QUINQUENNIAL REVIEW REPORT 2018-2023

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ICAR-Indian Institute of Farming Systems Research
(Indian Council of Agricultural Research)
MODIPURAM, MEERUT - 250 110 (U.P.)

QUINQUENNIAL

REVIEW REPORT: 2018-2023

(January 01, 2018 to December 31, 2023)

ICAR-Indian Institute of Farming Systems Research
(Indian Council of Agricultural Research)
Modipuram, Meerut - 250110 (U.P.)

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A REPORT OF THE QUINQUENNIAL REVIEW TEAM (2018-2023)

ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut
and
AICRP on Integrated Farming Systems and Network Project on Organic Farming

CERTIFICATE

This is to certify that QRT on ICAR- Indian Institute of Farming Systems Research, Modipuram, Meerut including AICRP on Integrated Farming Systems and Network Project on Organic Farming was constituted by the Council's Office Order F. No. NRM/1-22/2023-IA-II (Vol.I) (Comp.No.276143) dated 7th November, 2023 to review the research work undertaken by ICAR- Indian Institute of Farming Systems Research, Modipuram, Meerut, and AICRP on Integrated Farming Systems and Network Project on Organic Farming for the period of 2018-2023. This report is based on the in-depth review undertaken by the team, visits to different centres, visit to on-station and on-farm field experiments, farmer's field, interaction with scientists of institute, members of the Institute Management Committee (IMC) and other stakeholders etc.

(V.S. Thakur)
Member

(A.K. Singh)
Member

(Kusumakar Sharma)
Member

(Vandana Dwivedi)
Member

(N. P. Singh)
Member

(Raghavendra Singh)
Member Secretary

(Arvind Kumar) 24/10/2024
Chairman

ACKNOWLEDGMENT

The ICAR-Indian Institute of Farming Systems Research (IIFSR) playing a pivotal role in advancing Indian agriculture by focusing research and technological development on three key areas: integrated farming systems (IFS), cropping systems, organic and natural farming. Operating across 25 states and 1 Union Territory, the institute collaborates with State Agricultural Universities (SAUs), ICAR institutes, a central university, and a Deemed University to improve agricultural productivity, profitability, and sustainability. The central aspect of the institute's research is the farmer-participatory refinement of integrated farming systems and evaluating the impact of technological interventions. Over the years, IIFSR has made significant contributions by designing alternative production systems, including innovative cropping, farming, and organic systems. The research conducted under the ambit of ICAR-IIFSR during the review period of 2018-2023 has led to the development of 33 location-specific IFS models, 31 bankable IFS modules, 63-farmer participatory refinement of farming systems, 8 IOFS models and 30 cropping systems under organic production practices tailored to different regions of the country. In addition to its research contributions, the institute has made notable progress in human resource development, conducting multi-commodity, year-round activities alongside its stakeholders. To ensure continuous improvement, the QRT has undergone extensive review of institute, AICRP-IFS and AI-NPOF centres through region-wise meetings, field visits, and assessing its mandate, achievements, infrastructure, manpower, and financial resources. These evaluations, involving ICAR-IIFSR, AICRP-IFS, and AI-NPOF, have resulted in observations and recommendations that, if implemented, will enable the institute to achieve its long-term vision and contribute to India's Sustainable Development Goals.

For such an exhaustive exercise, I extend my gratitude to all the team members of the QRT, including Dr. V.S. Thakur, Former Vice-Chancellor, YS Parmar University of Horticulture and Forestry, Solan, HP; Dr. A.K. Singh, Former Vice-Chancellor, Bihar Agricultural University, Sabour, Bhagalpur, Bihar; Dr. Kusumakar Sharma, Former Assistant Director General (Human Resource Development), ICAR, New Delhi; Dr. (Mrs.) Vandana Dwivedi, Former Additional Commissioner, INM Division, Department of Agriculture and Farmers Welfare, GoI, New Delhi; and Dr. N.P. Singh, Member, Commission for Agriculture Costs and Prices, Ministry of Agriculture and Farmers Welfare, GoI, New Delhi.

I express my heartfelt gratitude to Dr. Himanshu Pathak, Secretary, DARE, and Director General, ICAR, New Delhi, for entrusting me with the challenging task of reviewing and assessing the impact of integrated farming systems, cropping systems, and organic and natural farming undertaken by the institute during 2018-2023. I feel privileged to extend my sincere appreciation to Dr. S.K. Chaudhari, Deputy Director General (NRM), ICAR, New Delhi, for his constant guidance in reviewing and developing the report. I also acknowledge the technical and administrative support provided by Dr. Rajbir Singh, ADG (AGAF&CC), ICAR, New Delhi, and other staff members of the NRM division at ICAR Headquarters. I extend my heartfelt appreciation and thanks to Dr. Sunil Kumar, Director, ICAR-IIFSR, for providing technical, administrative, and logistical support in organizing the planning, review, and report-writing meetings. I also express my sincere thanks to Dr. N. Ravisankar, Project Coordinator, for his consistent support throughout the review process. The contributions of Dr. Raghavendra Singh, Head & Member Secretary; Dr. A.L. Meena, Scientist and Associate; Dr. Vipin Kumar, CTO; and Mr. Rajesh Kumar, PA, in organizing and supporting the development of the report are highly commendable and appreciated. I would also like to place on record my sincere gratitude to the Vice-Chancellors, Directors, Chief Agronomists, Agronomists, and their teams of scientists from UAS Dharwad, ICAR-RC-NEH Umiam, IGKV Raipur, ICAR-CTCRI Thiruvananthapuram, ANDUAT Ayodhya, CSKHPKVV Palampur, and ICAR-IIFSR Modipuram for their invaluable technical, administrative, and logistical support during the review and report-writing meetings. The valuable suggestions from the Institute Management Committee of ICAR-IIFSR are duly acknowledged, and the efforts of the committee in producing this report are greatly recognized.

(Arvind Kumar)
Chairman

Date: 24.10.2024
Place: Modipuram, Meerut

ACRONYMS

AICARP	:	All India Coordinated Agronomic Research Project
AICRP	:	All India Coordinated Research Project
AICRP-IFS	:	All India Coordinated Research Project on Integrated Farming System
AI-NPOF	:	All India Network Programme on Organic Farming
AKMU	:	Agricultural Knowledge Management Unit
ATARI	:	Agricultural Technology Application Research Institute
AVRDC	:	Asian Vegetable Research and Development Centre
CeRA	:	Consortium for e-Resources in Agriculture
CHNS	:	Carbon, Hydrogen, Nitrogen and Sulphur Analyzer
CIMMYT	:	International Maize and Wheat Improvement Centre
DAC&FW	:	Department of Agriculture, Cooperation & Farmers Welfare
DSR	:	Direct Seeded Rice
EFC	:	Expenditure Finance Committee
FARMER FIRST	:	Farmer's Farm, Innovations, Resources, Science and Technology
GC	:	Gas Chromatography
IMC	:	Institute Management Committee
IPNI	:	International Plant Nutrition Institute
IRRI	:	International Rice Research Institute
ITM Unit	:	Institute Technology Management Unit
IWMI	:	International Water Management Institute
KPI		Key Performance Indicator
NAAS	:	National Academy of Agricultural Sciences
OFR	:	On-Farm Research
PFP	:	Partial Factor Productivity
PKVY	:	Paramparagat Krishi Vikas Yojana
PoP	:	Package of Practices
PME	:	Priority Setting Monitoring and Evaluation
REY	:	Rice Equivalent Yield
RFD	:	Result Framework Document
SFC	:	Standing Finance Committee
SoU	:	Statement of Understanding
SRFs	:	Senior Research Fellows

CONTENTS

EXECUTIVE SUMMARY

The review reports of Dr. A. B. Stewart from the Macaulay Institute of Soil Research, Aberdeen, U.K., around 1949, laid the foundation for the "Simple Fertilizer Trials on Cultivators' Fields," which later expanded into Cropping Systems Research in India. Based on these simple and complex fertilizer trials, agricultural departments were able to provide relevant guidance to farmers for increasing crop yields. The scope of research was subsequently broadened to include agronomic studies that encompassed cultural practices, irrigation, nutrition, chemical weed control, and multiple cropping systems. In 1968-69, the 'All India Coordinated Agronomic Research Project (AICARP)' was launched with two key components: 'Model Agronomic Experiments' and 'Simple Fertilizer Trials.' However, even after the Green Revolution, agricultural research continued to focus primarily on individual crops in isolation. Recognizing this limitation, there was a push to initiate cropping systems-oriented research. As a result, the project was upgraded to a Directorate during the 7th Five-Year Plan, and the 'Project Directorate for Cropping Systems Research (PDCSR)' was established in March 1989, with its headquarters in Modipuram, Meerut, U.P. During the 11th Five-Year Plan, PDCSR was re-designated as the 'Project Directorate for Farming Systems Research (PDFSR)' in 2009-2010. In 2014, during the 12th Five-Year Plan, PDFSR was upgraded to a full-fledged institute and renamed the "ICAR-Indian Institute of Farming Systems Research" (ICAR-IIFSR). Alongside, the All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS), with 74 centres, and the All-India Network Project on Organic Farming (AI-NPOF), with 20 cooperating centres, became integral parts of the institute. The cropping systems research conducted from 1989 to 2010 significantly contributed to increasing the country's cropping intensity since independence. Long-term nutrient management strategies developed for cereal-cereal cropping systems have sustained the productivity of rice-wheat and rice-rice systems. Additionally, the institute developed various agronomic practices, such as tillage and planting methods, site-specific nutrient management, and sustainable production models, which have improved crop and cropping system productivity and enhanced input use efficiency. During the 2018-2023 QRT review period, ICAR-IIFSR and its associated schemes AICRP on Integrated Farming Systems and the All-India Network Programme on Organic Farming developed 33 location-specific IFS models, 31 bankable IFS modules, and refined 63 farmer-participatory farming systems. They also created scientific organic farming packages for 30 cropping systems and documented 64 farmer success stories, effectively disseminating component technologies of cropping and farming systems. These IFS models, characterized by low or negative greenhouse gas emissions, have paved the way for promoting climate-resilient farming in India. Furthermore, the institute has developed indices for evaluating farming systems and identified key performance indicators, including the Ecological Security Index, Economic Efficiency Index, Social Equity Index, and Sustainable Livelihood Security Index. Statistical methodologies for on-farm farming system evaluations have also been established.

Indian agriculture stands at a crossroads, facing numerous challenges, including questions about food and nutritional security, profitability, production sustainability, resource use efficiency, employability, and climate change. These issues are particularly critical for small and marginal farmers, who currently make up about 86 percent of the country's total landholdings. Integrated farming systems research serves as an effective tool to address these challenges. Scientifically designed integrated farming systems play a significant role in providing sustainable livelihoods for small and marginal households, as existing farming systems often fail to generate sufficient year-round production and income to meet the needs of their relatively large families. In response, the committee analysed the strengths and constraints of the institute and made several recommendations. The detailed recommendations provided in the report are summarized below.

A. General

1. Introducing New Technologies and Innovations in Existing IFS Models to Boost Productivity and Income
2. Success Stories of On-farm Farming System Research Need to be Showcased and Replicated
3. Strategies to Augment the Productivity and Profitability between On-station and Farmer-adopted IFS Models
4. Studying the Soil-Plant-Animal-Human-Environmental Continuum in IFS Models

B. Research

5. Leveraging Data from Integrated Farming Systems Models for Ecosystem Services Valuation and a User-Friendly Digital Platform
6. Impact Study of the Adoption of IFS Models
7. Region-Specific Selection of Promising Livestock and Poultry Breeds for Efficient Resource Use in IFS
8. Addressing issues of Organic Farming in Niche Areas
9. Comprehensive Strategies to Scaleup Natural Farming
10. Strengthening Multidisciplinary Research Programmes

C. Organization and Management

11. Strengthening ICAR-IIFSR through the Establishment of Five Regional Centres for Strategic and Applied Research Across India's Agro-Ecologies
12. Reorganization of Existing Centres and Opening of New Centres of AICRP-IFS and AI-NPOF should be undertaken to further Strengthen the Basic and Applied Research on Diverse Farming Systems of India
13. Re-organization of AI-NPOF and New On-station and Outreach Centres
14. Performance of the AICRP-IFS and AI-NPOF Centres
15. Strong Capacity Building of IIFSR and its Network Scientists
16. Filling of Vacant Positions of Institute and AICRP-IFS
17. Strengthening Monitoring Mechanisms for AICRP-IFS and AI-NPOF Centres through Multidisciplinary Collaboration and Funding
18. Upgradation of All India Network Programme on Organic Farming (AI-NPOF)
19. Establishment of a Separate Natural Farming Network Programme with Additional Budgetary Support
20. Establishing Global Centre of Excellence on IFS and Natural Farming and propose 2027 as International Year of Natural Farming (IYNF)

D. Infrastructure

21. Conversion of Old Residential Quarters into a New Multi-Storeyed Residential Complex for Limited Accommodation within the IIFSR Campus

E. Financial

22. Increased Fund Allocation for the Institute, AICRP-IFS, and AI-NPOF: A Critical Requirement for Successful Program Implementation

01 INTRODUCTION

1.1 Constitution and Composition

The composition of the QRT of ICAR-Indian Indian Institute of Farming Systems Research, Modipuram, Meerut (including AICRP on Integrated Farming Systems and Network Project on Organic- Farming) was notified vide Council's Office Order F. No. NRM/1-22/2023-IA-II (Vol.I) (Comp.No.276143) Dated 07 November 2023 following the guidelines of ICAR. The composition of the QRT is given below;

#	Name and Designation	Contact Address	QRT
1.	**Dr. Arvind Kumar** Former Vice Chancellor, Rani Lakshmi Bai Central Agricultural University, Jhansi and Former Deputy Director General (Education) ICAR, New Delhi	515, Carnation Tower, Gaur Saundaryam, Greater Noida West (UP) Mobile: +919711008862 Email: akrlbcau@gmail.com	**Chairman**
2.	**Dr. V. S. Thakur** Former Vice Chancellor, YS Parmar University of Horticulture and Forestry, Solan, HP	Village-Kohlara, PO-Praunthi, Tehsil-Jubbal, District-Shimla-171205 (HP) Mobile:+919816082048 / +918219428022 Email: thakurvs1606@gmail.com	**Member**
3.	**Dr. A. K. Singh** Former Vice Chancellor, Bihar Agricultural University, Sabour, Bhagalpur, Bihar	Riverdale City, Phase II (near IICM), Kanke, Ranchi-834006 (Jharkhnad) Mobile:+919831372293 Email:ajoyasingh@gmail.com	**Member**
4.	**Dr. Kusumakar Sharma** Former Assistant Director General (Human Resource Development), ICAR, New Delhi	05073, ATS Greens Paradiso, Sector Chi 04, Greater Noida-201310 (UP) Mobile:+919650125552 Emai:ksharma52@gmail.com	**Member**
5.	**Dr. (Mrs) Vandana Dwivedi** Former Additional Commissioner, INM Division, Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, GoI, New Delhi	B-5, NASC, DPS Marg, New Delhi-110012 Mobile:+919911998756 Email:dwivedikrishi@gmail.com	**Member**
6.	**Dr. N. P. Singh** Member, Commission for Agriculture Costs and Prices, Ministry of Agriculture and Farmers Welfare, GoI, New Delhi	Member (Official), CACP, Room No.382 B, Krishi Bhawan, New Delhi-110001 Mobile:+919958650477 Email: naveenpsingh@gmail.com	**Member**
7.	**Dr. Raghavendra Singh** Head, Division of Cropping Systems and Resource Management, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut	Head, Division of Cropping Systems and Resource Management, ICAR-IIFSR, Modipuram, Meerut-250110 (UP) Mobile:+917905160105 Email:Raghavendra.Singh@icar.gov.in	**Member Secretary**

As per the guidelines and considering the volume of work done under 74 centres of AICRP-Integrated Farming Systems and 20 centres of All Indian Network Programme on Organic Farming in 26 states/Union Territories, additional scientific (Dr Amrit Lal Meena, Scientist, Cropping Systems and Resource Management Division) technical (Dr Vipin Kumar, Chief Technical Officer, Coordination Unit) and administrative (Shri Rajesh Kumar, Personal Assistant) man power was provided at the institute level to assist the team in coordinating the meeting, compilation of information and reports from all centres pertaining to schemes and experiments and compiling the final report.

1.2 Terms of Reference (As per ICAR Guidelines 2009)

i. Research achievements and their impact

To examine and identify the research achievements of the ICAR-IIFSR, AICRP-IFS and AI-NPOF operated by it vis-à-vis sectoral programmes since the previous QRT and critically evaluate them. Commensurate with the objectives, mandates and resources of the organization, the socio-economic impact of research on farmers/ beneficiaries and transferability of results to farmers through extension be critically reviewed.

ii. Research relevance and budget allocation

To examine the objectives, scope and relevance of the research programmes and budget of the institute for the next 5 years in relation to overall/ state/ regional/ national plans, policies and long and short-terms priorities. The committee may also draw its attention to the EFC/SFC Memo in relation to recommendations of the previous QRT and also the Vision 2050 document of the institute.

iii. Policies, priorities, and strategies

To examine the policies, priorities, strategies, and procedures adopted by the institute and the system in relation to perspective plan in arriving at these decisions, particularly the effectiveness of working of the Institute Research Council, Research Advisory Committee and the Institute Management Committee as well as the consultative machineries like Grievance Cell and Institute Joint Staff Council.

iv. Relationship/collaboration with SAUs and other stakeholders

Whether the research programmes of the past and proposal for future are in harmony with the vision of the Indian Council of Agricultural Research (ICAR) and the programme of related centres of research and agricultural university, state government, private sector and International Agricultural Research Centres (IARC)?

v. Linkages with clients/ end-users

To examine the kinds of linkages established with the clients and end users of research results, i.e., farmers and the extent of interest displayed in conducting “on-farm research” on farmers fields and in organizing demonstrations/ training courses for the transfer of technology to extension agencies.

vi. Proposed changes in organization, programmes and budgets

To examine whether any changes in the organizational setup are called for, to achieve an improved and effective working. The committee may also examine and draw attention to any imbalances in the staffing pattern consistent with the scientific, technical, and administrative needs as well as the allocation of research funds towards capital assets, and establishment and research contingencies. Further, the committee may also examine the resource generation efforts and assess the problems and prospects of the same. The progress and problem of implementing project-based budgeting may also be highlighted. While proposing major changes in organization and functioning, their feasibility in relation to ICAR rules, autonomy, resources etc. need to be kept in view.

vii. Organization and management

Whether the organizational structure of the institute is conducive to efficient functional/ working autonomy, decentralization, and delegation of authority in day-to-day routine working, and whether the Director and senior staff are interested in promoting collegiate and co-operate method of administration; is to be assessed. The committee may also critically examine the status of implementation of Office and Management reforms as introduced by the council from time to time and suggest ways and means to implement them at the directorate level. They may also suggest further reforms to be considered by the council. The suggested staff ratio by the council may have to be kept in view while reviewing the staff position in the institute.

viii. Constraints

To examine the constraints hindering the institute's achievement of its objectives and the implementation of its programmes and goals, and recommend ways to minimize or eliminate these obstacles.

ix. Looking forward

To examine any additional points deemed relevant by the committee or referred to it by ICAR, the Director, or the management committee.

1.3 Meetings and Visits

In accordance with the ICAR guidelines, a preliminary planning meeting was held on October 23, 2023, at the Natural Resource Management Division, Indian Council of Agricultural Research (ICAR), Krishi Anusandhan Bhawan-II, New Delhi. The meeting was chaired by Dr. S. K. Chaudhari, DDG (Natural Resource Management), included the participation of Dr. Arvind Kumar, Chairman QRT; Dr. Sunil Kumar, Director ICAR-IIFSR; Dr. Raj Bir Singh, ADG (AAFC); and Mrs. Raj Shree Sunil, Director (NRM). In view of the large number of centres operating under AICRP-IFS (74 no's) and AI-NPOF (20 no's), spread in 25 states and 1 union territory, the committee decided to convene region-wise review meetings/ field visits to critically examine the progress, bottlenecks, understand the issues and interact with stakeholders of integrated farming systems and organic farming research including farmers, agri-entrepreneurs, tribal and development department officials. The QRT adopted the following schedule of meetings and visits to review the progress of ICAR-IIFSR, AICRP-IFS, and AI-NPOF for a comprehensive review, ranking, and reporting of schemes and programs.

