankur Biswas, Senior Scientist	2015
19	Dr. Anindita Datta, Scientist	2016
20	Dr. Sarika, Principal Scientist	2018
21	Dr. Deepak Singh, Scientist	2018
22	Dr. Achal Lama, Scientist	2018
23	Dr. Mrinmoy Ray, Scientist	2018
24	Dr. Raju Kumar, Scientist	2019
25	Dr. Kanchan Sinha, Scientist	2019
26	Dr. Prabina Kumar Meher, Senior Scientist	2022

S.No.	Name of faculty	Year of Induction
27	Dr. Mohd. Harun, Scientist	2022
28	Dr. Md. Yeasin, Scientist	2023
29	Dr. Rajeev Ranjan Kumar, Scientist	2023
30	Dr. Bharti, Scientist	2023
31	Dr. Pankaj Das, Scientist	2023
32	Dr. Med Ram Verma, Head (Design of Experiments)	2023
33.	Dr. Prakash Kumar, Scientist	2018 & re-inducted in 2024

(ii) **Discipline of COMPUTER APPLICATION**

S.No.	Name of Faculty	Year of Induction
1	Dr. Alka Arora, Professor (Computer Application)	2001
2	Dr. Sudeep Marwaha, Head (Computer Applications)	2002
3	Dr. Shashi Dahiya, Principal Scientist	2001
4	Dr. Md. Samir Farooqi, Principal Scientist	2001
5	Dr. K. K. Chaturvedi, Principal Scientist	2002
6	Dr. Sangeeta Ahuja, Scientist	2002
7	Dr. Anu Sharma, Principal Scientist	2004
8	Dr. S.B. Lal, Principal Scientist	2004
9	Dr. Anshu Bharadwaj, Principal Scientist	2004
10	Dr. Rajni Jain, Principal Scientist (at ICAR-NCAP)	2007
11	Dr. Mukesh Kumar, Principal Scientist	2014
12	Dr. A.K. Mishra, Principal Scientist (at ICAR-IARI)	2014
13	Ms. Shaloo, Senior Scientist, (at WTC, ICAR-IARI)	2016
14	Dr. Soumen Pal, Senior Scientist	2020
15	Dr. Chandan Kumar Deb, Scientist	2021
16	Dr. Md. Ashraful Haque, Scientist	2023
17	Dr. Sapna Nigam, Scientist	2023

(iii) **Discipline of BIOINFORMATICS**

S.No.	Name of Faculty	Year of Induction
1	Dr. Rajender Parsad, Director	2010
2	Dr. Sarika, Professor (Bioinformatics) since 16.07.2024	2010
3	Dr. Sudeep Marwaha, Principal Scientist	2010
4	Dr. Kishore Gaikwad, Principal Scientist (at ICAR-NIPB)	2010
5	Dr. P.K. Singh, Principal Scientist (at ICAR-NIPB)	2010
6	Dr. A.K. Mishra, Principal Scientist (at ICAR-IARI)	2010
7	Dr. S.B. Lal, Principal Scientist	2010
8	Dr. Mohd. Samir Farooqui, Principal Scientist	2010
9	Dr. Anu Sharma, Principal Scientist	2010
10	Dr. Sunil Archak, Principal Scientist (ICAR-NBPGR)	2010
11	Dr. D.C. Mishra, Senior Scientist	2010
12	Sh. Sanjeev Kumar, Scientist	2010
13	Dr. Mir Asif Iquebal, Principal Scientist	2013
14	Dr. Monendra Grover, Principal Scientist	2013
15	Dr. U.B. Angadi, Principal Scientist	2014
16	Dr. K.K. Chaturvedi, Principal Scientist	2015
17	Dr. M.G. Mallikarjuna, Scientist	2017
18	Dr. Yasin Jeshma K, Scientist (at ICAR-NBPGR)	2018
19	Dr. Sudhir Shrivastava, Senior Scientist	2019
20	Dr. Sunil Kumar, Principal Scientist	2021
21	Dr. Neeraj Budhlakoti, Scientist	2022
22	Dr. Ratna Prabha, Scientist (at ICAR-IARI)	2022
23	Dr. Sarika Sahu, Scientist	2023
24	Dr. (Ms.) Sneha Murmu, Scientist	2023

*Dr. Girish Kumar Jha, Professor (Bioinformatics) till 15.07.2024.

DISSERTATIONS APPROVED

Ph.D. (Agricultural Statistics)

Name of Student: Ashis Ranjan Udgata
Roll No: 10975
Guide: Dr. Anil Rai

Development of Geographically Weighted Regression Estimator for Multi-collinear Survey Data

The primary objective of a sample survey is to gather information about a population and obtain a valid estimate of parameter using auxiliary information. In the model-assisted approach, parameter predictions are made by fitting a linear model between study variables and auxiliary variables, assuming independence among observations. However, in agricultural surveys, observations are spatially correlated, meaning that nearby observations are more closely related, with correlation diminishing as distance between units increases. This spatial correlation fails to be explained by the classical linear model used in parameter estimation. To address this limitation, Geographical Weighted Regression (GWR) emerges as a spatial technique for modelling spatial data. In the realm of model-assisted survey sampling, employing model-assisted estimation can be susceptible to multicollinearity, potentially compromising the accuracy of the estimates. In this study, three estimators - GWridge, GWRR, and GWLASSO have been proposed to address the multicollinearity issue in model assisted survey sampling. Among these, GWridge performs the best in comparison to other proposed estimators and the traditional estimator.

Name of Student: Ankita Verma
Roll No: 11439
Guide: Dr. Seema Jaggi

On Some Aspects of Asymmetrical Response Surface Designs

Methods for obtaining asymmetrical third-order rotatable designs, response surface designs with fewer design points have been developed when time and resources are the main limitations. A comparison of the designs developed is also made using efficiency criterion, Fraction of Design Space (FDS) plots and Variance Dispersion Graphs (VDGs). Third-order rotatable designs(symmetric and asymmetric) have been developed using unequal set sizes in t-designs. The resulting design has fewer runs than existing third-order designs, and proposed classes with G-efficiency are provided. A method is introduced to design response surfaces that capture both symmetric and asymmetric factors in qualitative and quantitative terms for second and third-order models. List of designs for 3 to 10 factors along with G- and D-efficiencies are also presented. If a second-order model falls short in representing the relationship between input and response variables, sequential third-order response surface designs can help. The first-stage design, used for fitting the second-order model, can still be retained while additional runs may be employed to fit the third-order model more effectively. Proposed strategies for sequential third-order designs address symmetric and asymmetric factors, ensuring necessary moment matrix requirements and rotatability. For every design that was obtained, R package named “MixedLevelRSDs” has been prepared for the users to generate the designs together with its efficiencies.

Name of Student: Vinayaka
Roll No: 11442
Guide: Dr. Rajender Parsad

PBIB Designs based on Higher Association Schemes and Their Applications

PBIB designs based on 2,3 or higher-associate classes have been extensively studied in the literature. For some parameters, neither a BIB design nor a 2-associate-class PBIB design is available. The best alternative for such situations is a higher-class PBIB design, if such a design exists. Hence, this investigation provides three new association schemes: the icosahedral association scheme, the octahedral association scheme, the pentagonal prism association scheme, and the construction of related PBIB designs. These schemes produce resolvable and PBIB designs in two-replications. A list of these PBIB designs for treatments ($v \leq 300$) and replications (r) ≤ 6 has been tabulated. While nested balanced treatment incomplete block (NBTIB) designs and 2-class nested partially balanced treatment incomplete block (NPBTIB) designs are available in literature, they might not cover all parameter combinations or may necessitate numerous replications. To address this, the study introduces higher-associate-class NPBTIB designs. Efficient catalogues of NPBTIB designs are provided for treatments (v) ≤ 16, test replications (r_1) ≤ 30, and control replications (r_2) ≤ 60. Furthermore, in experiments where researchers seek to compare tests with multiple controls, nested balanced bipartite block (NBBPB) designs are available but might not be obtainable for all parameter combinations or may demand excessive replications. To tackle this challenge, the inquiry introduces nested partially balanced bipartite block (NPBBB) designs. An

efficient catalogue of NPBBB designs is outlined for test treatments (v_1) ≤ 16, control treatments (v_2) =2, r_1 ≤ 30, r_2 ≤ 60. Some new methods of 3-class NPBIB and partially balanced bipartite block (PBBB) designs have also been given for constructing 3-class NPBTIB and NPBBB designs, respectively.

Name of Student: Prabhat Kumar
Roll No: 11443
Guide: Dr. Girish Kumar Jha

Singular Spectrum Analysis Based Decomposition Models for Agricultural Price Forecasting

Using the potato price series data, the forecasting performance of the proposed singular spectrum analysis (SSA)-based TDNN (SSA-TDNN) model is compared with SSA-ARIMA, TDNN, SSA, and ARIMA models using evaluation criteria such as RMSE, MAPE, and MAE. After that, a hybrid model is introduced, combining empirical mode decomposition (EMD) and SSA for improved forecasting. EMD decomposes the initial time series into intrinsic mode functions (IMFs), with the first IMF subjected to further SSA decomposition. Ultimately, all the decomposed subseries under goes forecasting using TDNN. While investigating different trend rates (TR) for SSA, it has been observed that TR values of 85% and 90% performed well in one and multi-step forecasting scenarios. At last, the application of SSA is extended for multivariate agricultural price series. Accordingly, proposed a hybrid model by combining multivariate singular spectrum analysis (MSSA) and multivariate GARCH (MGARCH) models. For this, MSSA is first employed on the multivariate agricultural price series and obtained the residuals. After testing the MARCH effects through the MARCH LM test, modelled the residuals using the DDC GARCH model.

Name of Student: Sandip Garai
Roll No: 11710
Guide: Dr. Ranjit Kumar Paul

A Study on Wavelet-based Nonlinear Time Series Models for Capturing Volatility in Agriculture

Wavelet-based artificial neural network (ANN) and support vector regression (SVR) models are employed to improve the accuracy of capturing volatility in agriculture. Traditional statistical methods, wavelet-based approaches and complete ensemble empirical mode decomposition with adaptive noise (CEEMDAN) methods are compared. Feature selection using multivariate adaptive regression splines (MARS) is employed before fitting the wavelet and CEEMDAN decomposed subseries into ANN and SVR models. To optimize the combination of predicted subseries and improve the final prediction of the original series, optimization technique such as particle swarm optimization (PSO) is employed. The proposed wavelet-based models are evaluated using different error functions and model confidence set (MCS)-based tests to assess their accuracy in capturing volatility. To facilitate practical implementation and enhance reproducibility, three R packages have been developed: WaveletML, CEEMDANML, and WaveletMLbestFL.

Name of Student: Nehatai Wamanrao Agashe
Roll No: 11713
Guide: Dr. Cini Varghese

Experimental Designs Involving Doubly Nested Blocking Factors

Some new methods of constructing Tri-Hierarchical Incomplete Block (Tri-HIB) designs have been developed that yield four series of Tri-HIB designs. These designs are easy to construct and cover a wide range of parametric combinations. Each design gives rise to six component designs, three nested block designs and three block designs. A list of parameters of Tri-HIB designs for number of treatments (v) ≤ 30 is presented along with efficiency factors. Further, for easy accessibility and wider adaptability of proposed Tri-HIB designs, an R package Tri.Hierarchical.IBDs has been developed. Tri-HIB designs, besides being useful as block designs have an excellent application in obtaining mating-environmental designs for breeding trials. The designs with sub-sub-block size 2, 3 and 4, with contents treated as lines, can be directly used to get desired types of crosses with high efficiency and low degree of fractionation. Tri-HIB designs have also been studied by considering a mixed-effects model, with blocks, sub-blocks, and sub-sub-blocks treated as random and treatments treated as fixed effects. Tri-HIB designs for equal block sizes are compared with those for unequal block sizes and it is observed that designs with equal block sizes performed better.

Name of Student: Subhrajit Satpathy
Roll No: 11766
Guide: Dr. A.R. Rao

Statistical Model-based Prediction of Discrete and Continuous Trait Response in Evolutionarily Distant Species using Genome-wide Variants

A main challenge in genomic selection (GS) is to predict the genomic estimated breeding values (GEBV) of individuals with high accuracy for selection

in breeding. The present investigation explored interactions between feature selection techniques and various GS models, including ElasticNet, LARS, random forest, support vector machine-recursive feature elimination, and without feature selection. These are combined with eleven GS models categorized under BLUP-based, Bayesian, and machine learning approaches. Different sample sizes, marker densities, heritability levels have been considered to address challenges such as additive × additive interaction effects and multi-trait-mixture response predictions. Results indicate that integrating feature selection methods with GS models consistently outperforms using GS models alone. Notably, the combination of LARS feature selection and SVM-lin GS model demonstrates high prediction. In the presence of additive × additive interaction effects, GS models like RKHS and EGBLUP, combined with LARS feature selection, show higher prediction accuracy.

Name of Student: G. Avinash
Roll No: 11711
Guide: Dr. V. Ramasubramanian

Hidden Markov Models for Time Series Forecasting in Agriculture

For hidden Markov models (HMMs) for time series (TS) forecasting, regime switching (RS) was addressed under three dimensions: Markov switching (MS) for regime transitions between states and change point (CP) for identifying structural breaks; Haas, Mittnik and Paolella (HMP) and Klassen approximation path dependence methods; unrestricted and restricted versions with the latter imposing simultaneous breaks on both mean and variance when regime shifts. Thus, eight versions of infinite hidden Markov switching cum auto-regressive fractionally integrated moving average (IHMS-ARFIMA) models were developed viz., IHMS-ARFIMA (HMP/ Klassen)×(MS/CP)× (Unrestricted/ Restricted). TS on Patanjali stock returns were used to validate the proposed models for forecasting. In addition, HMMs have been improved using dynamic time warping (DTW). DTW was employed for pairwise similarity comparisons while applying it in multiple paths generated across different HMM runs to discern a stable path in which the model parameters were re-estimated. Two optimization techniques viz., genetic algorithms (GA) and particle swarm optimization (PSO) were also considered. Thus, three models namely HMM-DTW, HMM-DTW-GA and HMM-DTW-PSO were proposed and were applied on five datasets - soyabean, mustard and groundnut; financial series - S&P 500 and Patanjali stock returns and the superiority of the developed models over the existing models were demonstrated. Moreover, HMMs were developed in combination with deep learning (DL). In the first of the two proposed HMM-DL approaches, HMMs were developed with DL models viz., multi-layer perceptron (MLP) neural network, recurrent neural networks (RNN), gated recurrent units (GRUs) and long short-term memory (LSTM). In the second approach, technical indicators like moving average, Bollinger bands, etc. were also considered along with the TS for developing HMM-DL models using RNN, convolutional neural network one dimensional (CNN1D), GRU, LSTM and their bidirectional versions - BiGRU and BiLSTM. The developed models were applied to price series of TOP (tomato, onion and potato) of Azadpur and potato of Champadanga markets. The proposed hybrid models were found better than the HMMs and DLs.

M.Sc. (Agricultural Statistics)

Name of Student: Akarsh Singh
Roll No: 21599
Guide: Dr. Ankur Biswas

Geographically Weighted Logistic Regression-based Model Calibration Estimator of Finite Population Proportion

When dealing with binary response variables and aiming to estimate population proportions, conventional linear regression models struggle to capture non-linear response functions. Two geographically weighted logistic regression-based model calibration (GWLRMC) estimators have been developed for population proportion using complete auxiliary information. The proposed GWLRMC estimators are proven to be asymptotically design unbiased and approximately model unbiased under specific regularity assumptions. Approximate variances and estimators of variances for these estimators have been derived using the same set of assumptions. Through a spatial simulation study conducted in R software, the performance of the developed estimators has been compared with existing ones like the NHT estimator, regression, and SLGREG estimators across various scenarios. Through simulation results, it has been observed that the proposed GWLRMC estimators for population proportion under simple random sampling without replacement (SRSWOR) are asymptotically design unbiased based on percentage relative bias. Additionally, the proposed estimators exhibit greater efficiency compared to existing estimators in terms of percentage relative root mean square error.

Name of Student: Saikath DasRoll No: 21600
Guide: Dr. Bishal Gurang

A Study on EXPAR and EXPARMA Models to Capture Cyclical Nature of the Data

Exponential autoregressive and exponential autoregressive moving average models show considerable promise for capturing the cyclical nature of time-series data, where the former has been devised by adding an exponential term to each lag of the commonly used autoregressive model and the latter is a simple modification of the former in the sense that it also contains the error terms in a similar fashion. A straight forward method for estimating the parameters of these afore mentioned models has been developed, through a minimization algorithm being applied on the residual sum of squares. Further, codes have been developed and distributed for implementing the algorithm in R, which have also been utilized for analyzing 8 datasets. To test the applicability of the developed codes, a simulated EXPARMA(2,2) process has been used. Once the codes were validated; fitting was done on real-world data and the fits were compared with ARIMA model on the basis of various accuracy measures. One of the datasets was also split into training and testing sets to demonstrate the superiority of the models under study for forecasting the cycles for out-of sample observations.

Name of Student: Surya Prakash Tripathi
Roll No: 21601
Guide: Dr. Kaustav Aditya

Development of Two Auxiliary Calibration Estimator of the Population Total under Two Stage Sampling Design When the Variance Function of the Study Variable is Known

Existing multi-auxiliary calibration estimation method employs multiple auxiliary variables to estimate population totals while incorporating linear constraints, resulting in highly efficient estimators. However, the said approach is limited to single-stage sampling designs, while real-world surveys often employ more complex multistage designs. To address this, a new multi-auxiliary calibration estimator for population totals has been proposed under a two-stage sampling design when the variance function of the study variable is known. This development takes into account, the study variable and the two auxiliary variables generated from the multivariate normal population. The empirical findings indicate that proposed estimator outperform existing estimators in terms of precision for estimating population total using auxiliary information within a two-stage sampling setup.

Name of Student: Rakesh Chhalotre
Roll No: 21602
Guide: Dr. Rajender Parsad

Algorithmic Approach for Construction of Uniform Designs

Uniform design aims to distribute the experimental points evenly across the design space, which reduces the risk of over- or under-sampling areas of the design space, and thereby minimizes biases and promotes data reliability and accuracy. Two algorithms for construction of uniform designs have been developed, one for the rectangular regions and another for the irregular regions. Discrepancies criteria RMSD (root mean square distance), AD (average distance) and MD (maximum distance) have been used for selecting the best design points that efficiently cover experimental region of interest. Both algorithms offer enhanced flexibility and applicability. The algorithms have been implemented using R codes. The implementation of the algorithms developed has also been demonstrated through examples. The algorithm developed for constructing uniform designs in rectangular region is an improvement over the existing algorithm for obtaining NT-Nets (number-theoretic nets) and is capable of generating uniform designs in higher dimensions as well. The second algorithm has been developed for construction of uniform designs in the irregular region. Proposed algorithm for construction of uniform designs in the irregular region has many advantages over existing algorithms in terms of time efficiency. R codes developed are general in nature and may be used for generation of uniform design for given parameters.

Name of Student: Subhankar Biswas
Roll No: 21603
Guide: Dr. Amrit Kumar Paul

Study of Time Series Models for Non-linear Intervention Effects

Any sudden man-made or natural event which significantly affects the behaviour of time series is known as an intervention. In the past, researchers attempted to study the effect of intervention in a time series with the help of time series models like ARIMA-X and ANN-X, where the exogenous variable is the linear function like the step function, ramp function or their combination. In the present investigation, a new algorithm has been proposed to study the time series with intervention with the help of ARIMAX and ANNX where the exogenous variable is a non-linear model rather than the linear function. The developed approach has been employed on the

intervention of a ban on blending of mustard oil by FSSAI. The proposed model has been developed by fitting the ARIMA /ANN at the pre-intervention period and fitting the non-linear model at the residual of the ARIMA/ANN forecast for the post-intervention period. Three major mustard producing districts of Rajasthan namely Alwar, Tonk and Sriganganagar have been considered to study the effectiveness of the proposed model. In all the selected markets Hoerl model fits best to the residual. On the basis of MAPE and MSE, the proposed models ARIMAX and ANNX both perform better than traditional models.

Name of Student: Banavath Samuel Naik
Roll No: 21604
Guide: Dr. Prachi Misra Sahoo

Estimation of Crop Yield at Gram Panchayat Level using Remote Sensing and Small Area Estimation Techniques

To reduce crop cutting experiments (CCEs), crop yield estimation procedures are developed using small area estimation (SAE) technique using geo-spatial variables as auxiliary variable, to obtain more efficient and reliable estimates of crop yield at gram panchayat (GP) level. The study was conducted for Fatehpur tehsil of Barabanki district in UP, using Sentinel-2 multispectral data and CCE data on yield. Three strata of low, medium and high vegetation were made using NDVI, NDWI, SAVI and the combination i.e., NDVI+NDWI+SAVI. The area under wheat crop has been obtained from each strata using crop mask of wheat developed by classifying satellite data using MXL classification, for developing weights to generate small area estimates at gram panchayat level. Estimates of crop yield were obtained based on synthetic and composite small area estimators and were compared with the usual estimator on the basis of percent coefficient of variation (%CV) and percent relative efficiency (%RE). The synthetic and composite estimators were found to be more efficient than the usual estimator. Synthetic estimator is found to be more efficient than the composite estimators based on %RE in most of the GPs. Based on %CV, among all the synthetic estimates and composite estimates, the estimates based on the stratification using the combination of NDVI+NDWI+SAVI exhibited low %CV values.

Name of Student: Subhradip Roy
Roll No: 21605
Chairman: Dr. Ranjit Kumar Paul

Modeling Agricultural Price Volatility using Garch-Itô Models

Although the GARCH model is frequently used to model volatility, it is not particularly efficient at capturing high-frequency volatility of agricultural commodities. To overcome this limitation, the unified GARCH-Itô model incorporates both high and low frequency volatility. However, it struggles to accurately capture and model jump variations in volatility, leading to the development of the realized GARCH-Itô model. This model combines both characteristics as well as jump variations to reflect volatility dynamics more realistically. This research investigates the application of these models in weekly price series data for onions across several marketplaces. It has been found that jump variations improve the GARCH-Itô models' efficiency. Conventional methods of determining jump points frequently result in fewer jumps or none at all. In order to improve computation robustness, an approach that uses the discrete wavelet transform to identify the ideal number of jump points has been proposed. The results indicate that the GARCH-Itô model with the proposed algorithm performs better than other conventional models in assessing volatility in agricultural price data.

Name of Student: Ashish Gupta
Roll No: 21606
Guide: Dr. B.N. Mandal

A Study on Cyclic Minimal Balanced Crossover Designs

Crossover designs have long been recognized for their efficiency in experimental research, allowing researchers to compare multiple treatments within the same group of units or subjects. In the present investigation, two new methods of construction of crossover designs have been proposed, assuming only the presence of first order residuals effects of treatments. Specifically, methods of construction for cyclic minimal balanced crossover designs (Cyclic MBCOD) and cyclic minimal strongly balanced crossover designs (Cyclic MSBCOD) are provided along with the illustration. Necessary condition for parameters (v, p, n) for existence of such designs is also derived. Efficiency in crossover designs is assessed using relative efficiency for estimating direct and residual treatment effects in comparison to corresponding row-column designs. These designs are catalogued within a restricted parameter range ($n \leq 30$, $p \leq 7$, $v \leq 20$) to serve as a ready reckoner for researchers seeking innovative and efficient design solutions for their experiments.

Ph.D. (Computer Application)

Name of Student: Sapna Nigam
Roll No: 11008
Guide: Dr. Rajni Jain

Development of Deep Learning Model for Identification of Major Wheat Diseases

A novel in-field automatic wheat rust disease identification and severity stage estimation system based on deep learning architectures has been proposed, which can be deployed on mobile devices to perform real-time diagnosis at farmer's fields. An image dataset for three major fungal diseases of wheat (stripe rust, leaf rust and stem rust) and healthy leaves were prepared from the experimental fields of ICAR-Indian Agricultural Research Institute, New Delhi and its regional centre at Madhya Pradesh, during 2019 to 2021. The image dataset is referred to as WheatRust21, consisting of 6556 images of healthy and diseased leaves from natural field conditions. CNN-based models such as VGG19, ResNet152, DenseNet169, InceptionNetV3, and MobileNetV2 were employed for wheat rust disease identification and obtained accuracy ranging from 91.2 to 97.8%. To further improve accuracy, experiments were conducted with eight variants of EfficientNet architecture and discovered that the proposed fine-tuned EfficientNet B4 model achieved a testing accuracy of 99.35%. Another disease severity stage estimation model for wheat rusts was also proposed in this study. It utilized EfficientNet architecture and convolutional block attention mechanism (CBAM) to classify disease symptoms into early, middle, and end stages based on their severity level. The proposed severity estimation model achieved an overall testing accuracy of 96.8% and an average F1 score of 96.2%. Lastly, the proposed models are deployed in a mobile application for facilitating the real-time image-based wheat disease detection and severity level by farmers in the field.

Name of Student: Lakshmi Sonkusale
Roll No: 11231
Guide: Dr. K.K. Chaturvedi

Study of Text Mining Approaches for Topic Discovery in Agriculture

Topic discovery is the innovation towards extracting the underlying semantic structure from large collection of unstructured text. It is a convenient way to analyze unclassified text into topic clusters that can be utilized in classification of documents. Topic discovery can group words with similar meaning and distinguish between uses of words with multiple meaning. In the present study, a novel approach was developed, for topic recognition based on latent Dirichlet allocation (LDA) technique with various combinations of text pre-processing methods. Agricultural text corpus was extracted from Google Scholar (https://scholar.google.com) and Krishi Portal (https://krishi.icar.gov.in) using customized search by using web scraping script for collection of required data. Three combinations of preprocessing methods were used, before training of the models for topic discovery and the models were evaluated on the performance metrics. A novel approach was proposed, to determine the number of topics in a document, enabling users to organize and explore documents by topic for easier access. Additionally, a topic discovery model was developed. The results indicated that LDA successfully identified topics from agricultural research articles. The number and quality of topics were found to be influenced by the text pre-processing method. The relevance of the identified topics was further confirmed by domain experts. The study emphasized the impact of pre-processing on the number and quality of topics.

Name of Student: Murari Kumar
Roll No: 11475
Guide: Dr. K.K. Chaturvedi

Natural Language Processing based Interactive System for Integrated Pest Management in Rice and Wheat

In this study, the integration of natural language processing (NLP) techniques have been explored to facilitate communication between farmers and digital systems, enabling real-time access to integrated pest management (IPM) in rice and wheat crops. To overcome the limitations of Kisan Call Centers (KCC) and provide an instant solution for pest management, the study aims to achieve three objectives: the establishment of a named entity recognition (NER) pipeline for the KCC dataset, the development of a model for intent classification using machine learning techniques, and the creation of a response generation system for interactive query answering. To accomplish these goals, an extensive dataset of 3.6 million queries was collected from the UP State of India from 2017 to 2021 by developing a web scraping interface. For NER, the open-source library 'SpaCy' was utilized, and an algorithm for automatic annotation of text data was developed, resulting in a high-performing NER model. The intent classification model was created using an ensemble approach of naïve Bayes and decision tree algorithms and deep learning methods like LSTM and BiLSTM, achieving remarkable accuracy.

Furthermore, an interactive response generation system was developed by integrating NER and intent models, offering contextually relevant responses for IPM-related queries.

M.Sc. (Computer Application)

Name of Student: Sakshi Rawat
Roll No: 21558
Guide: Dr. K.K. Chaturvedi

Development of Web Based Bibliometric Analysis Tool for Agriculture

Bibliometric analysis involves examining and assessing scientific literature through the extraction of vital information, primarily emphasizing quantitative evaluation of publications, citations, and co-authorship networks. This approach aims to pinpoint emerging research domains and trends within articles, while also evaluating journal performance, studying collaboration patterns among research components, and uncovering gaps within the chosen subject domain. However, bibliometric analysis specific to agricultural studies lacks comprehensive coverage. Many major scholarly databases do not encompass most Indian agriculture journals, and a performance indicator that incorporates. In this study, the Author Performance Indicator (AuthorPerIndic), a score that evaluates a scientist's productivity based on journal NAAS scores and their authorship has been developed. Additionally, a novel web tool using Django framework facilitating bibliometric analysis at the author level for ICAR-IASRI scientists has been created. Data is sourced from the ICAR-initiated KRISHI publication repository and processed to meet analysis requirements. The tool employs AuthorPerIndic for performance analysis alongside collaboration and keyword analyses.

Name of Student: Rohit Vanshraj
Roll No: 21628
Guide: Dr. Shashi Dahiya

Decision Support System for Energy Budgeting of Crop Production

The decision support system (DSS) for energy budgeting of crop production is a comprehensive solution aimed at optimizing energy budgeting in crop production. Leveraging Android Studio, Java programming, and the Android SDK, the App empowers developers to create a user-friendly interface for various stakeholders, including agronomists, farmers, policymakers, researchers and extension workers. Key features include intuitive UIs, cropping pattern comparison and recommendation, use of advanced energy budgeting algorithms, efficient data management and graphical data visualization. By facilitating informed decisions through data-driven insights, this system contributes to sustainable and efficient agricultural practices. The DSS stands as a transformative tool that modernizes agricultural practices, making them more sustainable, data-informed, and resource-efficient.

Name of Student: Sasikumaran S.
Roll No: 21630
Guide: Dr. Soumen Pal

Development of Web Application for Feature Selection and Crop Yield Prediction of Landscape Diagnostic Survey Data Using Machine Learning Techniques

Policy makers rely on accurate crop yield predictions to make timely decision to strengthen food security. Farmers and growers can also make informed financial and management decisions depending on crop yield prediction. To address such importance, a web-based tool has been developed for feature selection and crop yield prediction of landscape diagnostic survey data (under CSISA) for rice and wheat crop in Bihar and Eastern Uttar Pradesh. The web-based application has been developed using flask framework written in Python. This application requires a *.csv file from user as input and performs feature selection and crop yield prediction using machine learning techniques for that dataset. Methods such as stepwise regression, random forest regression, ridge regression and LAASO have been used for feature selection and models viz. multiple linear regression, random forest regression, ridge regression and support vector regression have been employed for crop yield prediction based on the selected features. The performance of the models was evaluated using statistical diagnostic measures and best model was identified for feature selection and yield prediction.

Name of Student: Bhavya Shree
Roll No: 21746
Guide: Dr. K.K. Chaturvedi

Development of Mobile App for Beneficial Insects in Crops

A mobile application that facilitates in effective utilization and conserving beneficial insects within agricultural landscapes has been developed. The proposed mobile App serves as a comprehensive tool for extension professionals, progressive farmers, entomologists and agriculture practitioners by enabling them to identify and protect these beneficial insect species relevant to specific

crops and geographic regions. The development process involves discussion and collaboration with entomologists and extension professionals to ensure scientific accuracy and practicality of the collected information. The beneficial insects are categorized into various categories such as pollinators, predators, parasitoid, scavengers, decomposers and soil builders. For these beneficial insects morphological appearance, special characters, behaviour, mechanism and interaction against pest are discussed. Validation of the App's effectiveness and user-friendliness is done through students of The Graduate School, ICAR-IARI, New Delhi.