#	Date(s) and Location of Meeting	Centres covered	Participating Members
1.	October 23, 2023 (NRM Division, KAB-II, ICAR, New Delhi)	Preliminary planning meeting. Dr. S. K. Chaudhari, DDG (Natural Resource Management) made appraisal about the schemes of ICAR-IIFSR, AICRP-IFS and AI-NPOF	Dr. S.K. Chaudhari Dr. Arvind Kumar Dr. Sunil Kumar Dr. Rajbir Singh Mrs. Raj Shree Sunil
2.	December 08-09, 2023 (ICAR-IIFSR, Modipuram, Uttar Pradesh)	Review of research programme and activities of ICAR-IIFSR, Modipuram including field, lab and other facilities. Interaction with all the staff of the institute was also organized. Committee also visited the experiments at farmers field under FARMER FIRST programme.	Dr. Arvind Kumar Dr. V.S. Thakur Dr. A.K. Singh Dr. Kusumakar Sharma Dr. Vandana Dwivedi Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar
3.	January 09-11, 2024 (University of Agricultural Sciences, Dharwad, Karnataka)	AICRP-IFS: Main centres: Rajendranagar, Kathelgere, Siruguppa, Coimbatore Sub-centres: Maruteru, Thanjavur, Rudrur OFR centres: Dharwad, Srikakulam, Salem, Erode, Chikkaballapura and Medak ICAR Institute based: ICAR-CCARI, Goa AI-NPOF: Dharwad, Coimbatore	Dr. V.S. Thakur Dr. A.K. Singh Dr. N.P. Singh Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar
4.	May 06-07, 2024 (ICAR RC for NEH Region, Umiam, Meghalaya)	AICRP-IFS: Main centres: Bhubaneswar, Sabour, Kalyani, Jorhat Sub-centres: Chiplima OFR centres: Nalanda, Goalpara, Nadia, Kalahandi and Kendujhar and Karbianalong ICAR institute based: Patna, Umiam, Port Blair AI-NPOF: Umiam, Gangtok, Narendrapur	Dr. Arvind Kumar Dr. V.S. Thakur Dr. Kusumakar Sharma Dr. Vandana Dwivedi Dr. N.P. Singh Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar

5.	May 17-18, 2024 (Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh)	AICRP-IFS: Main centres: Rahuri, Prabhani, Akola, Karjat, Raipur, Jabalpur, Ranchi Sub-centres: Powerkheda, Rewa, Indore OFR centres:Satara, Hingoli, Nagpur, Thane, Kanker, Anuppur, Umaria, East Singhbhum AI-NPOF: Bhopal, Jabalpur, Karjat, Ranchi, Raipur,	Dr. Arvind Kumar Dr. V.S. Thakur Dr. Kusumakar Sharma Dr. Raghavendra Singh Dr. N. Ravisankar
6.	June 07-08, 2024 (ICAR- CTCRI, Thiruvananthapuram & Kerala Agricultural University, Thrissur, Kerala)	AICRP-IFS: Main centres: Karamana, SK Nagar Sub-centres: Navsari, Junagadh OFR centres: Patan, Dahod, Thiruvananthapuram AI-NPOF: Thiruvananthapuram, Calicut, SK Nagar	Dr. Arvind Kumar Dr. A.K. Singh Dr. N.P. Singh Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar
7.	June 22-23, 2024 (Acharya NDUAT, Ayodhya, Uttar Pradesh)	AICRP-IFS: Main centres: Kanpur, Kumarganj, Durgapura, Hisar Sub-centres: Varanasi, Kota OFR centres: Fatehpur, Mirzapur, Dausa, Udaipur, Dungarpur, Fatehabad, AI-NPOF: Ajmer	Dr. Arvind Kumar Dr. V.S. Thakur Dr. A.K. Singh Dr. Kusumakar Sharma Dr. Vandana Dwivedi Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar
8.	July 06-07, 2024 (CSKHPKVV, Palampur (Himachal Pradesh)	AICRP-IFS: Main centres: Palampur, Jammu, Ludhiana, Pantnagar OFR centres: Patiala, Bilaspur, ICAR institute based: New Delhi AI-NPOF: Bajaura, Ludhiana, Pantnagar, Udaipur	Dr. Arvind Kumar Dr. V.S. Thakur Dr. A.K. Singh Dr. Kusumakar Sharma Dr. Vandana Dwivedi Dr. Raghavendra Singh Dr. Sunil Kumar Dr. N. Ravisankar
9.	October 23-24, 2024 (ICAR-IIFSR, Modipuram, Uttar Pradesh)	Report finalization and interaction meeting of Chairman with Institute Management Committee of ICAR-IIFSR, Modipuram	Dr. Arvind Kumar Dr. V.S. Thakur Dr. A.K. Singh Dr. Kusumakar Sharma Dr. Vandana Dwivedi Dr. N.P. Singh Dr. Raghavendra Singh Dr. Sunil Kumar Dr. S.K. Das Dr. Shiv Dhar Dr. S.K. Behera Dr. S.K. Dubey Dr. N. Ravisankar

Participation from the host Institutes/ University

Location	Name and Designation
University of Agricultural Sciences, Dharwad	Dr. P.L. Patil, Vice-Chancellor
	Dr. B.D. Biradar, Director of Research
	Dr. Shripad Kulkarni, Head, IOF

ICAR-Research Complex for North-Eastern Hill Region, Umiam	Dr. V.K. Mishra, Director, ICAR RC for NEH region, Umiam, Meghalaya
	Dr. Samarendra Hazarika, Head, DSRE, ICAR RC for NEH region, Umiam, Meghalaya
Indira Gandhi Krishi Vishwavidyalaya, Chhattisgarh	Dr. Girish Chandel, Vice-Chancellor, IGKV, Raipur
	Dr. V.K. Tripathi, Director of Research, IGKV, Raipur
ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala Agricultural University, Thrissur	Dr. G. Byju, Director, ICAR-CTCRI, Thiruvananthapuram
	Dr. Anith K. Naryanan, ADR, Southern zone, KAU, Thrissur
Acharya Narendra Dev University of Agriculture & Technology, Kumarganj, Ayodhya	Dr. Bijendra Singh, Vice-Chancellor, ANDUAT, Ayodhya
	Dr. A.K. Gangwar, Director of Research, ANDUAT, Ayodhya
CSK Himachal Pradesh Agricultural University, Palampur	Dr. D.K. Vatsa, Vice-Chancellor, CSKHPKVV, Palampur
	Dr. M.C. Rana, Director of Research CSKHPKVV, Palampur

02 PROCESS

In accordance with ICAR guidelines for the Quinquennial Review Team (QRT), the institute prepared and distributed detailed background information to the QRT members before the first meeting. This information included an overview of the institute's activities, administrative setup, available facilities, financial status, proceedings of the Research Advisory Committee and Institute Management Committee, action taken reports from the previous QRT, and significant research achievements. A preliminary planning meeting was held on October 23, 2023, at the Natural Resource Management Division, Indian Council of Agricultural Research (ICAR), Krishi Anusandhan Bhawan-II, New Delhi. The first QRT meeting took place on December 8-9, 2023, at ICAR-IIFSR, Modipuram, Meerut. During this meeting, the research progress and overall performance of ICAR-IIFSR, AICRP-IFS and AI-NPOF were thoroughly reviewed. The Director of ICAR-IIFSR provided a comprehensive presentation, covering the organizational structure, scientific, technical, and administrative manpower related to research programs, laboratory and farm facilities, financial resources, and key achievements. The QRT team visited various laboratories, field experiments, the library, and other facilities within the institute to gain a first-hand understanding of the infrastructure and resources. This enabled the team to assess the operational capacity and research environment at the institute.

In region-specific review meetings, the QRT invited Chief Agronomists, Agronomists, and Principal Investigators (PIs) from various AICRP-IFS and AI-NPOF centres located in different universities and ICAR institutes. List of the scientists representing the centres is being given in Annexures-VII. These representatives presented the progress made during the reporting period, highlighting research outputs such as significant achievements, technologies and techniques developed, their transfer to farmers, impacts, and scientific publications produced. Additionally, they discussed financial matters, identified constraints, and outlined future plans. The QRT also conducted field visits to evaluate ongoing research activities under AICRP-IFS and AI-NPOF. This on-field assessment provided insights into the practical implementation and effectiveness of research programs. Furthermore, the QRT reviewed the action taken reports from the previous QRT and considered the council's views presented in the report (Annexure-I). The team also examined current RAC and IMC recommendations and assessed the actions taken by ICAR-IIFSR in response to these recommendations. Before finalizing its recommendations, the QRT Chairman held an interactive meeting with the IMC, where he briefed the members on various observations and provided recommendations relevant to research, administration, and finance. This collaborative approach ensured that all stakeholders were informed and aligned with the proposed directions for improvement and future development.

03 BACKGROUND INFORMATION

3.1 Brief History

The project began in 1952-53, following a report submitted to the Government of India by Dr. A.B. Stewart of the Macaulay Institute for Soil Research, Aberdeen (U.K.), in 1947. Based on his recommendations, a scheme titled "Simple Fertilizer Trials on Cultivators' Fields" was initiated, which significantly popularized fertilizer use and boosted crop productivity. In 1956, the project expanded to include "Model Agronomic Experiments" at carefully selected centers, and it was renamed the "All India Coordinated Agronomic Experiments Scheme" under ICAR. In 1968-69, the scheme was restructured and approved as the "All India Coordinated Agronomic Research Project (AICARP)" with two key components: 'Model Agronomic Experiments' and 'Simple Fertilizer Trials (ECF).' The objectives of the Model Agronomic Experiments were broadened to include studies on the response of high-yielding varieties of cereals to the intensive use of fertilizers, irrigation, weed control, liming, and other factors, as well as evaluating production potential across different agro-climatic conditions in India. Additionally, the project focused on developing appropriate cropping patterns and assessing fertilizer responses under rain-fed conditions. AICARP significantly contributed to developing agronomic management practices for newly introduced high-yielding varieties, playing a critical role in the Green Revolution in India.

System-based research began in the early seventies as part of this program. However, it was during the Seventh Five-Year Plan that efforts to strengthen all aspects of cropping systems research led to the upgrade of the AICARP into the "Project Directorate for Cropping Systems Research (PDCSR)," with the "All India Coordinated Research Project on Cropping Systems" as one of its plan schemes. The PDCSR was established in Modipuram (Meerut) in April 1989. The directorate was tasked with undertaking and coordinating nationwide system-based basic and applied research from a cropping systems perspective. This was achieved through an 'On-Station (basic and applied) Research' approach at its headquarters and at the main and sub-centers of the AICRP-Cropping Systems, as well as 'On-Farm (farmers' participatory) Research' at the on-farm research centers of AICRP-CS. Starting in 2004-05, the directorate also added a new plan scheme titled the "Network Project on Organic Farming."

During the Eleventh Five-Year Plan, the scope of the PDCSR was expanded to address all aspects of farming systems. As a result, the PDCSR was renamed the "Project Directorate for Farming Systems Research" and the AICRP-CS scheme was rebranded as the "AICRP on Integrated Farming Systems." This transformation led to a reorientation of the directorate's research focus to address issues related to farming systems starting in February 2010. In the Twelfth Plan, on November 27, 2014, the Project Directorate for Farming Systems Research (PDFSR) was restructured and renamed the Indian Institute of Farming Systems Research (IIFSR). The All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) became a core component of ICAR-IIFSR. The institute now operates 74 research centres across India, including 25 main on-station centres, 11 sub-stations, 6 ICAR institute-based stations, and 32 on-farm research centres. Additionally, since 2004, IIFSR has been leading the All-India Network Project on Organic Farming (AI-NPOF), which involves 20 centres dedicated to organic farming research in 16 States. The current mandate of the institute, as well as its vision, mission, and major research area identified in the Vision 2050 plan, are outlined below.

Vision

Management of natural resources for holistic improvement of small and marginal farmers through Integrated Farming Systems.

Mission

Improve food, nutrition, livelihood of small and marginal households through climate smart Integrated Farming Systems (to make marginal and small households as bountiful).

Mandate

- Research in integrated farming systems on production technologies for improving productivity and resource use efficiencies.
- Develop efficient, economically viable and environmentally sustainable integrated farming system models for different farming situations.
- On-farm testing, verification and refinement of system-based farm production technologies.
- Coordinate and monitor integrated farming systems research in the country.

Major Research Areas

- Farming system design and farm typology work intensified on the farmer's field (On-farm research) for appropriate designing and efficient resource utilization in IFS.
- Research on whole farm concept by the inclusion of agri-voltaic integrated farming systems.
- Development of sensor-based input management options of predominant cropping systems for sustainably enhancing use efficiencies.
- Carbon neutral farming, vertical cropping, regenerative agriculture and circular economy and waste-wealth generation.
- Capacity building and Human Resource Development for Integrated Farming Systems Research, Education and Extension.

3.2 Research Programmes

The research at ICAR-IIFSR is being undertaken with three schemes, which are being funded separately by the Council. These are:

i. ICAR-Indian Institute of Farming Systems Research (Headquarter)

ii. All India Coordinated Research Project on Integrated Farming Systems (AICRP-IFS)

iii. All India Network Programme on Organic Farming (AI-NPOF)

To fulfil its mandate, the institute is structured into three divisions, one section, and a coordination unit. Each division is led by designated Heads and Principal Scientists, who manage their respective sections. Additionally, a Project Coordinator supervises the activities of the AICRP-IFS and AI-NPOF programs. The specific objectives are outlined below:

a. Integrated Farming Systems (IFS)

- To characterize existing farming systems and prioritize their constraints in different agro-climatic zones.
- To develop effcient, economically viable and environmentally sustainable integrated farming system models for different farming situations.

- Resource optimization in farming systems perspective through computer-based decision-making tools.

b. Cropping Systems and Resource Management (CSRM)

- To undertake basic and strategic research in resource management and system-based crop production technologies, including conservation agriculture, for improving productivity and resource use efficiencies in major cropping systems.

c. Organic Agriculture Systems (OAS)

- To undertake basic and strategic research on different aspects of organic and similar environment-friendly production systems.

d. Technology Transfer and Assessment (TTA)

- To disseminate, demonstrate and validate improved farming system technologies in farmers' participatory mode.
- To carryout impact analysis and provide feedback to the scientists for need-based refinement of improved technologies.
- To undertake national and international training programmes and short-term courses in frontier areas of integrated farming systems research and development.
- To develop and publish extension literature on improved farming systems technologies and techniques.

e. Coordination Unit

AICRP-IFS

On-Station Research

- To undertake applied and adaptive research on integrated farming systems (IFS), especially on production technologies for improving system productivity and resource use efficiencies.
- To develop efficient, economically viable and environmentally sustainable IFS models for different zones, with special reference to small and marginal farmers.
- To undertake capacity building and human resource development in IFS.

On-Farm Research

- To characterize the existing farming systems for identification of production constraints and problem prioritization.
- To undertake on-farm testing and refinement of system-based farm production technologies.
- To optimize on-farm integration of enterprises for enhanced farm incomes, resource/ input use efficiencies, and employment opportunities, with special reference to small and marginal farmers.

AI-NPOF

- To study productivity, profitability, sustainability, quality and input-use-efficiencies of different crops and cropping systems under organic farming in different agro-ecological regions.
- To develop efficient crop and soil management options for organic farming.
- To develop need-based cost-effective new techniques for farm-waste recycling (Already concluded).

3.3 Location

a. ICAR-IIFSR (Headquarters)

The ICAR-IIFSR is located at Modipuram in Meerut City, on Delhi-Dehradun National Highway 334, about 8.0 km from city centre. Modipuram is situated at an elevation of 237 metres above mean sea level, 29° 4" N latitude and 77° 46" E longitude.

b. AICRP on Integrated Farming Systems

During the period under review, research under AICRP-IFS was being carried out at 25 main, 11 sub, 32 on-farm research and 6 ICAR institute-based research centres (Table 1). All main and sub centres were engaged in basic and applied research. All these centres are located at SAUs or their Regional Research Stations or Agricultural colleges of general universities, where strong infrastructure for on-station agricultural research is available. The Six ICAR Institute based centres have taken up on-station development of IFS models except ICAR-IASRI, New Delhi which is providing the backstopping for design, sampling and Statistical analysis of cropping and farming systems research. The on-farm research (OFR) centres (earlier known as Experiments on Cultivators' Field/ ECF Centres) are engaged in farmers' participatory farming systems research and are located in different districts. These OFR centres get shifted from one district/ zone /farming situation to another after 5 years as per the previous QRT recommendation. The location of different centres under AICRP-IFS as on 31 December 2023 is given below and depicted in Fig.1.

Table 1. Location of the AICRP-IFS centres (2018-2023)

State / U.T.	University/ Institute	AICRP-IFS			
		On-station Research			On-farm Research (districts) (32 no's)
		Main Centre (25 no's)	Sub-Centre (11 no's)	ICAR institute-based Centre (6 no's)	
Andaman & Nicobar Islands	ICAR-CIARI, Port Blair	-	-	Port Blair	-
Andhra Pradesh	ANGRAU, Hyderabad	-	Maruteru	-	Vizianagaram
Assam	AAU, Jorhat	Jorhat	-	-	Karbi Anglong
Bihar	BAU, Sabour	Sabour	-	-	Nalanda
	ICAR-RCER, Patna	-	-	Patna	-
Chhattisgarh	IGKV, Raipur	Raipur	-	-	Kanker
Delhi	IASRI, New Delhi	-	-	Delhi	-
Goa	ICAR-CCARI, Goa	-	-	Old Goa	-
Gujarat	SDAU, S.K. Nagar	S. K. Nagar	-	-	Patan
	AAU, Anand	-	-	-	Dahod
	NAU, Navsari	-	Navsari	-	-
	JAU, Junagadh	-	Junagadh	-	-
Haryana	CCSHAU, Hisar	Hisar	-	-	Fatehabad
Himachal Pradesh	CSKHPKV, Palampur	Palampur	-	-	Bilaspur
Jammu & Kashmir	SKUAST, Jammu	Chatha	-	-	Jammu
Jharkhand	BAU, Ranchi	Ranchi	-	-	East Singhbhum

Karnataka	UAS, Bangalore	-	-	-	Chikkaballapura
	UAS, Dharwad	-	-	-	Dharwad
	UAS, Raichur	Siruguppa	-	-	-
	UAHS, Shivamogga	Kathalgere	-	-	-
Kerala	KAU, Thrissur	Karamana	-	-	Thiruvananthapuram
Madhya Pradesh	JNKVV, Jabalpur	Jabalpur	Powarkheda, Rewa	-	Anuppur, Umaria
	RVS KVV, Gwalior	-	Indore	-	-
Maharashtra	MPKV, Rahuri	Rahuri	-	-	Satara
	MAU, Parbhani	Parbhani	-	-	Hingoli
	DPDKV, Akola	Akola	-	-	Nagpur
	DBS KKV, Dapoli	Karjat	-	-	Thane
Meghalaya	ICAR-RC for NEH Region	-	-	Umiam	-
Odisha	OUAT, Bhubaneswar	Bhubaneswar	Chiplima	-	Keonjhar and Bhawanipatna
Punjab	PAU, Ludhiana	Ludhiana	-	-	Patiala
Rajasthan	SKRAU, Bikaner	Durgapura	-	-	Dausa
	KAU, Kota	-	Kota	-	-
	MPUAT, Udaipur	-		-	Dungarpur
Tamil Nadu	TNAU, Coimbatore	Coimbatore	Thanjavur	-	Salem and Erode
Telangana	PJTSAU, Rajendranagar	Rajendranagar	Rudrur	-	Medak
Uttar Pradesh	CSAUAT, Kanpur	Kanpur	-	-	Fatehpur
	NDUAT, Faizabad	Kumarganj	-	-	Mirzapur
	BHU, Varanasi	-	Varanasi	-	-
	IIFSR, Modipuram	-	-	Modipuram	Baghpat
Uttarakhand	GBPUAT, Pantnagar	Pantnagar	-	-	US Nagar
West Bengal	BCKV, Kalyani	Kalyani	-	-	Nadia

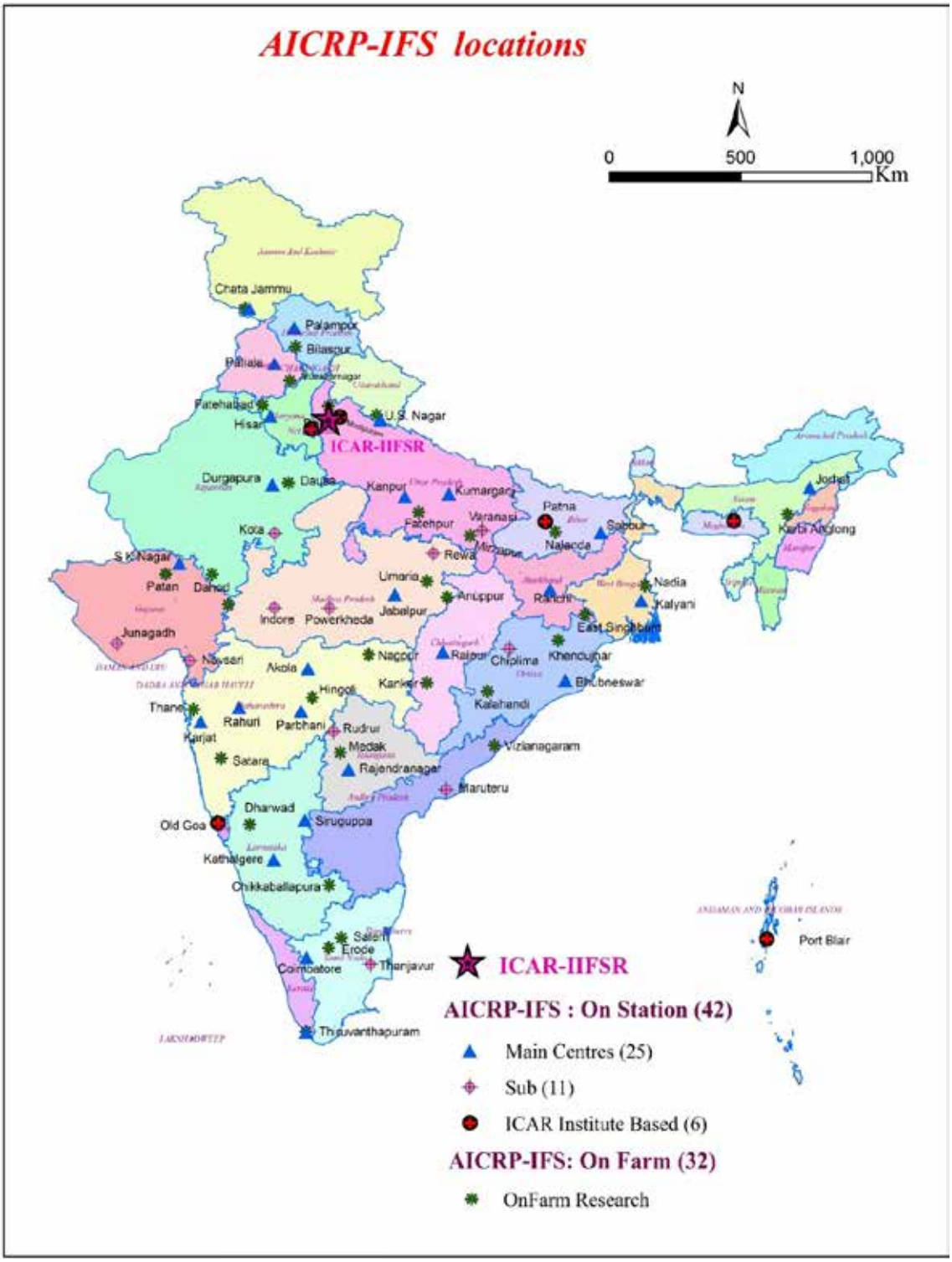


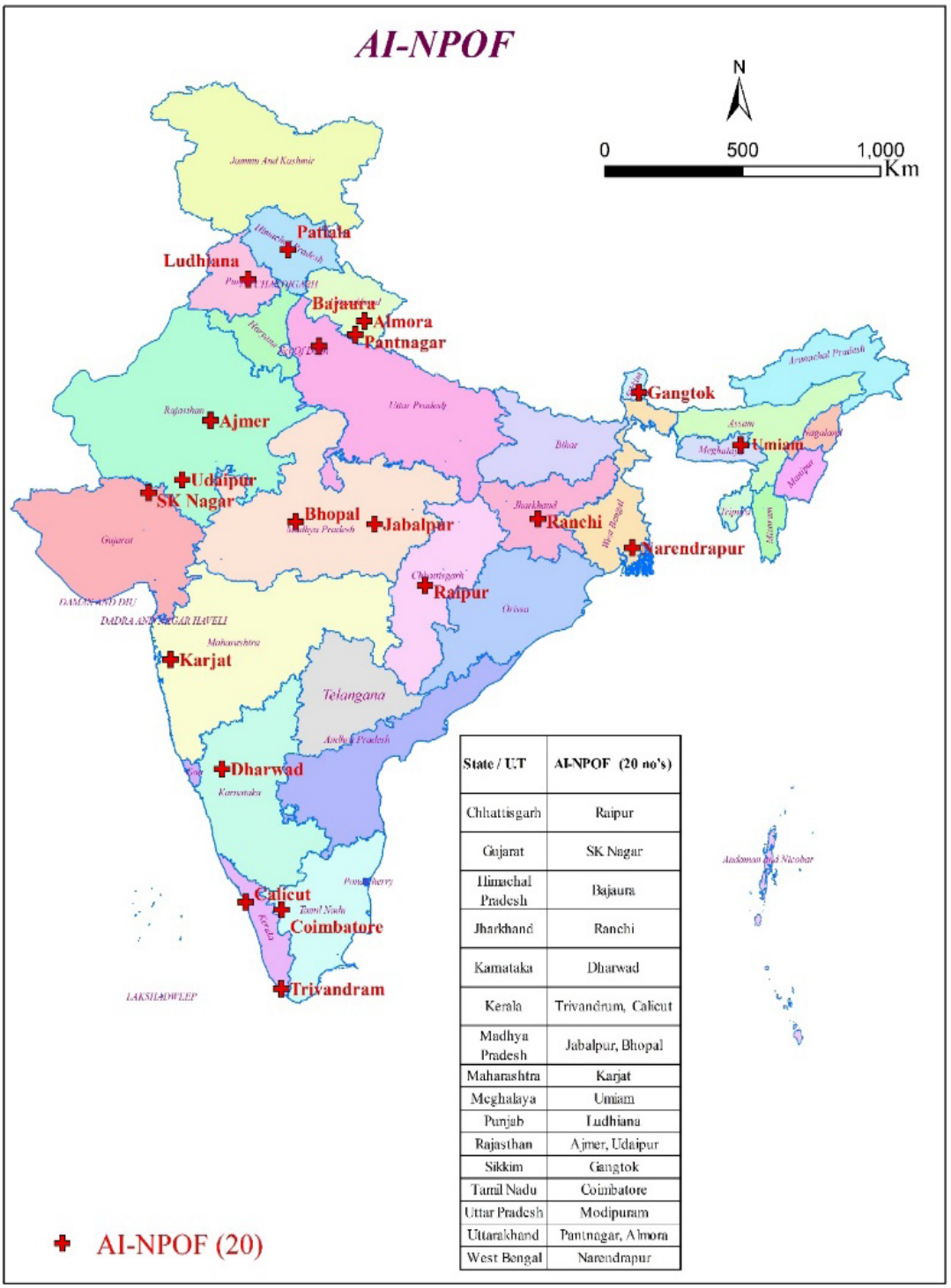
Fig 1. Spatial map of Main, Sub and On-Farm Research Centres of AICRP-IFS

c. All India Network Programme on Organic Farming (AI-NPOF)

The research under AI-NPOF was carried out at 20 centres covering 16 states during the review period Out of 20 centres, 13 centres were functioning from 2004-05 while 7 new centres were initiated from 2015-16. Out of 20 centres, 11 are in SAU's, 8 are in ICAR institutes while 1 is in Deemed to be University (Table 2). The location of different AI-NPOF centres as on 31 December 2023 is given below and depicted in Fig. 2.

Table 2. Location of the AI-NPOF Centres

State	University / Institute	Location
Chhattisgarh	IGKVV, Raipur	Raipur
Himachal Pradesh	CSKHPKVV, Palampur	Bajaura
Jharkhand	BAU, Ranchi	Ranchi
Karnataka	UAS, Dharwad	Dharwad
Kerala	ICAR-IISR, Calicut	Calicut
	ICAR-CTCRI, Thiruvananthapuram	Thiruvananthapuram
Madhya Pradesh	JNKVV, Jabalpur	Jabalpur
	ICAR-IISS, Bhopal	Bhopal
Maharashtra	DBS KKV, Dapoli	Karjat
Meghalaya	ICAR RC for NEH Region, Umiam	Umiam
Punjab	PAU, Ludhiana	Ludhiana
Tamil Nadu	TNAU, Coimbatore	Coimbatore
Uttar Pradesh	ICAR-IIFSR, Modipuram	Modipuram
Uttarakhand	GBPUAT, Pantnagar	Pantnagar
	ICAR- VPKAS, Almora	Almora
Gujarat	SDAU, Sardarkrushinagar	Sardarkrushinagar
Rajasthan	ICAR-NRC on Seed Spices, Ajmer	Ajmer
	MPUA&T, Udaipur	Udaipur
Sikkim	ICAR RC for NEH Region, Sikkim Centre	Sikkim
West Bengal	Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI-Deemed University), Narendrapur, Kolkata, West Bengal	Narendrapur



State / UT	AI-NPOF (20 no's)
Chhattisgarh	Raipur
Gujarat	SK Nagar
Himachal Pradesh	Bajaura
Jharkhand	Ranchi
Karnataka	Dharwad
Kerala	Trivandrum, Calicut
Madhya Pradesh	Jabalpur, Bhopal
Maharashtra	Karjat
Meghalaya	Umiam
Punjab	Ludhiana
Rajasthan	Ajmer, Udaipur
Sikkim	Gangtok
Tamil Nadu	Coimbatore
Uttar Pradesh	Modipuram
Uttarakhand	Pantnagar, Almora
West Bengal	Narendrapur

Fig. 2. Spatial map of All India Network Programme on Organic Farming centres (AI-NPOF)

3.4 Man Power (As on 31 December, 2023)

a. ICAR-IIFSR, Modipuram

The cadre strength of the institute is provided in Table 3, while the detailed discipline and cadre-wise breakdown of scientific manpower as of December 31, 2023, is presented in Table 6.

Table 3. Category-wise cadre strength

Category	Approved in XII Plan	In Position (31 December, 2023)	Vacant
RMP	01	01	00
Scientific	40	27	13
Technical	24	13	11
Administrative	22	14	08
Skilled Supporting Staff	23	23	00
Total	**110**	**78**	**32**

b. AICRP on Integrated Farming Systems

The cadre strength of the AICRP-IFS is provided in Table 4, while the details of filled and unfilled scientific, technical, and administrative manpower, categorized by discipline and cadre, are presented in Annexure V-A and Annexure V-B. Additionally, the centre-wise list of vacant posts for more than three years is included in Annexure V-C.

Table 4. Cadre Strength of AICRP-IFS as on date

Category	Existing		Vacant
	Sanctioned	In position	
Scientific	131	102	29
Technical	196	121	75
Total	**327**	**223**	**104**

c. All India Network Programme on Organic Farming (AI-NPOF)

There is no regular staff under AI-NPOF. During the review period, one Senior Research Fellow (SRF) and one Young Professional-I were provided to the cooperating centres. The Principal Investigator and team at these centres are nominated by the respective University or ICAR Institute.

3.5 Infrastructure Developed

a. Research Farm

The details about the research farm located at ICAR-IIFSR, Modipuram is given in Table 5.

Table 5. Details of the Research farm located at ICAR-IIFSR

#	Item	Details
1.	Research Farm	Main farm: 24.8 ha irrigated with underground irrigation system and protected with boundary wall. Siwaya farm: 26 ha with open channel irrigation protected with boundary wall. Farm office at Siwaya farm has been constructed during the period.

Organogram

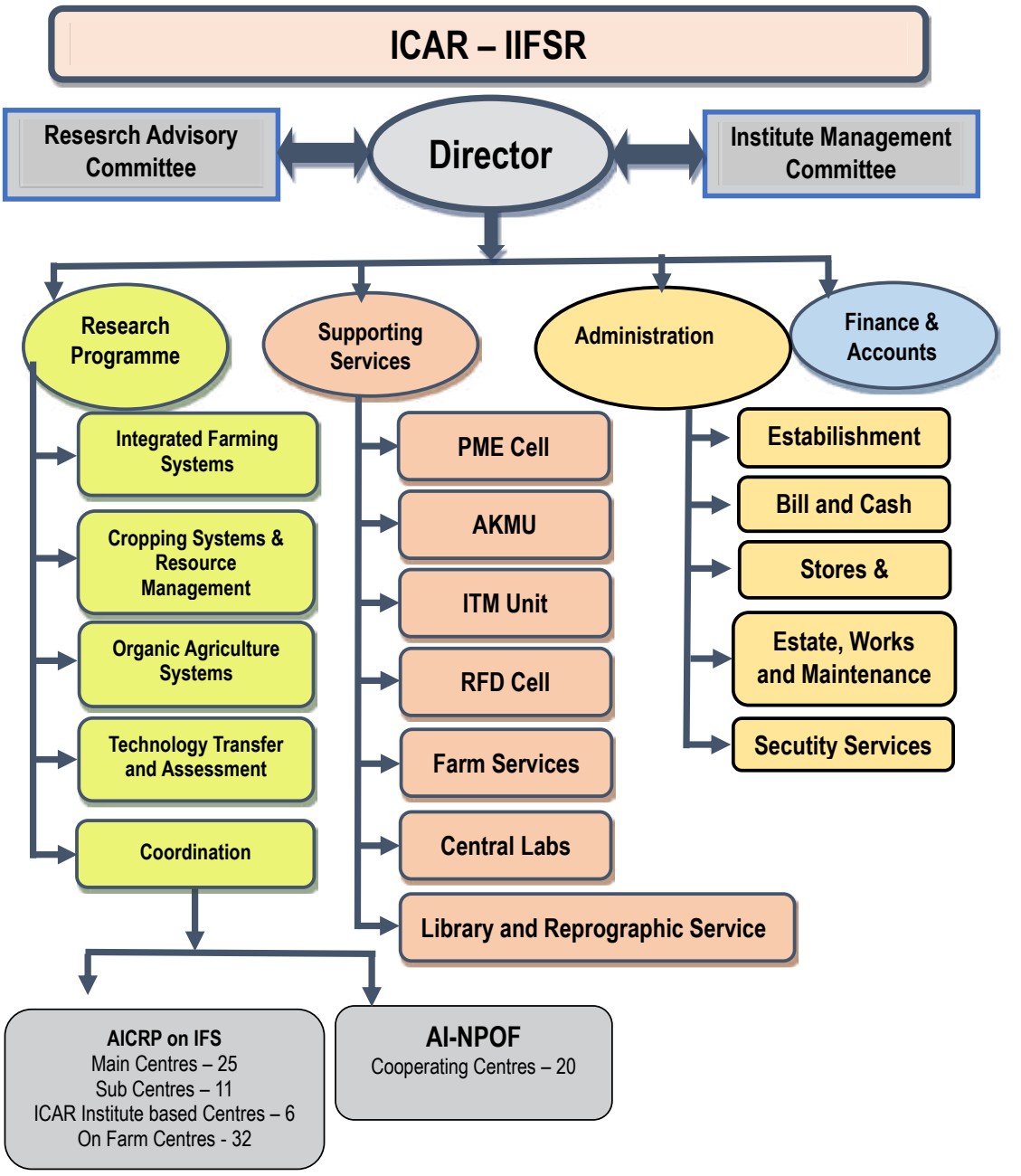

ICAR – IIFSR
Resesrch Advisory Committee
Director
Institute Management Committee
Research Programme
Supporting Services
Administration
Finance & Accounts
Integrated Farming Systems
Cropping Systems & Resource Management
Organic Agriculture Systems
Technology Transfer and Assessment
Coordination
PME Cell
AKMU
ITM Unit
RFD Cell
Farm Services
Central Labs
Library and Reprographic Service
Estabilishment
Bill and Cash
Stores &
Estate, Works and Maintenance
Secutity Services
AICRP on IFS
Main Centres – 25
Sub Centres – 11
ICAR Institute based Centres – 6
On Farm Centres - 32
AI-NPOF
Cooperating Centres – 20

Table 6 Discipline and cadre wise breakup of scientific manpower as on December 31, 2023

Discipline	Scientist (including Sr. Scientist and Pr, Scientists promoted through CAS)			Senior Scientist (DR)			Head of Divisions/Project Coordinator		
	Cadre Strength	In-Position	Vacancy	Cadre Strength	In-Position	Vacancy	Cadre Strength	In-Position	Vacancy
Agri Business Management	01	-	01	-	-	-			
Agricultural Chemicals	01	01	-	01	-	01	-	-	-
Agricultural Economics	01	01	-	-	-	-	-	-	-
Agricultural Entomology	01	-	01	-	-	-	-	-	-
Agricultural Extension	02	-	02	-	-	-	-	-	-
Agricultural Meteorology	01	01	-	01	-	01	-	-	-
Agricultural Microbiology	01	01	-	-	-	-	-	-	-
Agricultural Statistics	01	01	-	-	-	-	-	-	-
Agroforestry	01	01							
Agronomy	07	06	01	01	01	-	-	-	-
Aquaculture	01	01	-				-	-	
Computer Application in Agriculture	01	01	-	-	-	-	-	-	-
Environmental Science	01	-	01						
Farm Machinery & Power	01	-	01	-	-	-	-	-	-
Fish Resource Management	01	01	-	-	-	-	-	-	-
Fruit Science	01	01	-	01	-	01	-	-	-
Genetics & Plant Breeding	-	-	-	01	01	-	-	-	-
Home Science	01	01	-	-	-	-	-	-	-
Land & Water Management Engineering	01	-	01	-	-	-	-	-	-
Poultry Science	-	-	-	01	01	-	-	-	-
Plant Pathology	01	01	-	-	-	-	-	-	-
Plant Physiology	01	-	01	-	-	-	-	-	-
Soil Science	01	01	-	01	-	01	-	-	-
Vegetable Science	-	-	-	01	01	-	-	-	-
Head of Divisions/Project Coordinator							04	04	-
Total	**28**	**19+1***	**09**	**08**	**04**	**04**	**04**	**04**	**-**

*One Principal Scientist adjusted against the post of Scientist

a. Laboratories

The details of the laboratories, along with the major equipment, are provided in Table 7. The list of major equipment purchased during the review period is presented in Table 8.

Table 7. Details of the Research farm

#	Item	Details
1.	Number of labs	03 (Central Analytical Lab-Soil, Crop Physiology Lab and Organic Lab)
2.	Major Equipment's	Atomic Absorption Spectroscopy, Auto N Analyzer, Gas Chromatograph, Water double distillation Unit, Double-beam UV-VIS Spectrophotometer, CHNS Analyser, Pressure Plate Apparatus, On-line CO_2 Analyser, Cone Penetrometer, Root Image Analyser/Scanner, Infra-Red Thermometer, Automatic Weather station, Microwave digester, Leaf area meter, SPAD meter and Green Seeker, Willey mill, mechanical stirrer, nitrogen distillation assembly, flame photometer.
3.	International Standard Referral Laboratory for Organic Farming	01 - International Standard Organic Referral Laboratory for Organic Farming developed by the NCRTC.