Name of Student: Gaurav Maitra
Roll No: 21748
Guide: Dr. Md. Samir Farooqi

Development of Mobile App for Pest Surveillance and Management of Tomato Crop

PestSurv Tomato, an innovative mobile application has been designed and developed to revolutionize pest management in agriculture. This comprehensive mobile tool addresses the persistent challenges faced by farmers, particularly in the surveillance and management of pests that threaten crop productivity, food security, and environmental sustainability. The App's objectives, including the creation of a user-friendly interface for pest surveillance and the provision of real-time pest management advisories, have been successfully realized. PestSurv Tomato empowers farmers with the ability to independently conduct pest surveillance on their fields. This innovative approach ensures early detection of pest incidents, reducing crop damage and financial losses. One of the App's most significant advantages lies in its ability to generate timely and customized pest management recommendations. By processing surveillance data instantly, PestSurv Tomato provides farmers with tailored guidance for pest control measures.

Ph.D. (Bioinformatics)

Name of Student: Soumya Sharma
Roll No: 10778
Guide: Dr. Sunil Archak

Development of Database of Genes and Gene Families Responsible for Nutritional Traits in Field Crops

A comprehensive search strategy was followed to obtain the genes responsible for nutritional traits in plants. The gene sequences for mineral transportation, vitamin biosynthesis and essential amino acid biosynthesis were retrieved from 4 databases viz. GenBank, EnsemblPlants, Gramene, and UniProt. A total of 7695 sequences for mineral transportation, 1480 sequences for vitamin biosynthesis and 2583 sequences for essential amino acid were obtained. Machine learning models such as support vector machine (SVM), random forest (RF), Naïve Bayes and K-nearest neighbour (KNN) were employed for classification of mineral transportation, vitamin biosynthesis and essential amino acid biosynthesis related gene sequences. Firstly the machine learning techniques were applied for developing three binary classification models for mineral transportation, vitamin biosynthesis and essential amino acid biosynthesis genes. Then, three multiclass classification models mineral transportation, vitamin biosynthesis and essential amino acid biosynthesis genes were developed using each of the four classifiers. Five-fold cross validation was performed to compare the performance of four classifiers independently and the results suggested that RF, SVM and KNN performed best for both binary as well as multiclass classification. A database nutritional trait related gene sequences in flowering plants has also been developed.

Name of Student: Ritwika Das
Roll No: 11005
Guide: Dr. Anil Rai

Development of Advanced Learning Based Classification Approach for Fungal Metagenomic Data

Computational approaches, especially machine learning and deep learning algorithms, have been found efficient to classify prokayotic microorganisms from metagenomic datasets as compared to the reference-based method. However, identification of eukaryotic fungi species from metagenomic data is a highly challenging task. Internal Transcribed Spacer (ITS) region is the universal DNA marker for the taxonomic annotation of a majority of fungal species. In this study, a convolutional neural network (CNN) based approach, *CNN_Funbar* has been developed using UNITE+INSDC reference ITS datasets for classifying fungi ITS sequences at all the six taxonomic levels, *viz*., species, genus, family, order, class and phylum. The proposed *CNN_FunBar* models have produced > 93% average accuracy for classifying ITS sequences from balanced datasets at all the taxonomic levels. With simulated fungal metagenomic datasets, the species and genus classification accuracy of 91.93% and 95.16% are respectively obtained. *CNN_FunBar* has been found to outperform existing fungal taxonomy prediction

tools as well as competitive machine learning-based algorithms. A web application, *CNN_FunBar (*https://github.com/ritwika1993/CNN_FunBar_ITS*)* has been developed for extracting oligonucleotide frequency features from input ITS sequences followed by their classification at various taxonomic levels.

Name of Student: Sneha Murmu
Roll No: 11006
Guide: Dr. Sunil Archak

Development of Computational Approaches to Understand Plant-Pathogen Interactions

A machine learning-based ensemble model has been developed to construct a multi-species plant-pathogen protein-protein interactions (PPIs) predictor. This model incorporated diverse sequence encodings and multiple learning algorithms, including auto-covariance (AC), conjoint-triad (CT), and local descriptor (LD) schemes. AC and CT exhibited high accuracy with support vector machine, while LD performed optimally with random forest. Combining the predictions of these individual models yielded an ensemble model with enhanced accuracy (~97%). This newly developed ensemble model was compared with existing tools for PPI prediction using an independent test dataset. To further illustrate its utility, the model was applied to predict PPIs involved in wheat blast, a severe fungal disease threatening global wheat production. A web-based prediction server named PlantPathoPPI (http://login1.cabgrid.res.in:5080/) has been developed, allowing diverse end-users to benefit from the proposed model.

Name of Student: Shweta Kumari
Roll No: 11007
Guide: Dr. Sunil Archak

Comparative Genomic Studies for Domestication Related Traits in Vigna Species

To unravel the genetic basis of pod shattering and photo-period sensitivity traits in Vigna, a comparative genomic study has been undertaken. The research identified candidate orthologs and gene families related to shattering and photoperiod response traits in Vigna through comparative analysis and synteny studies. For overcoming shattering and photosensitivity, specific genes are proposed as targets. For instance, VungMSL23.1 in cowpea, VangMSL23.1 in adzuki bean, VumbMSL23.1 in rice bean, and VradMSL12 in mung bean are suggested for non-shattering traits. In the context of photoperiod sensitivity, five groups of potential genes have been identified across the four Vigna crops. Genome editing tools have been proposed to be applied to these target genes to gain insights into their role in non-shattering and photo-insensitive phenotypes, thus accelerating the domestication process. To facilitate further research and access to the generated data, a database has been developed. This comprehensive resource contains detailed information about genes related to shattering/non-shattering and photoperiod response traits in Vigna species. Additionally, a novel cis-regulatory enrichment analysis tool tailored for the Vigna genomic background has been created. The database and tool are accessible at http://www.nbpgr.ernet.in:9093/.

Name of Student: Dipro Sinha
Roll No: 11227
Guide: Dr. Sunil Archak

Development of Advanced Learning Model for Prediction of Epigenetic Modifications in Crop(s)

This study proposed machine learning frameworks for prediction of epigenetic modifications, N6-methyladenine (6mA) and 5-methylcytosine (5mC) in plants. The machine learning framework comprises ensemble machine learning model, a hybrid approach for feature selection, incorporation of average mutual information profile features (AMIP), and the use of bootstrap samples. Five distinct feature sets such as di-nucleotide frequency, GC content, AMIP, mono-nucleotide binary encoding and nucleotide chemical properties are chosen for encoding of DNA sequences. Nine machine learning models, including support vector machine, random forest, K-nearest neighbour, artificial neural network, multiple logistic regression, decision tree, naïve Bayes, AdaBoost, and gradient boosting, along with two deep learning models, long short term memory (LSTM) and Bidirectional-LSTM are used for classification. The top three performing models are selected to form a robust ensemble model named EpiSemble, for predicting 6mA and 5mC methylation sites. EpiSemble demonstrated significant accuracy improvements over existing models for various datasets related to crops. The developed R package, EpiSemble, is the first of its kind for predicting epigenetic sites in crop plant genomes, providing valuable support to plant researchers.

Name of Student: Nitesh Kumar Sharma
Roll No: 11466
Guide: Dr. Sarika

Deep Learning Based Algorithm for Identification of Copy Number Variation

A deep learning-based tool has been designed to

remove human intervention while validating copy number variation (CNV) calls, with emphasis on the calls made by PennCNV tool, one of the most reliable CNV callers reported in literature. An ensemble model has been developed that outperformed traditional machine learning techniques, with improved accuracy of 0.981 in CNV calls and an ideal area under the receiver operating characteristic curve of 0.998. The model's improvement resulted in reducing the false positives and instances when the CNV association results couldn't be replicated. A CNV prediction server (http://backlin.cabgrid.res.in/eqcnvdb/index.php) based on ensemble deep learning technique with minimum false discovery rate (FDR) has also been developed which can be used in other related species. This work is the first genome-wide, chromosome-wise, breedwise CNV Atlas of Indian Equine breeds, EqCNVDb, available at http://backlin.cabgrid.res.in/eqcnvdb/index.php. The results can further be evaluated for horse breed signature, evolutionary studies including adaptive response of equine germplasm against biotic and abiotic stresses.

Name of Student: Sharanbasappa
Roll No: 11739
Guide: Dr. D.C. Mishra

Computational Intelligence in the Discovery of Natural Products from Agriculturally Important Metagenomics Data

Focusing on agriculturally important metagenomics, the research employed direct DNA sequencing from soil, plants, and livestock. The challenge of reconstructing individual genomes from complex DNA mixtures is addressed through innovative binning strategies, with deep embedded clustering and variational autoencoders outperforming existing methods. The study emphasized the pivotal role of binning for identifying natural products (NPs) by clustering genomes or taxonomically related groups. A novel approach to NP identification has been developed, integrating physicochemical properties, CountVec, TFIDF and Word2Vec features. The study targeted five NP classes, including polyketide synthase (PKS), non-ribosomal polyketide synthase (NRPS), ribosomally synthesized and post-translationally modified peptides (RiPP), terpenes and hybrid PKS-NRPS. Nine models have been trained and tested on a comprehensive feature matrix, with logistic regression employing TFIDF and SMOTE emerging as the most accurate. The tool NaturePred has been developed based on the developed approach for NP class prediction and protein physicochemical property calculation.

Name of Student: Baibhav Kumar
Roll No: 11468
Guide: Dr. Mir Asif Iquebal

A Study on Machine Learning based Approach for Long Non-coding RNA Subcellular Localization Prediction

A multiclass classification model has been developed which can predict the lncRNA localisation in 7 locations. Novel motif feature extraction method based on local alignment using dynamic programming developed and compared with the combined sequence, structure and physico-chemical based features. Random forest-based model with 10 nucleotide motif size and 3 maximum mismatches allowed performed best, achieving 65% accuracy on the original dataset and an impressive 93% with a balanced dataset. To demonstrate the practical application of this classifier, the study employed a case study approach, focusing on black pepper (*Piper nigrum*) as an economically important spice crop. A total of 6406 lncRNAs and 4621 circRNAs have been identified, and their subcellular localizations have been predicted using the developed classifier. Furthermore, the classifier has been integrated into 'LncSubLoc', a user-friendly web server developed using python-based web framework Flask, allowing users to easily predict the localization of lncRNAs. A web resource "BPncRDB" has also been developed as black pepper ncRNA Atlas containing all the information related to lncRNAs/circRNAs identified.

Name of Student: Anubhav Roy
Roll No: 10781
Guide: Dr. Sudeep Marwaha

Development of a Genonme-phenome Browser for Rice Cultivars

This study took up the task of conducting a comprehensive analysis of functionally validated and characterized rice genes. The compilation of phenotypes caused by these genes has been instrumental in creating a robust and valuable database. Leveraging the power of MySQL and extending the capabilities of GBrowse genome browser, a state-of-the-art Genome-phenome browser has been developed. This browser serves as a comprehensive repository, facilitating easy access to genotype and phenotype information of rice genes that have undergone functional characterization during the course of the present investigation. By harnessing the potential of this genome-phenome browser, researchers can now dive into a wealth of information available across literature, enabling them to identify and explore genes responsible for influencing a diverse range of morphological,

physiological, and resistance or tolerance traits in rice. The detailed analysis offered by this resource also extends to the annotation of genes that have undergone functional characterization, contributing to a deeper understanding of their roles and implications in rice breeding efforts.

M.Sc. (Bioinformatics)

Name of Student: Abhik Sarkar
Roll No: 21621
Guide: Dr. D.C. Mishra

Development of Tool for Selective Sweep Analysis using Artificial Intelligence

Selective sweep is a biological phenomenon which increases the frequency of the alleles closely linked to the beneficial alleles and non-linked alleles shows decrement in their frequency. From evolutionary aspects to adaptation of newly developed varieties in the environment selective sweep plays crucial role and so analysis of selective sweep has wide importance in evolutionary and population genomics. In this research work artificial intelligence-based machine learning algorithms have been implemented for prediction of selective sweep, where random forest has performed best among the considered ones. The developed model performed better than the already existing tools such as Sweep Finder, Omega Plus, SweeD and diploS/HIC. Utilizing this as best model an interactive selective sweep analysis tool has been developed namely Sweep Discovery Tool (http://cabgrid.res.in:5599/). This tool has the ability to predict selective sweep status among three classes viz. hard selective sweep, soft selective sweep and no selective sweep through VCF files as input and this is a user-friendly tool where user can choose the chromosome and region of interest in the specific chromosome to obtain the selective sweep status.

Name of Student: Ravi
Roll No: 21622
Guide: Dr. Monendra Grover

Discovery of Molecular Markers and Development of Database for Rice Bean

The present study introduced the first whole genome-based molecular marker database for Ricebean, known as RbMmDb, which includes data on SSRs, primers, amplicons, and SNPs. Out of 511010 transcripts, there are a total of 61905 SSRs, 79359 primers for those sequences and 172749 amplicons. Dinucleotide repeats have been found to be predominant with an absolute proportion of 76.5%, followed by trinucleotides (20.8%). Out of the dinucleotide motif, AT accounted for 17.5%, followed by TA (16.9%) and others. The group motifs AT/TA accounted for 17.5% of the total, followed by TA/AT (16.9%). The 10-bp-long SSR motif accounted for 33.1%, followed by the 15-bp-long SSR motif (12.3%). A total of 196222 SNPs have been identified, and the highest quality has been 999. A total of 196221 SNPs have been found to be present in the Ricebean leaf and seed transcriptome. The database, accessible online and developed using a three-tier architecture, provides motif-wise SSR and location-wise SNP information, offering a valuable resource for researchers and the public interested in Ricebean genetics and cultivation.

Name of Student: Deeksha P.M.
Roll No: 21623
Guide: Dr. S.B.Lal

A Semi-supervised Approach for Binning of Metagenomics Data

Recognizing the need for more robust methods in binning, use of single-copy phylogenetic marker genes has been explored for accurate delineation of prokaryotic species. The research conducted a comprehensive investigation on a 10s metagenome dataset, employing a semi-supervised clustering approach. The process involved reducing the high-dimension feature matrix to 512 dimensions using autoencoder, followed by clustering and analysis using marker genes data identified in the contigs. The K-Means clustering phase revealed 8 clusters with a rand index of 0.85 and an F1 score of 0.61. Subsequent correction of clusters increased the count to 10 clusters, significantly enhancing clustering quality with a rand index of 0.68 and an overall accuracy of 0.62. The study emphasized the importance of rigorous cluster correction in metagenomic analysis, showcasing its impact on precision and the significance of final cluster outcomes.

Name of Student: Abhishek Anand
Roll No: 21624
Guide: Sh. Sanjeev Kumar

Web Tool for Crispr/Cas9 off Target Prediction in Plants

Gene editing allows to modify organism at genome level enabling to control their phenotypic traits. CRISPR-Cas9 is one such technology which has surpassed all the existing technology for gene editing. However, off-target cleavage is one of its major challenges preventing its application in real world because of its detrimental effect on the

target organism. Several techniques have been developed to predict off-target in CRISPR-Cas9 like in-vivo, in-vitro and in-silico techniques. But due to cost and time factors, in-vivo and in-vitro cannot be performed all the times. In in-silico mode of off-target predictions data obtained from previously conducted in-vivo and in-vitro techniques of off-target prediction are used to study statistical and mathematical relations between them, then using this data and their relations, different in-silico tools have been developed including web tools for off-target predictions. In recent past, tools developed based on Artificial Intelligence have become more popular. They have over shadowed the tools based on traditional alignment approach in terms of accuracy in predicting CRISPR-Cas9 off-targets. Recently plant based, machine learning model and deep learning models have been developed. Using these developed models IASRI-CRISPR (i-CRISPR) have been developed to predict off-targets in plants.

Name of Student: Subham Ghosh
Roll No: 21625
Guide: Dr. U.B. Angadi

Novel and Efficient Pipeline for Metagenomics Binning

A novel approach has been proposed to metagenomic binning by constructing a frequency table of motifs or segments through local alignment with gaps. The segments, crucially, should not overlap during alignment. K-means clustering is then applied to categorize contigs based on these segments and motifs. Notably, this motif-based binning approach demonstrated a Rand Index tending towards 1, indicating its effectiveness. It outperformed existing tools like MaxBin and MetaBat, showcasing its potential in metagenomic binning. Advanced clustering methods, incorporation of GC content and tetra-nucleotide frequency, hold promise for enhancing performance. Beyond binning, the approach sheds light on mutation concepts and conserved regions, offering insights into evolutionary biology.

Name of Student: Sorna A.M.
Roll No: 21626
Guide: Dr. Md. Samir Farooqi

Development of an Approach for Identification of Core Microbiome

The "core microbiome" concept, crucial for understanding consistent microbial communities in specific hosts or environments, has been addressed. To overcome the sampling bias and arbitrary cutoffs challenges in existing studies, "CoreMicrobiomeR" R package has been developed for implementation. *Arabidopsis thaliana* core root microbiome data has been used for investigation. The proposed approach involves distinct phases, including filtering, normalization, core microbiome determination, diversity analysis, significance testing and visualization. The unique aspect of designating the most abundant taxa as the core, based on total abundance, presents a straightforward yet effective strategy. Various filtering and normalization methods have been explored, and the default top ten percent of total abundance is adopted to determine the core microbiome. F-test analysis is applied for significance testing, and both alpha and beta diversity measures are computed. The culmination of this study is the "CoreMicrobiomeR" R package, representing a significant advancement in microbial community analysis.

Research Fellowships:

During 2024, 79 Ph.D. and 30 M.Sc. students received research fellowship. 53 Ph.D. students received IASRI fellowship @ Rs.31,000/-(First and Second Year), 35,000/- (Third Year) per month in addition to Rs.10,000/- per annum as the contingency grant. 08 Ph.D. students received UGC fellowship @ 31,000/- per month and Contingency Rs.10,000/-, 16 students ICAR-SRF fellowship @ Rs.31,000/-(First and Second Year), 35,000/- (Third Year) per month in addition to Rs.12,500/- per annum as the contingency grant. 01 Ph.D. Student received ST fellowship from Ministry of Tribal Affairs @Rs. 28,000/- per month and Rs 20,500 per annum as contingency grant and 01 Ph.D. Student received DBT fellowship. 10 M.Sc. students received ICAR Junior Research Fellowship @ Rs.12,640/- per month in addition to Rs.7,500/- per annum as contingency grant and 20 M.Sc. students received IASRI fellowship @Rs.7,560/- per month and Rs.6,000/- per annum as contingency grant.

Board of Studies for Academic Year 2024-25

Agricultural Statistics

1.	Dr. Cini Varghese, Professor (Agricultural Statistics)	Chairperson
2.	Dr. Rajender Parsad, Director	Member (Ex-officio)
3.	Dr. Md. Wasi Alam, Principal Scientist	Member
4.	Dr. Ankur Biswas, Senior Scientist	Member
5.	Dr. Raju Kumar, Scientist	Member Secretary
6.	Mr. Satyam Verma, Student	Students' Representative

Computer Application

1.	Dr. Alka Arora, Professor (CA)	Chairman
2.	Dr. Rajender Parsad, Director	Member (Ex-officio)
3.	Dr. Shashi Dahiya, Principal Scientist	Member
4.	Dr. Soumen Pal, Senior Scientist	Member Secretary
5.	Dr. Sapna Nigam, Scientist	Member
6.	Miss. Tanwi Kumari	Students' Representative

Bioinformatics

1.	Dr. Girish Jha, Professor (Bioinformatics) (Till 15.7.2024) Dr Sarika (From 16.7.2024)	Chairman
2.	Dr. Rajender Parsad, Director	Member (Ex-officio)
3.	Dr. Ulavappa Angadi, Principal Scientist	Member
4.	Dr. Mohammad Samir Farooqi, Principal Scientist	Member
5.	Dr. Sneha Murmu, Scientist	Member Secretary
6.	Mr. Asif Ali V.K.	Students' Representative

Central Examination Committee for Academic Year 2024-25

Agricultural Statistics

1.	Dr. Rajender Parsad, Director
2.	Dr. Cini Varghese, Professor (Agricultural Statistics)
3.	Dr. K.N. Singh, Head (F&ASM)
4.	Dr. Tauqueer Ahmad, Head (Sample Surveys)
5.	Dr. A.K. Paul, Head (Statistical Genetics)

Computer Application

1.	Dr. Rajender Parsad, Director
2.	Dr. Alka Arora, Professor (CA)
3.	Dr. Sudeep Marwaha, Head (CA)
4.	Dr. K.K. Chaturvedi, Principal Scientist
5.	Dr. Anshu Bhardwaj, Principal Scientist
6.	Dr. Md. Ashraful Haque, Scientist

Bioinformatics

1.	Dr. Rajender Parsad, Director
2.	Dr. Girish Jha, Professor (Bioinformatics) (Till 15.7.2024) Dr Sarika (From 16.7.2024)
3.	Dr. U.B. Angadi, Principal Scientist
4.	Dr. S.B. Lal, Senior Scientist
5.	Sh. Sanjeev Kumar, Scientist

National/International Training Programme

Senior Certificate Course in Agricultural Statistics and Computing

Senior Certificate Course in Agricultural Statistics and Computing was organized for the benefit of research workers engaged in handling statistical data collection, processing, interpretation and employed in research Institute of the Council, State Agricultural Universities and State Government Departments, & foreign countries including SAARC countries. The main objective of the course was to train the participants in the use of latest statistical techniques as well as use of computers and software packages. The course was organized during the period September 17, 2024 to February 28, 2025. The Course comprises of two independent modules of three months duration each. Module – I was organized during September 17, 2024 to December 11, 2024. Module-II was organized during December 16, 2024 to February 28, 2025. Three officers participated in Module – I and four officers participated in Module – II (03 Officers both module). The course covered under both the modules included Statistical Methods and Official Agricultural Statistics, Use of Computers in Agricultural Research, Sampling Techniques, Econometrics and Forecasting Techniques, Design of Experiments and Statistical Genetics. Dr. Alka Arora was the course coordinator of the course.

Training Programs Organized: 23; Number of Participants: 1340 and हिन्दी कार्यशाला: 05; सहभागी :114

S.No.	Title and Coordinators	Period	Number of Participants
	➢ Centre of Advanced Faculty Training, Education Division, ICAR, New Delhi: 82 Participants		
1	Statistical and Computational Advances for Bioinformatics Data Analysis in Agriculture: Practical Aspects (Coordinators: Girish Kumar Jha, Sudhir Srivastava and Neeraj Budhlakoti)	January 02-22, 2024	23
2	Advanced Forecasting Techniques in Agriculture Science Research (Coordinators: K.N. Singh, Achal Lama and Rajeev R. Kumar	January 24-February 13, 2024	24
3	Development of AI-based Android Mobile App (online) (Coordinators: Chandan Kumar Deb and Md. Ashraful Haque)	March 05-25, 2024	35
	➢ HRM Training Programmes: 125 Participants		
4	Digital Competency New Tools and Software for Efficient Computer Applications (Online) (Coordinators: Shashi Dahiya, Sanchita Naha and Akshay Dheeraj)	January 03-09, 2024	28
5	Recent Advances in Data Analysis and Application (Online) (Coordinators: Cini Varghese, Anindita Datta and Mohd. Harun)	January 16-22, 2024	34
6	E-Governance Tools and applications in ICAR (Online) (Coordinators: S.B. Lal, Mukesh Kumar and K.K. Chaturvedi)	February 08-14, 2024	30
7	Advanced Data Analysis and Statistical Programming for senior-level Ph.D. students of Agricultural Statistics & Informatics and under SEVA (Students Empowerment Via Alumni) (Coordinator: Cini Varghese)	March 01-10, 2024	33
	➢ Training Programmes Under Projects		
	Establishment of Centre for Bioinformatics and Computational Biology in Agriculture-BIC: 213 Participants		
8	Decoding Genomics & Proteomics Data using Machine Learning Approach (Online) (Coordinators: Girish Kumar Jha, Sunil Kumar, Sanjeev Kumar and Sarika Sahhu)	February 21-27, 2024	51
9	Genomic Data Analysis in Agriculture (Online) (Coordinators: M.A. Iquebal, Sarika and Dinesh Kumar)	March 18-28, 2024	125
10	Omics Analysis in the Era of AI (Online) (Coordinators: Monendra Grover, Ritwika Das and Sneha Murmu)	June 06-12, 2024	37
	CRP Genomics Project: 134 Participants		
11	RNAome: Profiling and characterization of non-coding RNAs (Coordinators: Sarika Sahu, Neeraj Budhlakoti and Soumya Sharma)	March 14-20, 2024	46
12	Metagenomics Data Analysis (Online) (Coordinators: Anu Sharma, Md. Samir Farooqi and Sneha Murmu)	July 22-24, 2024	30
13	Bioinformatics Advances in Genomic Data Analysis (Online) (Coordinators: Neeraj Budhlakoti, Ritwika Das and Soumya Sharma)	June 24-28, 2024	58
	Resilient Agricultural Education System: NAHEP Component 2: 758 Participants		
14	Usage of AI & AR/VR Technologies in Agriculture & Daily Life of Human Being (Coordinators: Sudeep Marwaha and Alka Arora)	May 13-15, 2024	46
15	NARES Blended Learning Platform (Coordinators: Shashi Dahiya, Sudeep Marwaha and Anshu Bharadwaj)	July 22-23, 2024	25

16	NARES Blended Learning Platform: Features and Functionalities (Coordinators: Alka Arora, Soumen Pal and Sudeep Marwaha)	July 29-30, 2024	25
17	Python (Online) (Course Directors: Sudeep Marwaha and Rajender Parsad; Coordinators: Soumen Pal and Chandan Kumar Deb)	August 02-08, 2024	271
18	Empowering Agriculture Through Artificial Intelligence and Digital Technologies (Online) (Course Directors: Sudeep Marwaha and Rajender Parsad; Coordinators: Sapna Nigam, Madhu and Akshay Dheeraj)	August 20-22, 2024	50
19	Technological Interventions for Sustainability in Horticulture (hybrid mode using NARES-BLP in collaboration with Dr. YSR Horticulture University, Andhra Pradesh) (Coordinators: Alka Arora, Anshu Bharadwaj, Rajender Parsad and Sudeep Marwaha)	August 27-30, 2024	34
20	Phenomics and High-Throughput Phenotyping: Dissection of Traits for Abiotic Stress Tolerance (Online through NARES-BLP) (Coordinators: Sudeep Marwaha and Chandan Kumar Dev)	August 25-30, 2024	45
21	Integrated Crop Management in Apple (hybrid mode using NARES-BLP in collaboration with Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan) (Coordinators: YSPUHF: Satish K Sharma, Bhupesh Gupta and Arshi Sultanpuri; ICAR-IASRI: Madhu, Sapna Nigam, Sudeep Marwaha and Rajender Parsad)	August 27-29, 2024	51
22	Decoding Startup and Entrepreneurial Ideas for Agriculture and Veterinary Graduates (hybrid mode using NARES-BLP in collaboration with SVPUAT, Meerut) (Coordinators: SVPUAT: Kuldeep Kumar Tygai; ICAR-IASRI: Shashi Dahiya and Sudeep Marwaha)	August 27-29, 2024	211
Sponsored by NSSTA, MoSPI, Govt. of India:28 Participants			
23	Data Analysis and Interpretation for 46th batch of Indian Statistical Service (ISS) Probationers (Coordinators: Ajit, Ankur Biswas and Upendra Kumar Pradhan)	August 12-23, 2024	28
हिन्दी कार्यशाला: 05; सहभागी: 114			
1	**कृषि शिक्षा में डिजिटल पहल** (संयोजक: मधु, संचिता नाहा, सपना निगम)	मार्च 06–08, 2024	14
2	**कृषि में ओमिक्स डेटा विश्लेषण का परिचय** (संयोजक: सुधीर श्रीवास्तव, मोहम्मद समीर फारुकी एव स्नेहा मुरमु)	जून 27, 2024	17
3	**परिषद में ई–गवर्नन्स का अनुप्रयोग** (संयोजक: एस.बी. लाल, मुकेश कुमार एव संजीव कुमार)	सितम्बर 13, 2024	26
4	**परीक्षण अभिकल्पना के अनुप्रयोग** (संयोजक: मो. हारून और अनिंदिता दत्ता)	दिसम्बर 19, 2024	23
5	**भारतीय संविधान** (संयोजक: संजय बोकोलिया और विशाल लखनपाल)	दिसम्बर 24, 2024	34

Sensitization Workshop/Trainings

- Following **19** workshops (Participants: **1721**) were conducted on **NARES-Blended Learning Platform**: (i) University of Horticultural Science, Bagalkot: January 09-10, 2024: Participants: 40; (ii) University of Agricultural Sciences, Raichur: January 12-13, 2024: Participants: 191; (iii) Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar: January 23-24, 2024: Participants: 57; (iv) Kerala University of Fisheries and Ocean Studies, Ernakulam: January 24-25,

2024: Participants: 195; (v) Andhra Pradesh Fisheries University, Naraspuram: January 24-25, 2024: Participants: 80; (vi) Maharana Pratap Horticulture University, Karnal: January 30, 2024: Participants: 20; (vii) University of Agricultural and Horticultural Sciences, Shivamogga: January 30-31, 2024: Participants: 50; (viii) Agriculture University Kota: February 07, 2024: Participants: 81; (ix) Punjab Agriculture University: February 07, 2024: Participants: 57; (x) Dr. Y.S.R. Horticultural University: February 07, 2024: Participant: 215; (xi) Tamil Nadu Dr. J. Jayalalithaa Fisheries University: February 09, 2024: Participants: 120; (xii) Mahatma Gandhi University of Horticulture & Forestry, Durg: Feburary 16, 2024: Participants: 55; (xiii) Sardar Krushinagar Dantiwada Agricultural University: February 16, 2024: Participants: 31; (xiv) Rajasthan University of Veterinary & Animal Sciences, Bikaner: February 16, 2024: Participants: 261; (xv) Kamdhenu University, Gandhinagar: February 16, 2024: Participant: 20+; (xvi) Central Agricultural University, Imphal: February 21, 2024: Participants: 24; (xvii) Vasantrao Naik Marathawada Krishi Vidyapeeth, Maharashtra: February 26, 2024: Participants: 121; (xviii) Nagaland University: February 21, 2024: Participants: 53 and (xix) Rani Lakshmi Bai CAU: July 11-12, 2024:Participants:50.

- Workshop on AR/VR modules conducted by ICAR-IASRI, New Delhi for SAUs during June 12-14, 2024 for strengthening agricultural education through ICT interventions; Participants: **1136**
- All-India online training programme on **Demonstration of eLISS V2.0** on March 22, 2024: participants: **869** State/UT officials and District Nodal Officers (DNOs) participated.
- Half day session for **20** foreign Government Officers/Statisticians from 04 countries viz. Laos, PDR, Vietman, Maynamar and Cambodia under a training programme "Large Scale Socio-Economic Sample Survey" organized by National Statistical Systems Training Academy (NSSTA) on 20 March, 2024 at ICAR-IASRI, New Delhi.
- Field training for the Master Trainers and Officials of DES Meghalaya from during May 20 -22, 2024, in Shillong, Meghalaya
- On Information system on long term fertilizer experiments (ISLTFE) for all the centers on July 18, 2024. Participants: **25** from 17 different centers.
- Half-day training (online) for all on-station agronomists on contrast analysis of on-station experiment in the forenoon of 24.09.2024 in collaboration with ICAR-IIFSR. Participants: **85**.