Table 8. List of key equipment's added during 2018-2023

#	Name of Equipment	Quantity (unit)	Cost (Rs. in Lakhs)
1.	Refrigerated Centrifuge	01	2.49
2.	Orbital shaking incubator	01	1.70
3.	UV-VIS Spectrophotometer	01	2.77
4.	Gas Chromatograph with accessories	01	40.95
5.	Deep freezer -20° C	02	2.35
6.	Rotary evaporator	01	3.29
7.	Digital soil moisture TDR	01	1.98
8.	Water bath Shaker	01	1.29
9.	Double distillation unit	01	1.10
10.	Centrifuge machine	01	1.70
11.	Heat Lux sensor with data logger	01	1.96

b. Library

Total number of books available in library is 3119.

c. Guest House

One new VIP-guest house developed by NCRTC which is not yet furnished.

d. Training hostel

One training-cum-farmers' hostel facility.

e. Transport facilities

At the Institute headquarters, transport facilities include one staff car (Swift-Dzire) and one multi-utility vehicle (Tata Sumo) for daily use. Each On-Farm Research (OFR) centre under the AICRP-IFS has been allocated one jeep (a total of 32) and one driver (a total of 32) to support the mobility of scientists and staff, enabling them to transport experimental materials to farmers' fields for participatory research. Recently, vehicles at 10 of the 32 centres have been replaced; however, the remaining 21 vehicles still need replacement to ensure effective research in farmers' fields.

f. Staff Welfare

The housing facilities at institute level is available, but these need to be further strengthened in line with ICAR norms. Currently, there are no provisions for staff transportation to the office, children's parks, or educational institutions for their children. The institute offers only limited sports facilities; however, a contingent of 20-25 staff members participates annually in the ICAR-organized inter-institutional sports meet. Due to the limited number of staff, the institute has not established its own health facilities. Nonetheless, common medical services are available to staff and their families through Authorized Medical Attendants (AMAs) and CGHS-approved hospitals. Details of the category-wise housing facilities are provided in Table 9.

Table 9. Housing facility (Number of quarters as on date)

#	Description of quarter	Category	Total (No.)	Allotted (No.)	Vacant (No.)
1	Director Residence	VI	1	1	-
2	OH-241	V-B	1	-	1
3	OH-13	V-A	1	-	1
4	OH-25, OH-26, OH-27, OH-28, OH-29, OH-240	IV Special	6	5	1
5	PH-1, PH-2, PH-3, PH-4, PH-5, PH-6, PH-7, PH-8, PH-9, PH-16, PH-17, PH-18, PH-19, PH-20, PH-21, PH-22, PH-23, PH-24,	IV	18	11	7
6	O-60, O-61, N-152, N-157, III/1, III/2, III/3, III/4, III/5, III/6, III/7, III/8	III	12	6	6
7	O-120, O-121, O-122, O-123, O-124, O-125, O-127, O-128, O-129, O-130, O-131, O-132, N-217, N-222, N-223, N-224, N-225, N-205/1, N-205/2,	II	19	5	14
		Total	**58**	**28**	**30**

Note: 6 number of quarters (Category-II) are in very dilapidated condition.

g. Other facilities

The other facilities, some of which were created earlier, have been suitably upgraded and strengthened to support the research activities and staff of the institute.

i. One number of 250 KVA Generator for office

ii. Seven number of RO cum water cooler were installed

iii. Installation of Roof Top Solar Panel

iv. One Technology Park

v. Other Facilities for Research

3.6 IMC, RAC, IRC meetings and action taken

The meetings of all committees (IMC, RAC, and IRC) were organized in accordance with ICAR norms. During the review period, the Institute made sincere efforts to take appropriate actions on the recommendations of these committees. The year-wise frequency of the different meetings is presented in Table 10.

Table 10. IMC, RAC and IRC meetings held during the review period

Year	IMC	RAC	IRC
2018-19	March 29, 2019	May 3-4, 2018	August 04, 2018
2019-20	May 22, 2019	August 2-3, 2019	Oct 04-05, 2019 & Oct 14, 2019
2020-21	-	-	May 6, 8, 9,15 &16, 2020
2021-22	-	June 24-25, 2021	March 19, 21, 26, 28 & 30, 2022
2022-23	-	June 06-07, 2022	-
2023-24	December 01, 2023	April 14-15, 2023	June 19-26, 2023

In addition, ICAR-IIFSR has the following fully functional committees to protect the interests of its employees:

i. Institute Joint Staff Council

ii. Grievance Cell

iii. Staff Welfare Committee

iv. Women Complaint Committee

3.7 Human Resource Development

a. Trainings and winter/ summer schools organized by Institute: During the review period, the institute organized 26 workshops, seminars, conferences, and symposia, 52 training programmes of varying durations, 3 summer/winter schools and short courses, and 102 other activities. The details are provided in Annexure II a, b, c and d.

b. Trainings, winter/ summer schools attended by ICAR-IIFSR staff: Many scientists and technical staff were assigned to attend training sessions, as well as winter and summer schools. Further details can be found in Annexure II e.

c. Participation of Scientists in Conferences/ Seminars/ Symposia etc.: Most of the scientists who worked at the institute during the review period attended conferences, seminars, and symposia where they presented their research findings. The details are provided in Annexure III.

3.8 Budget

a. ICAR-IIFSR, Modipuram

The budget outlay of ICAR-IIFSR is given in Table 11 and Table 12.

Table 11. Grant in General + Additional Fund and Capital **(Rs. in lakhs)**

Year	Plan Outlay	Allocation (BE/ RE)	Expenditure
2018-19	197.17	332.75	331.95
2019-20	245.07	407.26	391.26
2020-21	296.56	296.56	269.02
2021-22	320.20	320.89 + 100*	320.20 +100*
2022-23	310.38	310.39	310.34
2023-24	449.65	449.65	449.65
Total	**1819.03**	**2217.50**	**2172.42**

*Additional Fund under General

Table 12. Grant in Aid Salary and Pension **(Rs in lakhs)**

Year	Allocation	Expenditure
2018-19	1717.44	1717.44
2019-20	1326.00	1326.00
2020-21	1619.19	1619.19
2021-22	1740.73	1725.11
2022-23	1704.61	1703.51
2023-24	1752.15	1752.15
Total	**9860.12**	**9843.4**

b. AICRP-IFS

Table 12A. The budget outlay of AICRP-IFS **(Rs. in lakhs)**

Fin. Year	Plan Outlay	Allocation (RE)	Released	Excess (+) / Deficit (-)
2018-19*	3269.45	2797.07	2797.07	-472.38
2019-20*	3759.87	2128.03	2128.03	-1631.84
2020-21**	2635.05	2635.05	2635.05	0.00
2021-22***	673.37	673.37	673.37	0.00
2022-23***	579.37	579.37	579.37	0.00
2023-24***	603.46	603.46	603.46	0.00
Total	**11520.57**	**9416.35**	**9416.35**	**-2104.22**

*Medium term outlay, **Annual Plan, ***EFC period 2021 to 2026, G-I-A Salary excluded from Plan

c. All India Network Programme on Organic Farming

Table 13. The budget outlay of AI-NPOF **(Rs. in lakhs)**

Year	Plan Outlay	Allocation (BE/ RE)	Released	Excess (+) / Deficit (-)
2018-19*	181.70	184.62	184.62	2.92
2019-20*	208.96	150.45	150.45	-58.51
2020-21**	219.12	219.12	219.12	0
2021-22***	251.42	251.42	251.42	0
2022-23***	193.78	193.78	193.78	0
2023-24***	252.58	252.58	252.58	0
Total	**1307.56**	**1251.97**	**1251.97**	**-55.59**

*Medium term outlay, **Annual Plan, ***EFC period 2021 to 2026, G-I-A Salary excluded from Plan

3.9 Linkages

The institute has established linkages with several national and international institutions, in addition to collaborating with AICRP-IFS and OFR centres located in various ICAR institutes and State Agricultural Universities (SAUs). ICAR-IIFSR has developed Statements of Understanding (SoUs) with 12 ICAR institutes and 8 AICRPs to foster partnerships in knowledge, technology, material, and resource sharing for Integrated Farming Systems Research, which is conducted across the country through 74 centres (both on-station and on-farm) under the AICRP on IFS. The key points of the SoUs developed with various institutes are summarized in Table 14.

Table 14. List of the organization for collaboration with ICAR-IIFSR

Organizations/Institutes	Nature of collaboration (Major area of R&D partnership)	Area of collaboration
(a) National		
ICAR-CARI, Izatnagar, Bareilly	• Diversified poultry germplasm for marginal and small farmer's • Low-cost poultry housing • Training on preparation of salted egg for improving keeping quality	Bihar, Jharkhand, Odisha, Uttarakhand and Uttar Pradesh
ICAR-IIHR, Bengaluru	• Micro nutrient enriched vegetables for selected farming systems • Hybrid seedling technology to on-farm centres • Papaya hybrids for farming systems research • Dryland horti based systems	Karnataka, Tamil Nadu, Andhra Pradesh, Kerala and Goa
ICAR-NIANP, Bengaluru	• Area specific mineral mixture to dairy animals for selected farming systems • Area specific mineral mixture to small ruminants • Low-cost azolla production technology and silage making • Ration balancing using local feed resources	Karnataka
ICAR-CISH, Lucknow	• Identifications of options for fruit module • Rejuvenation and management of existing fruit plants • Supply of planting materials and capacity building	Bihar, Gujarat, Haryana, Jharkhand, Madhya Pradesh, Maharashtra and Uttar Pradesh
ICAR-NRC on Pig, Guwahati (including AICRP on Pig)	• Pig germplasm for livestock module • Scientific rearing of pig	A&N Islands, Assam, Chhattisgarh, Goa, Jharkhand, Meghalaya and West Bengal (Bali Island)
ICAR - DWR, Jabalpur (including AICRP on Weed control)	• Sharing of expertise in the field of weed management and weed dynamics • Utilization of weed biomass for mulch and vermicompost preparation	Madhya Pradesh, Andhra Pradesh, Assam, Odisha, Chhattisgarh, Himachal Pradesh, Jharkhand, Punjab, Tamil Nadu, Uttar Pradesh and Uttarakhand
AICRP on Nematodes	• Study on nematode behavior in various farming systems • Nematode management techniques and capacity building	Assam, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh and West Bengal
ICAR-IGFRI, Jhansi (including AICRP on Forage crops)	• Improved fodder varieties in farming systems • Knowledge sharing and capacity building	Punjab, Madhya Pradesh, Himachal Pradesh, Assam and Andhra Pradesh
ICAR-CAFRI, Jhansi (including AICRP on Agroforestry)	• Supply of improved MPTS planting materials and knowledge sharing • Carbon sequestration study in agroforestry systems	Gujarat, Punjab and Odisha

ICAR-IIWM, Bhubaneswar (including AICRP on Water Management)	• Water budgeting for agriculture and fish production system • Multiple water uses based farming systems • Runoff management in farming systems	Meghalay, Odisha, Maharashtra, Jammu and Kashmir, Himachal Pradesh, Tamil Nadu and Gujarat
ICAR-CIFA, Bhubaneswar	• Collaborative on-station and on-farm studies in farming system perspective • Collaboration in Bali Island under TSP for farming systems research and development • Refinement of farming system model at CIFA in collaboration with PDFSR	Assam, Odisha and West Bengal
ATARI, Kolkata	• On station and OFR centres of AICRP-IFS working in various districts in Zone-II to be linked to the respective KVKs for demonstration of identified IFS modules and models • Synthesis of IFS modules and models for all the districts in the zone • Analysis of technological, financial, policy and institutional impediments in up scaling IFS models to be done jointly by the AICRP-IFS centres and KVKs Organizing regional meetings with KVKs and AICRP centres for identifying/synthesizing the suitable IFS modules/models based on constraint analysis and demonstration of the same through KVK	States covered in Zone-II
ICAR-DPR, Hyderabad (Including AICRP on poultry)	• Rural poultry production technology • 17 AICRP & poultry seed project centres of DPR and AICRP-IFS can be linked to supply the germplasm of Vanaraja, Gramapriya, Srinidhi and other varieties developed by AICRP centres including scientific expertise. • Field testing of new chicken varieties developed at DPR and its centres	A&N, Andhra Pradesh, Assam, Chhatisgarh, Himachal Pradesh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal
ICAR-IIOR, Hyderabad (Including AICRP on oilseeds)	• Sharing of best varieties and scientific package of oilseeds for farming systems • Front Line Demonstration (FLD) on cropping/farming systems involving oilseeds	Andhra Pradesh, Karnataka, Gujarat, Tamil Nadu, West Bengal
(b) International		
International Maize and Wheat Improvement Centre (CIMMYT), Mexico	Farming Systems Analysis, systems modelling, Typology for targeting, Conservation Agriculture and Climate Smart Agriculture	ICAR-IIFSR and AICRP on IFS
Wageningen University of Research, The Netherlands	Farm Design	ICAR-IIFSR and AICRP on IFS
International Plant Nutrition Institute, USA	Designing of Nutrient Expert for cropping and farming systems	ICAR-IIFSR and AICRP on IFS
International Rice Research Institute, Philippines	Rice-based cropping systems	ICAR-IIFSR

University of Colombia, USA	The Agricultural Model Intercomparison and Improvement (AGMIP) and Global yield gap analysis (GYGA)	ICAR-IIFSR
BISA-CIMMYT	Atlas on Climate Adaptation in South Asian Agriculture (ACASA)	ICAR-IIFSR
International Maize and Wheat Improvement Centre (CIMMYT), Mexico & ACIAR	Additive Intercropping in Wide Row Crops for Resilient Crop Production in Bangladesh, Bhutan and India	ICAR-IIFSR
International Water Management Institute (IWMI)	Project on Transformational Agroecology across Food, Land and Water Systems	ICAR-IIFSR

3.10 Achievements and Impact

3.10.1 Achievements

3.10.1.1 ICAR-Indian Institute of Farming Systems Research, Modipuram

(A). Integrated Farming Systems (IFS)

(i) Sustainable IFS model for small and marginal farmers

The IFS model (1.5 ha) was developed with assured irrigation facilities and includes various components such as crops (1.04 ha), dairy (2 Murrah buffaloes and 1 Gir cow), horticulture (0.22 ha), fishery (1000 m^2), mushroom cultivation (200 m^2), a vermicomposting unit (200 m^2), a kitchen garden (20 m^2), and boundary plantation with fruit trees (200 m in length). The total productivity of the entire system, expressed in terms of sugarcane equivalent yield, amounted to 246.9 tonnes/ha/year. The gross and net returns from all components of the IFS model were ₹ 5.18 lakh/ha/year and ₹ 3.28 lakh/ha/year, respectively, resulting in a benefit-cost (B:C) ratio of 3.37. Additionally, the model produced 19.95 tonnes/year of by-products, which facilitated the recycling of 282.6 kg of nitrogen (N), 126.3 kg of phosphorus (P), and 229.4 kg of potassium (K), leading to a savings of 56.7% in the farm's NPK requirements. The economic value of this nutrient recycling was estimated at ₹ 15,052/year. The model also generated 525 man-days/ha/year, underscoring its contribution to employment generation. The highest greenhouse gas (GHG) emissions were recorded in cereal-based cropping systems (472 kg CO2-e), while vegetable-based systems exhibited the lowest emissions.

(ii) Refinement of vegetable-based farming system models for food and nutritional security

The horticulture-based farming system model was developed using four distinct modules: M_1 - fruit orchards with intercropping of vegetables (0.4 ha), M_2 - vegetables (0.5 ha), M_3 - field crop-based (0.4 ha), and M_4 - pond dyke system (0.1 ha) integrated with poultry for small and marginal farmers. M_2 accounted for the largest share of vegetable cultivation area at 34%, followed by M_1 at 27%, M_3 (crop-based) also at 27%, and M_4 (pond dyke system with poultry integration) at 7%. This horticulture-based farming system model (1.5 ha) provided a gross return of ₹ 4,07,776 and a net return of ₹ 2,25,961 per year, which is adequate to meet the food needs of a family of five. The model could generate a marketable surplus of ₹ 7,44,862 annually. The economic efficiency of M_1 (fruits with intercropping) was the highest at ₹ 685/ha/day, followed by M_3 at ₹ 361.03/ha/day. Overall, the total economic efficiency of the model was ₹ 460/ha/day. Additionally, the model promoted gender equity, with men contributing 40% and women contributing 60% of the total workforce.

(iii) Sustainable livelihood generation through IFS involving less economic cattle

The less economic cattle-based IFS module (crop + improved feed and care for cattle + additional poultry/ goatary) recorded an overall net return of Rs. 1.61 lakhs with a B:C ratio of 1.88. A total of 3977 kg of green moringa fodder was fed to the cows, which is equivalent to 266 kg of protein, saving 1332 kg of concentrate ration.

(iv) Influence of pesticides application in IFS model on aquaculture module and measurement of GHGs emission from aquaculture ponds

A database of pesticide usage and quantification of active ingredients in 25 IFS models was analyzed. The IFS models were categorized into low (less than 0.2 kg a.i. per ha), medium (between 0.2 to 0.4 kg a.i. per ha), and high (above 0.4 kg a.i. per ha). The results revealed that pesticide use varied from 0.006 to 5.12 kg a.i. per ha.

(v) Protocol for a marginal farmer for value added products from organically grown sugarcane

The process and protocol for immune-boosting organic jaggery were standardized for both solid and liquid forms. The maximum overall organoleptic score (7.9±0.2) was recorded for solid organic jaggery made from sugarcane juice treated with 1% Mulethi, 0.1% Safed musli, 0.1% Tulsi, and 1% Cinnamon. For liquid organic jaggery, the highest score (8.1±0.3) was recorded for sugarcane juice treated with 0.1% Cardamom oil.

(vi) Small tools and farm implements

A multi-purpose horticultural crop harvesting scissor has been ergonomically designed and developed to reduce and prevent risk factors while enhancing productivity and quality for manual harvesters of horticultural crops. The scissor features one blade with a serrated sharp edge and another blade with a notch cut design and a sharp edge. The notch design provides a firm grip on the stem being cut, while the serrated blade reduces cutting effort. The tool proved highly effective, improving work output by approximately 9–11%, reducing grip fatigue by around 49%, 39%, and 58%, and lowering the strain index by approximately 44.37%, 56%, 55%, 47%, and 69% during vegetable harvesting. A patent has been filed for this innovation.

(B). Cropping Systems and Resource Management

(i) Resource management for reduction in Global warming potential of rice-wheat cropping system

Global Warming Potential (GWP) was reduced by 11.5% in direct-seeded rice (DSR) compared to transplanted rice under higher carbon strata. CH_4 flux ranged from 170.8 to 608.34 mg m^{-2} day^{-1} under DSR and from 200.54 to 1225.87 mg m^{-2} day^{-1} under transplanted rice. The application of DCDA reduced GWP by 25.6% and 17.8% under higher carbon and medium carbon strata, respectively, under conventional tillage.

(ii) Evaluation of cropping sequences for crop intensification under conservation agriculture (CA) and conventional practices (CP)

Eight cropping sequences were evaluated for crop intensification under conservation agriculture (CA) and conventional practices (CP). The rice-wheat-green gram system recorded the highest net returns of Rs. 1.53 lakhs ha^{-1}. CA practices, with 8.63 t ha^{-1} of residue incorporation, increased soil organic carbon content by 7.14% and reduced bulk density by 3.84%. On average, CA practices saved 8.18% irrigation water, 28.62% labour, and 17.94% diesel and energy compared to CP. Among the cropping sequences, the sugarcane-ratoon-wheat system under CA recorded the maximum savings in irrigation water (18.26%) and labour (31.73%).

(iii) Physiological approaches for improving productivity of sugarcane

Indole butyric acid @ 100 ppm and waste decomposer improved tillering (171.8 and 167.3 '000'/ha), cane weight (1.64 and 1.59 kg), and yield (117.4 and 130.9 t/ha) in winter-planted sugarcane compared to other treatments. In spring-planted sugarcane (Co-0238), waste decomposer enhanced cane height (268.00 cm), tillering (181.19 '000'/ha), and yield (120.94 t/ha) over the other treatments. Across both planting seasons (winter and spring), waste decomposer increased tillering by 15.3% and 18.6% and yield by 20.4% and 31.6%, respectively.

(C). Organic Agriculture Systems

(i) Package of practices for organic production system in basmati rice-mustard system

An organic package of practices was developed for the basmati rice-mustard cropping system using concentrated organic manure during the conversion period. The application of mustard cake significantly improved growth, grain/seed yield, and chlorophyll content, outperforming FYM and vermicompost. Basmati rice yields increased by 44–115%,

and mustard productivity rose by 45.1–100.1% with mustard cake. The highest yields of basmati rice (4,565 kg/ha), mustard (2,647 kg/ha), and system productivity in rice equivalent yield (10.42 t/ha) were achieved with 5.0 t/ha of mustard cake in both seasons. The highest system net return of Rs. 1,17,638/ha with a B:C ratio of 1.82 was realized with 2.5 t/ha of mustard cake in both seasons. Mustard cake application boosted bacterial populations, while higher doses of FYM and vermicompost showed increasing trends in fungal populations and soil enzyme activity.

(ii) Nutrient management in different cropping systems under organic production systems

Nutrient management for three cropping systems—maize-chickpea-green gram, basmati rice-wheat, and sugarcane-ratoon-wheat—under organic production was standardized, specifying the appropriate dose and type of organic inputs, along with green manuring and legume residue incorporation.

Sugarcane-ratoon-wheat: Among organic nutrient management practices, the highest sugarcane yield was realized with 100% recommended dose of nitrogen (RDN) applied through a combination of 33% FYM, 33% vermicompost, and 33% mustard cake, along with green manuring (GM), followed by the same treatment without GM. Similarly, the highest net return was realized with 100% RDN without GM, followed by 75% RDN without GM.

Basmati rice-wheat-sesbania green manure: Among organic management practices, the highest basmati rice yield was recorded under 100% RDN + GM, followed by 75% RDN + GM. Grain yield was 15.4% higher under 100% RDN through 33% FYM, 33% vermicompost, and 33% mustard cake + GM, compared to 100% RDN without GM treatments. The highest rice equivalent yield (REY) and net return were observed under the 100% RDN through 33% FYM, 33% vermicompost, and 33% mustard cake + GM treatment, which were on par with inorganic management. The highest populations of bacteria, fungi, and dehydrogenase activities (DHA) were found under the 100% RDN through 33% FYM, 33% vermicompost, and 33% mustard cake + GM treatments. However, β-glucosidase and urease activity were highest under the 100% RDN without GM treatment.

Maize-chickpea-green gram: System productivity of the maize-chickpea-green gram system was highest under 100% RDN + legume crop residue (LCR) incorporation, followed by 75% RDN + LCR, and lowest under inorganic management. Legume crop residue incorporation improved system productivity by 11.3–14.1%. The highest system net return was observed under 100% RDN + LCR, followed by 75% RDN + LCR, and inorganic management.

(iii) Pest and disease management package for organic farming

A pest and disease management package for three vegetable crops - tomato, cauliflower, and brinjal was standardized using organic inputs. The package includes nursery raising in soil-solarized plots; application of nitrogen (N) at 150 kg/ha through organic sources (50% FYM, 35% vermicompost, and 15% neem cake); soil/seed/seedling treatment with *Trichoderma*, *Pseudomonas fluorescens*, *Beauveria bassiana*/*Metarhizium*; mulching with black polythene sheets; and scheduled preventive spraying of on-farm prepared botanical pesticide (dashparni extract @ 3% + livestock urine @ 10%) at 15-day intervals. Additionally, one spray of fermented buttermilk (10%) at 20 days after transplanting (DAT) and one spray of panchgavya (3%) at 50 DAT were included. The curd yield of cauliflower (326 q/ha) and fruit yields of tomato (219.6 q/ha) and brinjal (322.05 q/ha) were recorded under the organic pest and disease management package.

(iv) Validation of microbial consortia for crop residue recycling under organic farming system

A total of 30 fungal isolates were obtained from various samples, including those collected from waste decomposition sites, long-term 100% organic plots of AI-NPOF, mustard oil cake, undisturbed soil, etc. The isolates were screened for cellulolytic, hemicellulolytic, and lignolytic activities, both qualitatively and quantitatively, to assess their decomposition potential. Among these isolates, five Isolate 7, 8, 10, 11, and 13 were found to be superior in xylanase activity (229.85–258.93 IU/g dry paddy straw) and FP activity (>3.0 IU/g dry substrate) with paddy straw as the sole carbon source, using solid-state fermentation at 28°C for a 10-day incubation period. In-situ decomposition of paddy straw showed a 25% increase in dry weight reduction with Isolate 8, compared to the control (un-inoculated). The cultures exhibited good growth compatibility in the dual-culture plate technique, except for Isolate 12.

To enhance the nutrient solubilization potential (P, K, and Zn) of the consortia, 60 fungal isolates were obtained from various samples collected from forest areas, the Rapti River in Gorakhpur, the National Biodiversity Park, and coalmine areas in Ranchi. The nutrient solubilization potential of the different isolates was tested qualitatively on Pikovskaya agar (for P solubilization), zinc-solubilizing agar, and Aleksandrow agar (for K solubilization). Out of the 60 isolates, 18 were found to be good phosphorus solubilizers, 21 were zinc solubilizers, and 2 were potassium solubilizers.

(v) Crop improvement programme for organic production systems

Two mustard strains, MM16A241 (29.83 q/ha) and MM16A082 (29.06 q/ha), were developed for organic production through transgressive breeding. Both strains recorded a 10 to 13% higher seed yield compared to the standard check RH-749, along with a 46% higher oil content. Three mustard varieties Maya (24 q/ha), Varuna (19.5 q/ha), and Basanti (18.45 q/ha) and three wheat varieties 5-SR-05 (42.81 q/ha), DBW 187 (42.44 q/ha), and 3-SR-02 (37.07 q/ha) were identified for organic production. Additionally, three Basmati rice varieties Malviya Basmati (57.30 q/ha), PB 1609, and PB 1718 were also identified for organic cultivation.

(vi) Economics of ecosystems and biodiversity for agriculture and food initiative in Uttar Pradesh, India (Funded by UNEP)

The project under the Economics of Ecosystems and Biodiversity (TEEB) AgriFood in India focused on agricultural practices and ecosystem services with the aim of assessing agricultural schemes on Organic Farming (OF) and Agroforestry (AgF) practices in five districts of Uttar Pradesh: Meerut, Aligarh, Bulandshahr, Mirzapur, and Hamirpur. The study includes assessments and valuations of changes in natural capital, produced capital, and human and social capital as a result of scaling organic farming and agroforestry practices. In this project, three agricultural farming policy scenarios were considered: business as usual (BAU), optimistic policy, and pessimistic policy. These scenarios were integrated with two climate change scenarios: medium GHG emissions scenario (RCP 4.5) and high GHG emissions scenario (RCP 8.5), resulting in six future scenario combinations for assessment. The scenarios were modeled to capture the changes in the values of the capital base given the scaling of OF and AgF practices in the state. Under natural capital, total carbon (C) sequestration in the current year (2020) was 9.04, 12.4, 9.4, 55.4, and 10.2 million metric tons in Meerut, Bulandshahr, Aligarh, Mirzapur, and Hamirpur districts, respectively. Under the BAU policy, all districts showed a decline in C sequestration, ranging from -0.1% to -9.7% under RCP 4.5 and -0.43% to -15.5% under RCP 8.5, except for Aligarh district by the end of 2030. By 2050, C sequestration under BAU ranged from -6.3% to -14.5% under RCP 4.5 and -6.1% to -44.6% under RCP 8.5. However, under the pessimistic policy, C sequestration declined by -0.7% to -10.1% under RCP 4.5 and -0.8% to -28.3% under RCP 8.5 by 2030 across the respective districts. This decline in C sequestration further extended to -0.62% to -15.2% under RCP 4.5 and -1.05% to -45.4% under RCP 8.5 by 2050. On the other hand, under an optimistic land-use policy, C sequestration is predicted to increase substantially from 2030 to 2050 for all districts under both RCP 4.5 and RCP 8.5, compared to the BAU and pessimistic policy and climate change scenarios.

(D). Technology Transfer and Assessment

(i) On-farm evaluation of farming system modules for profitability and livelihood improvement for different farmer categories in the Western Plain Zone of Uttar Pradesh and Uttarakhand

Demonstrations of improved integrated farming system technologies were conducted at farmers' fields in two districts: Haridwar in Uttarakhand and Muzaffarnagar in Uttar Pradesh. Four villages were selected for the study, with two from each district: Badhai Kalan and Sahajpur Kalan in Muzaffarnagar, and Mandawali and Narsan Khurd in Haridwar. A baseline survey of 120 farmers (30 from each village) was conducted to determine the overall composition of landless, marginal, and small farmer categories in these villages:

- Different technological interventions were provided to farmers based on their identified problems and land holdings. Prior to the intervention, farmers cultivating sugarcane as a sole crop achieved a yield of 1100 q/ha. After the introduction of fennel as an intercrop with sugarcane, the system equivalent yield (SEY) increased to 1297 q/ha, resulting in an additional income of Rs. 80,400 per hectare.

- The sugarcane + garlic intercropping system achieved a higher system equivalent yield (SEY) of 1341 q/ha, which is 22% more compared to the existing sole cropping system.
- Cropping system diversification, integrated crop management, the inclusion of a fodder component, and proper feed management for dairy animals resulted in a 20.19% increase in the total income of small farmers compared to the existing system.
- Cropping system diversification with the inclusion of a vegetable component, a nutritional kitchen garden, and improved fodder availability for dairy animals resulted in a 32.21% increase in the annual income of marginal farmers compared to the existing system.
- Improved rearing practices, such as the use of feed supplements for milch animals and the inclusion of a nutritional kitchen garden, resulted in a 46.15% increase in the total net income of landless farmers.
- Weed management in sugarcane using the herbicide Sempra was found to control weeds by 85-90%, reducing labour costs. Due to timely weed control, the farmer gained an additional income of Rs. 20,000-25,000 per hectare from the increased sugarcane yield.

(ii) Cluster based on-farm participatory research in farming systems under Tribal Sub Plan

A total of 100 households in the tribal-dominated villages of Thari, Veerpur Tara, and Mallapuri in the Ramnagar block of Nainital district were covered under on-farm participatory research in farming systems as part of the Tribal Sub Plan. The rice-wheat-based tribal farming system households were characterized and diversified into four types: 1) Crop (Rice/black gram-wheat/mustard/lentil) + kitchen gardening (KG); 2) Crop (Rice/blackgram-wheat/lentil) + livestock (1 cow/1 buffalo + poultry) + vermicompost/mushroom + KG; 3) Crop (Rice/blackgram-wheat/mustard/lentil) + livestock (2 cows/1 buffalo + poultry) + mushroom/vermicompost + KG; and 4) Crop (Rice/blackgram-wheat/lentil) + livestock (0-1 local cow + poultry) + vermicompost + KG. The highest increase in income was observed in farm type 4, followed by farm type 2, with increases of 1.90 and 1.55 times, respectively, compared to the benchmark. Farm type 2 also showed the most significant changes in the consumption of pulses, milk, vegetables, and fruits (48.6%, 34.48%, 21.09%, and 29.62%, respectively), while farm type 4 had the highest increase in the consumption of animal foods (33.2%). Additionally, the greatest improvement in the consumption of green leafy vegetables was seen in farm type 3. The impact study indicated that partial adoption of improved practices (70-92%) was due to the non-availability of inputs such as improved poultry breeds, spawn, integrated pest management (IPM), and various marketing constraints.

(iii) Technology demonstrated for ensuring food and nutritional security through Integrated Farming Systems

Food and livelihood security through an Integrated Farming Systems (IFS) approach has been achieved in the villages of Satheri and Bhangi Bhangela, encompassing 1,036 households and an area of 828.8 hectares in the Khatauli block of Muzaffarnagar district. An impact study conducted in the adopted clustered villages revealed a significant improvement in the crop diversification index (Simpson's index), which increased from 0.42 to 0.53 due to IFS interventions. The highest sugarcane equivalent yield of 1,241.8 q ha^{-1} was recorded with sugarcane + mustard intercropping, followed by sugarcane + black gram intercropping at 1,068 q ha^{-1}. The system yield increased by 36% and 17% for mustard and black gram intercropping, respectively, compared to sole sugarcane cultivation. Livestock interventions, including improved fodder availability and mineral mixtures, led to an overall income improvement of 28% for cows and 20% for buffaloes compared to the benchmark. The highest net income increase was observed in the labour + goat farming system (201%), followed by labour + dairy + small ruminants (65%). Additionally, the introduction of piggery provided an extra gain of approximately Rs. 23,621 per landless household, while backyard poultry contributed about Rs. 8,643. A multi-tier horticulture-based integrated farming system resulted in a 136% increase in net income over the benchmark. The introduction of a secondary agriculture module yielded an additional gain of approximately Rs. 206,650 for the Devanjali Mahila Swayam Sahayata Samuh, a Self-Help Group linked to the Agri-Business Incubation (ABI) program for skill and marketing enhancement. Furthermore, a significant improvement in food consumption patterns was noted, with increases in green leafy vegetables (22% to 46%), other vegetables (15% to 36%), fruits (52% to 84%), milk (9% to

27%), and meat products (0% to 88%), while the consumption of sugar and jaggery decreased by 50% to 77%, aligning with recommended dietary allowances.

3.10.1.2 AICRP-Integrated Farming System

(A). On-Station Research

i. Establishment of 33 on-station integrated farming system models in 14 agro-climatic regions for research, extension, education, and business (bankable projects)

The major components of the IFS models include location-specific cropping systems, location-specific livestock components (cow, buffalo, poultry, duck, goat, pig), location-specific integration of fisheries, location-specific integration of horticulture (fruit orchard intercropped with vegetables), and location-specific integration of complementary/ supplementary enterprises such as apiary, mushroom cultivation, and biogas. Additionally, there is a compulsory integration of kitchen gardens, boundary plantations, and vermicomposting. These tailor-made prototype models, established at 30 State Agricultural Universities, 9 ICAR institutes, and 1 Central University, have the potential to increase income by 42% to 558% (Annexure VI) compared to existing systems/practices of farmers within 3 to 4 years across different regions. Thirty-one IFS models have been identified as bankable projects by NABARD, and a comprehensive financing package for IFS has been devised to support farmers. The IFS models developed for different regions address national priorities (Fig 3a to Fig 3e), such as reducing mineral fertilizer usage (0–100%), improving soil health (with a 22% improvement in soil organic carbon over 5 years), enhancing household-level human and livestock nutrition, and contributing to 13 Sustainable Development Goals in an integrated and holistic way. The IFS models are also found to be GHG emission neutral. The water productivity of the system has improved (5.4 to 12.3 kg/m^3 in various models) due to the integration of advanced management practices. These models also exhibit higher sustainable value indices (0.43 to 0.88) and generate employment ranging from 82 man-days (0.20 ha) to 737 man-days (1.0 ha).

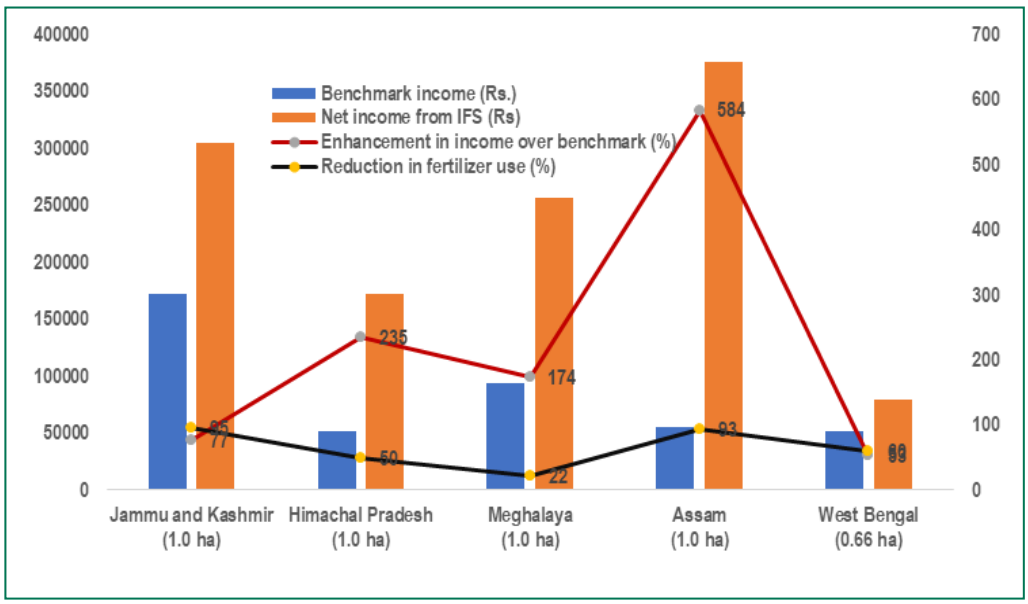


Fig 3a. Impact of IFS interventions on net income and fertilizer use in IFS models

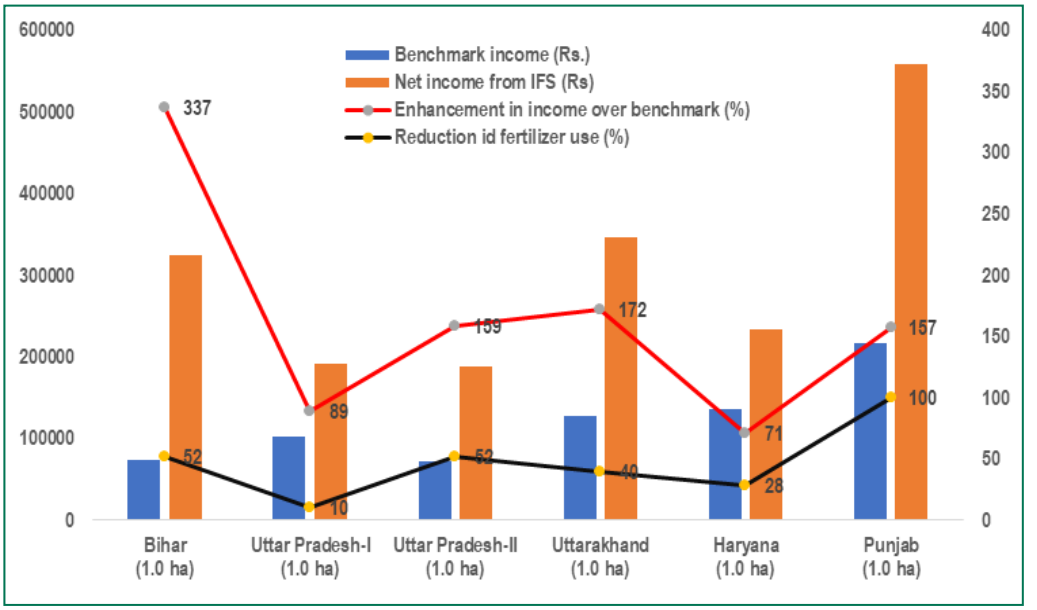


Fig 3b. Impact of IFS interventions on net income and fertilizer use in IFS models

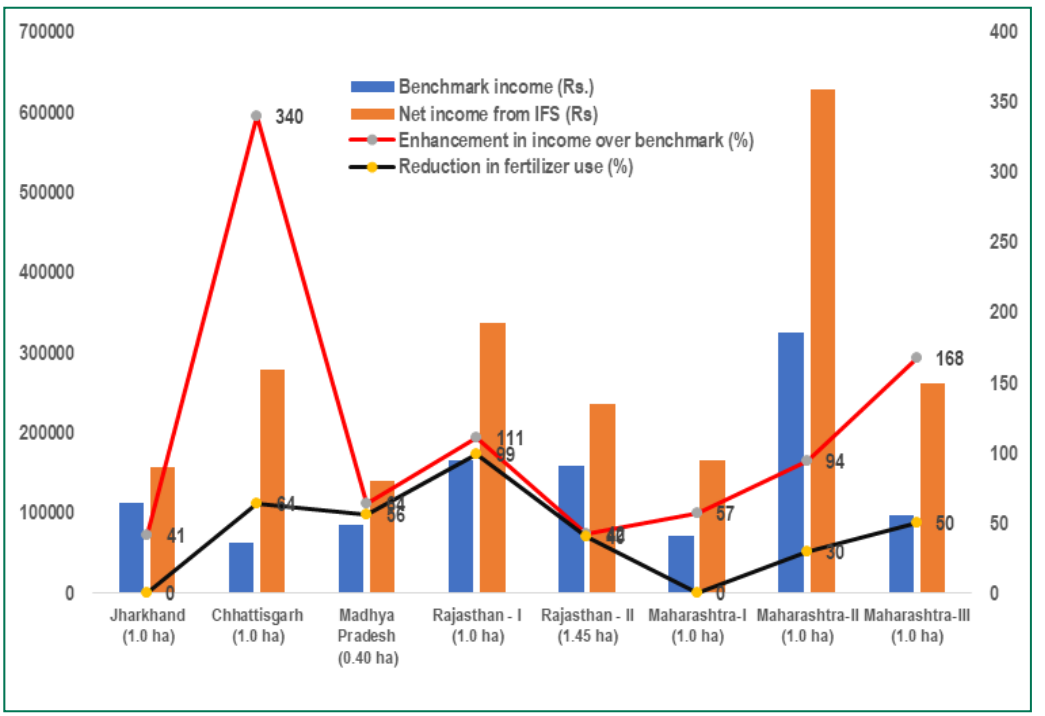


Fig 3c. Impact of IFS interventions on net income and fertilizer use in IFS models