Internship Training Programme

During the year 2024, following 27 students of different Universities/Institutes worked at ICAR-IASRI as project trainee for their Graduation/Post Graduation dissertation work.

S.No.	Name of Student and Organisation	Title of the Study	Name of the Mentor	Duration
1.	Mr. Ritwik Chaudhary, Department of Biotechnology, Chandigarh University, Punjab	A Computational Study on Cyclin Proteins in Plants	P.K. Meher	January 05-June 30, 2024
2.	Ms. Shruti Sharma, Department of Biotechnology, Chandigarh University, Punjab	Disease Susceptible Genes Identification in Plants	P.K. Meher	January 05-June 30, 2024
3.	Mr. Subham Kumar, Department of Biotechnology, Chandigarh University, Punjab	Computational Identification of Plant-based Therapeutic Peptides using Machine Learning Techniques	U.K. Pradhan	January 05-June 30, 2024
4.	Ms. Aanchal Gupta, Department of Biotechnology, Chandigarh University, Punjab	A Study on Computational Recognition of Disease Resistant Genes in Plants	U.K. Pradhan	January 05-June 30, 2024
5.	Mr. Ashis Kumar Nanda, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	A Computational Study on Retrocopied Genes in Plant	P.K. Meher	June 19-October 18, 2024
6.	Mr. Dibya Ranjan Patra, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	An Insilico Study for the Computational Identification of ABC Transporter Protein in Plant	U.K. Pradhan	June 19-October 18, 2024

S.No.	Name of Student and Organisation	Title of the Study	Name of the Mentor	Duration
7.	Mr. Aayush Tiwari, Vivekananda Institute of Professional Studies, Delhi	Vikas App using Android Technology	Alka Arora	January 19-August 06, 2024
8.	Ms. Nandini Singh, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut	Some Investigation into the Post-GWAS	Neeraj Budhlakoti	February 29-May 29, 2024
9.	Ms. Nisha Yadav, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut	Development of Machine-Learning Model for Urease and Ribosome-inactivating Protein Family	Soumya Sharma	March 03-June 03, 2024
10.	Ms. Pranjali Choudhary, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut	Development of Machine Learning Model for Alpha Amylase Inhibitors & Antimicrobial Peptides Protein Family	Sarika	March 03-June 03, 2024
11.	Ms. Priyanshi Bhardwaj, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut	Development of Machine Learning for Protease Inhibitors and Thionin Protein Family	Sarika	March 03-June 03, 2024
12.	Ms. Novika, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Development of Database of C, N & S Cycling Gene & Pathways from Crop Rhizosphere Metagenomes	Ritwika Das	March 18-June 17, 2024
13.	Ms. Ankita Sharma, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Identification of Antimicrobial Resistance Genes using Metagenomic studies	Sneha Murmu	March 18-June 17, 2024
14.	Ms. Abhilasha Sharma, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Development of Shiny App for Differential Abundance Analysis in Metagenomics Data	Sudhir Srivastava	March 18-June 17, 2024
15.	Ms. Janbhi Malik, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Identification of Phytochemicals Against GBM Targets using Docking and Molecular Dynamics Simulation	Sneha Murmu	March 26-June 26, 2024
16.	Ms. Lally Bhagat, Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu	Development of Classification Models of Toxic Proteins in Plants	Soumya Sharma	March 27-June 27, 2024
17.	Mr. Divyansh Rana, Amity University, Noida	Development of Machine-Learning based Model for Predicting Sulfur Cycling Genes and Pathways	Ritwika Das	April 18-July 17, 2024
18.	Ms. Yusra Ashfaque Ali, Amity University, Noida	R Shiny App for Differential Expression Analysis in Single-Cell RNA-Seq Data	Sudhir Srivastava	May 15-July 01, 2024
19.	Ms. Priyanshi Chauhan, Banasthali Vidyapith, Jaipur	Advanced Topics of Bioinformatics	Sudhir Srivastava	May 23-July 05, 2024
20.	Ms. Akansha Gupta, Banasthali Vidyapith, Jaipur	Identification of Fungicidal Compound using Machine Learning	Sneha Murmu	June 03-July 03, 2024
21.	Mr. Nalin Singhal, Thapar Institute of Engineering and Technology, Patiala, Punjab	Deep Learning based High-Throughput Phenotyping Applications for Automated Wheat Leaf Segmentation and Counting	Chandan Kumar Deb	June 03-August 03, 2024
22.	Mr. Badal Sharma, Jaypee University of Information Technology, Solan	Machine Learning Application in Metagenomics Data	Md. Samir Farooqi	June 10-August 09, 2024

S.No.	Name of Student and Organisation	Title of the Study	Name of the Mentor	Duration
23.	Ms. P. Sushree Soumya, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	Shiny Web Application for Efficient Network-Integrated Pathway Enrichment Analysis	Sudhir Srivastava	June 15-October 15, 2024
24.	Ms. Samiksha Barik, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	Metagenomics Insights into the Abundance and Mobility of Antibiotic Resistance Genes and Associated Mobile Genetic Elements in the Wheat Rhizosphere using Bioinformatics Approach	Sneha Murmu	June 15-October 15, 2024
25.	Ms. Sudiptamayee Biswal, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	Identification of Phytochemicals against Antibiotic Resistance Bacteria using In Silico Approach	Sneha Murmu	June 15-October 15, 2024
26.	Mr. Sumeet Kumar Parida, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha	Gene-Wise Analysis of Viral Genomes: Trends and Variations in GC Content with a Novel Graphical Tool for Gene-Specific Calculation	Samarth Godara	June 15-October 15, 2024
27.	Ms. Snigdha Dixit, Manipal University, Jaipur	Deep Learning Applications for Plant Disease Detection	Md. Ashraful Haque	June 22-August 07, 2024

Training Programmes Attended

- Digital Initiatives in Agricultural Education organized by ICAR-IASRI, New Delhi during March 06-08, 2024 (Ritwika Das and Soumya Sharma)
- Leadership and Change Management organized by Indian Institute of Management, Ahmadabad during May 27-31, 2024 (Alka Arora, Anshu Bharadwaj and Shashi Dahiya)
- MDP Training on AI for Managers organized by Indian Institute of Management, Lucknow during July 01-05, 2024 (Chandan Kumar Deb, Sanchita Naha, Ashraful Haque, Sapna Nigam and Madhu)
- Online Faculty Development Program on Handling Partial Least Squares - Structural Equation Modelling (PLS-SEM) during July 01-05, 2024 (Soumen Paul)
- Management Development Program on Accounting, Financial Management and Public Procurement organized at Arun Jaitley Institute of Financial Management, Faridabad during September 07-17, 2024 and Training Programme for Newly Recruited Assistant Finance and Accounts Officers of ICAR during September 17-October 04, 2024 (Pradeep Kumar)
- Remote Pilot Training Course organized by Directorate General of Civil Aviation (DGCA), Government of India at RPTO, Fore Institute of Drone Technology and Research (FIDTR), Foundation for Organizational Research and Education, Gurugram during September 23-27, 2024 (Pankaj Das and Ankur Biswas)
- Editor's Workshop-Enabling A Research Ecosystem organized by Agricultural Education Division, ICAR during September 24, 2024 (Shashi Dahiya, K.K. Chaturvedi)
- IP Awareness Program under the National Intellectual Property Awareness Mission organized by the Intellectual Property Office, India during October 18, 2024 (Samarth Godara, Upendra Kumar Pradhan)
- Preventive Vigilance for ICAR Officers organized by ICAR-NAARM, Hyderabad during November 06-08, 2024 (Anshu Bharadwaj)
- VAJRA Mapping Drone Training organized at ICAR-IASRI, New Delhi during November 06-12, 2024 (Tauqueer Ahmad, Prachi Misra Sahoo, Ankur Biswas, Deepak Singh, Pankaj Das, Rahul Bannerjee and Bharti)
- Orientation Training for New Assistants organized by ICAR-IASRI during October 23-24, 2024 (Apoorv Tomar, Shipra, Charu, Ashish, Yash, Abhijeet, Komal, Manish and Vineet Jayant)

5.
Awards and Recognitions

Awards

Ankur Biswas

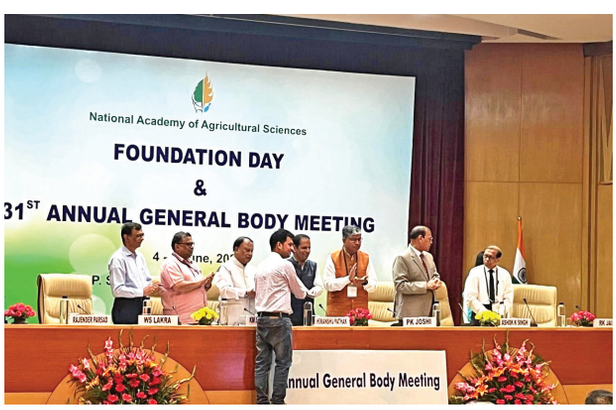
- **Young Scientist of the Year Award 2024** by the Cooch Behar Association for Cultivation of Agricultural Sciences (COBACAS), Uttar Banga Krishi Viswavidyalaya (UBKV) during the 6th National Conference on Nature-based Solutions for Achieving Sustainable Development Goals organized at UBKV, Pundibari, Cooch Behar, West Bengal during March 05-06, 2024.

Kanchan Sinha

- **Young Scientist of the Year Award 2024** by the Cooch Behar Association for Cultivation of Agricultural Sciences (COBACAS), Uttar Banga Krishi Viswavidyalaya (UBKV) during the 6th National Conference on Nature-based Solutions for Achieving Sustainable Development Goals organized at UBKV, Pundibari, Cooch Behar, West Bengal during March 05-06, 2024.

Neeraj Budhlakoti

- **NAAS Young Scientist Award** in Social Sciences on June 05, 2024



Bharti

- **Young Achiever Award 2023** by Society for Advancement of Human and Nature (SADHNA) on 15th February 2024.

Md. Yeasin

- **Young Scientist Award** 2024-25 by Agricultural Economics and Social Science Research Association (AESSRA), New Delhi in National Seminar on Sustainable Agriculture, Rural Development and Future Food Security in India: An Interdisciplinary Approach held at Department of Agricultural Economics, Palli Siksha Bhavana (Institute of Agriculture),Visva Bharati during March 01-02, 2024.

Best Paper Award (Published, Oral/ Poster Presentation)

Rahul Banerjee

- **Prof. R. Krishna Pillai Best Paper Presentation Award 2024** at the Tenth International Conference on Statistics for the Twenty-First Century (ICSTC-2024) organized jointly by the International Statistics Fraternity (ISF), the Department of Statistics, and the School of Physical and Mathematical Sciences, University of Kerala, in collaboration with the American Statistical Association during **December 13-16, 2024** for presenting the paper *Integrating Data from Multiple Surveys for Robust Estimation of Population Total: A Novel Approach Using M-Estimation*.

Sudhir Srivastava

- **2nd Best Oral Presentation Award** in the 74th Annual Conference of the Indian Society of Agricultural Statistics on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized by the Department of Agricultural Statistics, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024 for presenting the paper:{S. Srivastava, Md Samir Farooqi, K.K. Chaturvedi, A. Sharma, S.B. Lal, D. Bhatt, P. Balley and G.K. Jha. The Halophile Protein Database 2.0: A Comprehensive Resource of Chemical and Physical Properties of Halophilic Proteins}.

Prakash Kumar

- **Best Oral Presentation Award** in the 74th Annual Conference of the Indian Society of Agricultural Statistics on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized by the Department of Agricultural Statistics, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024 for presenting the paper: {P. Kumar and Md Yeasin. Picro-DB: an extensive genomic resource portal dedicated to *Picrorhiza kurroa* a medicinal plan}.

Recognitions

- Two of the Institute Technologies viz. (i) E-Learning Portal and (ii) Multivariate Adaptive Regression Spline based ANN and SVR Model for Copy Yield have been identified among the five best technologies of Agricultural Education Division and Certificates were given by Honourable Minister of Agriculture and Farmers Welfare, Govt. of India on ICAR Foundation and Technology Day July 16, 2024.
- Certificate of Appreciation for developing ASRB-Online Application & Scorecard Information System (ASRB-OASIS) on the 52nd Foundation Day- 2024 of Agricultural Scientists Recruitment Board on November 07, 2024 (Sudeep Marwaha and Rajender Parsad).
- Received certificate of appreciation for NAAS Fellowship-online Score-card Information System (NFOSIS) from National Academy of Agricultural Sciences (Rajender Parsad, Sudeep Marwaha and Alka Arora).

Rajender Parsad

- **Chairman**, Technical Monitoring Committee (TMC) for improvement of Fishery Statistics, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India.
- **Co-Chairman**, Technical Committee of Direction (TCD) for improvement of Animal Husbandry and Dairying Statistics, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India
- **Chief Data Officer**, DARE/ICAR for Open Data Initiative of Government of India to function as per National Data Sharing and Accessibility Policy.
- **Nodal Officer**, modernization and strengthening of National Agricultural Science Museum.
- **Technical Lead**, from ICAR/DARE for implementation of AI ENGAGE (Advancing Innovations for Empowering NextGen AgriculturE) for QUAD countries programme.
- **Chief Information Officer, DARE/ICAR** nominated by Honourable Secretary DARE and Director General, ICAR on December 18, 2023.
- **Co-Chairman**, Implementation and Operational Management Committee to provide overall support of ICT Initiatives at Council/DMS/ Institute Level.
- **Member Secretary**, ICAR Regional Committee-V, comprising the states of Punjab, Haryana and Delhi.
- **Member**, Expert Committee on Revising Survey Design constituted by National Statistical Commission to assist commission on various technical issues, initially for the period of one year.
- **Member**, Programme Steering and Monitoring Committee (PSMC) under the Biotech-Krishi Innovation Science Application Network (Biotech-KISAN) programme.
- **Member**, Committee to prepare Yield Estimation System based on Technology (YES-TECH) Manual for PMFBY, Ministry of Agriculture and Farmers Welfare, Govt. of India.
- **Member**, sub-committee constituted for developing technical framework for Fisheries Census of India, 2023-24 by Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India.
- **Member**, Technical Committee on 21st Quinquennial Livestock Census 2024.
- **Member**, High Level Coordination Committee on Crop Estimation of Surveys (HLCC), Orrisa Bhubaneswar.

- **Nodal officer** (nominated by Secretary, DARE & DG, ICAR) for providing relevant datasets for strengthening the DST supported data exchange platform by Ministry of Science and Technology, Govt. of India, DST
- **Chairman**, Expert Committee to screen/examine proposals for Projects/Studies/Workshops/ Seminars/Conferences and Travel Grants Assistance under the 'Grant-in-Aid' component of Capacity Development Scheme of MoSPI.
- **Member**, Expert Committee to Review Sampling Methodology for Integrated Livestock Sample Survey, DAHD, Govt of India
- **Member**, Research Coordination Committee of Central Silk Board for 2024-2027
- **Panelist** for the session on Agri-enterprenuership and Extending Research to Service organized during Precision Agriculture Conclave for Public Private Partnership organized by ICAR on March 20, 2024.
- **Panelist** in the Panel Discussion on Capacity Building and Hand Holding organized on December 17, 2024 in the National Conference on Digital Agriculture Empowering Indian Farming organized by ICAR and NAAS at NASC during December 17-18, 2024.
- **Chairman**, Dr. C.R. Rao Memorial Session in the 74thAnnual Conference of Indian Society of Agricultural Statistics organized at Agricultural Statistics Department, NM Agricultural College, Navsari Agricultural University, Navsari, Gujrat during February 02-04, 2024.
- **Special Guest** during the inaugural function during the one week training programme on Digital Literacy: Empowering Agriculture Students under the aegis of IDP SKUAST Jammu, NAHEP organized at SKUAST-Jammu during July 03-09, 2024.
- Chief Guest during the Valedictory Session of the Anusandhan National Research Foundation (ANRF) (DST-SERB) sponsored High-End workshop (KARYASHALA) on Hands-on training in Pre-breeding and Cytogenetic Approaches for Crop Improvement: Advancement, Challenges and Opportunities organized by ICAR-NIPB, New Delhi during March 04-13, 2024.
- **Certificate of appreciation** for outstanding contribution and dedication towards organizing the 32nd International Conference of Agricultural Economists on Transformation Towards Sustainable Agri-Food Systems organized by International Association of Agricultural Economists at NASC Complex, New Delhi during August 02-07, 2024.
- **Coordinator** in the Discussion on Digital Agriculture by Professional Society on December 18, 2024 in the National Conference on Digital Agriculture Empowering Indian Farming organized by ICAR and NAAS at NASC during December 17-18, 2024.

Girish Kumar Jha

- **Chief Guest** in State Level Workshop on Agriculture Marketing: Problems and Prospects at Krishi Vigyan Kendra, Kota (Agriculture University, Kota) on January 09, 2024.
- Elected as **Fellow** of National Academy of Agricultural Sciences (NAAS) in Social Sciences Section.
- Elected as **Fellow** of the Agricultural Economics Research Association, New Delhi in the year 2024
- Elected as a **Founder Fellow** of the Bihar Agriculture Science Academy, Pusa, Samastipur.
- **Member**, Board of Studies in Statistics of North-Eastern Hill University (NEHU) for a period of three years from 18 march 2024.
- **Member**, Scientific Advisory Committee (SAC) of National Horticultural Research and Development Foundation (NHRDF) for the period 2024-26.
- **Member**, Board of Studies in the discipline of Agricultural Statistics and Bioinformatics of ICAR-IVRI, Izzatnagar, UP for academic session 2024-25.

Tauqueer Ahmad

- **Member**, Review Committee to finalize Advance Estimate of Area and Oroduction of Horticultural Crops for the year 2023-24.
- **Member**, Technical Advisory Group for Enterprise Surveys of NSSO, Ministry of Statistics and Programme Implementation, Govt. of India.
- **Chairman**, Technical session and contributed paper session on Survey Methodology for Field Crop Yield Estimation during 74th Annual Conference of the Indian Society of Agricultural Statistics at Navsari Agricultural University, Navasari, and Gujarat during February 02-04, 2024.
- **Consultant,** FAO of the United Nations (Affiliate Workforce) - FAO's Roster.
- **Member**, Review Committee, Horticultural Statistics, Ministry of Agriculture and Farmers Welfare, Govt. of India.
- **Member**, Technical Committee of Direction (TCD) for Improvement of Animal Husbandry and Dairying Statistics, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India.
- **Member**, Board of Studies, Department of Statistics & Operations Research, Aligarh Muslim University (A.M.U.), Aligarh w.e.f. 04.01.2023 for a period of two years.

Sudeep Marwaha

- **Chairman**, Technical Session on Achievable-Relevant Time bound (ART) Agricultural Informatics and **Co-chairman**, Technical Session on Artificial Intelligence for Transforming Agriculture in the 74th Annual Conference on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized at Department of Agricultural Statistics, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024.
- **Member,** Evaluation Committee for the Hackathon on India AI Innovation Challenge in Agriculture. Committee formulation done by MeitY, Govt. of India.
- **Panelist,** In the session on Sustainable Agriculture in the India AI and GPAI Summit held on July 03-04, 2024 organized by the MeitY, Govt. of India.
- **Member**, National Steering Committee (NSC) on National Programme on Electronics and ICT Applications in Agriculture and Environment (AgriEnics) being implemented by C-DAC, Kolkata.
- **Member**, Project Implementation Committee (PIC) for the implementation of the Krishi -DSS Project constituted by DA&FW.
- **Member**, Committee of Pest and Disease Registry under Agri Stack of DA&FW, MoA&FW, Govt. of India.
- **Member,** Advisory Committee on AI in Agriculture and AI Cell constituted by the DA&FW, MoA&FW, Govt. of India.
- **Member,** Task Force Committee of the project Digitization of Traditional Agricultural Practices of India formed by CSIR-TKDL.

Med Ram Verma

- **Member,** Board of Studies of ICAR-IVRI (Deemed University), Izatnagar, Bareilly in the discipline of Agricultural Statistics
- **Chairman,** Contributory paper session on Modern Statistical Designs and tools for effective experimentation in 74th Annual Conference of Indian Society of Agricultural Statistics organized at Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024
- **Chairman,** Invited Talk Session on Emerging Trends of Statistical Sciences in AI and its Applications in an International Conference jointly organized by Society of Statistics, Computer and Applications (SSCA) and Department of Mathematics and Statistics, Banasthali Vidyapith, Rajasthan during February 26-28, 2024.

Alka Arora

- **Co-chairman and Session Convener,** Technical session on Achievable-Relevant Time bound (ART) Agricultural Informatics in the 74th Annual Conference on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized at Department of Agricultural Statistics, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024.
- **Member,** Expert SEG Agriculture group for evaluation of proposal under Unnat Bharat Abhiyan scheme.

- **Member,** Evaluation Committee for the Hackathon on India AI Innovation Challenge in Agriculture. Committee formulation done by MeitY, Govt. of India.
- **Member, Institute Management Committee** National Research Center for Integrated Pest Management (NCIPM), New Delhi
- **Panellist**, India Digital Agriculture Conference-2024 organised by the Indian Chamber of Food and Agriculture (ICFA) and IIT Ropar Technology and Innovation Hub - Agriculture and Water Technology Development Hub (AWaDH) on 11th October 2024 at The Park Hotel, Sansad Marg, New Delhi.

Cini Varghese

- **Chairperson,** contributury paper session in the 26th Annual Conference of Society of Statistics, Computer and Applications on Emerging Trends of Statistical Sciences in AI and its Applications (ETSSAA-2024) organized at Banasthali University during February 26-28, 2024.

Shashi Dahiya

- **Chairperson,** contributory papers session on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture in the 74th Annual Conference on the theme Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized at Department of Agricultural Statistics, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during during February 02-04, 2024.

Prachi Misra Sahoo

- **Co-chairperson**, Technical and contributed paper session on Survey Methodology for Field Crop Yield Estimation in the 74th Annual Conference of the Indian Society of Agricultural Statistics organized at Navsari Agricultural University, Navasari, Gujarat during February 02-04, 2024.

Krishna Kumar Chaturvedi

- **Member,** LITD 30 Artificial Intelligence Sectional Committee for development of standards in BIS, New Delhi
- **Member,** Joint Technical Working Committee for seamless integration of Ag. Extension system, KCC and Kisan Sarathi
- **Convener and co-chair**, Technical session on Translational Omics Research in the 74th Annual Conference of the Indian Society of Agricultural Statistics on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized by the Department of Agricultural Statistics, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024.

Prabina Kumar Meher

- Elected as **Fellow** of National Academy of Agricultural Sciences in Social Sciences Section.
- **Co-convenor,** National Academy of Agricultural Sciences-Youth United for Visionary Agriculture (NAAS-YUVA)

Mohd Harun

- **Co-Chairman,** Contributed papers session on Modern Statistical Designs and Tools for Effective Experimentation in the 74th annual conference of Indian Society of Agricultural Statistics organized by the Department of Agricultural Statistics, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024.

ICAR-AED-IASRI-Methodology-2024-021

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Sudeep Marwaha
(Lead Developer)

Associate Developers
Dr. Shashi Dahiya, Dr. Anshu Bharadwaj
Dr. Rajender Parsad, Dr. Anuradha Agrawal
Dr. R.C. Agrawal

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

E-Learning portal for agricultural education (Product)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

(R.C. Agrawal)
Deputy Director General (Agril. Edn.)

ICAR-AED-IASRI-Methodology-2024-042

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Ankur Biswas
(Lead Developer)

Associate Developers
Dr. Kaustav Aditya, Dr. Raju Kumar
Dr. Deepak Singh, Dr. Pradip Basak

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Sampling methodology of calibration estimation of finite population parameters under two stage sampling and adaptive cluster sampling design (Methodology)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

(R.C. Agrawal)
Deputy Director General (Agril. Edn.)

ICAR-AED-IASRI-Methodology-2024-022

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Cini Varghese
Dr. Mohd Harun
(Lead Developers)

Associate Developers
Dr. Seema Jaggi, Mr. Ashutosh Dalal, Dr. L.N. Vinaykumar
Dr. Sayantani Karmakar, Dr. Nehatai Agashe

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

have developed the technology

AlGenIBD: Algorithmic generation of some useful families of Incomplete Block Designs (Methodology)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

(R.C. Agrawal)
Deputy Director General (Agril. Edn.)

ICAR-AED-IASRI-Methodology-2024-038

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Deepak Singh
(Lead Developer)

Associate Developers
Dr. Pradip Basak
Dr. Raju Kumar
Dr. Tauqueer Ahmad

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Survey weighted composite index for complex survey data (Methodology)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

(R.C. Agrawal)
Deputy Director General (Agril. Edn.)

ICAR-AED-IASRI-Methodology-2024-025

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Dr. Md. Yeasin
(Lead Developer)

Associate Developer
Dr. Ranjit Kumar Paul

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

OptisembleForecasting: Optimization based ensemble forecasting using MCS algorithm and PCA based error index (Methodology)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

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Associate Developers
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Dr. Atmakuri Ramakrishana Rao

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Software for identification of herbicide and insecticide resistant genes (Product)

16th July, 2024
New Delhi

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ICAR-AED-IASRI-Methodology-2024-026

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ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Software for identification of splice sites (Methodology)

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(Lead Developer)

Associate Developers
Dr. Anil Rai, Dr. Tauqueer Ahmad
Dr. Md. Samir Farooqi

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Integrated sampling methodology for crop acreage estimation using remote sensing, GIS and ground survey in Meghalaya (Methodology)

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has developed the technology

WaveML: Wavelet based machine learning techniques for time series forecasting (Model)

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Dr. Himadri Shekhar Roy, Dr. Prakash Kumar

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Tools for evaluating impact of pandemics on agricultural prices (Methodology)

16th July, 2024
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Assistant Director General (EP&HS)

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Dr. Himadri Shekhar Roy, Dr. Prakash Kumar

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

TSEnsemble: Ensemble algorithm for time series forecasting (Methodology)

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ICAR-AED-IASRI-Product-2024-028

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Associate Developers
Dr. Krishna Kumar Chaturvedi
Dr. Mukesh Kumar
Dr. Avanaksh Singh Sambyal

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Web application for land record management system in ICAR institutes (Product)

16th July, 2024
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Assistant Director General (EP&HS)

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ICAR-AED-IASRI-Product-2024-024

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Dr. Atmakuri Ramakrishna Rao, Dr. Anil Rai, Dr. Soumya Sharma
Dr. Ritwika Das, Dr. Md. Samir Farooqi, Dr. Girish Kumar Jha

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

PlantMicrobeProinteract: A web application to predict the protein-ligand interactions in plants and microbes (Product)

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ICAR-AED-IASRI-Methodology-2024-027

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Associate Developers
Dr. Prachi Misra Sahoo, Dr. Ankur Biswas
Dr. Kaustav Adityam, Dr. Deepak Singh, Dr. Raju Kumar

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Modified sampling methodology for estimation of area and production of horticultural crops (Methodology)

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ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Sampling methodology for estimation of cotton production using double sampling approach (Methodology)

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(Lead Developer)

Associate Developers
Dr. Achal Lama, Dr. Girish Kumar Jha
Dr. Rajender Parsad

of

ICAR-Indian Agricultural Statistics Research Institute (IASRI), New Delhi

has developed the technology

Multivariate adaptive regression spline based ANN and SVR model for crop yield prediction (Methodology)

16th July, 2024
New Delhi

(Bimlesh Mann)
Assistant Director General (EP&HS)

(R.C. Agrawal)
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6.