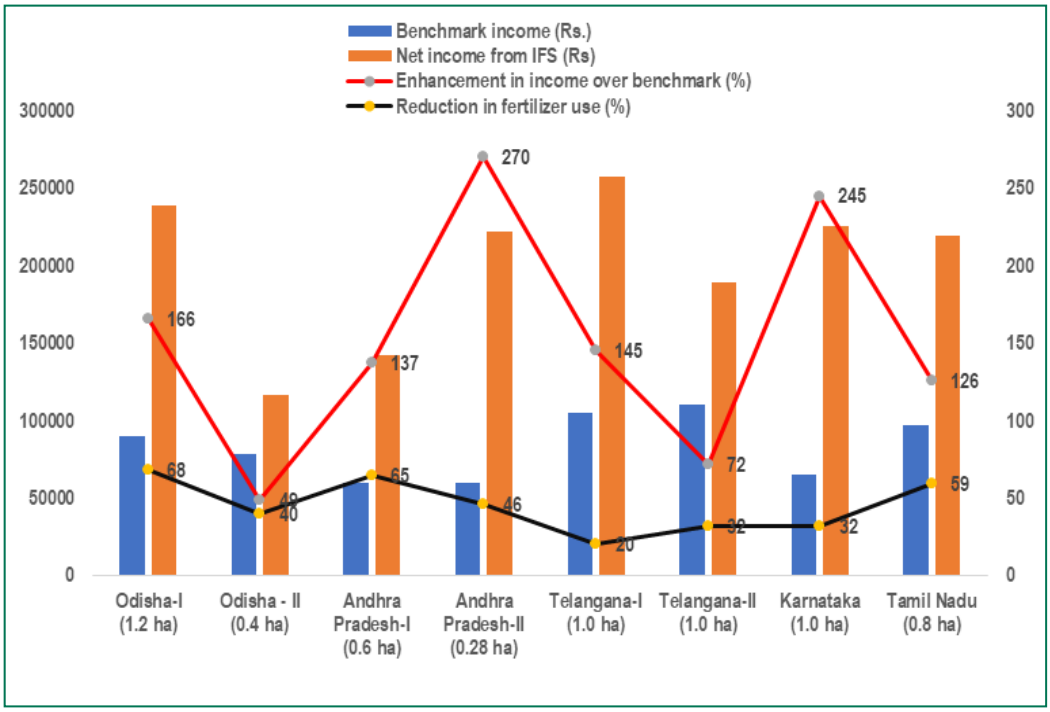


Fig 3d. Impact of IFS interventions on net income and fertilizer use in IFS models

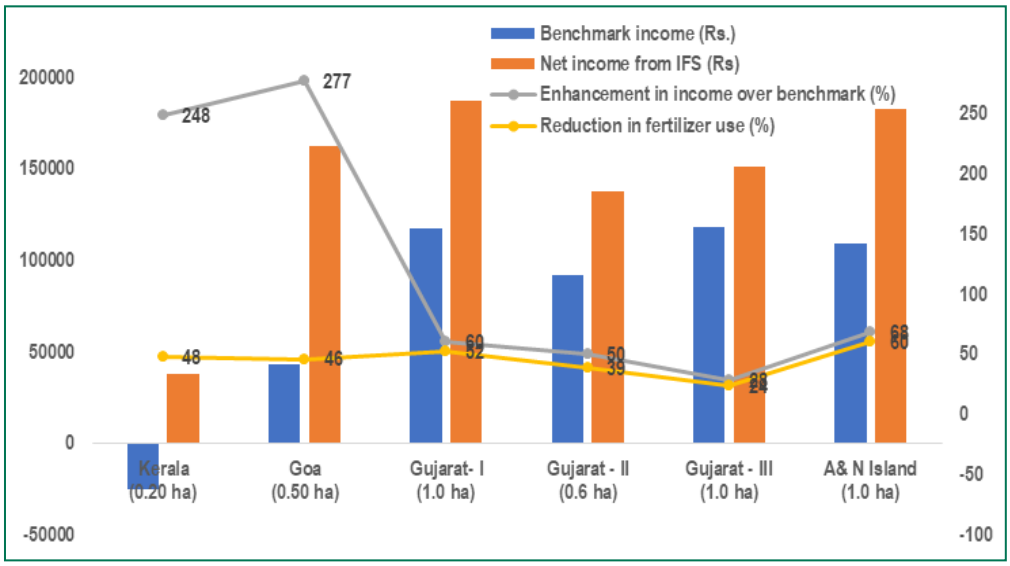


Fig 3e. Impact of IFS interventions on net income and fertilizer use in IFS models

ii. Bankable Projects on IFS

Based on the prototype IFS models developed, 31 bankable projects suitable for 21 states have been prepared, which meet the financing criteria for medium-term loans for capital investment and short-term (yearly) credit for recurring costs under the Kisan Credit Card (KCC). An interest rate of 11% for medium-term loans and 4% for KCC has been considered while developing the bankable projects. Since, over the years, the recycling from IFS models will increase

and recurring costs will reduce, a variable rate of recurring cost financing (80%, 70%, 60%, and 36% financing in the 1st to 4th years, respectively) is proposed to improve viability and net surplus. The 31 bankable projects meet the banking parameters, such as a B:C ratio (1.03 to 1.80), an internal rate of return (>15%), Net Present Worth (Rs 1.70 to 7.05 lakhs), with a payback period ranging from 3 to 5 years.

iii. Estimation of greenhouse gases (GHG) emission from IFS

A user-friendly ICAR-AICRP-IFS-GHG estimator was developed on the Excel platform, following the coefficients of IPCC (2007). The tool estimates the GHG emissions and carbon sequestration potential of all the IFS models based on the inputs applied and outputs obtained in each IFS model. It is simple to use and user-friendly. Most of the scientifically developed IFS models are found to be emission-neutral or emission-negative.

iv. Efficient alternative cropping systems with component packages

Based on multi-location studies at 37 on-station centers, efficient alternative cropping systems with agronomic management practices were identified, documented, and recommended for different farming systems (Table 15). The carrying capacity of the land was assessed for different agro-climatic regions. These alternative systems, along with their production packages, have been included in the Crop Production Guide/package of practices of the respective states.

v. Crop plan developed for 14 major crops using primary and secondary datasets

Identification of potential areas for crops followed a two-stage procedure. In the first stage, the Relative Spread Index (RSI), Relative Yield Index (RYI), and Sustainable Yield Index (SYI) were calculated using primary and secondary data on area, production, and productivity. These indices were then linked with the suitability class of the crop in different Land Management Units (LMUs) using the Soil Climate Suitability Index. The crops covered include rice, wheat, maize, sorghum, pearl millet, pigeonpea, chickpea, soybean, groundnut, mustard, sugarcane, cotton, onion, and potato (Table 16).

vi. Technologies shared among cooperators

An interface meeting with all the States was organized in May 2020, with the involvement of the Department of Agriculture & Farmers Welfare (DA&FW). During this meeting, on-station and on-farm IFS models were shared with all the States for implementation under NMSA/RFS/NRLM by the Ministry of Agriculture and Farmers Welfare and the Ministry of Rural Development. State-wise technologies and production packages developed from the project were included in the crop production guides published by both Central and State governments. The following developed technologies were shared among the co-opters (Table 17).

Table 15. Alternate cropping systems/ component packages developed

State	Name of the cropping system/ component technology	Description of the improved package / technology
Assam	Organic weed management practices for rice- toria– rice system	Stale seedbed + reduced spacing (up to 25%) + mulching with previous crop residues + one hand weeding for rice–toria – rice system
Chhattisgarh	Raised and sunken bed	Raised and sunken bed [rice in sunken bed and other remunerative upland crops like vegetable/ maize/pulses in raised bed during kharif.
Himachal Pradesh	Alternate cropping system to rice-wheat	Okra-turnip-tomato
Karnataka	Alternate cropping Systems to soybean-wheat	Sweetcorn -marigold - okra
Kerala	Intensification of cropping system in rice-based cropping system	Rice-rice- dhaincha + vegetables + maize

Madhya Pradesh	Alternate cropping System to rice-wheat /soybean-wheat	Baby corn +brinjal (1:1) – onion – okra
Maharashtra	Alternate cropping system	Cluster bean-carrot - coriander
	Weed management for organic production	Stale seed bed + reduced spacing + 2 tonne of straw+ one hand weeding at 25 DAS in soybean-chickpea
Odisha	Alternative cropping system to rice-rice/rice-fallow	Rice-potato-okra Rice-sweet corn-bitter gourd
Uttar Pradesh	Alternate cropping system with cereal and vegetables	Rice-potato- greengram Rice-Frenchbean- Greengram
	Weed management practices under organic production system	Stale seed bed + reduced spacing (up to 25%) + mulching with previous crop residues + one hand weeding (50 DAT/ DAS) for rice-potato- okra

Table 16. Season-wise potential states for major crops

Potential area classification	**Highly potential (Top 5 States based on suitability)**			
Season/Crop	***Kharif***	***Autumn***	***Rabi***	***Summer***
Rice	Tamil Nadu, Telangana, Uttar Pradesh, Karnataka, Bihar		Telangana, Odisha, Andhra Pradesh, Karnataka, Tamil Nadu	
Wheat			Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan, Bihar	
Maize	Karnataka, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh	Bihar, Jharkhand, West Bengal	Andhra Pradesh, Tamil Nadu, Telangana, Bihar, Karnataka	Bihar, Karnataka, West Bengal
Pearl Millet	Rajasthan, Maharashtra, Gujarat, Karnataka, Madhya Pradesh		Tamil Nadu	Gujarat
Sorghum	Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh		Karnataka, Maharashtra, Tamil Nadu, Andhra Pradesh, Telangana	
Pigeonpea	Maharashtra, Madhya Pradesh, Uttar Pradesh, Gujarat, Andhra Pradesh			
Mustard			Bihar, Uttar Pradesh, Rajasthan, Punjab, Haryana	
Groundnut	Odisha, Gujarat, Tamil Nadu, Maharashtra, Rajasthan		Tamil Nadu, Telangana, Odisha, Andhra Pradesh	Gujarat
Soybean	Madhya Pradesh, Telangana, Rajasthan, Maharashtra, Uttar Pradesh			

Table 17. Technology shared among cooperators during 2018 to 2023

State	Name of the technology	Technology details
Assam	Intensified and diversified Cropping systems for irrigated conditions	Winter rice-Chilli-Black gram Winter rice-Cabbage-Greengram
	Resource Conservation through cropping system and land configuration management under rainfed situation	Greengram and Sesamum (in 2:1 ratio) in broad bedded (BB) system and Rice in furrow (F) during Kharif; following Chili in broad bed (BB) and Toria in furrow during Rabi as well as growing of Cowpea during Summer
	IFS Model for 0.80 ha area	IFS Model with Field crops + Horticultural crops + Apiary along with additional return from processing in an area of 0.80 ha
Andhra Pradesh	50% RDF + 50% N through either FYM or Green manure in Rice-Rice cropping system	Integrated nutrient supply system viz., 50% RDF through inorganic and remaining 50% N through either FYM or Sesbania green manure
Bihar	Integrated nutrient anagement in rice-wheat system	Substitution of 25-50% N through FYM or G.M or wheat straw in rice- wheat system
	Two-acre IFS model	Crops + Livestock (two cows) + Fish/Duck
Chhattisgarh	Remunerative rice based cropping system	Rice- onion + coriander (1:1) – cowpea cropping system.
Gujarat	Permanent plot experiment on integrated nutrient supply system for a cereal based crop sequence	75% recommended dose of NPK through fertilizer + 25 % N through gliricidia leaves & tender twigs to kharif pearl millet and 75 % recommended dose of NPK to wheat
	Cropping system diversification and / or intensification	Groundnut + sweet corn (2:1) – Coriander + vegetable pea (2:1)- sesame + vegetable cow pea (2:1)
	Development of organic farming package for system based high value crops	FYM 6 t + vermicompost 4 t + castor cake 700 kg/ha in rice and FYM 1.5 t + vermicompost 1 t + castor cake 170 kg/ha in summer groundnut
Goa	Integrated farming system	Adoption of diversified integrated farming system (crops + dairy+poultry+goat) to improve the livelihood security
Haryana	Integrated nutrient management	Integrated nutrient management in pearl millet – wheat cropping system
Himachal Pradesh	Alternative cropping system to improve productivity and profitability of hill farmers	Rice-palak-cucumber Okra-radish-onion Rice-letuce-potato Turmeric-pea-summer squash
	Development and validation of on-station Integrated Farming System Model	Crop + livestock (dairy and poultry) + horticulture + mushroom
Jharkhand	50% N FYM+ 50% RDF - 100% RDF in cereal-cereal cropping system	50% N through FYM and 50% RDF through chemical fertilizers in kharif and 100% RDF through chemical fertilizers in rabi in maize- wheat system

Maharashtra	IFS model Bio-intensive complementary cropping system	Crop + Dairy + Goat + Poultry + Vermicompost
	Bio-intensive complementary cropping system	Planting on broad bed furrow at 1.5 in Kharif season Maize + Soybean (Bed), sesbania (Furrow) (2:1:2) and in rabi season, Chick pea (Bed) + Wheat (Furrow) (3:2) and in summer season Cowpea for veg (Bed) + Okra (Furrow) (3:2)
Odisha	Bio-intensive cropping system	Rice – potato + radish – pumpkin + amaranth, Rice– maize + coriander–cowpea + amaranth
	IFS Model	IFS with crops, horticulture, dairy, fishery and poultry modules.
Tamil Nadu	Bio-intensive complementary cropping systems	Onion - cotton - maize Green gram - cotton + sunnhemp –sunflower
	Organic farming packages for Chillies – Cowpea –Baby corn sequence	100% N to both chillies and cowpea given as EFYM + Vermicompost + NC (1/3rd each) with biofertilizer and phosphorus solubilising bacteria
	Integrated farming systems for irrigated uplands	Crop - horticulture - dairy (2 cows and one calf) - goat rearing (10+1) - biogas –vermicompost
Uttar Pradesh	Efficient and profitable cropping system	Maize + Black gram- Potato-Onion
	Organic Nutrient Management for Maize- Potato-Onion System	50% N through (FYM) + bio-fertilizers for N (Azoto) + Rock phosphate + PSB
Uttarakhand	Bio-intensive complementary cropping systems	Rice (DSR) - Veg. Pea – Maize Maize + Cowpea + Sesbania- Veg. Pea + Toria – Ground nut + Mentha
	Integrated farming system model for small farmers	Crops + dairy + horticulture / agroforestry + vermicompost + biogas
West Bengal	Raised and sunken bed model	Raised bed for vegetable cultivation and sunken beds for rice and fish cultivation in rainy season. Slope in the junction of beds utilized for fodder cultivation and some vegetable creepers may be grown above the sunken beds on netted scaffolds.

(B). On-Farm Research

i. Geo-referenced characterization of existing farming system in 20 states

Studied and documented 64 number of geo-referenced farming system success stories from on-farm farming systems research in 20 states (Annexure VIII). Some of the successful models practiced by farmers with slight improvement promises 110-222% higher net income to farmers than existing farming systems.

ii. Farming System modules and model identified for on-farm testing and validation Promising farming system modules (1) and models (14) identified for 12 States is given in Table 18.

Table 18. Promising farming system modules and models identified

State	Name of the technology / IFS module	Improved package / technology
A & N Islands	Land Configuration based farming system (0.75 ha)	Broad Bed and Furrow (vegetables + fodder on beds and rice, fish in furrows) (40%) + rice-based cropping systems (46%) + dairy (14%)
	Coconut + pig (1 ha)	Coconut + spices (85%) + pig (6%) + fish cum poultry (9%)
Bihar	Crop + goat + poultry (0.40 ha)	Cropping systems (69%) + horticulture (10%) + livestock (18%) + mushroom (3 %)
Gujarat	Crop + dairy + fish (0.80 ha)	Cropping systems (67%) + livestock (16%) + fish cum duckery (17%)
	IFS for marginal farmer (1 ha)	Cropping systems (75%) + horticulture (12%) + livestock (buffaloes) (10%) + boundary plantation (3%)
Jammu & Kashmir	Crop + livestock + fish cum poultry (1 ha)	Cropping system (62%) + multi-tier system (16%) + dairy (13%) + fish cum poultry (9%)
Karnataka	Crop + livestock + orchard (1 ha)	Cropping systems (59%) + orchard (18%) + dairy + goat (23%)
Kerala	Integrated terrace garden	Vegetables, azolla, poultry and vermicompost
Maharashtra	Vertical farming structure	Vertical farming structures for crop + poultry
	Crop + horticulture + dairy (1 ha)	Cropping systems (61%) + horticulture (21%) + livestock (18%)
Odisha	Crop + horticulture + livestock (1 ha)	Cropping systems (60%) + horticulture (30%) + livestock- dairy, goat, poultry (10%)
	Crop + fishery (1.25 ha)	Cropping system (40%) + fishery (60%)
Punjab	Crop + livestock (1 ha)	Cropping systems (64%) + multi-tier system (10%) + dairy (20%) + fish cum poultry (5%) + mushroom (1%)
Rajasthan	Preparation of mineral mixture	Using undersized grains of various cereals, legumes and oil cakes, mineral mixture module was added in the system.
Telangana	Crop + livestock (1 ha)	Cropping systems (65%) + horticulture (14%) + livestock -dairy, goat, backyard poultry (21%)

iii. Refinement of existing 06 farming systems at farmers' fields in 4 states

On-farm interventions made in farming systems at various locations across the country through on-farm centres of AICRP-IFS have shown that productivity can be enhanced by 2-3 times with low-cost interventions. State-wise details of farming systems refined with farmer participation are provided in Table 19. A sample success story of on-farm refinement is provided in Table 19a and illustrated in Figures 4a and 4b.