Linkages and Collaborations including Outside Funded Projects

S.No.	Title	Collaborative /Funding Agency	Date of Start	Date of Completion
1.	Designing and analysis of on-farm and on-station research experiments planned under AICRP on IFS	AICRP on IFS, ICAR-IIFSR, Modipuram	15.03.2023	31.03.2026
2.	Planning, designing and analysis of data relating to experiments for AICRP on Long Term Fertilizer Experiments (LTFE)	AICRP on LTFE, ICAR- IISS, Bhopal	01.04.2021	31.03.2026
3.	ICAR research data repository for knowledge management as KRISHI: Agricultural Knowledge Resources and Information System Hub for Innovations (ICAR Headquarters component ICT including Data Centre & Research Data Repository)	ICAR-NAARM, Hyderabad; ICAR-NBSSLUP, Nagpur; ICAR-IARI, New Delhi; ICAR-CRIDA, Hyderabad; ICAR- CMFRI, Kochi; ICAR- DKMA, New Delhi as partners and all other ICAR Institutes as Nodal Centers	24.07.2015	31.03.2026
4.	Efficient designs for double cross experiments under fixed/mixed effects model	ICAR-DPR, Hyderabad; ICAR-IARI, New Delhi	11.11.2021	10.11.2024
5.	Application of next-generation breeding, genotyping, and digitalization approaches for improving the genetic gain in Indian staple crops	ICAR-IIMilletsR, Hyderabad; ICAR-IIPR, Kanpur; ICAR-CPRI, Shimla; ICAR-NRRI, Cuttack; ICAR-IIRR, Hyderabad; ICAR-IIWBR, Karnal; ICAR-Project Coordinating Unit (Pearlmillet), ICRISAT(upto November, 2021), Excellences in Breeding, CIMMYT (since November 2021)	22.01.2019	31.03.2024
6.	Biomass and carbon mapping across altitudinal gradient of major Darjeeling and Sikkim Himalayan land uses: implications for carbon sink management and mitigation (DST funded)	UBKV, Cooch Behar	10.02.2021	09.05.2024
7.	Diversified farming through livestock and agriculture (ICAR-CIRB Farmer First)	ICAR-CIRB, Hisar; ICAR-IARI, New Delhi	25.11.2021	31.03.2024
8.	Knowledge management system for agriculture extension services in Indian NARES (ICAR-Extramural Research Project)	ICAR, New Delhi	04.03.2016	31.03.2026
9.	Market information system	ICAR-NIAP, New Delhi	22.01.2022	31.03.2026
10.	Management and impact assessment of Farmer FIRST Project	ICAR-NIAP, New Delhi; ICAR-NAARM, Hyderabad; ICAR-DKMA, New Delhi	14.02.2017	31.03.2026
11.	Mainstreaming rice landraces diversity in varietal development through genome wide association studies: A model for large-scale utilization of gene bank collections of rice (DBT Funded)	ICAR-IARI, New Delhi	01.05.2020	30.04.2025

S.No.	Title	Collaborative /Funding Agency	Date of Start	Date of Completion
12.	Germplasm characterization and trait discovery in wheat using genomics approaches and its integration for improving climate resilience, productivity and nutritional quality (DBT Funded)	ICAR-NBPGR, New Delhi	01.04.2020	28.02.2025
13.	Minor oilseeds of Indian origin: Mainstreaming sesame germplasm for productivity enhancement and sustainability through genomics assisted core development and trait discovery (DBT Funded)	ICAR-NBPGR, New Delhi	29.02.2020	28.02.2025
14.	Improving seed health and storage system	ICAR- Indian Institute of Seed Science (IISeedS), Mau	25.01.2022	31.03.2026
15.	Potential irrigated area mapping through remotely sensed high resolution data	ICAR-IIWM, Bhubaneswar; ICAR-NBSSLUP, Nagpur; Office of Climate Research and Services, IMD, Pune	05.09.2021	04.09.2024
16.	Network Program on Precision Agriculture (NePPA) at ICAR-IARI New Delhi	ICAR-IARI, New Delhi; ICAR-IIWBR, Karnal; ICAR-NRRI, Cuttack; ICAR-IIWM, Bhubaneswar; ICAR-IIVR, Varanasi; ICAR-IISS, Bhopal; ICAR-CIAE, Bhopal; ICAR-NRCB, Tiruchirappalli; ICAR-CICR, Nagpur; ICAR-NBSSLUP, Nagpur; ICAR-NDRI, Karnal; ICAR- CIPHET, Ludhiana; ICAR-CIFE, Mumbai; ICAR-CIFA, Bhubaneswar; ICAR-CIFRI, Barrackpore	04.09.2021	31.03.2026
17.	Investments in Indian Council of Agricultural Research leadership on agricultural higher education under the National Agricultural Higher Education Project (NAHEP Funded)	ICAR-NAARM, Hyderabad; ICAR-NIAP, New Delhi	28.02.2019	31.08.2024
18.	Development of artificial intelligence integrated big-data based system for automatic query-response generation and analysis of Indian farmers' queries	ICAR-IARI, New Delhi	09.12.2021	08.12.2024
19.	AI and machine learning for supply forecasts	ICAR-NIAP, New Delhi	03.03.2022	30.09.2024
20.	Mining agricultural microbiome datasets for antibiotic resistance genes (ARG) diversity and prediction of microbial resistome	ICAR-NBAIM, Mau	03.10.2022	02.04.2025
21.	Development and assessment of conversational virtual agents 'Chatbots' for improving livestock, pet and poultry health and production	ICAR-IVRI, Izatnagar	10.10.2022	31.08.2025
22.	Energy audit survey of AICRP on EAAI: sampling design and analysis	ICAR-CIAE, Bhopal	01.06.2018	31.03.2026
23.	Agri-Drone in ICAR: ICAR-IASRI Component	ICAR-ATARI, Jodhpur	21.07.2022	31.03.2025

S.No.	Title	Collaborative /Funding Agency	Date of Start	Date of Completion
24.	Planning and data analysis of FSSAI and NeTSCoFAN surveys	ICAR- IIHR, Karnataka; ICAR- CARI, Uttar Pradesh; ICAR- CIFT, Kerala; ICAR-NRCM, Telangana; ICAR-NRCG, Makhdoom	22.07.2022	31.03.2024
25.	Statistical approaches for analysis of zero-inflated and over-dispersed counts data and their applications in single cell studies	ICAR-DFMD, Bhubaneswar	25.11.2021	24.11.2024
26.	Forest cover trend and above ground biomass estimation using advanced statistical technique based on remote sensing data	IIRS, ISRO, Dehradun	22.10.2022	21.10.2025
27.	Genome wide association studies in giant freshwater prawn, M rosenbergii: Linkage mapping and QTL identification	ICAR- CIFA, Bhubaneswar	01.09.2022	31.08.2025
28.	KISAN SARATHI 2.0 (Powered by IIDS): System of Agri-information Resources Auto-transmission and Technology Hub Interface (Funded by ICT and ICAR Data Repository, ICAR Hq)	DIC, MeitY, New Delhi; ICAR-IARI New Delhi; ICAR-NDRI, Karnal; ICAR-CIFE Mumbai; ICAR-IVRI, Izatnagar; ICAR-IIHR Bengaluru and All ICAR-ATARI	01.04.2024	31.03.2027
29.	Consortium of Research Project-Biofortification	ICAR-IARI, New Delhi	15.03.2023	14.03.2026
30.	Global Challenges Research Fund (GCRF) South Asian Nitrogen Hub	ICAR-IARI, New Delhi	03.08.2023	28.02.2024
31.	Genomic selection accuracy for key quality traits in potato (*Solanum Tuberosum L.*)	ICAR-CPRI, Shimla	17.07.2023	16.07.2026
32.	Development of precision engineering technologies for agricultural input production management and value addition to ensure profitability, sustainability and environmental safety	ICAR-IARI, New Delhi	20.01.2023	31.03.2026
33.	Development of artificial intelligence based model and tools for genomic studies	ICAR-NIPB, New Delhi	11.09.2023	10.09.2026
34.	Landscape diagnostic survey of cotton production practices and crop performance in Maharashtra (Funded by Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra)	ICAR-CICR, Nagpur	10.10.2023	31.05.2024
35.	Development of advanced information and communication technologies (ICT)-based communication and education tools for millets promotion	ICAR-IIMilletsR, Hyderabad	30.11.2023	30.09.2026
36.	Development of methodology for CCE on squash and methodological improvement for CCE on Cashewnut, Pineapple and Arecanut in Meghalaya	DES, Govt. of Meghalaya	26.07.2023	25.01.2025

S.No.	Title	Collaborative /Funding Agency	Date of Start	Date of Completion
37.	Network project on agricultural bioinformatics and computational biology	ICAR-NBAIR, Bengaluru; ICAR-NBAIM, Mau; ICAR-NBPGR, New Delhi; ICAR-IARI, New Delhi; ICAR-IIWBR, Karnal; ICAR-NIPB, New Delhi; ICAR-DRMR, Bharatpur, ICAR-IIPR, Kanpur; ICAR-CPRI, Shimla; ICAR-IISpicesR, Kozikode; ICAR-IIHR, Bengaluru; ICAR-IIVR, Varanasi; ICAR-NBFGR, Lucknow; ICAR-CIBA, Chennai; ICAR-CIFA, Bhubaneswar; ICAR-CIFRI, Barrackpore; ICAR-CIFE, Mumbai; ICAR-NBAGR, Karnal; ICAR-IVRI, Izatnagar; ICAR-CIRG, Makhdoom; ICAR-CIRB, Hisar; ICAR- NRCE, Hisar	12.07.2020	31.03.2025
38.	Development of AI enabled models and web solution for prediction of crop yield	DST Core Research Grant	12.09.2024	11.09.2027
39.	Development of artificial intelligence / machine learning models for generating yield estimates of crops covered under “Comprehensive Scheme for Forecasting Agricultural output using Space, Agro-meteorology and Land based observations (FASAL 2.0)	Ministry of Agriculture and Farmers Welfare, Govt. of India	01.10.2024	31.03.2026
40.	Pilot study to develop improved methodology for cost of cultivation of principal crops in India	Ministry of Agriculture and Farmers welfare, Govt. of India	02.09.2024	01.09.2026
41.	Pilot study for development of sampling methodology for cost of cultivation of minor crops in India	Ministry of Agriculture and Farmers welfare, Govt. of India	02.09.2024	01.09.2026
42.	Pilot study to investigate the causes of high cost of cultivation of mandated principal cops in Maharashtra	Ministry of Agriculture and Farmers welfare, Govt. of India	02.09.2024	01.03.2026
43.	Integrating whole genome resequencing transcriptome sequencing and genome wide association analysis for allele mining of yield and quality traits in black pepper and cardamom (Funded by NASF)	ICAR- IISpicesR, Kozhikode; KAU-Cardamom Research Station, Pampadumpara, Idukki; ICAR-IISpicesR, Regional Station, Appangala, Madikeri	01.03.2024	28.02.2027
44.	NNP: Agri-Genomic Repository and Intelligent Analytical System (funded by DBT)	ICAR-NIPB, New Delhi; ICAR-NBPGR, New Delhi; ICAR-NBFGR, Lucknow; ICAR-NBAIR, Bengaluru	13.05.2024	12.05.2029
45.	Deep learning-based identification of nutrient deficiencies and weeds in crops	ICAR-IARI, New Delhi	03.01.2024	31.07.2026
46.	Mapping QTLs for drought tolerance in cotton	ICAR-CICR, Nagpur	09.09.2024	31.03.2027
47.	Natural grassland ecosystem monitoring system for Peninsular and Trans Himalayan India to sustain pastoral communities (Funded by NASF)	ICAR-IGFRI, Jhansi; G.B. Pant National Institute of Himalayan Environment, Almora; ICAR-CCARI, Goa	01.03.2024	28.02.2027

S.No.	Title	Collaborative /Funding Agency	Date of Start	Date of Completion
48.	Artificial intelligence enabled biotic & abiotic stress detection and advisory mobile application for crops (Funded by NASF)	ICAR-CITH, Srinagar; ICAR- IIWBR, Karnal; ICAR-IIPR, Kanpur; ICAR-CRRI, Cuttack; University of Agricultural Sciences, Bengaluru; ICAR-CAZRI, Jodhpur	01.04.2024	31.03.2027
49.	Co-operating for accessing the laboratory and infrastructure facilities and mentoring under the incubation proramme of a-IDEA, NAARM.	Association of Innovation Development for Entrepreneurship in Agriculture Centre for Agri-Innovation ICAR-NAARM, Hyderabad	08.07.2022	07.07.2025
50.	ASRB-Online Application & Scorecard Information System	ASRB (Agricultural Scientists Recruitment Board)	28.11.2022	31.03.2026
51.	Recruitment management system for Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RMS-RVSKVV) (Contract research)	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior	25.09.2023	24.08.2024
52.	AI-DISC (integration) in POCRA App for providing advisory and receiving new images from POCRA	Nanaji Deshmukh Krushi Sanjivani Prakalp (NDKSP), Department of Agriculture, Govt. of Maharashtra presently located in Mumbai through it's Project Director (POCRA: Project on Climate Resilient Agriculture)	04.10.2023	03.07.2026
53.	Integration KVK APIs, KCC-CHAKSHU and AI-DISC: Undertaking programmes in research, capacity building, extension, consultancy in various areas of agricultural sciences	National Bank for Agriculture and Rural Development (NABARD), Mumbai (Work Plan under ICAR Umbrella MOU)	04.10.2023	-
54.	Sampling procedure for selection of representative sample for food grain quality check for DCP and Non-DCP system	Department of Food and Public Distribution (DFPD), Ministry of Consumer Affairs, Food and Public Distribution, (MCAF&PD), Govt. of India. The Food Corporation of India	31.10.2023	30.10.2025
55.	Consultation Mission to Support the Yemen Agricultural Survey	FAO of the United Nations, Yemen (FAO-Yemen)	20.05.2024	12.06.2024
56.	To enhance and support the e-voting system for the Indian Dairy Association (IDA)	Indian Dairy Association (IDA)	01.03.2024	12.03.2024
57.	To promote teaching, research, training and exchange of information and technology between themselves, related to agriculture, engineering, statistics and allied sciences	Sher-e- Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J), Jammu	05.07.2024	-
58.	Customization and implementation of TMIS, PMS and LRMS in UHS, Bagalkot	University of Horticultural Sciences, Bagalkot	05.11.2024	05.11.2025

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11. कृति के प्रतिनिधित्वकार स्वत्व विलेख अधिकारों के स्वामियों के नाम, पते और राष्ट्रीयता और उपलब्धता और अनुज्ञप्तियों के विवरण के साथ प्रत्येक के अधिकार का विवरण, यदि कोई हो। / Names, addresses and nationalities of the owners of various rights comprising the copyright in the work and the extent of rights held by each, together with particulars of assignments and licences, if any : DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
12. इस्तांतरित के नाम, पते और राष्ट्रीयता, यदि कोई हो, जो उपलब्धकर्ताओं को अनुज्ञप्ति या स्वत्व के इस्तांतरण की परिस्थिति में कृति में प्रतिलिप्याधिकार के संबंध में कृति देने वाले या लेने की स्थिति में हो। / Names, addresses and nationalities of other persons, if any, authorised to assign or licence of rights comprising the copyright : N.A.
13. यदि कृति एक 'कलात्मक कृति' है, तो कृति का प्रतिलिप्याधिकार संरक्षण कब तक रहेगा, इस संबंध में कृति देने वाले या लेने की स्थिति में हो। / If the work is an 'Artistic work', the location of the original work, including name, address and nationality of the person in possession of the work, (In the case of an architectural work, the year of completion of the work should also be shown). : N.A.
14. यदि कृति एक 'कलात्मक कृति' है या किसी भी माल या सामग्री के संबंध में प्रयोजन की जाती है या प्रयोजन किए जाने में सक्षम है, तो आवेदक ने प्रतिलिप्याधिकार अधिनियम, 1957 की धारा 45 की उप-धारा (3) के परंतुक के उपबंध के अनुसार व्यापार चिह्न रजिस्ट्रार से रजिस्ट्रीकरण प्रमाण-पत्र प्राप्त किया है। / If the work is an 'Artistic work' which is used or capable of being used in relation to any goods or services, the application should include a certification from the Registrar of Trade Marks in terms of the provision to Sub-Section (3) of Section 45 of the Copyright Act, 1957 : N.A.

Registrar of Copyrights

Extracts from the Register of Copyrights

बौद्धिकसम्पदाकार्यालय, भारतसरकार | Copyright Office, Government Of India

दिनांक/Dated 22/02/2024

1. पंजीकरण क्रमांक/Registration Number : SW-18327/2024
2. आवेदक का नाम, पता तथा राष्ट्रीयता / Name, address and nationality of the applicant : DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
3. कृति के प्रतिनिधित्वकर्ता में आवेदक के हित की प्रकृति / Nature of the applicant's interest in the copyright of the work : OWNER
4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : SWEEP DISCOVERY TOOL
6. कृति की भाषा / Language of the work : R PROGRAMMING LANGUAGE, HTML, CSS
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : ASHOK SAIKAR , M.SC. SCHOLAR, ICAR-IASRI, LIBRARY, AVENUE, PUSA, NEW DELHI -110012 INDIAN

DWIDESH CHANDRA MISHRA , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY, AVENUE,PUSA, NEW DELHI -110012 INDIAN

GIRISH KUMAR JHA , HEAD AND PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

KRISHNA KUMAR CHATURVEDI , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

SHASHI BHUSHAN LAL , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

SANJEEV KUMAR , SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

RANJIT KUMAR PAUL , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

NEERAJ BUDHLAKOTI , SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

DIPEO SINHA , PH.D. SCHOLAR, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

8. कृति प्रकाशित है या अप्रकाशित / Whether the work is published or unpublished : PUBLISHED
9. प्रथम प्रकाशन का वर्ष और देश तथा उपलब्ध का पता, तथा और राष्ट्रीयता / Year and country of first publication and name, address and nationality of the publisher : 2023 INDIA DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
10. साथ के प्रकाशनों के वर्ष और देश, यदि कोई हो, और उपलब्धता के पता, तथा और राष्ट्रीयता / Years and countries of subsequent publications, if any, and names, addresses and nationalities of the publishers : N.A.
11. कृति के प्रतिनिधित्वकार स्वत्व विलेख अधिकारों के स्वामियों के नाम, पते और राष्ट्रीयता और उपलब्धता और अनुज्ञप्तियों के विवरण के साथ प्रत्येक के अधिकार का विवरण, यदि कोई हो। / Names, addresses and nationalities of the owners of various rights comprising the copyright in the work and the extent of rights held by each, together with particulars of assignments and licences, if any : DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
12. इस्तांतरित के नाम, पते और राष्ट्रीयता, यदि कोई हो, जो उपलब्धकर्ताओं को अनुज्ञप्ति या स्वत्व के इस्तांतरण की परिस्थिति में कृति में प्रतिलिप्याधिकार के संबंध में कृति देने वाले या लेने की स्थिति में हो। / Names, addresses and nationalities of other persons, if any, authorised to assign or licence of rights comprising the copyright : N.A.
13. यदि कृति एक 'कलात्मक कृति' है, तो कृति का प्रतिलिप्याधिकार संरक्षण कब तक रहेगा, इस संबंध में कृति देने वाले या लेने की स्थिति में हो। / If the work is an 'Artistic work', the location of the original work, including name, address and nationality of the person in possession of the work, (In the case of an architectural work, the year of completion of the work should also be shown). : N.A.
14. यदि कृति एक 'कलात्मक कृति' है या किसी भी माल या सामग्री के संबंध में प्रयोजन की जाती है या प्रयोजन किए जाने में सक्षम है, तो आवेदक ने प्रतिलिप्याधिकार अधिनियम, 1957 की धारा 45 की उप-धारा (3) के परंतुक के उपबंध के अनुसार व्यापार चिह्न रजिस्ट्रार से रजिस्ट्रीकरण प्रमाण-पत्र प्राप्त किया है। / If the work is an 'Artistic work' which is used or capable of being used in relation to any goods or services, the application should include a certification from the Registrar of Trade Marks in terms of the provision to Sub-Section (3) of Section 45 of the Copyright Act, 1957 : N.A.

Registrar of Copyrights

Extracts from the Register of Copyrights

बौद्धिकसम्पदाकार्यालय, भारतसरकार | Copyright Office, Government Of India

दिनांक/Dated 26/02/2024

1. पंजीकरण क्रमांक/Registration Number : SW-18351/2024
2. आवेदक का नाम, पता तथा राष्ट्रीयता / Name, address and nationality of the applicant : DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
3. कृति के प्रतिनिधित्वकर्ता में आवेदक के हित की प्रकृति / Nature of the applicant's interest in the copyright of the work : OWNER
4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : DESIGN AND DEVELOPMENT OF SOFTWARE FOR ABIOTIC STRESS RESPONSIVE ANNOTATED ESTS IN MAJOR CEREAL CROPS, CEREALESTOR
6. कृति की भाषा / Language of the work : R PROGRAMMING LANGUAGE, HTML AND CSS
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : DWIDESH CHANDRA MISHRA , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY, AVENUE,PUSA, NEW DELHI -110012 INDIAN

KRISHNA KUMAR CHATURVEDI , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

SHASHI BHUSHAN LAL , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

DR. MOHAMMAD SAMIR FAROOQI , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

SANJEEV KUMAR , SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

ANIL RAI , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

JYOTSNA BHATI , RESEARCH ASSOCIATE CAR-IASRI, LIBRARY, AVENUE,PUSA, NEW DELHI -110012 INDIAN

ARJIT SAHA , RESEARCH ASSOCIATE CAR-IASRI, LIBRARY, AVENUE,PUSA, NEW DELHI -110012 INDIAN

8. कृति प्रकाशित है या अप्रकाशित / Whether the work is published or unpublished : PUBLISHED
9. प्रथम प्रकाशन का वर्ष और देश तथा उपलब्ध का पता, तथा और राष्ट्रीयता / Year and country of first publication and name, address and nationality of the publisher : 2022 INDIA DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
10. साथ के प्रकाशनों के वर्ष और देश, यदि कोई हो, और उपलब्धता के पता, तथा और राष्ट्रीयता / Years and countries of subsequent publications, if any, and names, addresses and nationalities of the publishers : N.A.
11. कृति के प्रतिनिधित्वकार स्वत्व विलेख अधिकारों के स्वामियों के नाम, पते और राष्ट्रीयता और उपलब्धता और अनुज्ञप्तियों के विवरण के साथ प्रत्येक के अधिकार का विवरण, यदि कोई हो। / Names, addresses and nationalities of the owners of various rights comprising the copyright in the work and the extent of rights held by each, together with particulars of assignments and licences, if any : DIRECTOR , ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
12. इस्तांतरित के नाम, पते और राष्ट्रीयता, यदि कोई हो, जो उपलब्धकर्ताओं को अनुज्ञप्ति या स्वत्व के इस्तांतरण की परिस्थिति में कृति में प्रतिलिप्याधिकार के संबंध में कृति देने वाले या लेने की स्थिति में हो। / Names, addresses and nationalities of other persons, if any, authorised to assign or licence of rights comprising the copyright : N.A.
13. यदि कृति एक 'कलात्मक कृति' है, तो कृति का प्रतिलिप्याधिकार संरक्षण कब तक रहेगा, इस संबंध में कृति देने वाले या लेने की स्थिति में हो। / If the work is an 'Artistic work', the location of the original work, including name, address and nationality of the person in possession of the work, (In the case of an architectural work, the year of completion of the work should also be shown). : N.A.
14. यदि कृति एक 'कलात्मक कृति' है या किसी भी माल या सामग्री के संबंध में प्रयोजन की जाती है या प्रयोजन किए जाने में सक्षम है, तो आवेदक ने प्रतिलिप्याधिकार अधिनियम, 1957 की धारा 45 की उप-धारा (3) के परंतुक के उपबंध के अनुसार व्यापार चिह्न रजिस्ट्रार से रजिस्ट्रीकरण प्रमाण-पत्र प्राप्त किया है। / If the work is an 'Artistic work' which is used or capable of being used in relation to any goods or services, the application should include a certification from the Registrar of Trade Marks in terms of the provision to Sub-Section (3) of Section 45 of the Copyright Act, 1957 : N.A.

Registrar of Copyrights

Extracts from the Register of Copyrights

बौद्धिकसम्पदाकार्यालय, भारतसरकार | Copyright Office, Government Of India

दिनांक/Dated 07/02/2024

1. पंजीकरण क्रमांक/Registration Number : SW-18244/2024
2. आवेदक का नाम, पता तथा राष्ट्रीयता / Name, address and nationality of the applicant : DIRECTOR , ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, INDIAN COUNCIL OF AGRICULTURAL RESEARCH, LIBRARY AVENUE, PUSA, NEW DELHI-110012 INDIAN
3. कृति के प्रतिनिधित्वकर्ता में आवेदक के हित की प्रकृति / Nature of the applicant's interest in the copyright of the work : OWNER
4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : INFORMATIVE GENE SELECTION TOOL: IGST,
6. कृति की भाषा / Language of the work : JAVA PROGRAMMING LANGUAGE, R, HTML AND CSS
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : NITISH KUMAR SHARMA , PH.D. RESEARCH SCHOLAR, ICAR-IASRI, LIBRARY AVENUE,PUSA, NEW DELHI -110012 INDIAN

DWIDESH CHANDRA MISHRA , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY, AVENUE,PUSA, NEW DELHI -110012 INDIAN

ANIL RAI , ASSISTANT DIRECTOR GENERAL- ICT, INDIAN COUNCIL OF AGRICULTURAL RESEARCH KRISHI BHAWAN, NEW DELHI-110012, INDIAN

A.R. RAO , ASSISTANT DIRECTOR GENERAL- PIM, INDIAN COUNCIL OF AGRICULTURAL RESEARCH KRISHI BHAWAN, NEW DELHI-110012, INDIAN

GIRISH KUMAR JHA , HEAD & PRINCIPAL SCIENTIST, DARE, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

KRISHNA KUMAR CHATURVEDI , PRINCIPAL SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

SANJEEV KUMAR , SCIENTIST, ICAR-IASRI, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

MD. SAMIR FAROOQI , SENIOR SCIENTIST, ICAR-IASRI, LIBRARY AVENUE,PUSA, NEW DELHI -110012 INDIAN

8. कृति प्रकाशित है या अप्रकाशित / Whether the work is published or unpublished : PUBLISHED
9. प्रथम प्रकाशन का वर्ष और देश तथा उपलब्ध का पता, तथा और राष्ट्रीयता / Year and country of first publication and name, address and nationality of the publisher : 2023 INDIA DIRECTOR , ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, INDIAN COUNCIL OF AGRICULTURAL RESEARCH, LIB -110012 INDIAN
10. साथ के प्रकाशनों के वर्ष और देश, यदि कोई हो, और उपलब्धता के पता, तथा और राष्ट्रीयता / Years and countries of subsequent publications, if any, and names, addresses and nationalities of the publishers : N.A.
11. कृति के प्रतिनिधित्वकार स्वत्व विलेख अधिकारों के स्वामियों के नाम, पते और राष्ट्रीयता और उपलब्धता और अनुज्ञप्तियों के विवरण के साथ प्रत्येक के अधिकार का विवरण, यदि कोई हो। / Names, addresses and nationalities of the owners of various rights comprising the copyright in the work and the extent of rights held by each, together with particulars of assignments and licences, if any : DIRECTOR , ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, INDIAN COUNCIL OF AGRICULTURAL RESEARCH, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
12. इस्तांतरित के नाम, पते और राष्ट्रीयता, यदि कोई हो, जो उपलब्धकर्ताओं को अनुज्ञप्ति या स्वत्व के इस्तांतरण की परिस्थिति में कृति में प्रतिलिप्याधिकार के संबंध में कृति देने वाले या लेने की स्थिति में हो। / Names, addresses and nationalities of other persons, if any, authorised to assign or licence of rights comprising the copyright : N.A.
13. यदि कृति एक 'कलात्मक कृति' है, तो कृति का प्रतिलिप्याधिकार संरक्षण कब तक रहेगा, इस संबंध में कृति देने वाले या लेने की स्थिति में हो। / If the work is an 'Artistic work', the location of the original work, including name, address and nationality of the person in possession of the work, (In the case of an architectural work, the year of completion of the work should also be shown). : N.A.
14. यदि कृति एक 'कलात्मक कृति' है या किसी भी माल या सामग्री के संबंध में प्रयोजन की जाती है या प्रयोजन किए जाने में सक्षम है, तो आवेदक ने प्रतिलिप्याधिकार अधिनियम, 1957 की धारा 45 की उप-धारा (3) के परंतुक के उपबंध के अनुसार व्यापार चिह्न रजिस्ट्रार से रजिस्ट्रीकरण प्रमाण-पत्र प्राप्त किया है। / If the work is an 'Artistic work' which is used or capable of being used in relation to any goods or services, the application should include a certification from the Registrar of Trade Marks in terms of the provision to Sub-Section (3) of Section 45 of the Copyright Act, 1957 : N.A.

Registrar of Copyrights

Extracts from the Register of Copyrights

बौद्धिकसम्पदाकार्यालय, भारतसरकार | Copyright Office, Government Of India

दिनांक/Dated 13/04/2024

1. पंजीकरण क्रमांक/Registration Number : SW-18627/2024
2. आवेदक का नाम, पता तथा राष्ट्रीयता / Name, address and nationality of the applicant : DIRECTOR , ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN
3. कृति के प्रतिनिधित्वकर्ता में आवेदक के हित की प्रकृति / Nature of the applicant's interest in the copyright of the work : OWNER
4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : GLPRED: A WEB SERVER FOR PREDICTION OF GIGANTEA-PROTEINS IN PLANTS
6. कृति की भाषा / Language of the work : PHP, R AND JAVA
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : DR. PRABINA KUMAR MISHRA , SENIOR SCIENTIST, ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

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4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : ASRPRO: A WEB SERVER FOR PREDICTING MULTI-LABEL ABIOTIC STRESS RESPONSIVE PROTEINS IN PLANTS
6. कृति की भाषा / Language of the work : PHP, R AND JAVA
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : DR. PRABINA KUMAR MISHRA , SENIOR SCIENTIST, ICAR-INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI -110012 INDIAN

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4. कृति का वर्ग और ब्यौरा / Class and description of the work : COMPUTER SOFTWARE WORK
5. कृति का शीर्षक / Title of the work : WHEATOS: WHEAT DROUGHT ROOT TRANSCRIPTOME DATABASE
6. कृति की भाषा / Language of the work : PERL, PHP (HYPERTEXT PREPROCESSOR) AND MYSQL DATABASE
7. रचयिता का नाम, पता और राष्ट्रीयता तथा यदि रचयिता की मृत्यु हो गई है तो मृत्यु की तिथि / Name, address and nationality of the author and if the author is deceased, date of his decease : DR. M.A. KUERAL , SENIOR SCIENTIST, ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, LIBRARY AVENUE, PUSA, NEW DELHI, INDIAN-110012 INDIAN

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DR. SONIA SHEORAN , SENIOR SCIENTIST , ICAR

7. Publications

Research Papers

1. Adak S, Bandyopadhyay K, Sahoo RN, Krishnan P, Sehgal VK, Kumar SN, Datta SP, Sarangi A, Bana RS, Mandal N, Bhattacharya P and Yeasin M (2023). Long-term impact of tillage, residue, nitrogen and irrigation management on growth, yield and nitrogen productivity of maize under maize-wheat rotation in North-Western India. *Journal of Agricultural Physics*, **23(2)**, 180-195.
2. Adupa S, Kumbhare NV, Muralikrishnan L and Sinha K (2024). Cow-based traditional farming practices as a basis for regenerative agriculture: Andhra Pradesh community managed natural farming and Indian perspective. *Biological Forum-An International Journal*, **16(4)**, 191-197.
3. Agashe NW, Varghese C and Harun Mohd (2024). Mating-environmental designs for breeding trials using bi-hierarchical incomplete block designs. *Current Science*, **127(10)**, 1246-1251.
4. Agashe NW, Varghese C, Harun Mohd and Dalal A (2024). Tri-hierarchical incomplete block designs. *Communications in Statistics: Simulation and Computation*, 1-13. https://doi.org/10.1080/03610918.2024.2339991
5. Agashe NW, Varghese C, Vinayka, Harun Mohd and Kumar D (2024). On construction of doubly nested partially balanced incomplete block designs. *Bhartiya Krishi Anusandhan Patrika*, **39(2)**, 101-107.
6. Ahlawat OP, Khippal A, Venkatesh K, Chhokar RS, Gill SC, Kashyap PL, Kharub AS, Kumar L, Kumar N, Sharma A, Kumari K, Sheoran S and Singh G (2024). Impact of different tillage and residue retention practices on soil nutrients, microbial community composition and grain yield of malt barley. *Journal of Soil Science and Plant Nutrition*, **24**, 7651-7668. https://doi.org/10.1007/s42729-024-02065-5
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8. Ajmal S, Venkatesh P, Singh A, Praveen KV, Renjini VR, Jha GK, Sharma DK and Sangeeth V (2024). What factors determine the economic value of wetland agroecosystem services in developing countries? A meta-regression approach. *Wetlands Ecology and Management*, **33(9)**. https://doi.org/10.1007/s11273-024-10016-1
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11. Anand R, Parray RA, Mani I, Khura TK, Kushwaha H, Sharma BB, Sarkar SK and Godara S (2024). Spectral data-driven machine learning classification models for real-time leaf spot disease detection in brinjal crops. *European Journal of Agronomy*, **161(2)**, 127384. https://doi.org/10.1016/j.eja.2024.127384
12. Anjum A, Jaggi S, Lal S, Varghese E, Rai A, Bhowmik A and Mishra DC (2024). A two-step procedure for detecting change points in genomic sequences. *Current Science*, **126(1),** 54-58.
13. Aravind KS, Vashisth A, Krishnan P, Kundu M, Prasad S, Meena MC, Lama A, Das P and Das B (2024). Development of multistage crop yield estimation model using machine learning and deep learning techniques. *International Journal of Biometeorology,* **69***,* 499-515. https://doi.org/10.1007/s00484-024-02829-9
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15. Ashok K, Bhargava CN, Pradeep C, Pradhan SK, Jha GK, Maligeppagol M, Shivanna B and Asokan R (2024). Toward the genetic suppression of *Bactrocera dorsalis* (Diptera: Tephritidae) through CRISPR/Cas9-mediated editing of spermatogenesis-related genes, Tssk1 and topi for imparting male sterility. *Annals of the Entomological Society of America*, **117(5)**, 270–279. https://doi.org/10.1093/aesa/saae021

16. Ashok K, Bhargava CN, Venkatesh R, Balasubramani V, Murugan M, Geethalakshmi V, Manamohan M, Jha GK and Asokan R (2024). Molecular characterization and CRISPR/Cas9 validation of the precursor of egg yolk protein gene, vitellogenin of *Leucinodes orbonalis* Guenée (Lepidoptera: Crambidae). *Gene*, **933**, 148925.