Table 19. Farmers participatory refined Integrated Farming Systems

State	Recommended Refined farming system	Critical interventions for refining existing farming systems
Andhra Pradesh	Crop + poultry (0.98 ha)	Duplex Poultry Unit made-up of with double Zinc mesh for secure rearing of Backyard poultry birds of size 8x4x5½ ft (Rs.20,000/ unit for 15-20 birds)
Bihar	Crop + Dairy + Fishery (1.16 ha)	HYV with balance fertilizer, green fodder, Mineral mixture, deworming & composite fish culture
	Crop+ Dairy (0.64 ha)	HYV with balance Nutrition, Round the year green fodder, M.M, Deworming, Artificial Insemination

Karnataka	Crop + Dairy + Horticulture (0.88 ha)	Diversified cropping systems (Bt Cotton (Dr Brent / Beejaraja – DCH 32 Bt) intercrop with Peas (AP 3) (1:1) / Soybean (1:1) (JS 9305); Soybean (DSb 21) – Chickpea (Jaki 9218) / Hy Maize (BRMH 1)] + recommended balanced nutrition + recommended pest management + vegetables (okra: Arka anamika) + perennial fodder (COBN 5), Mineral mixture, Salt cake @ 1 kg / month, vaccination, Deworming, Medicines, Artificial insemination and butter preparation, Biocomposting, boundary plantation (Coconut / Mango / Sapota / Lime / Curry leaf
Madhya Pradesh	Crop + dairy (1.20 ha)	Paddy (MTU-1010), Wheat (JW-3288) with 100:60:40 kg/ha NPK + 25 kg $ZnSO_4$ and green fodder Berseem & MP Chari
	Crop + Goat + Poultry (0.70 ha)	Paddy (MTU-1010), Wheat (JW-3288) with 100:60:40 kg/ha NPK + 25 kg $ZnSO_4$ and green fodder berseem & MP Chari, salt, cake, improved breed of poultry (Giriraja)

Success Story on on-Farm Research (Refinement)- An example

Andhra Pradesh, characterized by semi-arid, moist to dry, sub-humid climate with annual rainfall of 966.2 mm of which 57.5% is from southwest monsoon. State has geographical area of 16.3 m ha of which 6.0 m ha is under cultivation. Rainfed area constitutes 64% of net sown area and cropping intensity is 125%. The soils are red lateritic and black with low fertility and salinity problem. The 62% of the population of the state live in rural areas and depend on agriculture and related livelihood opportunities. Out of 76, 21,118 farm households, 86.26% constitute marginal and smallholdings with average holding size of 0.67 ha. The major field crops grown are Rice, Maize, Pulses, Groundnut, Cotton, Chillies, Tobacco, and Sugarcane. As per of 20th Livestock Census, state is having livestock population of 7.11 million constituting largely buffaloes (61.4%), cattle (27.0%), goat (4.7%), sheep (4.0%) and pig (1.5%). Andhra Pradesh is the largest fish producing state in the country and second largest state in both availability of inland fishery resources and coastal areas in the country with 36.1lakh t from Inland and 5.64 lakh t from marine production. Doubling Farmers' Income (DFI) committee estimated the benchmark income of Rs 104092 per household based on 2015-16 prices. Out of total income, 24.3%, 12.4%, 9.8% and 53.5% is from cultivation, livestock, non-farm business and wages and salary respectively (Table 19a). Seven success stories documented from Vizianagaram district of Andhra Pradesh representing East Coast Plain and Hills agro-climatic zone indicated significant improvement in net income compared to DFI committee estimated benchmark income for doubling of farmers income.

Table 19a. Economics of Crop+ horticulture+ dairy poultry (Success story) over different years

Parameters	Benchmark (Before intervention)	Intervention period (years)				
		1	2	3	4	Mean
Cost of cultivation (Rs/year)	17680	26195	28240	29640	31720	28948
Gross return (Rs/year)	53110	83630	96840	104720	112960	99537
Net income (Rs/year)	35430	57435	68600	75080	81240	70588
B : C ratio	3.00	3.19	3.42	3.53	3.56	3.40

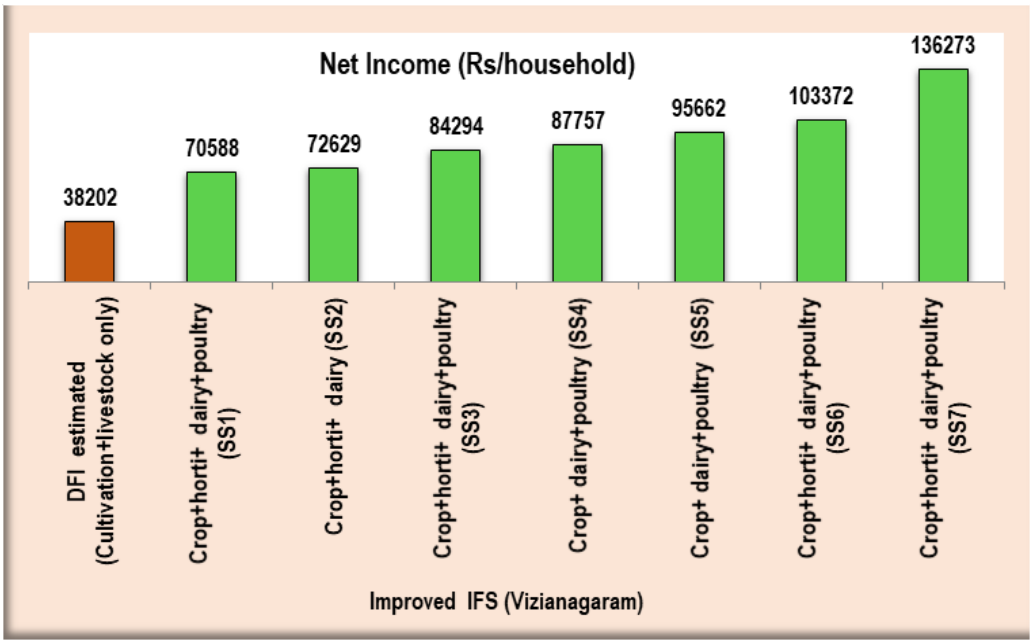


Fig 4a. Improvement in net income due to IFS interventions at seven farmers' sites (Andhra Pradesh) *SS - success story

Fig 4b. Refinement of Modules/Models of Integrated Farming Systems with farmers participation in Vizianagaram (Andhra Pradesh)

iv. Standardize promising on-farm packages and modules of IFS

Eleven packages and ten modules for eight states have been developed for upscaling through developmental schemes of State and Central Agencies, as shown in Table 20.

Table 20. On-Farm tested and refined management packages developed

State	Name of the technology	Brief description of the improved technology
Andhra Pradesh	Management package	Short duration rice (MTU-1121)- zero tillage maize (Kaveri bumper)
	Backyard poultry module	Closed rearing with Rajshri, Kadakanath, Srinidhi
Chhattisgarh	Alternate cropping system	Rice (Hybrid-6444)-wheat (Amber)- blackgram (local) Rice (Hybrid 6444)-maize (Hybrid PAC 751)
	Poultry module	Improved breed of poultry- Kadaknath, feeding and timely vaccination
	Fish module	40:30:30 ratio of Catla, Rohu and Mrigal, 3:2 ratio of rice grain husk and oil cakes feeding
	Pig module	Breed of Pig- Devar and feeding of butter milk during summer
Karnataka	Balanced nutrient management package for soybean- chickpea	Soybean (DSb-21) 40-80-25-12.5 kg NPK $ZnSO_4$, and Chickpea (Jaki 9218) 25-50 kg NP
	Balanced nutrient management for soybean – hybrid maize	Soybean (DSb-21) 40-80-25-12.5 kg NPK $ZnSO_4$; Hybrid Maize (BRMH-1) 150-62.5-62.5-25-25 kg NPK $ZnSO_4$ $FeSO_4$
	IFS model	Diversified cropping systems (Soybean- Chickpea/Hy Maize) + livestock (perennial fodder, Mineral mixture, Salt lake; Health management: Deworming, Medicines, Artificial insemination) + . bio-composting. + nutritional kitchen garden+boundary plantation.
	Finger millet - tomato	Production of vermicompost by use of worms (like Eisenia foetida etc.) in permanent vermi beds
Madhya Pradesh	Vermicompost production	Conversion of whole pulse grain into processed pulses
	Value addition in farming systems	Paddy (MTU-1010), Wheat (JW-3211) with 100:60:40 kg/ha NPK + 25 kg $ZnSO_4$
	Management package for rice-wheat	Rice (JR-206/JR-81)-wheat (JW-3211/JW3382, green fodder berseem & MP Chari for dairy
	Improved farming system	Rice (Karjat-3)-okra (hybrid)
Maharashtra	Alternate cropping system	Kadaknath poultry breed
	Poultry module	Improved breed of konkan khanayal
	Goat module	Crop + Dairy + Horticulture (0.89 ha) farming system with advanced management practices
	Alternate Farming System	Crop + Dairy + Poultry (1.1 ha) farming with improved management packages and practices
	Improved farming systems	Crop + dairy + goat (0.84 ha)
		Crop + dairy (0.55 ha) with improved management
Odisha	Improved package for crop + dairy system	Application of N80 P40 K40 + $ZnSO_4$ 25 kg/ha to rice (Hiranmayee) and N20 P40 K 40 kg/ha + seed treatment with Sodium Molybdate @ 3g/ 10kg seed to green gram (IPM-02-3)
	Management package	120kg/ha N, 60 kg/ha P_2O_5 and 40 kg/ha K_20, 50kg /ha $ZnSO_4$ for rice (RNR-15048)

Rajasthan	Seed treatment in Pearl Millet and Mustard	Short duration rice (MTU-1121)- zero tillage maize (Kaveri bumper)
Telangana	Balanced nutrient management	Closed rearing with Rajshri, Kadakanath, Srinidhi

v. Important technological/capacity building documents/ policy guidelines generated from the project

Information from 2018 to 2023 regarding the formulation of national-level schemes and policies is presented in Table 21.

Table 21. Various documents formulated during 2018-2023

Year	Name of document	Used by/Benefits
2018	Researchers' manual for quantitative farming systems typologies applications using the R Statistical Tool	All the AICRP-IFS centres and others involved in IFS research
2019	Integrated Farming Systems for Agricultural diversification, enhanced income and employment (English)	Information on 51 IFS models developed for various States. Publication was sent to all the Chief Secretaries of the State by Secretary (DARE) and DG (ICAR) for promotion of IFS models
2020	Integrated Farming Systems for Agricultural diversification, enhanced income and employment (Hindi)	Information on 51 IFS models developed for various States. Publication was sent to all the Chief Secretaries of the State by Secretary (DARE) and DG (ICAR) for promotion of IFS models
2020	Integrated Farming Systems and Organic Farming Packages for the Indian Himalayan region	National Mission on Sustaining Himalayan Ecosystem (NMSHE)
2021	Bankable project on Integrated Farming Systems for doubling farmers income	31 bankable IFS models are documented. National Bank for Agriculture and Rural Development for whole package financing of IFS model
2021	Crop plan for major crops	Crop plan developed for 14 major crops are documented

3.10.1.3 All India Network Programme on Organic Farming (AI-NPOF)

i. Geo-referenced characterization of organic and natural farming farmers

A total of 3,755 organic growers from 16 states were characterized, along with five indigenous organic inputs, six ITKs, and natural farming practices in one cropping system. Accession numbers were generated for 13 bacterial isolates.

ii. Package of practices for organic production of 30 cropping systems suitable for nine states

The scientific package of practices has been found to enhance productivity, profitability, and soil health, particularly in terms of higher soil organic carbon, compared to conventional cropping. The details of the states and cropping systems for which PoPs have been developed are provided in Table 22.

Table 22. Package of practices of various cropping systems*

State	Cropping systems
Gujarat	Groundnut-wheat-green gram
	Green gram-coriander-vegetable cowpea
	Green gram-fennel-fallow
Karnataka	Soybean-wheat
	Groundnut-sorghum
	Chilli - cotton relay intercropping
	Maize-chickpea

Kerala	Cassava - groundnut
	Cassava-vegetable cowpea
Madhya Pradesh	Scented rice-durum wheat- green manure (Sunhemp)
	Scented rice-chickpea-maize (fodder)
	Scented rice-berseem (fodder + seed)
	Scented rice-vegetable pea-sorghum (fodder)
Maharashtra	Rice-red pumpkin
Rajasthan	Cluster bean -coriander
	Cluster bean-fennel
	Fennel + cabbage -cowpea + maize
	Maize + black gram -durum wheat
	Black gram -wheat
	Sweetcorn + black gram-chickpea
	Soybean-fenugreek
Sikkim	Maize + turmeric -rajmash
	Maize+ ginger -French bean
	Maize-soybean-buckwheat
	Maize-black gram-toria
Uttarakhand	Grain amaranth – wheat + lentil under rainfed
	Finger millet + black soybean -wheat + toria
West Bengal	Rice -French bean-green gram
	Rice-mustard-green gram
	Rice-vegetable pea-sesame

*Organic Farming Packages for Major Cropping Systems, Published by ICAR, New Delhi during 2022. (Panwar et al., 2022)

iii. Screening and identification of best performing varieties of crops for organic farming

Varieties have been identified for three cereals (rice, basmati rice, wheat, and maize), one pulse (chickpea), one oilseed (mustard), five vegetables (okra, French bean, tomato, cassava), and one spice (turmeric). The details are provided in Table 23.

Table 23. Varieties identified for organic farming

State	Season	Crop	Variety
Chhattisgarh	Kharif	Rice	Vishnu Bhog
			Sugandhit Bhog
	Rabi	Chickpea	Vaibhav
			RG 2009-01
Himachal Pradesh	Kharif	Okra	Perkins Long Green
			Pusa Mukhmali
		French bean	Contender
			Falguni
	Summer	Tomato	RK-123
			Heem Sona

Jharkhand	Kharif	Rice	Birsa Vikash Dhan 203
			Sahbhagi dhan
			Birsamati
	Rabi	Wheat	GW-366
			BG-3
Karnataka	Rabi	Chickpea	A1
			MABC-37
		Wheat	UAS 466 (Bread wheat)
			DWR2006(DW)
Kerala	Kharif	Turmeric	Pragati
			Suguna
		Cassava	Sree Reksha
			Sree Pavithra
Madhya Pradesh	Kharif	Rice	Pusa Sugandha 3
			Pusa Sugandha 5
	Rabi	Wheat	HI-1500
			HI 1418
Punjab	Kharif	Basmati rice	Punjab basmati 4
			RYT 3649
	Rabi	Wheat	PBW1 Zn
			Unnat PBW 550
Tamil Nadu	Rabi	Rice	Bhawani
			IW Ponni
			CB05022
			Red Kavuni
Uttar Pradesh	Kharif	Maize	HQPM 1
			H (Pioneer-1866)
	Rabi	Mustard	NRCHB 506
			DRMRIJ 31
Uttarakhand	Kharif	Rice	Pant Sugandha dhan 27
			Pant Sugandha dhan-25

iv. Management of insect pests

An organic management protocol was developed for 12 crops, including coriander, fennel, brinjal, maize, large cardamom, ginger, cotton, okra, tomato, chili, soybean, and toria, across 4 states to combat major insect pests. Detailed management protocols are provided in Table 24.

Table 24. Insects' pest and their management practices

State	Centre	Crop	Insect pest	Management package
Rajasthan	Ajmer	Coriander	Aphid	IPM module-3 (garlic extract 10ml/lit + azadirachtin 0.03% EC @ 5ml/lit + tumba fruit extract 10ml/lit.)
			Thrips	
		Fennel	Aphid	IPM module-3 (garlic extract 10 ml/lit + azadirachtin 0.03% EC @ 5ml/lit + tumba fruit extract 10ml/lit.)
			Thrips	
	Udaipur	Brinjal	Brinjal shoot & fruit borer	10% Dashparni herbal pesticide at 30 & 45 DAS
Sikkim	Gangtok	Maize	Stem borer infestation	Spinosad 45 SC @ 0.3 ml/l
		Large cardamom	Stem borer damage (%)	Spinosad 45 SC @ 0.3 ml/l
		Ginger	Rhizome fly (%)	Spinosad 45 SC @ 0.3 ml/l
			Shoot borer	
Tamil Nadu	Coimbatore	Cotton	Leafhoppers	Ginger, garlic and green chilli extract @ 5%
			Thrips	
			Whiteflies	
			Aphids	
		Maize	Fall armyworm	Ginger, garlic and green chilli extract @ 5%
		Okra	Leafhoppers	Organic Integrated Pest Management module (OIPDM)
			Aphids	
			Whiteflies	
		Brinjal	Shoot and fruit borer	OIPDM module*
			Brown Leafhoppers	
		Tomato	Thrips	OIPDM module*
			Whiteflies	
		Chilli	Aphids	OIPDM module*
			Thrips	
			Whiteflies	
Uttrakhand	Almora	Soybean	Soybean sucking bug (Chauliopschoprai)	M. azedarach seed extract 5%
		Toria	Leaf miner beetle (Platypriahystrix)	Thuja orientalis seed extract 5%
			Aphid (Lipaphis erysimi)	Thuja orientalis seed extract 5%

*OIPDM module for insect management in brinjal, tomato, chilli: Cowpea, Lablab, Coriander as border crop + Sorghum as barrier crop + yellow sticky trap+Need based application of 3 G/herbal leaves extract.

v. Management of diseases

Disease management protocols for organic farming were developed to address major diseases affecting coriander, fennel, maize, large cardamom, ginger, okra, brinjal, tomato, and chili in Rajasthan, Sikkim, and Tamil Nadu. Detailed information is provided in Table 25.

Table 25. Diseases and their organic management

State	Centre	Crop	Disease	Management package
Rajasthan	Ajmer	Coriander	Powdery mildew	Garlic extract (0.5%)
				Neem oil (0.5%)
		Fennel	Ramularia blight	Neem oil (0.5%)
Sikkim	Gangtok	Maize	Turcicum leaf blight	COC @ 0.25% every 10 days interval till grain filling stage
		Large cardamom	Chirkey (Maclura virus), Foorkey (Nano virus)	Commercial neem-based formula (Azadirachtin 1500 ppm) @ 0.15%
		Ginger	Rhizome rot	Bioagents +botanicals spray
Tamil Nadu	Coimbatore	Okra	Yellow vein clearing disease (Virus)	Organic Integrated Pest Management module (OIPDM)
		Brinjal	Little leaf disease (MLO)	OIPDM*
		Tomato	Early blight (Fungal)	OIPDM*
		Chilli	Yellow leaf curl disease (Virus)	OIPDM*

*OIPDM for disease management in brinjal, tomato, chilli: Bacillus subtilis + butter milk

vi. Management of weeds

Organic weed management practices were developed using stale seedbed techniques, altered crop spacing, mulching, and hand weeding at different intervals for 11 cropping systems across 11 states. Details are provided in Table 26.

Table 26. Organic weeds management practices

State	Cropping system	Recommended management package
Chhattisgarh	Sweet corn - tomato	Stale seed bed + reduced spacing (upto 25%) + mulching with paddy straw + hand weeding at 20 DAS
Himachal Pradesh	Black gram-cauliflower-summer squash	Stale seed bed technique (standing water for 3-4weeks) + reduced spacing up to 25% + mulching with wheat straw + one hand pulling at 20 DAS
Jharkhand	Rice-wheat	One mechanical weeding at 25 DAS+ One Hand weeding at 50 DAS
Kerala	Turmeric	Dried coconut leaf application at the time of planting, Hand weeding at 45&90 DAP
Madhya Pradesh	Maize-mustard	Cotton seed cake 15 days before planting/sowing @ 5t/ha + one hand weeding at 40 DAS
Maharashtra	Rice-groundnut	Stale seed bed + reduced spacing up to 25% + mulching with previous crop residue + one hand weeding at 30 DAS
Meghalaya	Maize +soybean	One hand weeding (HW) at 35 DAS +soybean intercropping
Rajasthan	Sweet corn-fennel	Stale seed bed preparation + plastic mulch at sowing
Tamil Nadu	Tomato	Mulching with dried mango leaves @ 5 t ha^{-1} followed by one hand weeding on 45 DAT
Uttarakhand	Rice-wheat	Sesbania + 2 mechanical weeding at 20 & 40 DAT in rice and 2 HW in wheat
Uttar Pradesh	Maize-mustard	Soil solarization + 1HW

vii. 8 Integrated Organic Farming System (IOFS) models

Eight Integrated Organic Farming System (IOFS) models were developed for one-acre (0.43 ha) across 7 states. Economic analysis of these systems indicated that under an organic farming system with a livestock component, a net income ranging from Rs 0.62 lakhs (diversified farming) to Rs 1.66 lakhs per acre (spice-based farming) can be achieved, depending on the combination of modules adopted. The components of the IOFS for different regions are detailed in Table 27.