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20. Avinash G, Ramasubramanian V, Ray M, Paul RK, Godara S, Nayak GHH, Kumar RR, Manjunatha B, Dahiya S and Iquebal MA (2024). Hidden markov guided deep learning models for forecasting highly volatile agricultural commodity prices. *Applied Soft Computing*, **158**, 111557. https://doi.org/10.1016/j.asoc.2024.111557

21. Banerjee M, Srivastava S, Rai SN and States JC (2024). Chronic arsenic exposure induces malignant transformation of human HaCaT cells through both deterministic and stochastic changes in transcriptome expression. *Toxicology and Applied Pharmacology*, **484**, 116865. https://doi.org/10.1016/j.taap.2024.116865

22. Banerjee R, Bharti, Das P, Barman S, Ankita and Devi S (2024). Comprehensive analysis of millets in India: area, production, cost of production and export statistics. *Current Agriculture Research Journal*, **12(3)**. https://doi.org/10.12944/CARJ.12.3.13

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- राहुल बनर्जी, भारती, दीपक सिंह, पंकज दास, अंकुर विश्वास, कौस्तव आदित्य एवं राजूकुमार।. मल्टीस्ट्रैटम प्रतिक्रिया सतह अभिकल्पनाओं पर एक अवलोकन, 05–12।
- दीपक सिंह, राहुल बनर्जी, भारती, पंकज दास, समर्थ गोदारा, राजू कुमार, अंकुर विश्वास एवं कौस्तव आदित्य। प्रतिदर्श सर्वेक्षणों में परिमित समष्टि माध्य के अनुमानकों का एक बेहतर वर्ग, 13–18।
- पंकज दास, भारती, राहुल बनर्जी, दीपक सिंह एवं राजूकुमार। ड्रोन–प्रौद्योगिकीरू कृषि में उच्च उत्कृष्टि का संवर्धन, 19–23 ।
- समर्थ गोदारा, राम स्वरूप बाना, श्रुति गोदारा, राजेन्दर प्रसाद, सुदीप मरवाहा, राजू कुमार एवं दीपक सिंह। कृषि आवश्यकताओं के व्याख्यान हेतु किसान कॉल सेंटर के किसानों के प्रश्नों का गहन विश्लेषण, 24–32।
- आशुतोष दलाल, सिनी वर्गीस, मो. हारून एवं देवेन्द्र कुमार। न्यूट्रोसोफिक आंकड़ो हेतु सांख्यिकीय तकनीकें, 33–38।
- नीतू आर एस, सिनी वर्गीस, मो. हारून, आशुतोष दलाल, अनिंदिता दत्ता एवं देवेन्द्र कुमार। अभिकल्पना परीक्षणों का गैर दृप्राचलिक विश्लेषण, 39–47।
- नोबिन चन्द्र पॉल, नव्याश्री पोन्नगंटी, राहुल बनर्जी, ध्ानञ्जय डी नंगारे एवं तौकीर अहमद। महाराष्ट्र के पुणे जिले के लिए गूगल अर्थ इंजन का इस्तेमाल कर के भूमि की सतह के तापमान का स्थानिकमान चित्रण, 48–50।
- सुशील कुमार सरकार, अनिंदिता दत्ता एवं रवि वंजारी। दीर्घावधि उर्वरक परीक्षणरू एक अवलोकन, 51–58।
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- हिमाद्री शेखर रॉय, अमृत कुमार पॉल, रंजीत कुमार पॉल, प्रकाश कुमार, मो. यासीन एवं एस.पी.सिंह। बेसियन फ्रमेवर्क का उपयोग करके सिस और ट्रांस–एक्सप्रेशन क्वांटिटेटिव ट्रेट लोसाइ (ईक्यूटीएल) की पहचान, 72–82।
- अनीता सरकार, मो. यासीन, रंजीत कुमार पॉल, हिमाद्री शेखर रॉय, प्रकाश कुमार, अंकित कुमार सिंह, अमृत कुमार पॉल एवं एस.पी.सिंह। समय श्रंखला पूर्वानुमान

के लिए इंट्यूशनिस्टिक फजी आधारित ऑटोरेग्रेसिव इंटीग्रेटेड मूविंग एवरेज (फरिमा) मॉडल, 83–87।

- प्रकाश कुमार, रंजीत कुमार पॉल, मो. यासीन, राजू कुमार, दीपक सिंह एवं अमृत कुमार पॉल। जैव सूचना विज्ञान में ब्रहत आंकड़ों विश्लेषण, 88–98।
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8.

IRC, RAC, QRT and IMC

Institute Research Committee (IRC)

The Institute Research Committee (IRC) is an important forum to guide the scientists in the formulation of new research projects and it also prioritizes and reviews the progress of on- going research projects periodically. It also monitors the follow up action on the recommendations of the Quinquennial Review Team (QRT) and Research Advisory Committee (RAC) in respect of technical programmes of the Institute. Director, ICAR-IASRI is the Chairman and all scientists of the Institute are the members of IRC.

The 95th IRC meeting was held during 15, 23-24 October 2024. Progress of 61 on-going research projects (32 Institute funded and 29 outside funded) were reviewed and 12 research projects were declared as complete in the 95th IRC meeting. 13 new research projects (5 Institute funded and 08 outside funded) were approved and initiated during 94th to 95th IRC period.

Research Advisory Committee (RAC)

The 23rd meeting of Research Advisory Committee (RAC) was held on 27 November 2024. The meeting was Chaired by Professor Bikas K Sinha, Former Member, National Statistical Commission, Govt. of India & Former Professor of Statistics, Indian Statistical Institute, Kolkata; Professor K. Muralidharan, Professor, Department of Statistics, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat; Dr. Bimlesh Mann, Assistant Director General (Education Planning & Home Science), ICAR, New Delhi; Dr. S.K. Sharma, Assistant Director General (Human Resources Management), ICAR, New Delhi; Dr. Rajender Parsad, Director, ICAR-IASRI, New Delhi as Members also graced the occasion. Sh. Aakash Rathi, Member, IMC (Institute Management Committee) and Sh. Somveer Kodan, Member, IMC (Institute Management Committee) also attended the meeting as special Invitees. Dr. Ajit as Member Secretary organized the meeting.

Dr Mausam, Professor, Jai Gupta Chair, Department of Computer Science and Engineering, Indian Institute of Technology (IIT), Delhi; (ii) Dr. Punam Bedi, Professor and Former Head of Department of Computer Science, University of Delhi, Delhi (iii) Dr. Indrarnil Mukhopadhyay, Professor, Human Genetics Unit, Indian Statistical Institute, Kolkata and (iv) Dr. Sitabhra Sinha, Institute of Mathematical Sciences, C.I.T Campus, Taramani, Chennai, all Members-Research Advisory Committee could not attend the meeting because of other engagements. Head of Divisions and Professor of teaching disciplines were also present as invitees.

Dr. Rajender Parsad, Director, ICAR-IASRI, welcomed all the members of the Research Advisory Committee (RAC) and informed about brief achievements of the Institute as (i) one year "Diploma in Data Sciences" in Off-Line-mode is being initiated by the Institute under the aegis of PG-School, ICAR-IARI, New Delhi; (ii) The Institute (as a collaborating partner) received one Patent with ICAR-CIRB, Hissar as the Lead Institute; five Design-Registered with SKUAST, Srinagar as the Lead Institute; (iii) Eighteen (18) Technologies of the Institute have been certified by the Indian Council of Agricultural Research during 2024; (iv) Thirty-nine (39) students at the Institute were awarded Degrees in 2024; (v) The Institute is Technical Lead in QUAD AI-ENGAGE program with four countries. The QUAD AI-ENGAGE program is a collaborative initiative involving four countries. ICAR-IASRI is the technical lead in this program. This program aims to leverage artificial intelligence and engage in innovative research and development activities; (vi) The Institute has signed several MoUs (Memorandum of Understanding) including **POCRA** (*The Project on Climate Resilient Agriculture (POCRA)*; **NABARD-**National Bank for Agriculture and Rural Development, **ASRB** (*The Agricultural Scientists Recruitment Board)*. The Institute is also in process of signing and MoU with **Wadhvani-AI-Institute** and (vii) published 200+ referred research papers in national and international journals of repute (as senior author as well as coauthors).

Action taken report on the recommendations of 22nd RAC meeting was presented by the Member Secretary.

The research and development activities of the Institute were presented by Head of Divisions and In-Charge TAC. The summarized and significant research achievements of the Institute during the current year 2024 since the last RAC (January to November 2024) includes **(a) Statistical methodologies** (*Resolvable Dichotomized Split-Set Partially Balanced Incomplete Block Designs; Generation of Designs for Semi Latin Rectangles; Generation of Designs for Semi Latin Rectangles;*

Wavelet-based fuzzy LSTM model for forecasting complex time series data; Estimation of Unbiased Variance in Dual Frame Surveys; Geographically Weighted Spatially Integrated (GWSI) Estimator etc.) **(b) R-packages**-*twenty-three (23) in number* **(c) Database/Web Server-*Eighteen*** *(18) in number (AScirRNA: A machine learning based online prediction tool for the discovery of abiotic stress specific Circular RNAs (circRNAs) in plants; DBPMod: A machine learning based approach to identify species-specific DNA binding proteins (DBPs); GARUD: Genetically aggregated rice user-interface database; ProkDBP: A novel machine learning-driven computational model for prediction of prokaryotic DNA binding proteins (DBPs); RBProkCNN: A deep learning based computational tool for RNA binding protein discovery in prokaryotes etc.)* **(d) Portals/Apps**-*Eight in number (Sabji-Gyan-app, Smart Hueristic Response Based Intelligent Assistant (SHRIA); Agricultural Query-Response Generation System for Assisting Nationwide Farmers (AgriResponse); Agricultural Research Management System (ARMS 2.0); NARES-Blended Learning Platform etc.*) **(e) Technologies certification** by ICAR-Eighteen technologies of the Institute were certified by the Council **(f) Intellectual Property Rights-** *The Institute received twenty-three (23)* Copyrights, *One* Patent *(with ICAR-IASRI as collaborating Institute and ICAR-CIRB-Hissar as lead Institute)* and *Five* Design Registered *(with ICAR-IASRI as collaborating Institute and SKUAST-Srinagar as lead Institute)*. The scientists of the Institute have published more than 200 referred research articles in Journals of National and International repute during last one year (2024).

RAC members highly appreciated the contributions and achievements made by the Institute in all spheres of research, teaching, training, advisory services and e-governance services. From the day long deliberations, presentations and discussions on the research, teaching and training activities of the Institute, the following action points/ recommendations emerged:

- Each Division/Unit shall list at least one program that is innovative in nature i.e utilizes out of box thinking and concepts.
- All patents/copyrights received should be commercialized.
- Rate of Return should be invariably mentioned with each technology developed.
- The piece-wise developed results/tools should be integrated in the form of a PRODUCT and that should be popularized rigorously.
- The extension kind of training programs should be arranged on-farmers-site (villages/tehsil/ districts) for the various tools/mobile-apps/ portals etc. developed for benefit of peasant community.
- The PSCC (Professional Statistics Certificate Course) program be discontinued considering the participation of only 3-4 participants every year.

Quinquennial Review Team (QRT)

The QRT usually reviews the progress of the Institute for preceding five-year period. The last QRT Team reviewed the progress of the Institute during 01.04.2011 to 31.03.2018. The QRT submitted its report in the year 2020. Dr. G.C. Manna were the Chairman, and the members include Professor Rita Saha Ray, Dr. Ashish Kumar, Dr. N. Balakrishna, Dr. BVS Sisodia, Dr. Sridhar Sivasubbu and Dr. Hukum Chandra as Member Secretary. Action Taken report on the recommendations have been prepared. As per recommendations of the last QRT meeting, Centre of Agricultural Bioinformatics has been renamed as Division of Agricultural Bioinformatics including Statistical Genetics also in the mandate. The proposal of re-naming Division of Statistical Genetics to Division of Statistical Ecology and Environmental Statistics with a mandate to develop statistical techniques/algorithms pertaining to environmental and ecological research for sustainable agriculture and integrating them with machine learning has been accepted by the Council. Diploma Course in data Science and Analytics has been approved.

Dr. Bimal Roy, Former Chairman, National Statistical Commission, Government of India & Former Director, Indian Statistical Institute, Kolkata is the Chairman of next QRT of the Institute and the constitution of the next QRT of the Institute is in process.

Institute Management Committee

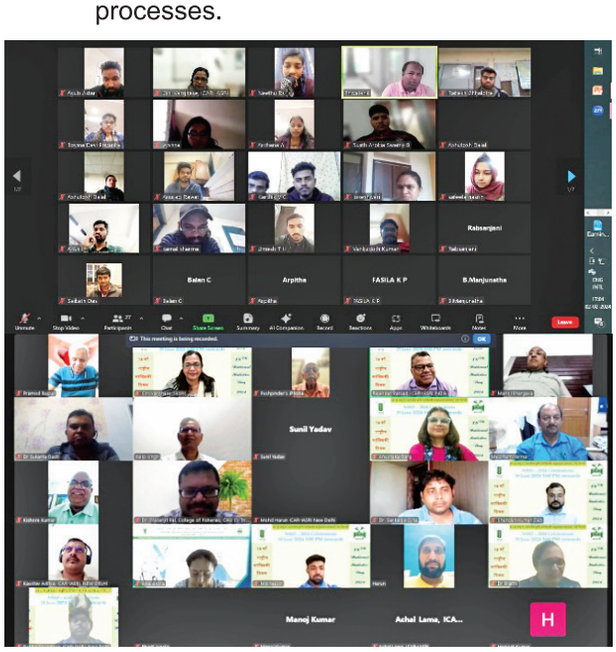
Two Non-Official Members representing rural/ agricultural interest (namely Sh. Sombir Kodaan from District Jhajjar, Haryana and Sh. Aakash Rathi from Meerut, Uttar Pradesh) have been nominated to the Institute Management Committee (IMC) for a period of three years w.e.f. 30/05/2023 to 29/05/2026 vide FN:Agril.Edn.14(12)/2018-A&P(e32131) dated June 20, 2023.

9.

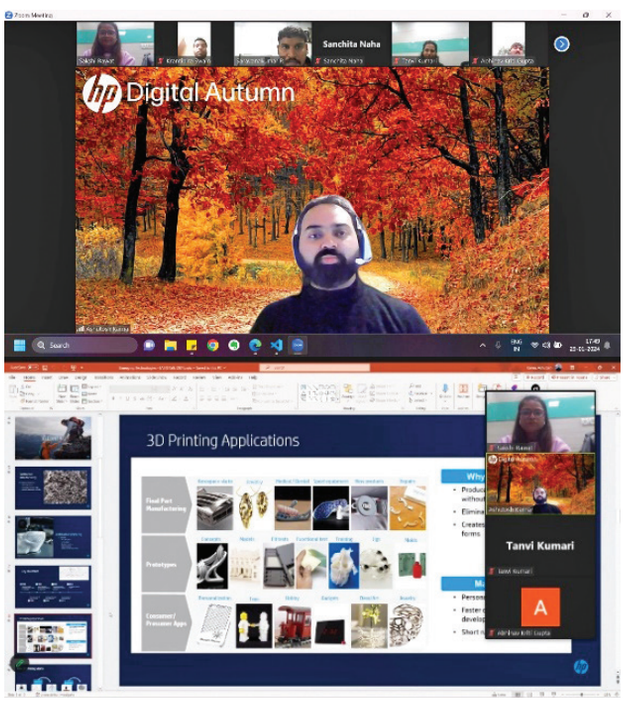
Conferences, Workshops, Webinars, Symposium, Meetings and Special Events Organized

Webinars/Seminars

- A series of interactive sessions were organized to connect students with alumni working in reputed multinational companies (MNCs), with the aim of helping students gain valuable insights into the professional world. The sessions facilitated guidance on career preparedness, skill development, and navigating the corporate landscape.
  - Dr. Pratyush Dasgupta, Senior Consultant at Deloitte, and Dr. Shwetank Lall, Lead Math Architect at AvatarUX Studios, shared their professional experiences in sessions held on 26.01.2024 and 02.02.2024, respectively. During these sessions, students received valuable advice on several key topics, including: (i) qualities MNCs look for when selecting candidates, (ii) How to prepare for MNC job opportunities, particularly in terms of programming and analytical skills, (iii) The essential software and tools students should be proficient in, (iv) Major advantages and disadvantages of working in MNCs, (v) Tips on crafting an impressive bio-statement and LinkedIn profile and (vi) Commonly asked interview questions in MNC recruitment processes.



  - Sh. Ashutosh Karna, Principal Technologist at HP Inc. in Spain, a proud alumnus from discipline of Computer Applications delivered an insightful lecture on Current Industry Trends on 3D Printing on 20.01.2024.



  - Dr. Subhra Sarker, Deputy Director General, National Accounts Division, Ministry of Statistics and Programme Implementation, Government of India delivered a seminar on **Agriculture in National Accounts Statistics in India** on 12.06.2024.

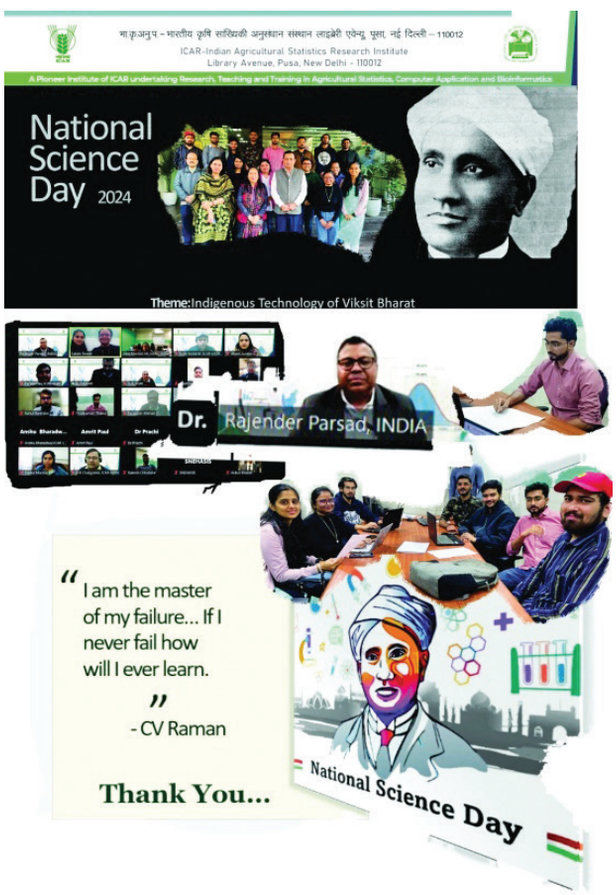
Exhibition Stalls

- **ICAR Foundation Day and Technology Day:** The Institute participated in the 96th ICAR Foundation Day and Technology Day celebrations organized at Dr. C. Subramaniam Auditorium of NASC Complex, New Delhi during July 15-16, 2024 and showcased different technologies including virtual reality modules.

Celebrations

- **Republic Day Celebrations:** Institute celebrated 75th Republic Day on January 26, 2024, with active participation from staff and students. Dr. Rajender Parsad, Director, ICAR-IASRI unfurled the national flag and presided over the celebrations. Students showcased a captivating cultural program featuring patriotic songs, poems, and dances.

- **National Science Day:** The Institute celebrated National Science Day on February 28, 2024 on the theme **Indigenous Technology for Viksit Bharat**. Students showed a captivating documentary on the life of Sir C.V. Raman and his ground breaking discovery of the Raman Effect. Their presentation also covered India's major scientific and agricultural achievements, highlighting the incredible strides made in these fields. One of the highlights was discussing Honourable Prime Minister's vision for National Science Day, to inspire us to continue breaking boundaries in science and technology.



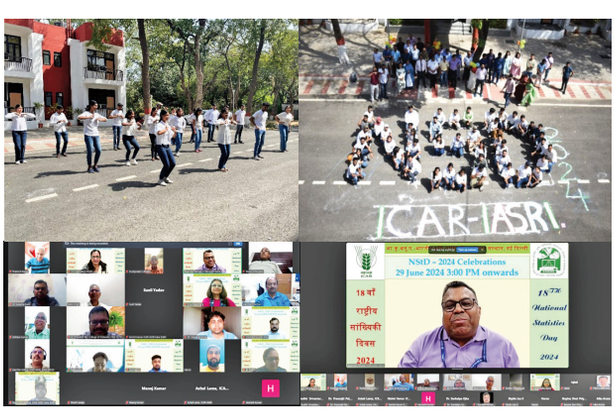
- **International Women's Day:** Institute celebrated International Women's Day with a series of engaging events during March 07-08, 2024. The celebration aimed to honour the achievements of women and promote gender equality. The esteemed presence of Prof. (Dr.) Charru Malhotra, Professor in e-Governance and ICT at the Indian Institute of Public Administration, as the Chief Guest, added prestige to the occasion. The Chief Guest delivered an insightful talk on **Inclusiveness in Innovations: A Woman-Centric Perspective**,

emphasizing the necessity of increased female participation in the TechSpace, highlighting the importance of engaging women to explore creativity through technology.

- **Plantation Drive:** Litchi sapling plantation by Dr R C Agrawal, Deputy Director General (Agricultural Education); Dr. Rajender Parsad, Director, ICAR-IASRI, Heads of Divisions and staff at ICAR-IASRI campus on 12.06.2024

- **International Yoga Day:** Institute celebrated International Day of Yoga on June 21, 2024 with the theme **Yoga for Self and Society** to achieve the objective of **Yoga for Humanity and Peace**. The session focused on promoting a Balanced Nutritional Diet for a healthy lifestyle, emphasizing both dietary choices and behavioral habits. In this context, Dr. Sugeeta Mutreja, a nutrition expert [BAMS, DNHE, MBA(HA)] and founder of Aarogya Clinic: Diet and Nutrition, delivered a lecture and addressed participants' queries. The session was chaired by Dr. Rajender Parsad, Director, ICAR-IASRI, who emphasized the importance of Yoga and its genesis of the celebration and practice of yoga with special mention of maintaining mental and physical health with positive attitude in life and power of subconscious mind.

- **18th National Statistics Day:** The Institute celebrated National Statistics Day on June 29, 2024, with a series of pre-events leading up to the occasion. The celebrations commenced with "The Flashmob-Mob Momentum", a vibrant performance by ICAR-IASRI students, followed by "Camera Quest" on June 12, 2024. The event was graced by the Honourable DDG (Education), Dr. R.C. Agrawal, and Director, ICAR-IASRI, Dr. Rajender Parsad, whose presence, along with the enthusiastic participation of students, faculty and staff contributed to its grand success. The 18th National Statistics Day was celebrated with the theme **Use of Data for Decision Making**. The keynote address was delivered by Dr. Dalip Singh, Additional Director General, Economic Statistics Division, MoSPI, Government of India, on **Some Aspects of Economic Census and Follow-up Surveys**. The event was presided over by the Director, ICAR-IASRI, and saw active participation from alumni, faculty from NARES/ ICAR-IASRI and students.



- **Institute Annual Day:** Celebrated Annual Day of the Institute on July 02, 2024. Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR was the Chief Guest; Dr. Suresh Kumar

Chaudhari, Deputy Director General (Natural Resource Management) was the distinguished speaker for 34th Nehru Memorial Lecture; Dr. R.C. Agrawal, DDG (Agricultural Education), ICAR & ND (NAHEP) and Dr. SK Sharma, ADG (HRM), ICAR were the guest of honour. The celebrations started with the planting the saplings of Ashok by the Chief Guest Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR and other dignitaries. Dr. Rajender Parsad, Director of the Institute delivered the welcome address and presented the activities and accomplishments of the Institute during 2023. The dignitaries had all applauded for the good work done and being done by ICAR-IASRI.

Speaking on the presidential address, Chief Guest of the function Dr. Himanshu Pathak congratulated the entire IASRI fraternity on the occasion of the annual day and also appreciated the efforts of past and present IASRIians for their immense contributions to the system. He emphasized the importance of statistics in research and policy planning and cited several anecdotes regarding Professor P.C. Mahalanobis. He also conveyed that the Institute which has contributed significantly in the area of Statistical Sciences, ICAR has higher expectations from the Institute. He also emphasized about the importance of quality data, correct data and authenticated data for well informed decisions. He stressed upon the need of real time capturing of data through one of the largest network of agricultural research, education and extension. The real time data captured for crop, fisheries, and livestock, etc. should be calibrated and after authentication it should be made available to all. All agricultural related data should be available with the Council and IASRI should play the lead role in this endeavor. Efforts on AI/ML should be strengthened. All information to be converted to knowledge and provided to farmers in the form of advisories, research managers and policy planners on a realistic basis at any time.

Dr. S.K. Chaudhuri, DDG (NRM), ICAR delivered 34th Nehru Memorial Lecture on the topic **Natural Resource management for Ecosystem Sustainability**. Guest of Honour and IASRI alumni Dr. R.C. Agrawal, DDG (Agricultural Education), ICAR & National Director (NAHEP), addressed the gathering in online mode. In his address, he not only mentioned about the glorious past of IASRI but also thrown light on the contributions and importance of the Institute at present not only for ICAR but for entire NARES. Following five publications were also released on the occasion: (i) Annual Report 2023 (ii) Agricultural Research Data Book 2024; (iii) Monograph on “Crop Cutting Experiments Techniques for Determination of Yield Rates of Field Crops” (iv) Pamphlet on “eLISS end-to-end solution for major Livestock Products”; and (v) Sankhyiki Vimarsh. Merit medal and certificates were awarded to the best M.Sc. students in all the three disciplines: (i) Sh. Surya Kant Tripathi, Agricultural Statistics; (ii) Ms Sakshi Rawat, Computer Applications and (iii) Sh. Abhik Sarkar, Bioinformatics.

- **Independence Day Celebrations:** The Institute celebrated the 78th Independence Day on August 15, 2024 with a vibrant program. Director, ICAR-IASRI led the flag-hoisting ceremony, followed by inspiring performances from students, including poetry, dance, group songs, and a presentation on India's freedom struggle.

- **एक पेड़ मां के नाम:** संस्थान में दिनांक 29 अगस्त 2024 को एक पेड़ मां के नाम का आयोजन किया गया। इसमे संस्थान के निदेशक महोदय और अन्य अधिकारियों द्वारा 11 अशोका के पौधों का वृक्षारोपण कर इस आयोजन को सफल बनाया।

- **Teacher's Day Celebrations:** Institute celebrated Teacher's Day on September 05, 2024. Chief Guest Sh. Parvin Srivastava, Former Chief Statistician and Secretary, Ministry of Statistics and Program Implementation, Govt. of India delivered a lecture on **Use of Data in Decision Making**. Guest of Honor Dr. Punam Bedi, Senior Professor, University of Delhi delivered a lecture on **My Journey in Academics and Research**.

- **Swachhata Campaign (September 15-October 02, 2024):** The drive was celebrated as "Swachhata Hi Seva 2024" स्वच्छता बनाए रखें, न तो गंदगी करें और न ही दूसरों को करने दें, सूखा और गीला कचरा अलग–अलग करें, सूखा कचरा कम करें, पेड़ लगाएं, जल और ऊर्जा का संरक्षण करें, एकल उपयोग प्लास्टिक का उपयोग न करें। As part of Swachhata Pakhwada, gratitude was expressed for sanitation and housekeeping workers. A photo of staff with sanitation and housekeeping workers was taken. ICAR-IASRI staff and students took the Swachhta Pledge administered by Secretary (DARE) & DG (ICAR) online on September 17, 2024; "Ek Ped Maa Ke Naam" plantation drive was organized in the campus after the Swachhata Pledge. A cleanliness drive was carried out in the Institute campus by staff members as well as around hostels by the staff and students. Cleanliness campaign at religious place (temple near ICAR-NIAP) was also conducted. A health check-

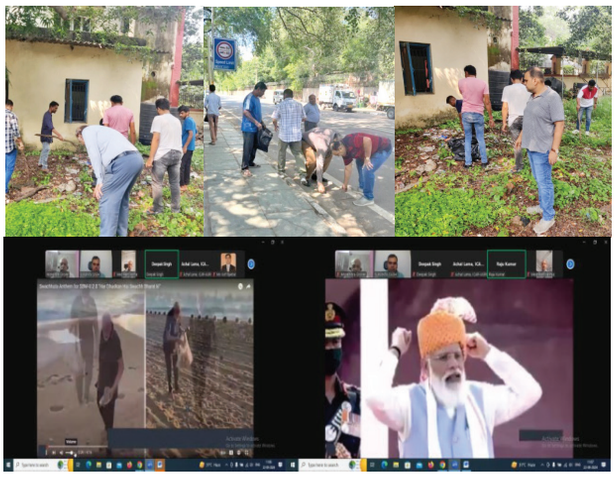
up of Safai Karamcharis in the Institute was conducted in nearby Mohalla Clinic by Doctors of the clinic. Video shows were organized on (i) Single use plastic ban: DTE call for action; (ii) Nature and you: Single use plastic; (iii) Swachh Bharat Abhiyan - Short Film; (iv) Incredible India - 'Swachhata Hi Sewa' Cleanliness Campaign.

- **SC-Sub Plan Programmes:** An exposure visit was organized at ICAR-IASRI on September 13, 2024, under the SCSP scheme for scheduled caste (SC) beneficiaries from the villages of Kair and Khaira in Najafgarh, New Delhi. Twenty-five beneficiaries attended the event. While addressing the participants, Dr. Rajender Parsad, Director of ICAR-IASRI, highlighted the Institute's achievements and urged all to contribute effectively in (i) maintaining and enhancing Swachchhta in their neighbourhood, (ii) Plant more trees under Ek Ped Maa ke Naam Campaign and (iii) encourage the school going children towards agriculture education and work. During the event, all participants and officials took the swachhata pledge. Dr. Mukesh Kumar and Dr. Soumen Pal briefed the role of ICT in agriculture and provided insights into the AI-DISC, KRISHI Portal, and Kisan SARATHI. The SCSP committee organized the programme, and sewing machines were distributed to the SC beneficiaries.

- **Showcasing Digital Initiatives to School Students:** An exposure visit was organized at ICAR-IASRI on September 27, 2024, for scheduled caste (SC) students of Sulabh Public School, Mahavir Enclave, Palam, New Delhi. Twenty students participated in the event. As a part of this excursion, the students also visited the National Agricultural Science Museum (NASM) at NASC Complex. Another student visit to Institute and NASM was organized on December 08, 2024 under SCSP scheme. This was attended by 35 students.

- **Vigilance Awareness Week:** Institute organized the Vigilance Awareness Week (October 28-November 03 2024) on the theme "सत्यनिष्ठा की संस्कृति से राष्ट्र की समृद्धि" (Culture of integrity for Nation's Prosperity). Dr Rajender Parsad, Director ICAR-IASRI administered integrity pledge to all employees on October 28, 2024. The Institute employees were also encouraged to take the e-pledge of integrity and many of the employees did so. An online quiz was organised on 30th November 2024. Scientists and other staff members of the Institute participated in the quiz.

- **Swachhata Campaign (December 16-31, 2024):** Swachhata Pakhwada was organized during December 16-31, 2024. Swachhata pledge was taken on December 16, 2024 at the photo shoot point. Discussions were held on water saving and reuse wherever possible, efficient and effective use of electricity, single use plastic free campus, contribute significantly to environmental pollution. During Swachhata Pakhwada other activities were also performed by ICAR-IASRI Staff/Students and Contractual staff which includes cleanliness and sanitation drives in residential colony near IASRI campus; cleaning awareness in vicinity of IASRI campus promoting green drive focusing on the care and maintenance of all plants and trees across the campus. The residents of the colony were counselled on cleaning of their premises and surroundings. Staff members were requested to perform cleaning in their respective residential colonies and nearby market places. Video shows on the following topics were organized: (i) Swachhamev Jayate! -Anthem for Swachhata Hi Seva (SHS) 2024, (ii) Water conservation: how the water conservation can be carried out in arid and hot region, and (iii) Swachch Bharat Mission Grammeen. The Institute campus was maintained as clean and green campus. The



valedictory function was held in the gracious presence of Dr. R.C. Agarwal, Deputy Director General (Education), Dr. S.K. Sharma, Assistant Director General (HRM), and staff members of IASRI in the virtual session.

- **National Integration Day:** Institute celebrated National Integration Day (Rashtriya Ekta Diwas) on October 31, 2024
- **Communal Harmony Day:** Institute celebrated Communal Harmony Day (Sadbhavana Diwas) on November 19, 2024
- **Constitution Day 2024:** Institute celebrated Constitution Day on November 26, 2024. The staff and students read Preamble along with Director, ICAR-IASRI, New Delhi.
- **Kisan Diwas (National Farmers' Day) 2024:** Kisan Diwas was celebrated online on December 23, 2024. Director, ICAR-IASRI inaugurated the celebrations and explained the importance of celebrating Kisan Diwas on the birthday of Late Choudhary Charan Singh, former Prime Minister of India. In 2001, the Government of India announced December 23 (his birthday) to be celebrated as National Farmer's Day to honour Chaudhary Charan Singh's and Lal Bahadur Shastri's contributions for the welfare of farming community. Director, ICAR-IASRI welcomed the farmers (i) Sh. Sumer Singh; (ii) Sh. Satish Kumar from Kaur Village, Delhi; (iii) Sh. Ashok; (iv) Surender Singh; (v) Sh. Yuvraj Singh Pushkar; (vi) Ersad Malki; (vii) Jia Bhim Singh and (viii) Sh. Dinesh Kumar from Mumraj Pur, Buland Shahar. The farmers while expressing their views lauded the efforts of ICAR scientists and also stressed the need for further improvement in the farmer research community interaction.

Methodologies/Information Systems Portals Launched

- **Launch of ASEAN-INDIA Fellowship Portal:** The ASEAN-INDIA Fellowship Portal was launched by Shri. Shivraj Singh Chouhan, Union Minister of Agriculture and Farmers' Welfare & Rural Development on August 14, 2024 and NPSS 2.0 on August 15, 2025.

- **Launch of National Pest Surveillance System (NPSS) Mobile Application:** On August 15, 2024, Shri Shivraj Singh Chouhan, Hon'ble Minister of Agriculture & Farmers Welfare, unveiled the National Pest Surveillance System (NPSS) mobile application at C. Subramaniam Auditorium, NASC complex, New Delhi.

Following the launch, Shri Faiz Ahmed Kidwai, Additional Secretary, MoA&FW, GoI, provided an in-depth overview of the App's capabilities. NPSS is a cutting-edge tool designed for comprehensive pest surveillance across India. It currently supports the identification of pests and diseases for 61 crops, with advisory services available for 15 crops. Mr. Kidwai further acknowledged the pivotal contributions of ICAR-NCIPM, ICAR-IASRI, DPPQ&S, Wadhwani AI and Plantix in the development and success of this vital initiative.

- **Pilot Launch of Kisan Sarathi:** Launched Krishi e-Nidanshala (A joint initiative of Indian Council of Agricultural Research, Digital India Corporation and Common Service Centers) by Dr. Udham Singh Gautam, DDG Extension, ICAR in the presence of Dr. Anil Rai, ADG ICT, ICAR and Dr. Rajender Parsad, Director, ICAR-IASRI on December 19, 2024 at ICAR-IASRI, PUSA. The highlights of the Krishi e-Nidanshala included availability of Kisan Sarathi services at nearest common service centre, expert guidance and timely response for farming, livestock queries for famrmers and personalised advice & expert guidance for farmers in their local language.

- **Drone Flying and Launch:** Drone Flying and Launch event was organized on December 20, 2024, procured as part of the project "Agri-Drone in ICAR: ICAR-IASRI Component". Dr. R. C. Agrawal, DDG (Agricultural Education) inaugurated the event and Dr. Rajender Parsad, Director, ICAR-IASRI presided over the event. The objectives of the study are to develop smart sampling technique for Crop Cutting Experiments (CCEs) using drone data and develop crop acreage and crop yield estimation methodologies for generating estimates using drone technology.

Radio Talk

- Kisan ki Baat on फसलों से अधिक उत्पादन में कृषि वैज्ञानिकों की भूमिका at FM Gold on May 28, 2024. (Girish Kumar Jha)
- Kisan ki Baat on Budget 2024-25 Mein Kisan, Krishi Evam Pashupalan at FM Gold on July 24, 2024. (Girish Kumar Jha)
- Kisan ki Baat on प्रधानमंत्री फसल बीमा योजना at FM Gold on November 22, 2024. (Girish Kumar Jha)

Television Talk

- Invited Panelist for Vichar Vimarsh Program of DD Kisan on Makhana Cultivation on February 14, 2025. (Girish Kumar Jha)
- Expert on CPC DOORDARSHAN Vichar Vimarsh, a Panel Discussion Programme

on कृषि मे AI की भूमिका on November 08, 2024 on DD Kisan (Sudeep Marwaha)

Hackathon on Digital Crop Survey Conducted using Kritagya Portal:

- The Kritagya Hackathon, a National Level Agtech Hackathon platform designed and developed by the Institute to organize Hackathon on Digital Crop Survey by the Department of Agriculture & Farmers Welfare (DA&FW), Ministry of Agriculture and Farmers Welfare, Govt. of India. This national Agtech platform attracted participation from 173 teams. The winners were honoured at an award ceremony held on May 15, 2024, at Krishi Bhawan, New Delhi, where the Secretary of Agriculture & Farmers Welfare presented the awards.

Participation in Inter Zonal Sports Meet:

- Institute participated in the Inter Zonal Sport Meet 2024 organized in the month of October at ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan. The Institute won 1st prize in Table Tennis and Chess (Women).

ICAR-IASRI

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26 JANUARY

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10.

Paper Presentations in Conferences, Workshops and Symposium

- State Level Workshop on Agriculture Marketing: Problems and Prospects at Krishi Vigyan Kendra, Kota during January 09-10, 2024
  - GK Jha. Artificial intelligence based market intelligence for unified market (e-NAM).
- International Conference as Golden Jubilee Celebration of Life Sciences Research at Central University, JNU, New Delhi during January 21-24, 2024
  - Dinesh Kumar. Computational genomics in agricultural germplasm improvement and management: Indian perspective and challenges.
- Annual Group Meeting of AICRP on IFS organized at Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, Chhattisgarh during January 28-30, 2024
  - Cini Varghese. Online data submission system and statistical analysis techniques for on-station and on-farm experiments.
- 74th Annual Conference of the Indian Society of Agricultural Statistics on Harnessing Statistics and Artificial Intelligence for Sustainable and Smart Agriculture organized by the Department of Agricultural Statistics, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during February 02-04, 2024
  - Rajender Parsad. Life and achievements of Late Prof. M.N. Das. (Dr. M.N. Das Centenary Celebrations) (Invited Talk)
  - Med Ram Verma. Meta-analysis-an important statistical methodology for estimating pooled prevalence of animal diseases. (Invited Talk)
  - Susheel Kumar Sarkar. Optimal covariate designs: an overview. (Contributory paper)
  - Sukanta Dash. A note on balanced and partially balanced semi-latin rectangles. (Invited Talk)
  - Anindita Datta. Ordering factorial experiments: an overview. (Invited Talk)
  - Mohd Harun. Experimental designs for breeding trials. (Invited Talk)
  - Amrit Kumar Paul. Heritability estimation with correlated error structures (Dr. Prem Narain Memorial Session). (Invited Talk)
  - Ranjit Kumar Paul. Can denoising enhance prediction accuracy in the technical session on forewarning and forecasting modelling for crop production and health monitoring. (Invited Talk)
  - Prakash Kumar*, Tanvi Sharma, Nitesh Kumar Sharma, Ravi Shankar and Sanjay Kumar. Picro-DB: an extensive genomic resource portal dedicated to *Picrorhiza kurroa* a medicinal plant.
  - Himadri Shekhar Roy*, Ranjit Kumar Paul, Md Yeasin, Kanchan Sinha, S Vennila and Amrit Kumar Paul. Impact of environmental factors on pest population using multivariate cointigration model evidence from India.
  - Md Yeasin. Arbitrage of forecasting experts based hybrid time series model for crop yield prediction. (Contributory paper)
  - Prachi Misra Sahoo. Integrated sample survey for crop yield estimation using advanced technologies in the technical session on survey methodology for field crop yield estimation.
  - Ankur Biswas. Generation of horticultural statistics in India: Methodological aspects, challenges and the road ahead in the session on current status and challenges in official and horticultural statistics.
  - Deepak Singh*, Raju Kumar, Ankur Biswas, Kaustav Aditya and Tauqueer Ahmad. An efficient exponential-type family of estimators for the population variance in simple random sampling. (Invited Talk)
  - Nitin Varshney*, Tauqueer Ahmad, Anil Rai, Ankur Biswas and Prachi Misra Sahoo. Rescaling bootstrap variance estimation of the prediction-based estimator under two-phase sampling. (Invited Talk)
  - Raju Kumar*, Deepak Singh, Ankur Biswas and Tauqueer Ahmad. A novel survey-weighted propensity score methodology to enhance impact assessment. (Invited Talk).
  - Pankaj Das. The co-integration based support vector regression model and its application in Agriculture. (Invited Talk)
  - Sudhir Srivastava*, Mohammad Samir Farooqui, K.K. Chaturvedi, Anu Sharma, Shashi Bhushan Lal, Deepa Bhatt, Priyanka Balley and Girish Kumar Jha. The halophile

protein database 2.0: a comprehensive resource of chemical and physical properties of halophilic proteins.
  - Anu Sharma*, Dwijesh Chandra Mishra, Sharunbasappa, Dipro Sinha, Bhavesh Kumar Choubisa and Ragini Kushwaha. Omics research in the era of artificial intelligence. (Invited talk)
  - Mukesh Kumar. Information technology application for assessment of physiological and postural ergonomics in agricultural activities. (Invited Talk)
  - Chandan Kumar Deb. Artificial Intelligence (AI) in agriculture: advancing steps towards sustainability.
  - Manoj Verma*, KN Singh, Achal Lama and S. Verma. A new regression model based on globe distribution for proportional data.
  - Anushaka Garg*, K.N. Singh and Achal Lama. Forecasting agricultural price volatility using GARCH-MIDAS model for onion crop.
  - Ankit Kumar Singh*, Ranjit Kumar Paul, Md. Yeasin and Amrit Kumar Paul. Time dependent dynamic ensemble method for pest population prediction in rice crops.
  - Satyam Verma*, K.N. Singh and Achal Lama. Seasonal approach of deep learning models for forecasting rainfall series.
  - Anita Sarkar*, Amrit Kumar Paul, Ranjit Kumar Paul and Md. Yeasin. Intuitionistic fuzzy time series forecasting based on long short term memory.
  - Kaushal Kumar Yadav*, Sukanta Dash, Baidya Nath Mandal, Rajender Parsad. Construction of balanced semi-latin rectangles in block size two.
  - Deepak Pandey*, Y.A. Garde, V.S. Thorat, Nitin Varshney and Alok Shivastava. Quantifying agricultural diversification trends: a statistical analysis in Gujarat.
- Quad AI-Engage Scoping Workshop on Advancing Innovation × Agriculture Research Collaboration among Japan, the United States, Australia and India held at Singapore during February 14-15, 2024
  - Rajender Parsad. AI-ENGAGE: Advancing innovation to empower nextgen agriculture (Indian Perspective)
- Annual Conference of Vice Chancellors of Agricultural Universities and Directors' of ICAR Institutes organized at NASC complex during February 26-27, 2024
  - Rajender Parsad. Promoting digital agriculture through NARE-NAAS-PAAS collaboration.
- 26th Annual Conference of the Society of Statistics, Computer and Applications (SSCA) on International Conference on Emerging Trends of Statistical Sciences in AI and Its Applications organized by Department of Mathematics and Statistics & Centre for Artificial Intelligence, Banasthali Vidyapith, Banasthali, Rajasthan during February 26-28, 2024
  - Med Ram Verma. Sample allocation proportional to strata total and joint effect of linear and exponential phases under cost constraints. (Invited Talk)
  - Cini Varghese. Analysis of neutrosophic data from designed experiments. (Invited Talk)
  - Susheel Kumar Sarkar. Optimum covariate design. (Contributory paper)
  - Sukanta Dash. Construction of three associate constant block sum PBIB designs. (Contributory paper)
  - Sudhir Srivastava. Advanced approach for differential expression analysis in label-free LC-MS proteomics data.
  - Neeraj Budhlakoti. An integrated analysis of lncRNAs, miRNAs, and mRNAs regulatory networks in response to heat stress in wheat.
  - Ashutosh Dalal*, Cini Varghese, Rajender Parsad, Mohd. Harun, B.N. Mandal. Algorithmic construction of Gerechte-based uniform designs.
  - Neethu R.S.*, Cini Varghese, Mohd. Harun, Susheel Kumar Sarkar, Sukanta Dash and Anindita Dutta. Optimal covariate designs with good space-filling properties.
  - Anita Sarkar*, Prachi Misra Sahoo, Tauqueer Ahmad and Ankur Biswas. An improvement over estimation of milk production in integrated sample survey scheme.
  - Ankit Kumar Singh*, Ranjit Kumar Paul, Md. Yeasin and Amrit Kumar Paul. Temporal aggregation and forecast reconciliation for improving rainfall predictions.
  - Anushaka Garg*, Anindita Dutta and Rajender Parsad. Designing factorial experiments involving order-of-addition effects with six components.
- National Symposium on Genomics Revolution to Foster Advances and Innovation in Crop Improvement, organized at PAU, Ludhiana during February 27-29, 2024
  - Sarika Sahu. Identification of non-coding regulatory molecules from transcriptome data by machine learning approaches.
- National Seminar on Sustainable Agriculture, Rural Development and Future Food Security in

India: An Interdisciplinary Approach organized by Department of Agricultural Economics Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharti, Sriniketan, Birbhum, West Bengal during March 01-02, 2024

- Ranjit Paul. Forecasting agricultural prices using wavelet based approach.
- Md. Yeasin. Impact of blending policy on mustard prices in India: Insights from a Bayesian structural causal inference model. (Contributory talk)

- 6th National Conference on Nature-based Solution for Achieving Sustainable Development Goals organized by Cooch Behar Association for Cultivation of Agricultural Sciences, in association with Uttar Banga Krishi Viswavidyalaya, Pundibari, West Bengal during March 05-06, 2024
  - Kanchan Sinha. Innovative multivariate deep learning frameworks for forecasting volatile Indian onion market prices.
  - Ankur Biswas. Food loss assessment for achieving sustainable development goals.
  - Himadri Shekhar Roy. Deep neural network models with attention for prediction of evapotranspiration.
- 17th Annual International Biocuration Conference (AIBC) at Regional Centre for Biotechnology, Faridabad during March 06-08, 2024
  - K.K. Chaturvedi. Supercomputing platform and data resources derived from OMICS data in agriculture.
- National Conference on Advances in AI Systems organized by Department of Computer Science, Fakir Mohan University, Balasore, Odisha in collaboration with IEEE during March 22-23 2024
  - Mrinmoy Ray* and Rajeev Ranjan Kumar. Spatio-temporal long-short term memory models for potato price forecasting.
- 5th IGM Conference on Climate-Proofing Cereal Agriculture: Strategies for Resilience and Sustainability organized at ICAR-IIWBR during March 27-29, 2024
  - Anu Sharma. A comparative study on applying machine learning techniques for seed classification.
- Inception Workshop on Impact of Nutritional Interventions on Production and Consumption Diversity: A Step Towards Achieving SDGs held at NASC, New Delhi on April 09, 2024
  - Rajender Parsad. Impact of nutritional interventions on production and consumption diversity: a statistical perspective. (Invited Talk)
- International Conference on Globalisation and Sustainable Development: Interdisciplinary Perspective held at DPG Degree College, Gurgaon (Affiliated to MDU Rohtak) on April 25, 2024
  - Dinesh Kumar. Interdisciplinary research.
- International Conference on Recent Advances in Mathematics and Data Science, ICRAMDS 2024 held at MANIT, Bhopal during June 27-28, 2024
  - Samarth Godara*, Rajender Parsad, Sudeep Marwaha. Utilizing data analytics for understanding farmers' information demand: an analysis of Haryana's Kisan Call Center data.
  - Shabana Begam*, Samarth Godara, Hukam C Rawal and Tapan Kumar Mondal. Intelligent advancements in pioneering chloroplast genome research through computational extraction and assembly from whole genome data.
  - Monika Singh*, Anu Sharma, K.K. Chaturvedi, Sanjeev Kumar, Dwijesh Chandra Mishra, Alka Arora, Rakesh Bharadwaj, Mrinmoy Ray, Mamatha Y.S. and Samarth Godara. Seed germination viability detection with ANN-assisted NIR spectroscopy.
- International Conference on Intelligent Computing and Communication Techniques held at Jawaharlal Nehru University, New Delhi during June 28-29, 2024
  - Rajnish Chaturvedi, Hardeo Kumar, Dinesh Sahu and Akshay Dheeraj*. A book recommender system based on visual cues of book cover "Judge a book by its cover".
- Regional Advisory Group Meeting at NABARD, West Bengal Regional Office on July 10, 2024
  - Ashraful Haq. Artificial intelligence in agriculture.
- National Conference on Digitalization of Agriculture and Rural Management Challenges, Priorities and Strategies at Shobhit University, New Delhi on July 19, 2024
  - Sanjeev Kumar. Empowering the farmers through agri-extension services and knowledge dissemination with reference to national policy framework – Kisan Sarathi.
- 28th Conference of Central and State Statistical Organization organized by Ministry of Statistics

ad Program Implementation at Dr. Ambedkar International Centre, New Delhi during August 12-13, 2024

- Rajender Parsad. Statistical literacy. In the technical session on Capacity building and statistical classification. (Invited Talk)

- International Conference on AI in Health, Humanity and Indian Culture held at University of Cincinnati, Ohio, USA during August 23-25, 2024
  - Dwijesh Chandra Mishra. Disease diagnosis: A journey from ancient time to artificial intelligence era.
- International Conference on Emerging Technologies in Agriculture and Allied Sciences (ETAAS-2024) organized by Society for Agriculture, Allied Sciences and Technology (SAAST), Odisha; School of Agriculture, SR University, Warangal and Meadow Agriculture Pvt. Ltd., Uttar Pradesh during August 10-11, 2024
  - Samarth Godara*, R. Kumar, G.K. Jha, Sudeep Marwaha and Rajender Parsad. Information demand of Indian farmers on edible oil-crops: Insights from Kisan Call Center data.
  - Shabana Begam*, Samarth Godara. SSRminer: Python command-line tool for precise extraction of genomic SSR markers.
  - S.K. Parida*, Samarth Godara and Shabana Begam. Regional GC content analysis of tobacco mosaic virus genome: Insights into functional and evolutionary implications.
- 7th International Conference on Current Innovations and Technological Advances in Agriculture and Allied Sciences (CITAAS 2024) organized at GKU, Talwandi Sabo, Bathinda, Punjab during August 29-31, 2024
  - M. Singh*, A. Sharma, K.K. Chaturvedi, S. Kumar, Dwijesh Chandra Mishra, A. Arora, R. Bhardwaj, M. Ray, Y.S. Mamatha and Samarth Godara. Advanced seed classification using a deep neural network framework with NIR spectroscopic technology.
- KVK Zonal Workshop of Zone-XI, Bengaluru organised at IISR, Kozhikode on September 03, 2024
  - Alka Arora. KVK Portal.
- Discussion Meet on AI for Agriculture Sector – Trends, Challenges & Future Prospects organised in online mode by Centre for Development of Advanced Computing, Mohali on September 6, 2024
  - Alka Arora. Advancing AI innovations in agriculture.
- Faculty Development Programme of CAU, Imphal during September 10-23, 2024
  - Chandan Kumar Deb. Leveraging artificial intelligence for enhancing crop improvement and protection: some initiatives.
- Annual Zonal Workshop of Krishi Vigyan Kendras (KVKs) of Zone–I organised at GDVASU, Ludhiana on September 18, 2024
  - Alka Arora. Managing data through KVK Portal.
- 3rd International Wheat Congress-2024 organized by Murdoch University, Perth, Western Australia during September 22-27, 2024
  - Lokeshwari M, Girish Kumar Jha*, Jyoti Kumari, Rajender Parsad, Sudhir Navathe, Yashavantha Kumar K.J., Sundeep Kumar, Gyanendra Pratap Singh, P.V. Vara Prasad and Arun Kumar Joshi. Wheat yield prediction with optimized deep neural network using spectral vegetation indices. (Poster presentation)
  - Neeraj Budhlakoti*, Dwijesh Chandra Mishra, Divya Sharma, Reyazul Rouf Mir, V.K. Vikas, Sundeep Kumar and Girish Kumar Jha. Investigating genetic structure of powdery mildew resistance in wheat via QTL meta-analysis. (Poster presentation)
- Workshop on Student READY Portal and RAWE App (VIKAS) organised in online mode by Agricultural Education Division, ICAR for all State Agricultural Universities & its affiliated colleges on September 25, 2024
  - Alka Arora. Student READY portal & VIKAS App.
- 3rd International Conference on Climate-Smart Nutri-Sensitive Integrated Farming System for Gender-equitable Sustainable Agriculture: Prospects and Challenges (ICNSFS-2024) held at ICAR-Central Institute for Women in Agriculture, Bhubaneswar during November 06-08, 2024 (Hybrid Mode)
  - Shashi Dahiya*, Akash, Pratibha Joshi, Sudeep Marwaha, Chandan Kumar Deb, Ramasubramanian V. Decision support system for assessment of agricultural activities using physiological and postural analysis.
- 84th Annual Conference of Agricultural Economics organized by Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, Puducherry during November 11-13, 2024

- Biswajit Mondal, Jaiprakash Bisen*, R.P. Saha, Sudipta Paul, Nitiprasad Jambhulkar, G.A.K. Kumar, Ankita Kandpal and Rajni Jain. An innovative approach to estimate varietal adoption through breeder seed statistics.

- 11th International Electronic Conference on Sensors and Applications, at MDPI: Basel, Switzerland during November 26-28, 2024
  - Samarth Godara. Robosim: design, implementation, and applications of a line follower robot simulator.
- 4th International Conference on Emerging Electronics and Automation organized at NIT Silchar during December 9-11, 2024
  - Akshay Dheeraj. Hybrid CNN-LSTM model for Indian medicinal plant classification.
- 2nd National Genetic Congress organized by Indian Society of Genetics and Plant Breeding at IARI, New Delhi during December 11-13, 2024
  - Rajkaran Tripathi*, Vaidurya Pratap Sahi, Sandeep Nalla, Nidhi Pandey, Jai Chand Rana, Satish Kumar Yadav, Mohd. Harun, Gyanendra Pratap Singh. Application of AMMI model to analyze the stability and G×E interaction of buckwheat genotypes in the agro-climatic region of Prayagraj. (Poster Presentation)
- 10th International Conference on Statistics for the Twenty-First Century (ICSTC 2024) organized by University of Kerala, Kerala during December 13-16, 2024
  - Kaustav Aditya. Calibration estimator of the finite population total under two stage sampling design using deterministic response mechanism for nonresponse.
  - Rahul Banerjee. Integrating data from multiple surveys for robust estimation of population total: a novel approach using m-estimation.
  - Bharti. Calibration estimator in dual frame surveys under two-stage sampling when auxiliary information is available at cluster level.
- 7th International Conference on Recent Trends in Image Processing & Pattern Recognition (RTIP2R) organized by Indian Institute of Information Technology, Bhopal, MP during December 19-20, 2024
  - Sapna Nigam. Automated weed classification using attention-embedded ConvNeXtV2 architecture.
- IISA-2024 Conference organized by the International Indian Statistical Association (IISA) at Cochin University of Science and Technology, Kochi during December 27-31, 2024
  - Cini Varghese. Analysis of non-crisp data derived from designed experiments.
  - Anindita Datta. Symmetric ordering factorial experiments.
  - Mohd. Harun. Product optimization through unified DoE and ML techniques.
  - Neethu RS. Space filling designs based on optimal covariate designs.
  - Boyina Devi Priyanka. Designs for multi-session sensory trials in the presence of assessor constraints.
  - Ashish Gupta*, B.N. Mandal, Rajender Parsad and Cini Varghese. Construction of minimal balanced and minimal strongly balanced crossover designs.
- 11th International Triennial Calcutta Symposium on Probability and Statistics organized during December 27-30, 2024
  - Ankita, Susheel Kumar Sarkar* and Shashi Shekhar. Variance components testing for continuous data from nested unbalanced designs.
  - Anushaka Garg*, Anindita Datta and Rajender Parsad. Designing factorial experiments involving order of addition effects with some components.
  - Ranjit Paul*, Prakash Kumar, HS Roy and Md. Yeasin. Wavelet based deep learning models for time series forecasting. (Invited Talk)
  - Pankaj Das*, A. Shrama, S.K. Sharma and T. Adhikary. Deep learning based yield forecasting in horticulture: a case study of apple.
  - Achal Lama. Dirichlet regression model for forewarning jute semilooper infestation using weather variables.
  - Kaustav Aditya. Model assisted estimators under two stage sampling design in the presence of unit non-response.
  - (*denotes the author who presented the paper)
- Foreign Visits
  - Dr. Tauqueer Ahmad participated in the *Regional Training Workshop for Fish Loss Assessment Methods: A Gender-Responsive Approach* organized by Food and Agricultural Organization of the United Nation for Regional Office in Asia and the

Pacific (FAO RAP) in Bangkok, Thailand during June 24-28, 2024

- Dr. Girish Jha and Dr. Neeraj Budhlakoti attended 3rd International Wheat Congress 2024 held at Murdoch University, Perth, Western Australia during September 22-27, 2024
- Dr. Dwijesh Chandrs Mishra visited as Post Doc Fellow to University of Cincinnati (UC), Cincinnati, Ohio, USA during September 4, 2023 - September 3, 2024

11.

संस्थान की हिन्दी के प्रगामी प्रयोग की रिपोर्ट

भा.कृ.अनु.प.– भारतीय कृषि सांख्यिकी अनुसंधान संस्थान में हिंदी प्रगामी प्रयोग की रिपोर्ट

भा.कृ.अनु.प.–भारतीय कृषि सांख्यिकी अनुसंधान संस्थान में दिन प्रतिदिन हिन्दी के प्रगामी प्रयोग में अभिवृद्धि हो रही है। राजभाषा नीति को संस्थान में सुचारु रूप से कार्यान्वित किया जा रहा है। भारत सरकार, गृह मंत्रालय, राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम में निर्धारित लक्ष्यों को संस्थान में लगभग पूरा कर लिया गया है। संस्थान द्वारा समस्त प्रशासनिक कार्य शत–प्रतिशत हिन्दी में किया जाता है तथा धारा 3(3) का भी पूर्ण रूप से अनुपालन किया जा रहा है।

संस्थान में राजभाषा हिन्दी की प्रगति का जायजा लेने के लिए उपमहानिदेशक (कृषि शिक्षा), भारतीय कृषि अनुसंधान परिषद् मुख्यालय द्वारा 01 जनवरी 2024, 21 मई 2024, 14 अक्टूबर 2024 तथा 20 दिसम्बर 2024 को संस्थान के राजभाषा संबंधी निरीक्षण किए गए। उपमहानिदेशक (कृषि शिक्षा), ने निरीक्षण रिपोर्ट में संस्थान में हिन्दी में हो रहे कार्यों की प्रगति पर संतोष व्यक्त करते हुए संस्थान की सराहना की। संस्थान के अलग–अलग प्रभागों/अनुभागों में हिन्दी में किए जा रहे कार्यों की समीक्षा करने के लिए हिन्दी एकक के अधिकारियों द्वारा कुल 19 प्रभागों/अनुभागों का निरीक्षण किया गया।

संस्थान में प्रशासनिक कार्य के साथ–साथ वैज्ञानिक प्रकृति के कार्यों में भी हिन्दी के उपयोग को प्रोत्साहित किया जाता है। संस्थान के वैज्ञानिक प्रभागों द्वारा आयोजित प्रशिक्षण कार्यक्रमों की ई–संदर्भ पुस्तिकाओं में आमुख एवं आवरण पृष्ठ द्विभाषी रूप में प्रस्तुत करने के साथ–साथ परियोजना रिपोर्टों के आवरण पृष्ठ, आमुख, एवं सारांश द्विभाषी रूप में प्रस्तुत करने के साथ –साथ कुछ हिन्दी के व्याख्यान भी शामिल किए। संस्थान के वैज्ञानिकों द्वारा हिन्दी में वैज्ञानिक विषयों पर हिन्दी कार्यशालाओं का भी आयोजन किया गया। इसके अतिरिक्त, संस्थान में एम.एस.सी. तथा पी.एच.डी के विद्यार्थियों ने अपने शोध–प्रबन्धों के सार द्विभाषी रूप में प्रस्तुत किए। वैज्ञानिकों एवं तकनीकी कर्मियों द्वारा कुछ शोध–पत्र भी हिन्दी में प्रकाशित किए गए।

प्रतिवेदनाधीन अवधि के दौरान संस्थान में राजभाषा कार्यान्वयन समिति की 04 बैठकें क्रमशरू मार्च 26, 2024; जून 27, 2024, सितम्बर 27, 2024 एवं दिसम्बर 30, 2024 को आयोजित की गई। इन बैठकों में राजभाषा नियम एवं अधिनियम को कारगर ढंग से लागू करने तथा इसमें दिए गए प्रावधानों के अनुसार वार्षिक कार्यक्रम में निर्धारित लक्ष्यों की प्राप्ति हेतु चर्चा की गई तथा आवश्यक कदम उठाए गए।

संस्थान के समस्त कर्मियों को 02 वर्ष की अवधि में कम से कम एक बार हिन्दी कार्यशाला में सहभागिता करने का अवसर मिले, इस अनिवार्यता के संबंध में भारत सरकार, गृह मंत्रालय, राजभाषा विभाग द्वारा समय–समय पर जारी कार्यालय ज्ञापन द्वारा निर्धारित लक्ष्य की प्राप्ति के लिए, संस्थान द्वारा अक्तूबर 10, 2022 से दिसम्बर 31, 2024 के दौरान राजभाषा हिन्दी के साथ–साथ संस्थान से संबंधित विभिन्न विषयों पर हिन्दी कार्यशाला का आयोजन कर संस्थान के समस्त कर्मियों को कम से कम एक बार हिन्दी कार्यशाला में प्रशिक्षित किया गया। इस प्रकार संस्थान ने राजभाषा विभाग द्वारा निर्धारित लक्ष्य को उक्त अवधि में पूरा किया।

प्रतिवेदनाधीन अवधि के दौरान संस्थान में विभिन्न वर्गों के कर्मियों एवं राष्ट्रीय कृषि अनुसंधान प्रणाली के अन्य संस्थानों के वैज्ञानिकों के लिए पाँच हिन्दी कार्यशालाएं आयोजित की गई। पहली कार्यशाला संस्थान में वैज्ञानिक एवं तकनीकी वर्ग के कर्मियों के लिए संगणक अनुप्रयोग प्रभाग के वैज्ञानिकों, डॉ. मधु दहिया, डॉ. संचिता नाहा एवं डॉ. सपना निगम द्व ारा मार्च 06–08, 2024 (03 दिवसीय) के दौरान "कृषि शिक्षा में डिजिटल पहल" विषय पर ऑफ–लाइन आयोजित की गई, जिसमें 07 वक्ताओं द्वारा विषय से संबन्धित 13 उप–विषयों पर व्याख्यान दिए गए। इस कार्यशाला में कुल 14 प्रतिभागियों ने सहभागिता की, जिसमें संस्थान के 09 वैज्ञानिक, 04 तकनीकी अधिकारी तथा 01 तकनीकी सहायक ने सहभागिता की।

दूसरी कार्यशाला संस्थान में वैज्ञानिक एवं तकनीकी वर्ग के कर्मियों के लिए कृषि जैव सूचना विज्ञान प्रभाग के वैज्ञानिकों, डॉ. सुधीर श्रीवास्तव, डॉ. मोहम्मद समीर फारुकी एवं डॉ. स्नेहा मुर्मु द्वारा 27 जून 2024 को (एक पूर्ण दिवसीय) के दौरान "कृषि शिक्षा में ओमिक्स डेटा विश्लेषण का परिचय'' विषय पर ऑन–लाइन आयोजित की गई, जिसमें 05 वक्ताओं

द्वारा विषय से संबंधित 05 उप–विषयों पर व्याख्यान दिए गए। इस कार्यशाला में कुल 17 प्रतिभागियों ने सहभागिता की, जिसमें संस्थान के 11 वैज्ञानिक तथा 03 तकनीकी सहायक तथा भा.कृ.अनु.प. के बाह्य संस्थानों से 01 वैज्ञानिक और 01 सहायक प्रोफेसर के अलावा 01 तकनीकी अधिकारी ने सहभागिता की।

तीसरी कार्यशाला संस्थान में वैज्ञानिक, तकनीकी एवं प्रशासनिक वर्ग के कर्मियों के लिए सूचना प्रौद्योगिकी प्रकोष्ठ के वैज्ञानिकों डॉ. एस. बी. लाल, डॉ. मुकेश कुमार एवं श्री संजीव कुमार द्वारा सितम्बर 11, 2024 (01 पूर्ण दिवसीय) के दौरान परिषद में ई–गवर्नेस का अनुप्रयोग" विषय पर ऑफ–लाइन आयोजित की गयी जिसमें 06 वक्ताओं द्वारा विषय से संबंधित 06 उप–विषयों पर व्याख्यान दिए गए। इस कार्यशाला में कुल 26 कर्मियों ने सहभागिता की, जिसमें संस्थान के 12 वैज्ञानिक, 01 वरिष्ठ तकनीकी अधिकारी, 01 सहायक मुख्य तकनीकी अधिकारी, 03 सहायक प्रशासनिक अधिकारी, 01 तकनीकी सहायक, 04 सहायक, 02 प्रवर लिपिक तथा 02 अवर लिपिक ने सहभागिता की।

चौथी कार्यशाला संस्थान में वैज्ञानिक एवं तकनीकी वर्ग के कर्मियों के लिए परीक्षण अभिकल्पना प्रभाग के वैज्ञानिकों, डॉ. मोहम्मद हारून एवं डॉ. अनिंदिता दत्ता द्वारा दिसम्बर 19, 2024 (01 पूर्ण दिवसीय) के दौरान "परीक्षण अभिकल्पनाएं एवं विश्लेषण" विषय पर ऑन–लाइन आयोजित की गई। जिसमें 03 वक्ताओं द्वारा विषय से संबंधित 06 उप–विषयों पर व्याख्यान दिए गए। इस कार्यशाला में कुल 23 कर्मियों ने सहभागिता की, जिसमें संस्थान के 16 वैज्ञानिक, 02 मुख्य तकनीकी अधिकारी, 01 वरिष्ठ तकनीकी अधिकारी, 01 तकनीकी अधिकारी, 01 सहायक मुख्य तकनीकी अधिकारी, तथा 02 तकनीकी सहायक ने सहभागिता की।

पाँचवी कार्यशाला संस्थान में वैज्ञानिक, तकनीकी एवं प्रशासनिक वर्ग कर्मियों के लिए हिन्दी एकक द्वारा दिसम्बर 24, 2024 को "भारतीय सविधान" विषय पर ऑफ–लाइन आयोजित की गई। जिसमें 01 वक्ता द्वारा विषय से संबंधित 01 उप–विषय पर व्याख्यान दिया गया। इस कार्यशाला में कुल 34 कर्मियों ने सहभागिता की, जिसमें संस्थान के 13 वैज्ञानिक, 01 मुख्य प्रशासनिक अधिकारी, 01 मुख्य तकनीकी अधिकारी, 02 सहायक मुख्य तकनीकी अधिकारी, 04 सहायक प्रशासनिक अधिकारी, 01 निजी सहायक, 07 सहायक, 02 प्रवर लिपिक एवं 03 अवर लिपिक ने सहभागिता की।

राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम में निहित लक्ष्यों को पूरा करते हुए संस्थान के अधिकारियों एवं कर्मचारियों द्वारा समस्त पत्राचार हिन्दी में अथवा द्विभाषी रूप में किया गया। संस्थान के विभिन्न वैज्ञानिक प्रभागों तथा प्रशासनिक अनुभागों द्वारा आयोजित बैठकों की कार्यसूची तथा कार्यवृत्त हिन्दी अथवा द्विभाषी रूप में जारी किए गए। संस्थान में अपना कार्य शत–प्रतिशत हिन्दी में करने के लिए 11 अनुभागों को विनिर्दिष्ट किया गया है। गृह मंत्रालय, राजभाषा विभाग द्वारा जारी विभिन्न नकद पुरस्कार योजनाएँ संस्थान में लागू हैं तथा संस्थान के कर्मियों ने इन योजनाओं में बढ़–चढ़कर भाग लिया।

संस्थान में कार्यरत सभी हिन्दीतर अधिकारियों/कर्मचारियों द्वारा हिन्दी ज्ञान संबंधी प्रशिक्षण पूरा किया जा चुका है। आज तक की स्थिति के अनुसार, संस्थान में अब कोई ऐसा हिन्दीतर अधिकारी/कर्मचारी शेष नहीं रह गया है जिसे हिन्दी ज्ञान संबंधी प्रशिक्षण दिया जाना शेष हो।

संस्थान की वेबसाइट पर 'हिन्दी सेवा लिंक' उपलब्ध है। जिसमें सांख्यिकीय एवं प्रशासनिक शब्दावली के वर्ण क्रमानुसार कुछ शब्द, कुछ द्विभाषी प्रपत्र, दैनिक काम–काज के प्रयोग में आने वाली कुछ टिप्पणियाँ, द्विभाषी पदनाम, वाक्यांश इत्यादि उपलब्ध हैं। संस्थान के कर्मियों द्वारा अपना दैनिक कार्य हिन्दी में सरलता से करने के लिए इस सेवा का उपयोग किया जाता है।

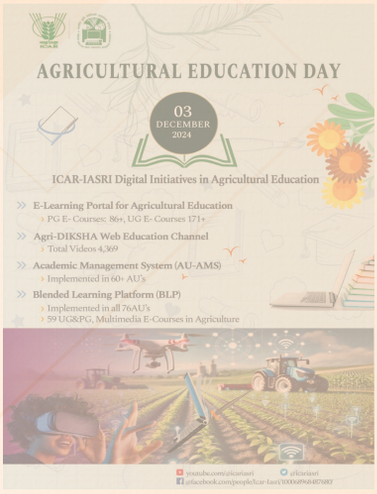
संस्थान द्वारा प्रकाशित वार्षिक हिन्दी पत्रिकाः 'सांख्यिकी–विमर्श' का नियमित प्रकाशन किया जा रहा है तथा 19वें अंक का प्रकाशन प्रतिवेदनाधीन अवधि के दौरान किया गया।

संस्थान में 14 से 30 सितम्बर, 2024 के दौरान हिन्दी पखवाड़े का आयोजन किया गया। इस वर्ष हिन्दी पखवाड़े का शुभारम्भ अर्थात उदघाटन हिन्दी दिवस एवं चतुर्थ अखिल भारतीय राजभाषा सम्मेलन के अवसर पर 14 सितम्बर, 2024 को भारत मंडपम, नई दिल्ली मैं माननीय गृह राज्य मंत्री जी द्वारा किया गया था। हिन्दी पखवाड़े का आयोजन एवं इससे संबन्धित प्रतियोगताएं संस्थान मैं दिनांक 18 से 30 सितम्बर, 2024 के दौरान आयोजित की गयी। दिनांक 18 सितम्बर, 2024 को काव्य–पाठ प्रतियोगिता का आयोजन किया गया। हिन्दी पखवाड़ा के दौरान डॉ दरोगा सिंह स्मृति व्याख्यान के साथ–साथ वैज्ञानिक प्रभागों में हिन्दी में सर्वाधिक वैज्ञानिक कार्य करने के लिए प्रभागीय चल–शील्ड, डिजिटल हिन्दी शोध–पत्र प्रस्तुतिकरण प्रतियोगिता (वैज्ञानिक वर्ग के कर्मियों के लिए), हिन्दी श्रुतलेख प्रतियोगिता, हिंदीतर कर्मियों के लिए शब्दार्थ लेखन प्रतियोगिता, अंताक्षरी प्रतियोगिता तथा प्रश्न मंच प्रतियोगिता भी आयोजित की गईं। सभी प्रतियोगिताओं में संस्थान के विभिन्न वर्ग के कर्मियों ने

बढ़–चढ़कर हिस्सा लिया। संस्थान में प्रत्येक वर्ष हिन्दी दिवस के अवसर पर डॉ दरोगा सिंह स्मृति व्याख्यान का आयोजन किया जाता है। इस वर्ष इस कड़ी का तैंतीसवां व्याख्यान राष्ट्रीय प्रतिदर्श कार्यालय (एन.एस.एस.ओ.) के पूर्व महानिदेशक श्री राकेश कुमार त्यागी द्वारा दिया गया और इस कार्यक्रम की अध्यक्षता संस्थान के निदेशक महोदय द्वारा की गई। दिनांक 30 सितम्बर, 2024 को हिन्दी पखवाड़ा के समापन समारोह के अवसर पर इस दौरान आयोजित प्रतियोगिताओं के सफल प्रतियोगियों को नकद पुरस्कारों की घोषणा की गयी। इसके अतिरिक्त इस अवसर पर अक्टूबर, 2023 से अगस्त, 2024 तक की अवधि के दौरान संस्थान में आयोजित हिन्दी कार्यशालाओं के वक्ताओं को प्रशस्ति–पत्र प्रदान किए जाने की भी घोषणा की गयी।

भा.कृ.अनु.प.-भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
लाइब्रेरी एवेन्यू, नई दिल्ली-110012
SWACHHATA HI SEVA 2024
स्वच्छता ही सेवा 2024
मन, कर्म और बचन से स्वच्छ रहे
Swabhav Swachhta - Sanskaar Swachhta
स्वभाव स्वच्छता - संस्कार स्वच्छता
15 September – 02 October 2024
15 सितंबर – 02 अक्टूबर 2024

भा.कृ.अनु.प.- भारतीय कृषि सांख्यिकी अनुसंधान संस्थान,
लाइब्रेरी एवेन्यू, पूसा, नई दिल्ली-110012
ICAR-Indian Agricultural Statistics Research Institute,
Library Avenue, Pusa, New Delhi -110012
एक पेड़ माँ के नाम अभियान
29 अगस्त, 2024
29 August, 2024
प्रकृति
को हरा-भरा बनाना है
माँ के नाम एक पेड़
लगाना है।


AGRICULTURAL EDUCATION DAY
03 DECEMBER 2024
ICAR-IASRI Digital Initiatives in Agricultural Education
E-Learning Portal for Agricultural Education
PG E- Courses: 86+, UG E- Courses 171+
Agri-DIKSHA Web Education Channel
Total Videos 4,369
Academic Management System (AU-AMS)
Implemented in 60+ AU's
Blended Learning Platform (BLP)
Implemented in all 76AU's
59 UG&PG, Multimedia E-Courses in Agriculture

ICAR-IASRI

भा.कृ.अनु.प.-भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
लाइब्रेरी एवेन्यू, पूसा, नई दिल्ली-110 012
सतर्कता जागरूकता सप्ताह 2024
28 अक्टूबर से 3 नवंबर 2024
VIGILANCE AWARENESS WEEK 2024
28 October to 3 November 2024
सत्यनिष्ठा की संस्कृति से राष्ट्र की समृद्धि
Culture of Intergrity for Nation's Prosperity

Annexure-I

LIST OF RESEARCH PROJECTS

01 January to 31 December, 2024

DEVELOPMENT AND ANALYSIS OF EXPERIMENTAL DESIGNS FOR AGRICULTURAL SYSTEMS RESEARCH

On-going

Institute funded

1. Statistical analysis and online solution of neutrosophic data derived from designed experiments. (AGEDIASRISIL202300600220)
   Cini Varghese, Sukanta Dash, Susheel Kumar Sarkar, Anindita Datta, Mohd Harun: 07.08.2023-06.08.2026

Outside funded

2. Designing and analysis of On-farm and On-station research experiments planned under AICRP on IFS. Funded by AICRP on IFS as Voluntary Centre, ICAR-IIFSR, Modipuram. (AGEDIASRISOL202300900223)
   Cini Varghese, Sukanta Dash, Susheel Kumar Sarkar, Mohd Harun: 15.03.2023-31.03.2026
3. Planning, designing and analysis of data relating to experiments for AICRP on Long Term Fertilizer Experiments. Funded by AICRP on Long Term Fertilizer Experiments as Voluntary Centre, ICAR-IISS, Bhopal (AGEDIASRISOL 201702100107)
   B.N. Mandal (till 22.08.2022), Aninditta Datta, Sunil Kumar Yadav (till 10.04.2023): 01.04.2017-31.03.2026
4. ICAR research data repository for knowledge management as KRISHI: Agricultural Knowledge Resources and Information System Hub for Innovations. Funded by ICAR Headquarter Non-Scheme. (AGENIASRICOL201503100068)
   ICAR-IASRI: Rajender Parsad, A.K. Choubey (till 20.01.2018), Anil Kumar, Mukesh Kumar, Anshu Bharadwaj, Susheel Sarkar and Sukanta Dash (since 03.04.2017); ICAR- NAARM: A. Dhandapani; ICAR-NBSS&LUP: G.P. Obi Reddy, Nirmal Kumar, Sudipto Chattaraj; ICAR-IARI: Vinay Kumar Sehgal, Joydeep Mukerjee, Rajkumar Dhakar (since 18.01.2019); ICAR-DKMA: S.K. Singh (07.08.2019-28.02.0222), H.K.Tripathi (since 07.08.2019), Mitali Ghosh Roy; ICAR-CMFRI: J. Jayasankar; ICAR-CRIDA: N.S. Raju, P.Vijaya Kumar (Since 17.12.2017-31.03.2020), A.V.M. Subba Rao (Since 17.12.2017), Shantanu Kumar Bal (since 21.12.2018): 24.07.2015- 31.03.2026

Completed

Institute funded

5. Efficient designs for order-of-addition experiments. (AGEDIASRISIL202100800179)
   B.N. Mandal (till 22.08.2022), Sukanta Dash (PI since 23.08.2022 & Co-PI till 22.08.2022), Rajender Parsad: 09.09.2021-30.09.2024
6. Efficient designs for double cross experiments under fixed/mixed effects model. (AGEDIASRICIL202101300184)
   ICAR-IASRI: Mohd Harun, Cini Varghese; ICAR-DPR: L.Leslie Leo; ICAR-IARI: Mallikarjuna M.G: 11.11.2021-10.11.2024

Outside funded

7. Diversified farming through livestock and Agriculture under farmer farm, innovations, resources, Science and Technology programme. Funded by Farmer First programme, ICAR. (AGEDIASRICOP202101500186)
   ICAR-CIRB: Sarita Yadav, Ashok K. Boora, PC Lailer, Sajjan Singh, Bharat Singh; ICAR-IARI: Manjeet Singh; ICAR-IASRI: Anil Kumar, Sukanta Dash: 25.11.2021- 31.03.2024
8. Application of next-generation breeding, genotyping, and digitalization approaches for improving the genetic gain in Indian staple crops. Funded by BMGF and ICAR. (AGEDIASRICOP201900200148)
   ICAR-IARI: A.K. Singh, Ranjith Kumar Ellur, S. Gopala Krishnan, C. Bharadwaj, Shailesh Tripathi, Rajbir

Yadav, Harikrishna, Neelu Jain, M. Ganapathi, Jyoti Kaul, R.S. Raje, G. Rama Prashat, Durgesh Kumar; ICAR-IIMR: T. Nepolean, Madusudhana, B. Aruna, Sanjana Reddy; ICAR-IIPR: Abhishek Bohra, B. Mondal; ICAR-CPRI: Vinay Bhardwaj, Vinod; ICAR-NRRI: J.N. Reddy, Anandan; ICAR-IIRR: L.V. Subbarao, Abdul Fiaz; ICAR-IIWBR: Satish Kumar, Ravish Chatrath; ICAR- Project Coordinating Unit (Pearl millet): Vikas Khandelwal; ICAR-Project Coordinating Unit (Chickpea): A.K. Srivastava; ICAR-IASRI: Susheel Kumar Sarkar; ICRISAT/Excellence in Breeding Platform, CIMMYT: Abhishek Rathore: 22.01.2019- 31.12.2024

9. Biomass and carbon mapping across altitudinal gradient of major Darjeeling and Sikkim Himalayan land uses: implications for carbon sink management and mitigation. Funded by DST (AGEDIASRICOP202100400175)
   UBKV: Sumit Chakravarty, Gopal Shukla and Ganesh Banik; ICAR-IASRI: Arpan Bhowmik (till 08.04.2022), Ankur Biswas (since 09.04.2022): 10.02.2021-09.02.2024

FORECASTING, MODELLING AND SIMULATION TECHNIQUES IN BIOLOGICAL AND ECONOMIC PHENOMENA

On-going

Institute funded

10. An AI-based approach for modelling evapotranspiration using remote sensing observations. (AGEDIASRISIL202301300227)
    Himadri Shekhar Roy, Md Yeasin, Ranjit Kumar Paul, Prakash Kumar: 14.11.2023- 13.05.2026
11. Modelling of proportional data for forewarning pest attacks in crops (AGEDIASRISIL202200700200)
    Bishal Gurung (till 18.08.2023), Achal Lama (since 19.08.2023), K.N. Singh: 21.05.2022-20.02.2025
12. Forest cover trend and above ground biomass estimation using advanced statistical technique based on remote sensing data. (AGEDIASRISIL202201700210)
    ICAR-IASRI: Md Yeasin, Ranjit Kumar Paul, Ajit; IIRS, ISRO: Dipanwita Haldar: 22.10.2022-21.10.2025

Outside Funded

13. Market information system. Funded by ICAR-NIAP. (AGEDIASRICOP202200100194)
    ICAR-NIAP: Purushottam Sharma; ICAR-IASRI: Ranjit Kumar Paul, Md Yeasin, A.K. Paul, Ajit: 22.01.2022-31.03.2026

Completed

Institute funded

14. Development of spatio-temporal neural network models for forecasting space-time data. (AGEDIASRISIL202101900191)
    Mrinmoy Ray, K.N. Singh, Kanchan Sinha, Rajeev Ranjan Kumar: 21.12.2021- 20.09.2024
15. A novel approach for time series forecasting of demand and supply of food grains in India (AGEDIASRISIL202201900212)
    Wasi Alam, Kanchan Sinha, Prawin Arya: 28.11.2022-27.09.2024
16. An effective approach for combining time series and deep learning models. (AGEDIASRISIL202101600187)
    Md Yeasin, Ranjit Kumar Paul: 25.11.2021-20.10.2024
17. Potential irrigated area mapping through remotely sensed high-resolution data. (AGEDIASRICIP202102100192)
    ICAR-IIWM: R.K. Jena, R.R. Sethi; ICAR-NBSS&LUP: Nirmal Kumar; Office of Climate Research and Services, IMD, Pune: S. Khedikar; ICAR-IASRI: Upendra Kumar Pradhan: 05.09.2021-04.09.2024

New initiated

Outside funded

18. Development of AI enabled models and web solution for prediction of crop yield. Funded by DST Core Research Grant. (AGEDIASRISOL202401000238)
    Ranjit Kumar Paul, Md Yeasin, Prakash Kumar, H.S. Roy: 12.09.2024-11.09.2027
19. Development of artificial intelligence/machine learning models for generating yield estimates of crops covered under comprehensive scheme for Forecasting Agricultural output using Space, Agro-

meteorology and Land based observations (FASAL 2.0). Funded by Ministry of Agriculture and Farmers Welfare, Govt. of India. (AGEDIASRISOL202401300241)

Anshu Bharadwaj, Mrinmoy Ray, Achal Lama, Md. Ashraful Haque: 01.10.2024-31.03.2026

DEVELOPMENT OF TECHNIQUES FOR PLANNING AND EXECUTION OF SURVEYS AND STATISTICAL APPLICATIONS OF GIS AND REMOTE SENSING IN AGRICULTURAL SYSTEMS

On-going

Institute funded

20. Machine learning models in complex surveys for crop yield estimation. (AGEDIASRISIL202200900202)
    Pankaj Das, Ankur Biswas, Tauqueer Ahmad, Prachi Misra Sahoo: 01.09.2022- 31.08.2025
21. Model-assisted estimators using survey weighted artificial neural networks in complex surveys. (AGEDIASRISIL202201500208)
    Deepak Singh, Raju Kumar, Samarth Godara, Bharti: 10.10.2022- 31.03.2025

Outside funded

22. Energy audit survey of AICRP on EAAI: sampling design and analysis. Funded by AICRP on EAAI as Voluntary Centre, ICAR-CIAE, Bhopal. (AGEDIASRICOP201802000129)
    ICAR-CIAE: K.C. Pandey (till 17.02.2022), M. Din (since 18.02.2022); ICAR-IASRI: Hukum Chandra (till 26.04.2021), Kaustav Aditya (since 27.04.2021) Susheel Kumar (till 05.07.2018), Pradeep Basak (till 30.11.2020), Ajit, Bharti (since 23.11.2021): 01.06.2018-31.05.2026
23. Integrated sample survey solution for major livestock products. Funded by Animal Husbandry Statistics Division, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture and Farmers Welfare, Govt. of India. (AGEDIASRISOL201900800154)
    Prachi Misra Sahoo, Tauqueer Ahmad, Ankur Biswas, Pradip Basak (till 30.11.2020), Anil Rai (till 23.01.2023), S.B. Lal: 28.03.2019-31.01.2025
24. Planning of survey and analysis of AICRP data on Honeybees and Pollinators. (AGEDIASRICOP202100600177)
    ICAR-IARI: Balraj Singh; Project Coordinator, AICRP on Honeybees & Pollinators: Kumaranag, K.M; ICAR-IASRI: Deepak Singh: 30.03.2021- 31.03.2026
25. Development of methodology for CCE on squash and methodological improvement for CCE on cashewnut, pineapple and arecanut in Meghalaya. Funded by DES, Govt. of Meghalaya. (AGEDIASRISOL202301000224)
    Tauqueer Ahmad, Prachi Misra Sahoo, Ankur Biswas, Bharti, Rahul Banerjee: 26.07.2023-31.03.2026

Completed

Institute funded

26. A regression type estimator in dual frame surveys under two-stage sampling. (AGEDIASRISIL202200800201)
    Bharti, Kaustav Aditya, Deepak Singh, Rahul Banerjee: 01.08.2022-31.10.2024
27. Development of robust estimator by integrating data from different surveys. (AGEDIASRISIL202202000213)
    Rahul Banerjee, Pankaj Das, Raju Kumar, Ankur Biswas: 28.11.2022-27.11.2024

Outside funded

28. Planning and data analysis of FSSAI and NeTSCoFAN surveys. Funded by FSSAI. (AGEDIASRICOL202201300206)
    ICAR-IASRI: Deepak Singh, Raju Kumar, Ankur Biswas, Tauqueer Ahmad, Prachi Mishra Sahoo, Kaustava Aditya, Bharti, Pankaj Das, Rahul Banerjee; ICAR- IIHR: R. Venugopalan; ICAR- CARI: Sandeep Saran; ICAR- CIFT: Satyen Kumar Panda, Girish Patil, S.; ICAR-NRCM: Yogesh Gadekar; ICAR-NRCG: Ahammed Shabeer T.P.: 22.07.2022-31.03.2024
29. Agri-drone in ICAR: ICAR-IASRI component. Funded by ICAR HQ through ATARI, Jodhpur. (AGEDIASRICOL202201200205)
    Tauqueer Ahmad, Prachi Mishra Sahoo, K.K. Chaturvedi, Ankur Biswas, Pankaj Das: 21.07.2022-31.03.2024

New initiated

Institute funded

30. Development of survey-weighted and AI-based survey-weighted impact assessment techniques. (AGEDIASRISIL202400100229)
    Raju Kumar, Deepak Singh, Ankur Biswas, Tauqueer Ahmad: 03.01.2024-02.07.2026

Outside funded

31. Pilot study to develop improved methodology for cost of cultivation of principal crops in India. Funded by Ministry of Agriculture and Farmers Welfare, Govt. of India. (AGEDIASRISOL202400600234)
    Ankur Biswas, Tauqueer Ahmad, Prachi Misra Sahoo, Kaustav Aditya, Raju Kumar, Rahul Banerjee: 02.09.2024-01.09.2026
32. Pilot study for development of sampling methodology for cost of cultivation of minor crops in India. Funded by Ministry of Agriculture and Farmers Welfare, Govt. of India. (AGEDIASRISOL202400700235)
    Tauqueer Ahmad, Prachi Misra Sahoo, Rajender Parsad, Ankur Biswas, Raju Kumar: 02.09.2024-01.09.2026
33. Pilot study to investigate the causes of high cost of cultivation of mandated principal crops in Maharashtra. Funded by Ministry of Agriculture and Farmers Welfare, Govt. of India. (AGEDIASRISOL202400800236)
    Raju Kumar, Tauqueer Ahmad, Prachi Misra Sahoo, Ankur Biswas, Deepak Singh, Bharti: 02.09.2024-01.03.2026

DEVELOPMENT OF STATISTICAL TECHNIQUES FOR GENETICS/ COMPUTATIONAL BIOLOGY ANDAPPLICATIONS OF BIOINFORMATICS IN AGRICULTURAL RESEARCH

On-going

Institute funded

34. Network project on agricultural bioinformatics and computational biology. (AGEDIASRISOL202000900168)
    Anil Rai (till 23.01.2023), Rajender Parsad (from 24.01.2023 to 12.07.2023), G.K. Jha (since 13.07.2023), Dinesh Kumar (up to 02.12.2021 and again from 01.03.2023 onwards), Monendra Grover, U.B. Angadi, Sunil Kumar, K.K. Chaturvedi, S.B. Lal, Anu Sharma, Sarika, M.A. Iquebal, Samir Farooqui, Sanjeev Kumar, Dwijesh Chandra Mishra (till 04.09.2023), Sudhir Srivastava, Neeraj Budhlakoti, Ratna Prabha (till 09.03.2023), Sarika Sahu: 12.07.2020-31.03.2026
35. Development of artificial intelligence and big data analytics-based framework for predicting protein- ligand interaction. (AGEDIASRISIL202200600199)
    Sneha Murmu, Soumya Sharma, Bharati Pandey (till 29.12.2022), Samir Farooqi, Ritwika Das (since 06.02.2023): 11.05.2022-10.02.2025
36. Meta-analysis of crop rhizosphere microbiome for identification of abiotic stress responsive microbial signatures and development of integrated information system. (AGEDIASRISIL202201000203)
    Ratna Prabha (till 09.03.2023), Sudhir Srivastava (since 10.03.2023), Sarika Sahu: 02.09.2022-01.03.2025
37. Mining agricultural microbiome datasets for antibiotic resistance genes (ARG) diversity and prediction of microbial resistome. (AGEDIASRICIP202201400207)
    ICAR-NBAIM: Kumar M., Harsh Vardhan Singh, Abhijeet Shankar Kashyap, Jyoti Prakash Singh; ICAR-IASRI: Ratna Prabha (till 09.03.2023), Sunil Kumar (since 10.03.2023), Sneha Murmu (since 27.11.2023), Ritwika (since 27.11.2023): 03.10.2022-02.04.2025
38. Development of an integrated framework for the analysis of biogeochemical cycles from metagenomics data. (AGEDIASRISIL202201800211)
    Ritwika Das, Sneha Murmu, Anu Sharma: 28.11.2022- 28.05.2025
39. Improving seed health and storage system. (AGEDIASRICIP202200200195)
    ICAR-IISS: Arvind Nath Singh; ICAR-IASRI: Sunil Kumar: 25.01.2022-31.03.2026
40. CRP Biofortification in black rice. Funded by CRP(AGEDIASRICIP202300200216)
    ICAR-IARI: Haritha Bollinedi; ICAR-IASRI: Sarika Sahu: 15.03.2023-14.03.2026
41. Statistical approach to study the ecological effects on an integrated framework for GWAS and genomic selection. (AGEDIASRISIL202300300217)

Prakash Kumar, Himadri Shekhar Roy, Neeraj Budhlakoti, Amrit Kumar Paul: 17.03.2023-16.09.2025

42. Development of prediction server for internal ribosomes entry sites in agricultural important species. (AGEDIASRISIL202300400218)
    Sarika Sahu, Soumya Sharma, Dwijesh Chandra Mishra (till 04.09.2023): 14.06.2023- 13.06.2025

Outside Funded

43. Computational and analytical solutions for high-throughput biological data. Funded by ICAR platform on CRP Genomics. (AGENIASRISOL201502400061)
    ICAR-NBFGR: Vindhya Mohindra; ICAR-IASRI: Anil Rai (till 23.01.2023), Anu Sharma, Dwijesh Chandra Mishra (till 04.09.2023), Sudhir Srivastava, Neeraj Budhlakoti, Sarika Sahu: 04.09.2015-31.03.2026
44. Genomic prediction for micro-nutritional traits in bread wheat: a study on machine learning algorithm. ICAR-LBS Young Scientist Award Scheme. (AGEDIASRISOL202200500198)
    P.K Meher: 01.04.2022-31.03.2025
45. Genome wide association studies in giant freshwater prawn, M rosenbergii: Linkage mapping and QTL identification. NASF Funded. (AGEDIASRICOP202201100204)
    ICAR- CIFA: P. Das, B.R. Pillai, Lakshman Sahoo, Debabrata Panda; ICAR-IASRI: P.K. Meher: 01.09.2022-31.08.2025
46. Mainstreaming rice landraces diversity in varietal development through genome wide association studies: A model for large-scale utilization of gene bank collections of rice. Funded by DBT. (AGEDIASRICOP202000300162)
    ICAR-IARI: Gopala Krishnan S; ICAR-IASRI: Sarika, Dinesh Kumar (deputation on 02.12.2021 and again from 01.03.2023 onwards), M.A. Iquebal: 01.05.2020- 30.04.2025
47. Characterization of genetic resources: germplasm characterization and trait discovery in Wheat using genomics approaches and its integration for improving climate resilience, productivity and nutritional quality. Funded by DBT. (AGEDIASRICOP202000400163)
    ICAR-NBPGR: G.P. Singh; ICAR-IASRI: Dinesh Kumar (up to 02.12.2021 and again from 01.03.2023 onwards), M.A. Iquebal (since 03.12.2021- 28.02.2023 as a PI and again 01.03.2023 onwards as a Co-PI), U.B. Angadi, Dwijesh Chandra Mishra (up to 04.09.2023 and again from 04.09.2024 onwards), Neeraj Budhlakoti, Sarika: 01.03.2020-28.02.2025
48. Minor oilseeds of Indian origin: Mainstreaming sesame germplasm for productivity enhancement and sustainability through genomics assisted core development and trait discovery. Funded by DBT. (AGEDIASRICOP202100200171)
    ICAR-NBPGR: G.P. Singh, Rashmi Yadav, Ashok Kumar; ICAR-IASRI: U.B. Angadi, Dinesh Kumar (up to 02.12.2021 and again from 01.03.2023 onwards), Dwijesh Chandra Mishra (up to 04.09.2023 and again from 04.09.2024 onwards): 01.03.2020- 28.02.2025
49. Establishment of Centre for bioinformatics and computational biology in agriculture- BIC at ICAR-IASRI. Funded by DBT. (AGEDIASRISOL202102200193)
    Anil Rai (till 23.01.2023), Sunil Kumar (since 24.01.2023-27.07.2023), G.K. Jha (since 28.07.2023), K.K. Chaturvedi, Sanjeev Kumar, MA Iquebal, Sarika, Anu Sharma, Dinesh Kumar (till 02.12.2021 and again from 01.03.2023 onwards), Monendra Grover, Dwijesh Chandra Mishra (till 04.09.2023), Samir Farooqi. U.B. Angadi, Sudhir Srivastava, Neeraj Budhlakoti: 16.12.2021-15.12.2026
50. Genomic selection accuracy for key quality traits in potato (*Solanum Tuberosum L.*). Funded by DST. (AGEDIASRICOP202300800222)
    ICAR-CPRI: Salej Sood, Vijai Kishor Gupta, Bandana Kaundal; ICAR-IASRI: P.K. Meher: 17.07.2023-16.07.2026
51. NNP Project: Sequence to Systems (S2S): Development of a genome to systems discovery software and server platform using high throughput data and machine learning. Funded by DBT. (AGEDIASRICOP202301100225)
    CSIR-IHBT, Palampur: Ravi Shankar, Vishal Acharya, Rituraj Purohit; IISER, Mohali: K.S Sandhu; ICAR-IASRI: U.K. Pradhan, Prakash Kumar; IIT, Mandi: Samar Agnihotri, Manoj Thakur: 05.10.2023- 04.10.2028

Completed

Institute funded

52. Development of artificial intelligence framework for prediction of protein 3Dstructure. (AGEDIASRISIL202100500176)

U.B. Angadi, K.K. Chaturvedi, Sudhir Srivastava: 16.03.2021-15.03.2024

53. Development of computational pipeline(s) for identification, characterization and functional analysis of ncRNAs in agriculturally important species. (AGEDIASRISIL202201600209)
    Sarika Sahu, Ratna Prabha (till 09.03.2023), Soumya Sharma, (since 20.10.2023): 18.10.2022-17.10.2024
54. Development of machine learning models and Bayesian network for discovery of nucleic acid-binding protein and their application in disease/pest surveillance. (AGEDIASRISIL202101700188)
    Upendra Kumar Pradhan, Samarendra Das (till 02.04.2022), Prabina Kumar Meher, Sanchita Naha (since 06.12.2022): 25.11.2021-24.05.2024, Ext.- 24.11.2024
55. Statistical approaches for analysis of zero-inflated and over-dispersed counts data and their application in single cell studies. (AGEDIASRISIL202101800189)
    Samarendra Das (till 02.04.2022 as PI), Upendra Kumar Pradhan (since 03.04.2022 as PI), Upendra Kumar Pradhan (till 02.04.2022 as Co-PI), Sudhir Srivastava, Prakash Kumar, ICAR/DFMD: Samarendra Das (since 13.09.2022 as Co-PI): 25.11.2021- 24.05.2024, Ext.- 24.11.2024

Outside funded

56. Global Challenges Research Fund (GCRF) South Asian Nitrogen Hub. (Collaborative Projects-International). (AGEDIASRICOP202300500219)
    ICAR-IARI: Arti Bhatia; ICAR-IASRI: G.K. Jha: 03.08.2023-31.08.2024
57. Development of artificial intelligent based computational tools for genomic data analysis in domestic animal species. ICAR-LBS Young Scientist Award Scheme. (AGEDIASRISOL202101400185)
    M.A. Iquebal: 12.11.2021-30.11.2024

New initiated

Institute funded

58. Machine learning based prediction of mineral nutrition related genes in higher plants. (AGEDIASRISIL202400400232)
    Soumya Sharma, Sneha Murmu, Ritwika Das: 23.04.2024-22.10.2026

Outside funded

59. Integrating whole genome resequencing transcriptome sequencing and genome wide association analysis for allele mining of yield and quality traits in black pepper and cardamom. Funded by NASF(AGEDIASRICOP202401100239)
    ICAR- IISpicesR: T.E. Sheeja, S Mukesh Sankar, Mhd. Azharuddin T.P., Sona Charles; KAU-Cardamom Research Station, Pampadumpara, Idukki, Kerala: Preethy T.T., Murugan M.; ICAR-IASRI: Sarika Jaiswal, Mir Asif Iquebal; ICAR-IISpicesR, Regional Station, Appangala; M S Shivakumar CCPI: Akshitha H.J., Honnappa Asangi 01.03.2024-28.02.2027
60. NNP: Agri-genomic repository and intelligent analytical system. Funded by DBT. (AGEDIASRICIL202401200240)
    ICAR-IASRI: G.K. Jha, U.B. Angadi, Dinesh Kumar, K.K. Chaturvedi, Sudhir Srivastava, Neeraj Budhlakoti, Sunil Kumar, Monendra Grover, Sanjeev Kumar, Shashi Bhushan Lal, Mohammad Samir Farooqi, Sarika Jaiswal, M.A. Iquebal, Dwijesh Chandra Mishra, Anu Sharma; ICAR-NIPB: Amolkumar U. Solanke, SV Amitha Charu R Mithra; ICAR- NBPGR: Rakesh Singh, Sundeep Kumar, Amit Kumar Singh[ICAR-NBFGR: Murali S., Basedeo Kushwaha; ICAR-NBAIR: Gandhi Gracy, Prathepa M., Mohan M., Venkatesan T.: 13.05.2024-12.05.2029

DEVELOPMENT OF INFORMATICS IN AGRICULTURAL RESEARCH

On-going

Institute funded

61. Development of advanced information and communication technologies (IcTs)-based communication and education tools for millets promotion. (AGEDIASRICIP202301400228)
    ICAR-IIMilletsR: Rajendra R. Chapke, I.K. Das, J. Stanley; ICAR-IASRI: Sudeep Marwaha, Shashi Dahiya, Chandan Kumar Deb, Asharaful Haque, Akshay Dheeraj: 30.11.2023-30.09.2026

62. AI and machine learning for supply forecasts. (AGEDIASRICIP202200300196)
    ICAR-NIAP: Rajni Jain, Dilip Kumar, Abimanyu Jhajhria; ICAR-IASRI: Anshu Bharadwaj, Sapna Nigam:03.03.2022-31.10.2024
63. Development and assessment of conversational virtual agents 'Chatbots' for improving livestock, pet and poultry health and production. (AGEDIASRICIP202202100214)
    ICAR-IVRI: Rupasi Tiwari; ICAR-IASRI: Sanchita Naha, Chandan Kumar Deb: 10.10.2022-31.08.2025
64. Development of precision engineering technologies for agricultural input production management and value addition to ensure profitability, sustainability and environmental safety. (AGEDIASRICIP202300100215)
    ICAR-IARI; P.K. Sharma; ICAR-IASRI: Samarth Godara, Himadri Shekhar Roy: 20.01.2023-31.03.2026
65. Development of artificial intelligence-based model and tools for genomic studies. (AGEDIASRICIP202101200183)
    ICAR-NIPB: Shbana Begam; ICAR-IASRI: Samarth Godara: 11.09.2023- 10.09.2026
66. Development of improved attention based deep learning network for analysis of agricultural image dataset. (AGEDIASRISIL202300700221)
    Ashraful Haque, Chandan Kumar Deb, Akshay Dheeraj: 10.08.2023- 09.02.2026

Outside funded

67. Management and impact assessment of farmer FIRST project. Funded by ICAR farmer FIRST programme, ICAR- ATARI-I. (AGENIASRICOP201700200088)
    ICAR-NIAP: Shiv Kumar, Rajni Jain, Vinayak R. Nikam, Kinsly IT, Abhimanyu Jhajhria; ICAR-NAARM: P. Venkatesan, Bharat S. Sontakki, N. Sivaramane; ICAR-IASRI: Mukesh Kumar, Anshu Bharadwaj, Soumen Pal; ICAR-DKMA: Aruna T. Kumar, Mitali Ghosh Roy: 14.02.2017- 31.03.2026
68. Knowledge management system for agriculture extension services in Indian NARES. Funded by ICAR Extramural Research Projects-Agricultural Extension Division. (AGENIASRICOL201600500074)
    ICAR-IASRI: Alka Arora, A.K. Choubey (till 20.01.2018), N.S. Rao (till 24.09.2016), S.N. Islam, Soumen Pal, Sudeep Marwaha, Ajit (since 29.08.2018), R.K. Paul (since 29.08.2018); ICAR Hq: P. Adiguru: 04.03.2016-31.03.2026
69. Cereal systems initiative for south asia (CSISA) integration with KVK portal. Funded by International Maize and Wheat Improvement Center (CIMMYT) through Extension Division, ICAR. (AGEDIASRICOP202000700166)
    Soumen Pal, Alka Arora, Sudeep, S.N. Islam, Ajit, R.K. Paul: 01.04.2020-31.03.2025
70. KISAN SARATHI (Powered by IIDS): System of agri-information resources auto- transmission and technology hub interface: ICT and ICAR Data Repository. (AGEDIASRICOL202100900180)
    Sanjeev Kumar, K.K. Chaturvedi, S.B. Lal, Mukesh Kumar: 09.08.2021-31.03.2026
71. Network program on precision agriculture (NePPA). (AGEDIASRICOP202101100182)
    ICAR- IARI: Rabi N. Sahoo; ICAR-IASRI: K.K. Chaturvedi, Sanjeev Kumar, S.B. Lal, Mukesh Kumar, Ankur Biswas, Rajeev Ranjan Kumar, Samarth Godara: 04.09.2021- 31.03.2026

Completed

Institute funded

72. Landscape diagnostic survey of cotton production practices and crop performance in Maharashtra. Funded by Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra. (AGEDIASRICIP202301200226)
    ICAR-CICR: Ramkrushna G.I., Y.G. Prasad, A.R. Reddy (ATARI-Hyderabad), M.V. Venugopalan, Shailesh Gawande, Rahul M. Phuke, M. Sabesh, R. Jaya Kumarvaradan; ICAR-IASRI: Soumen Pal, Ranjit Kumar Paul: 10.10.2023-31.05.2024

Outside funded

73. Investments in Indian Council of Agricultural Research Leadership on Agricultural Higher Education. (NAHEP Component-2 Funded). (AGEDIASRISOL201900500151)
    ICAR-IASRI: Sudeep Marwaha, Alka Arora, Anshu Bharadwaj, Mukesh Kumar, Shashi Dahiya, Pal Singh (till 30.06.2021), S.N. Islam, Soumen Pal, Ajit, V. Ramasubramanian (till 12.07.2023), Mrinmoy Ray, Achal Lama, Arpan Bhowmik (since 13.12.2019 to 08.04.2022), Sapna Nigam(02.03.20222-31.08.2022,

0104.2023-31.08.2024), Md Ashraful Haque(since 02.03.2022), Chandan Kumar Deb (since 02.03.2022); ICAR-NAARM: S.K. Soam, D. Thammi Raju, N. Srinivasa Rao, Alok Kumar, V.V. Sumanthkumar, Sanjiv Kumar, Surya Rathore; ICAR-NIAP: Rajni Jain: 28.02.2019- 31.03.2024

74. Resilient Agricultural Education System (RAES). (AGEDIASRISOL202101000181)
    Sudeep Marwaha, Alka Arora, Anshu Bharadwaj, Ajit, V. Ramasubramanian (till 12.07.2023), Shashi Dahiya, S.N. Islam, Soumen Pal, Sanchita Naha, Madhu, Samarth Godra: 29.07.2021-31.03.2024
75. Development of artificial intelligence integrated big-data based system for automatic query-response generation and analysis of Indian farmers' queries. (AGEDIASRICIL202101900190)
    ICAR-IASRI: Samarth Godara, Madhu, Sanchita Naha; ICAR-IARI: J.P.S. Dabas: 09.12.2021-08.12.2024

New initiated

Institute funded

76. Deep learning-based identification of nutrient deficiencies and weeds in crops. (AGEDIASRICIL202400200230)
    ICAR-IASRI: Sapna Nigam, Madhu, Akshay Dheeraj; ICAR-IARI: Vaibhav Kumar Singh, Bipin Kumar: 03.01.2024-31.07.2026
77. Mapping QTLs for drought tolerance in cotton. (AGEDIASRICIP202400900237)
    ICAR-CICR: Nagpur J. Amudha, M. Saravanan, A.H. Prakash, J.H. Meshram; ICAR-IASRI: Sudhir Srivastava, Neeraj Budhlakoti: 09.09.2024- 31.03.2027

Outside funded

78. Natural grassland ecosystem monitoring system for Peninsular and Trans Himalayan India to sustain pastoral communities. Funded by NASF. (AGEDIASRICOP202400300231)
    ICAR-IGFRI: Avijit Ghosh; GBPNHE: A.K. Gupta; ICAR-CCARI: Bappa Das; ICAR-IASRI: Ashraful Haque: 01.03.2024-28.02.2027
79. Artificial intelligence enabled biotic & abiotic stress detection and advisory mobile application for crops. Funded by NASF. (AGEDIASRICOL202400500233)
    ICAR-IASRI: Sudeep Marwaha, Alka Arora, Chandan Kumar Deb, Ashraful Haque, Sapna Nigam; ICAR-CITH: Sajad Un Nabi, Om C Sharma, Abas Shah; ICAR- IIWBR: Poonam Jasrotia, Prem Lal Kashyap, Anuj Kumar; ICAR- IIPR: Devraj, Bandi Sanjay Maruti, Rishikesh Kumar; ICAR-NRRI: S. Raghu, Basana Gowda, Asit Kumar Pradhan; University of Agricultural Sciences, Bengaluru: Prasanna Kumar M K, Shivanna B, Shivlingaiah; ICAR - CAZRI: Ritu Mawar, Saranya R, Sugan Chand Meena, N.S. Nathawat: 01.04.2024-31.03.2027

Consultancy Projects

80. Sampling procedure for selection of representative sample for food grain quality check for DCP and Non-DCP System. Funded by Ministry of Consumer Affairs, Food & Public Distribution (MCAFPD), Govt of India.
    Tauqueer Ahmad, Prachi Misra Sahoo, Rajender Parsad, Ankur Biswas, Raju Kumar and Manish Kumar: 31.10.2023- 30.10.2025
81. Consultation mission to support the yemen agricultural survey. Funded by FAO of the United Nations, Yemen (FAO-Yemen).
    Tauqueer Ahmad: 20.05.2024- 12.06.2024
82. Recruitment management system for Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RMS-RVSKVV). Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), Gwalior.
    Sudeep Marwaha; Chandan Kumar Deb: 25.09.2023- 24.08.2024
83. To enhance and support the e-voting system for the Indian Dairy Association (IDA). Funded by Indian Dairy Association (IDA).
    Sudeep Marwaha: 01.03.2024-12.03.2024
84. Customization and implementation of TMIS, PMS and LRMS in UHS, Bagalkot. Funded by University of Horticultural Sciences, Bagalkot.
    Sudeep Marwaha; Alka Arora; Shashi Dahiya: 05.11.2024-05.11.2025

Annexure-II

DISTINGUISHED VISITORS

Following dignitaries visited the institute in person during 2024

Dr. Himanshu Pathak
Secretary, DARE & Director General, ICAR, New Delhi

Dr. Bimal Roy
Former Chairman, National Statistical Commission, Govt. of India and Former Director, Indian Statistical Institute, Kolkata

Dr. R.C. Agrawal
DDG (Agricultural Education) & ND (NAHEP), ICAR, New Delhi

Dr. Suresh Kumar Chaudhari
Deputy Director General (Natural Resource Management), ICAR, New Delhi

Dr T.R. Sharma
Deputy Director General (Crop Science), ICAR, New Delhi

Dr. J.K. Jena
Deputy Director General (Fisheries Sciences), ICAR, New Delhi

Dr. U.S. Gautam
Deputy Director General (Agricultural Extension), ICAR, New Delhi

Sh. Parvin Srivastava
Former Chief Statistician and Secretary, Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi

Prof. BK Sinha
Former Member, National Statistical Commission, Govt. of India & Former Professor (Statistics), Indian Statistical Institute, Kolkata

Sh. PR Meshram
Director General (C&A), Ministry of Statistics and Programme Implementation, Govt. of India

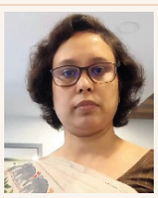
Sh. Rakesh Tyagi
Former DDG (NSSO), Ministry of Statistics and Programme Implementation, Govt. of India

Dr R. Sarada Jayalakshmi Devi
Vice Chancellor, ANGRAU, Guntur, Andhra Pradesh

Dr. Punam Bedi
Senior Professor, University of Delhi, New Delhi

Prof. K Muralidharan
Professor, Department of Statistics, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat

Dr. Dalip Singh
Additional Director General, Economic Statistics Division, MoSPI, Govt. of India, New Delhi



Dr. Subhra Sarker
Deputy Director General, National Accounts Division, Ministry of Statistics and Programme Implementation, Govt. of India

	Dr. SK Sharma ADG (HRM), ICAR, New Delhi
	Dr Rajbir Singh ADG (Agronomy), NRM Division, ICAR, New Delhi
	Dr Bimlesh Mann ADG (EPHS), ICAR, New Delhi
	Dr Ajit Yadav ADG (EQR), ICAR, New Delhi
	Dr. Seema Jaggi ADG (HRD), ICAR, New Delhi
	Dr Anil Rai ADG (ICT), ICAR, New Delhi
	Dr AR Rao ADG (PIM), ICAR, New Delhi

	Dr Anil Kumar ADG (Technical Coordination), ICAR, New Delhi
	Dr. Jitendra Kumar ADG (NASF), ICAR, New Delhi
	Dr VK Gupta Director, ICAR-National Research Centre on Pig, Guwahati, Assam
	Dr N.B. Mazumdar Honorary Chairman, International Academy of Environmental Sanitation and Public Health, New Delhi
	Dr. Charru Malhotra Professor (e-Governance and ICT), Indian Institute of Public Administration, New Delhi
	Dr. Sugeeta Mutreja Nutrition expert and founder of Aarogya Clinic: Diet and Nutrition, New Delhi
	Dr. SK Raheja Former Joint Director, ICAR-IASRI, New Delhi

ANNEXURE-III

ICAR-NATIONAL AGRICULTURAL SCIENCE MUSEUM (NASM)

ICAR-National Agricultural Science Museum (NASM) was conceived by the ICAR and executed by the National Council of Science Museum (NCSM), Ministry of Culture, Government of India during 2004. This museum is the only one of its kind in the country and is located in a sprawling two-storey building spread over 2000 sq. m. In this museum, the development of civilizations and Indian Agriculture since pre-historic age to the present time is displayed in a vibrant and vivid detail. Global issues pertaining to agriculture have also been presented. All this knowledge has been made available using computers, posters, models, audios as well as visuals. The responsibility of up-keep and maintenance of NASM rests with ICAR-IASRI. NASM is situated at NASC Complex, New Delhi. The major sections of the museum are:

1. Six Pillars of Agriculture
2. Agriculture in Pre-historic Period
3. Agriculture during Indus-valley Civilization
4. Agriculture during Vedic and Post Vedic Period
5. Agriculture during Sultanate and Mughal Period
6. Agriculture during British Period
7. Agricultural Science in Independent India
8. Global Issues Related to Agriculture
9. Golden Future of Indian Agriculture
10. Children Section

Following committee looks after Management, Strengthening and Modernization of NASM

1.	Dr. R.C. Agrawal, DDG (Agricultural Education) ICAR	:	Chairman
2.	Dr. Rajender Parsad, Director, ICAR-IASRI	:	Nodal Officer and Member
3.	Dr. Ashok Kumar, ADG (Animal Science), ICAR	:	Member
4.	Dr. S.C. Dubey, ADG (PP&B), ICAR	:	Member
5.	Joint Secretary (Finance), ICAR	:	Member
6.	Director (GAC), ICAR	:	Member
7.	Shri Kumar Rajesh, Director (Agricultural Education)	:	Member
8.	Director (Works), ICAR	:	Member Secretary

The responsibility of upkeep and maintenance of NASM rests with the Institute. Sh. M M Maurya, A.C.T.O, ICAR-IASRI is the In-Charge, NASM. Under the guidance of the management committee of museum, the activities of the museum relating to up-keep and maintenance are looked after. The fully air-conditioned Museum remains open to visitors on all days from 10:30 hrs to 16:30 hrs except Monday (weekly holiday). There is a nominal fee of Rs. 10/- per head, but the groups of farmers, children from school/college are exempted from entry fee. During COVID 19, the museum was closed for some time for general public.

During 2024, a total of 10,837 visitors (7955 students, 1522 NARES and Government Officials, 497 farmers, 74 foreign delegates, 114 trainees from different training programmes conducted by ICAR Institutes and other Government Departments and 675 ticket holders) visited NASM.

राष्ट्रीय कृषि विज्ञान

एक वैदकालीन गांव
A VEDIC VILLAGE
अशोक के समय वृक्ष रोपण और बागवानी
ARBORICULTURE AND HORICULTURE DURING THE REIGN OF ASHOKA

Annexure-IV

ACRONYMS

ADG: Assistant Director General
AESSRA: Agricultural Economics and Social Science Research Association
AICRP: All India Coordinated Research Project
AI ENGAGE: Advancing Innovations for Empowering NextGen Agriculture
AMU: Aligarh Muslim University
ANRF: Anusandhan National Research Foundation
ASRB: Agricultural Scientists Recruitment Board
ATARI: Agricultural Technology Application Research Institutes
ATIC: Agricultural Technology Information Centre
BASU; Bihar Animal Sciences University
BAU: Bihar Agricultural University
BHU: Banaras Hindu University
BMGF:Bill & Melinda Gates Foundation
CAFT: Centre for Advanced Faculty Training
CARI: Central Avian Research Institute
CAU: Central Agricultural University
CAZRI: Central Arid Zone Research Institute
CBSE: Central Board of Secondary Education
CCS NIAM: Chaudhary Charan Singh National Institute of Agricultural Marketing
CCARI: Central Coastal Agricultural Research Institute
C-DAC: Centre for Development of Advanced Computing
CIAE: Central Institute of Agricultural Engineering
CICR: Central Institute of Cotton Research
CIFA: Central Institute of Freshwater Aquaculture
CIFE: Central Institute of Fisheries Education
CIFRI: Central Inland Fisheries Research Institute
CIRB: Central Institute for Research on Buffaloes
CIRG: Central Institute for Research on Goats
CITH: Central Institute of Temperate Horticulture
CMFRI: Central Marine Fisheries Research Institute
CIMMYT: International Maize and Wheat Improvement Center
CIPHET: Central Institute of Post Harvest Engineering & Technology
COBACAS: Cooch Behar Association for Cultivation of Agricultural Sciences
CPRI: Central Potato Research Institute
CRIDA: Central Research Institute on Dryland in Agriculture
CSKHPKV: Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya
CSSRI: Central Soil Salinity Research Institute
DAHD: Department of Animal Husbandry and Dairying
DARE: Department of Agricultural Research and Education

DA&FW: Department of Agriculture, Cooperation & Farmers Welfare
DBT: Department of Biotechnology
DDG: Deputy Director General
DES: Department of Economics and Statistics
DFMD: Directorate of Foot and Mouth Disease
DFPD: Department of Food and Public Distribution
DG: Director General
DGCA: Directorate General of Civil Aviation
DKMA: Directorate of Knowledge Mangement in Agriculture
DPP&S: Directorate of District Distribution, Procurement & Supply
DPR: Directorate of Poultry Research
DRMR: Directorate of Rapeseed Mustard Research
DST: Department of Science and Technology
EAAI: Energy for Agriculture and Agro-based Industries
FAO: Food and Agriculture Organization of the United Nations
FASAL: Forecasting Agricultural output using Space, Agro meteorology and Land based Observations
FIDTR: Fore Institute of Drone Technology and Research
FSSAI: Food Safety and Standards Authority of India
GKVK: Gandhi Krishi Vigyan Kendra
IARI: Indian Agricultural Research Institute
ICAR-RCER: ICAR Research Complex for Eastern Region
ICARDA: International Center for Agriculture Research in the Dry Areas
ICRAF: International Center for Research in Agroforestry
ICRISAT: International Crops Research Institute for the Semi-Arid Tropics
ICT: Information and Communications Technology
IFS: Integrated Farming Systems
IIFSR: Integrated Farming Systems
IIHR: Indian Institute of Horticultural Research
IGFRI: Indian Grassland and Fodder Research Institute
IMD: India Meteorological Department
IIMR: Indian Institute of Maize Research
IIMilletsR: Indian Institute of Millets Research
IPR: Intellectual property rights
IIPR: Indian Institute of Pulses Research
IIRR: Indian Institute of Rice Research
IISeedS: Indian Institute of Seed Science
IISpicesR: Indian Institute of Spices Research
IISR: Indian Institute of Soybean Research
ISO: International Organization for Standardization
ISRO: Indian Space Research Organization
IISS: Indian Institute of Soil Sciences
IIWBR: Indian Institute of Wheat and Barley Research
IIWM: Indian Institute of Water Management

IIVR: Indian Institute of Vegetable Research
IVRI: Indian Veterinary Research Institute
KCC: Kisan Call Center
KVK: Krishi Vigyan Kendra
LTFE: Long Term Fertilizer Experiments
MCAF&PD: Ministry of Consumer Affairs, Food and Public Distribution
MeitY: Ministry of Electronics and Information Technology
MoSPI: Ministry of Statistics and Programme Implementation
NAARM: National Academy of Agricultural Research and Management
NAAS:National Academy of Agricultural Sciences
NABARD: National Bank for Agriculture and Rural Development
NADCL: National Agriculture Development Co-operative Ltd
NASC: National Agricultural Science Complex
NAHEP:National Agricultural Higher Education Project
NARES: National Agricultural Research & Education System
NASF: National Agricultural Science Fund
NBAIM: National Bureau of Agriculturally Important Microorganisms
NBAIR: National Bureau of Agricultural Insect Resources
NBFGR: National Bureau of Fish Genetic Resources
NBPGR: National Bureau of Plant Genetic Resources
NBSSLUP: National Bureau of Soil Survey and Land Use Planning
NCERT: National Council of Educational Research and Training
NCIPM: National Research Centre for Integrated Pest management
NDKSP: Nanaji Deshmukh Krushi Sanjivani Prakalp
NDRI: National Diary Research Institute
NEHU: North Eastern Hill University
NHRDF: National Horticultural Research and Development Foundation
NIAP: National Institute of Agricultural Economics and Policy Research
NIC: National Informatics Centre
NICRA: National Innovations on Climate Resilient Agriculture
NIFMD: National Institute of Foot and Mouth Disease
NIPB: National Institute for Plant Biotechnology
NRCB: National Research Centre for Banana
NRCE: National Research Centre on Equines
NRCG: National Research Centre for Grapes
NRCM: National Meat Research Centre on Meat
NRRI: National Rice Research Institute
NSSO:National Sample Survey Office
OFR: On Farm Research
PAU: Punjab Agricultural University
PMFBY: Pradhan Mantri Fasal Bima Yojana
POCRA: Project on Climate Resilient Agriculture
RCER: Research Complex for Eastern Region
RCNEHR: Regional Complex for North Eastern Hilly Region

RLBCAU: Rani Lakshmi Bai Central Agricultural University
PPVFRA: Protection of Plant Varieties and Farmers' Rights Authority
RVSKVV: Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
SAARC: South Asian Association for Regional Cooperation
SAUs: State Agricultural Universities
SADHNA: Society for Advancement of Human and Nature
SDGs: Sustainable Development Goals
SKNAU: Sri Karan Narendra Agriculture University
SKUAST: Sher-e-Kashmir University of Agricultural Sciences and Technology
SMD: Subject Matter Division
SSCA: Society of Statistics, Computer and Applications
UAS: University of Agricultural Sciences
UAHS: University of Agricultural and Horticultural Sciences
UBKV: Uttar Banga Krishi Viswavidyalaya
VNMKV: Vasantrao Naik Marathwada Krishi Vidyapeeth
WTC: Water Technology Centre

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