Table 27. Integrated organic farming system models of different states

State	Centre	Module	Components	Key Performance Indicator (KPI)
Chhattisgarh	Raipur (1.0 ha)	Crops	Rice, French bean, groundnut, berseem, sorghum, sweetcorn, tomato, coriander, vegetable pea, cowpea	• Soil organic carbon (SOC) increased from 0.59 to 0.62 in two years • System profitability of 674 Rs/ha/day • Employment generated 389 Man days/year
		Livestock	Dairy, poultry, goat	
		Horticulture	Fruit garden with vegetables as intercrops	
		Others	Recycling unit	
Kerala	Calicut (0.40 ha)	Crops	Veg cow pea, Coconut, Turmeric, Fodder (Co3, Co4, DHN6, Congo Signal)	• SOC increased from 1.45 to 2.31 in five years • Employment generated 295 Man days/year • Net profit of Rs 2.13 lakhs/year from 0.4 ha model
		Livestock	2 cows	
		Horticulture	Banana, Tapioca	
	Thiruvananthapuram (0.30 ha)	Crops	Maize, Hybrid Napier grass, pulses (green gram, black gram, soybean), oilseeds (groundnut), vegetables (amaranthus, bhindi, cucumber, cluster bean, cowpea, winged bean)	• SOC increased from 0.72 to 0.75 in three years • System profitability of 1095 Rs/ha/day • Energy productivity of 0.71 kg/MJ
		Livestock	4 indigenous cows & 1 calf	
		Horticulture	Cassava, taro, banana, elephant foot yam, pineapple, agathi and moringa	
Gujarat	Sardarkrushinagar (0.40 ha)	Crops	Groundnut-wheat-green gram and F. Pearl millet-F. Maize+ oat- F. pearl millet	• System profitability of 357 Rs/ha/day • Net income of Rs 1,30,148 from 0.40 ha model • SOC increased upto 0.364 in five years
		Livestock	Two cow and 2 calves	
		Complimentary enterprises	Boundary plantations: Ardusa, lemon grass, napier grass Repellent plants: Lemongrass, Coriander, Marigold, Onion, Basil, Chrysanthemums, Citronella grass	

Rajasthan	Udaipur (0.45 ha)	Crops	Sweet corn+ black gram, wheat, fodder maize + cowpea, barseem, vegetables (cluster bean & potato)	• SOC increased from 0.66 to 0.75 in five years • Employment generated 289 Man days/year • Net income of Rs 1.72 lakhs/year from 0.44 ha model
		Horticulture	Guava	
		Complimentary enterprises	NADEP compost, Vermicompost, Vermiwash, BD 500 & 501	
Sikkim	Gangtok (0.60 ha)	Crops	large cardamom, maize, rice, cauliflower, spinach, coriander, broccoli, fenugreek, pahenlo dal, vegetable pea and buckwheat	• Net income -Rs. 177400 • Net returns per rupee invested (NRPRI)- 2.05
		Livestock	1 milch cow + 1 calf	
		Complimentary enterprises	Fishery, poultry (25 Vanaraja birds) and duckery	
Tamil Nadu	Coimbatore (0.40 ha)	Crops	Bhendi-maize-dhaincha Cotton-sorghum-dhaincha	• System equivalent yield – 19118 kg • Net income of Rs.1,82,183 per year • Employment generation – 548 man days • NRPRI-2.06
		Livestock	2 Crossbreed Jersey	
Meghalaya	Umiam (0.43 ha)	Crops	Rice, pea, vegetables	• Net income of Rs. 76,573 per year
		Livestock	Dairy (02 cows)	
		Fish	Catla, Rohu, Mrigal	

3.10.2 Quantified impact of the important technologies developed

Quantifying the impact of natural resource management is quite complex due to the influence of several factors, including management practices, weather conditions, market dynamics, and infrastructure. The theme-wise quantifiable impact and coverage are provided below:

A. Integrated Farming Systems

- Organized research in the field of integrated farming systems are 14 years old (up to 2022-23) and the institute and its sub scheme namely AICRP on Integrated Farming Systems have developed several technologies including 33 IFS models suitable to 22 states and 2 Union Territory, refined 63 farming systems and also worked out with statistical methodology for analysis of on-farm farming systems and indices for evaluation of farming systems.
- Thirty-one IFS models have been identified as bankable projects by NABARD and whole package financing for IFS is devised to support farmers.
- The 64 geo-referenced farming system success stories from on-farm farming systems research in 20 states have resulted in effective dissemination of component technologies of cropping and farming systems through various sources.
- The IFS models developed for different regions address national priorities by reducing input costs (30-72%), improving soil health (with a 22% increase in soil organic carbon over 5 years), enhancing water productivity (ranging from 5.9 to 12.6 kg/m^3 across various models), and improving human and livestock nutrition at the household level. These models

also contribute to achieving 13 Sustainable Development Goals in an integrated and holistic manner. Additionally, the IFS models have been found to be GHG emission neutral.

- The developed IFS models were promoted by the Government of Kerala (21,040 farm households in 14 districts), Odisha (2,826 farm households in 30 districts), and Tamil Nadu (41,490 farm households in 35 districts) under state-specific plan schemes with a financial outlay of Rs 367.55 crores until March 2023. Other states/UTs, such as Jammu and Kashmir and Telangana, have also formulated strategies to promote IFS models among farmers.
- An interface meeting on IFS with all the states was organized in 2020-21 to implement IFS models through the Rainfed Area Development/Rainfed Farming Systems schemes under DA&FW. A total of approximately 1.7 million hectares have been covered under the scheme, benefiting a targeted 2.70 lakh beneficiaries.
- An interface meeting with the Department of Rural Development was organized in 2020, during which state-specific IFS models, along with details of AICRP-IFS and AI-NPOF centres, were shared with DORD. ICAR-IIFSR assisted in preparing the guidelines for Integrated Farming System Clusters (IFC) under the Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM). The guidelines were notified vide No. K-11060/02/2020-21/NRETP/FL dated 25 September 2020.

B. Cropping Systems

- The Cropping System Atlas was successfully updated. A futuristic crop plan was prepared for 14 crops, including rice, wheat, maize, sorghum, pearl millet, pigeon pea, chickpea, mustard, groundnut, soybean, cotton, sugarcane, potato, and onion. The crop plan includes agro-climatic zone, agro-ecological region, state, and district-specific plans. Additionally, a futuristic crop plan map was developed for all seasonal crops grown, including Kharif, Autumn, Rabi, and Summer.
- Based on the development of crop plans for 14 major crops, the Department of Agriculture and Farmers Welfare has launched a pilot project to diversify rice areas into other crops across 75 districts nationwide
- Based on multi-location studies conducted at 37 on-station centres, efficient alternative cropping systems with appropriate agronomic management practices were identified, documented, and recommended for various farming systems. These alternative systems, along with their production packages, have been included in the Crop Production Guide and the package of practices for the respective states.

C. Organic Farming Research

- The development of packages of practices for 30 cropping systems has been submitted to the Ministry of Agriculture, Cooperation and Farmers Welfare for upscaling through the Paramparagat Krishi Vikas Yojana (PKVY) scheme. These packages of practices have also been shared with all state governments for promotion under state-specific schemes.
- Institutional development, such as the launch of the National Programme for Organic Production (NPOP) in 2001, followed by the establishment of the National Centre of Organic Farming (NCOF) under the Ministry of Agriculture and Farmers Welfare, and the initiation of research through the All India Network Programme on Organic Farming (AI-NPOF) by ICAR-Indian Institute of Farming Systems Research in 2004, laid the foundation for the systematic development of organic farming technologies in the country. Starting with just 58,300 ha in 2003-04 (the year AI-NPOF was launched by ICAR), the area under organic farming has grown 92-fold, reaching 5.39 million ha by March 2023 (APEDA, 2023). Based on studies conducted under AI-NPOF, the Centre for Science and Environment (CSE) and NITI Aayog have also issued policy recommendations to promote organic farming in India.
- The country success story on 'A Holistic Approach to Sustainable Agriculture in India – The Use of Integrated Organic Farming System Models' was published in the Compendium of Country Case Studies: Accelerating Transition to Sustainable Agriculture. This compendium was jointly brought out by Just Rural Transition, the UN Climate Change Conference (UK-2021), and the World Bank Group, and was released during the Nature Day event at the Conference of Parties-26 (COP-26) in 2021. The publication highlights several success stories related to organic farming and Integrated Organic Farming Systems (IOFS).

- The country success story also highlighted that under the Mission Organic Value Chain Development in the Northeastern Region (MOVCD-NER), over 6 years, 79,000 hectares of land have been certified as organic farmland, with 83,000 farmers participating using various approaches, including IOFS.

3.11 Publications

The list of research publications (>6.0 NAAS rating wise) is attached as Annexure-IV and the abstracted information is given in Table 28 -30.

a. ICAR-IIFSR, Modipuram: A total 225 research papers published during the review period. Year wise publication is given in Table 28. The details of the published research papers in high impact journals (>6 NAAS rating) are given in Annexure-IV.

Table 28. Details of the publications of ICAR-IIFSR

Publication	2018	2019	2020	2021	2022	2023	Total
Research papers	34	25	27	43	43	53	225
Book Chapters	30	07	09	17	16	14	93
Books/ Monographs/ Manuals	33	10	12	20	24	17	116
Popular/ Extension Articles	13	37	18	8	43	19	138
Seminar/symposia abstract	24	38	07	44	28	34	175
Total	**134**	**117**	**73**	**132**	**154**	**137**	**747**

b. AICRP-Integrated Farming Systems: Details of the publication is given in Table 29.

Table 29. Details of the publication of AICRP-IFS

Year	NAAS rated research papers	Popular articles	Seminar/ Symposia abstracts	Books/ Book chapter	Bulletins/ manuals
2018	163	-	55	-	-
2019	138	21	74	23	-
2020	114	62	37	24	
2021	127	67	35	-	-
2022	124	42	31	39	7
2023	102	47	34	11	2
Total	**768**	**239**	**266**	**97**	**9**

c. All India Network Programme on Organic Farming: Details of the publication is given in Table 30.

Table 30. Details of the publication of AI-NPOF

Year	NAAS rated research papers	Popular articles	Seminar/ symposia abstracts	Books	Bulletins/ manuals	Radio/ TV talks
2018	40	20	29	3	4	1
2019	50	27	5	1	7	
2020	46	35	14	4	13	7
2021	33	50	7	6	9	6
2022	41	68	0	2	18	8
2023	22	24	16	1	6	6
Total	**232**	**224**	**71**	**17**	**57**	**28**

04 ISSUES AND STRATEGIES

4.1 Issues

In the context of evolving climate challenges, degraded resource bases, the profitability of agricultural systems, food safety, consumer preferences, and growing expectations from policymakers, several critical issues specific to integrated farming systems, cropping systems, organic farming, and natural farming need to be addressed through targeted research. These thematic areas offer focused solutions to agricultural challenges unique to these systems. The following are the key issues identified that require dedicated research efforts in the future:

4.1.1 Cropping and Integrated Farming Systems

- Small and fragmented land holdings and resource poor marginal and small farmers.
- The lack of credit facilities and technological support for landless farmers, coupled with a shortage of skilled labour and the high cost of agricultural labour, poses significant challenges for farm households engaged in farming systems and crop diversification.
- Depleting natural resource base, including land, labour, water, and biodiversity affecting the cropping / farming system productivity.
- Declining partial factor productivity, deteriorating soil health, increase in cost of production due to higher input cost and reduced rate of recycling with in the farm are major problems which affects the agriculture in general and farmers income in particular.
- National level priorities such as reducing mineral fertilizers usage, reducing pesticides usage, improving soil health, addressing the climate and market related risks are not properly addressed at state and local level.
- Although 84% of farm households in India have crop and dairy together, their recycling is very low (< 25%) and depend for markets for their farm inputs including meeting the family food and nutritional requirement.
- Due to erratic rainfall patterns, over-reliance on groundwater, and rising temperatures caused by climate change, many regions face acute water shortages, more frequent extreme weather events like droughts and floods, and shifts in growing seasons, leading to reduced crop irrigation capacity and increased prevalence of pests and diseases.
- Monoculture and the overuse of chemical inputs diminish agricultural biodiversity, weakening ecosystem services such as pest control and soil health.
- Inadequate improved quality seed/planting material and improved breeds of livestock for diversification options.
- Lack of farm implements and tools for small farms especially for cropping systems and integrated farming systems considering the multi-commodity and ergonomics.
- Lack of simple primary processing and cleaning techniques and tools for many crops and small-scale value addition.
- Low level of marketable surplus of commodities in cropping /farming systems models as multiple commodities are produced with low volumes.
- Lack of suitable mechanism for addressing market demand and supply issues especially for identified alternative cropping and farming systems.

4.1.2 Organic Farming and Natural Farming

- Low yield in transition phase.
- Lack of balancing of recommended doses of N, P, K and other micronutrients though organic nutrient sources.
- Non-availability of sufficient and quality organic inputs within the farm and affordability of organic inputs obtained from outside the farm.
- More labour-intensive compared to conventional farming particularly weed management.
- Limited pest and disease management practices in package of practices evaluated and developed for organic farming.
- Minimum scientific validation of organic practices promoted by different stakeholders including NGOs.
- Low resource allocation and lack of infrastructure facilities for basic research on organic farming at the country level.
- Low level of awareness among farmers on process of certification, regulations and marketing of organic produces.
- As per latest Research Institute of Organic Agriculture (FiBL) report, 43% global organic farmers are in India but their productivity levels being low owing to unscientific package of practices for growing of crops under organic farming, the use of varieties identified for organic ecosystem, and lack of awareness etc among other factors.
- Natural farming practices and models suitable for different niches are under evolving stage, hence, sincere efforts are required for its standardization, validation, and upscaling for different ecologies.
- Innovations in natural farming need thorough scientific understanding, capturing data and leading to a conclusion to be drawn to established it as an alternate agriculture.
- Many farmers are unfamiliar with the principles and practices of natural farming. Without adequate training and extension services, it becomes difficult to adopt and scale up natural farming methods.

4.2 Strategies

4.2.1 Integrated Farming Systems

1. The experiences in context of small and marginal farmers from across the states and regions have clearly evinced the fact that income from crop production or livestock alone is hardly sufficient to sustain the household needs. Therefore, farmers' income and food requirements would have to be augmented and supplemented by adoption of efficient and optimized secondary/ tertiary enterprises like animal husbandry, horticulture (vegetables/ fruits/ flowers/ agro-forestry/ medicinal and aromatic plants), apiary, mushroom cultivation, fisheries, farm-waste recycling, on-farm processing/ value addition and non-conventional agriculture methods etc by scientifically integrating them with main stream agriculture.
2. Diversification in cropping and livestock components is essential to meet the changing consumption pattern and nutrition is essential. The number of components in an IFS should be based on farmers' preference and local needs. This will help to improve the efficiency of marginal and small-scale farming without much changes in their operation.
3. Climate resilient IFS models need to established for different regions by incorporating suitable crop varieties, breeds, adaptation practices etc and evaluated in farming systems perspective.
4. Good agricultural practices for crops and animal husbandry in Integrated Farming Systems perspective necessarily needs to be evaluated, documented, and popularized.
5. Screening of quality seed/planting material and improved breed for higher productivity and quality of farming system components are essential taking help from other AICRPs.

6. Improved resource base and recycling through mapping and its efficient utilization.
7. Low external input based nutrient application strategy (LEINAS) needs to be developed for farming systems for a specific region/ niche.
8. Small farm mechanization technologies need to be strengthened in farming systems perspective to reduce cost on manual labourer and ensure timeliness of operations.
9. Primary processing and value addition at farm gate level with market linkage following cluster approach in public-private partnership mode specific to district particularly for horticulture and animal module should be made.
10. Quantitative impact analysis of technological interventions and research-extension-farmer feedback mechanism should be developed for effective refinement of technologies.

4.2.2 Cropping Systems

1. Integrate nutrient-rich bio-fortified varieties of different crops into existing predominant cropping systems for enhancing nutrition enriched with vitamins, minerals, and other essential nutrients.
2. Designing climate-resilient cropping systems that prioritize drought-tolerant crops, efficient water use, enhanced carbon sequestration, and the reduction of greenhouse gas emissions.
3. Precision agriculture technologies for optimizing inputs and improving productivity of cropping systems using artificial intelligence (AI), agri-drones, remote sensing, and data analytics for crop monitoring, yield prediction, and input optimization.
4. Cropping systems that recycle waste and make efficient use of resources by utilizing crop residues, composting, biogas generation, and waste recycling within the system should be developed.
5. Enhancing practices in cropping systems that improve soil organic carbon, such as conservation agriculture, cover cropping, and agroforestry. Implementing farming practices that reduce methane, nitrous oxide, and carbon emissions, such as precision nutrient management and reduced tillage.

4.2.3 Organic Agriculture Systems

1. Research on Concentrated Manure Technology (CMT) should be intensified to develop and commercialize products that enhance nutrient use efficiency and support sustainable farming practices.
2. Characterization of indigenous organic inputs/ITK for integration in the already developed packages for organic production.
3. Scientific research on the long-term effects of natural farming practices, for sustainability.
4. The package of practices (PoP) for organically grown crops and cropping systems needs to be refined with the active participation from farmers.
5. Integrated Organic Farming Systems (IOFS) need to be developed and standardized for different regions to promote profitable and sustainable organic farming. This approach can significantly reduce the reliance on external inputs.
6. With the increasing awareness of sustainable farming practices, organic and natural farming adequate policy and financial support is needed for research and wider adoption.
7. Validation of organic package of practices under diverse agro-climatic conditions at farmers' field needs to be done. This can help for adoption of organic farming at a larger scale.
8. Area under organic agriculture in India is growing at the Annual Growth rate of about 22% during last 7 years. Area under Third Party Certification and PGS certification reached to more than 5 m ha (APEDA, 2023). Since, more and more farmers are involved in organic farming through systematic transformation of identified areas by Government of India, it is essential to provide technological backstopping to reduce the yield gaps and cost of

production under organic farming.

9. Previous research findings clearly indicate that use of external organic inputs for organic farming increases the cost of cultivation by 13% besides compromising on the quality of inputs (Ravisankar et al., 2021). Timely availability of inputs at the reach of farmers be ensured. Farmers training for generating organic input at their own farm be promoted.

10. States like; Uttarakhand, Karnataka, Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, Tamil Nadu, Kerala, Nagaland, Mizoram, Sikkim have been promoting organic farming and developed the policy for promotion of organic farming. Sikkim is already declared as organic state from 2016. States needs to be supported with technological options for promotion of organic farming.

11. Health consciousness among consumers especially after COVID-19 also pushed for demand of organic products at the domestic and international market. During 2022-23, export value of Indian organic commodities was Rs 5500 crores and domestic market value was about Rs 3000 crores (APEDA, 2023). Farmers livelihood can be significantly enhanced by supporting with technological options.

4.2.4 Human Resource Development

1. Initiating Training for Trainers programmes will be a strategic move to enhance the knowledge and skills of researchers. This approach ensures that trained researchers can subsequently train others, creating a multiplier effect in capacity building and advancing sustainable agricultural practices across various regions.

2. Skill development for the farmers on integrated farming systems, cropping systems, organic and natural farming should also be taken up.

3. Systematic and dedicated training programmes be organized to benefit different stakeholders like KVK personals, FPOs, and SHGs.

4. Training modules for different farming situations to be developed and yearly plan to be framed out.

4.3 Looking Forward

The institute's core research themes i.e. integrated farming systems, cropping systems, organic farming, and natural farming are crucial for sustaining the livelihoods of marginal and small farmers. The advanced knowledge, practices, and tools being developed will play a vital role in both the near and long term. Therefore, ensuring adequate resources in terms of budget, manpower, and infrastructure for these critical research themes is essential. The outcomes of these research strategies are expected to have a significant long-term impact on the Indian economy. Furthermore, the current farming systems may evolve into biodiversity-driven systems, enhancing ecosystem services for greater sustainability.

05 OBSERVATIONS

A. Action Taken on Recommendations of Previous QRT (1 April 2012 to 31 March 2017)

The action taken report of the previous QRT is provided in Annexure-I. A total of 25 recommendations were made by the previous QRT, covering various aspects. Out of these, the Council did not agree with 4 recommendations (Sl. Nos. 18, 19, 24, and 25). Thus, of the remaining 21 recommendations, the actions taken on 17 by the institute were deemed appropriate and satisfactory. Partial action has been taken on 4 recommendations due to various reasons, some of which are outlined below.

- The previous QRT recommended technical posts for the OFR Centre, ICAR-IIFSR, Modipuram, under the AICRP on IFS, which was agreed upon by the Council to facilitate smooth implementation of the program at no additional cost to the scheme. This provision for 4 YP-I positions was proposed in the EFC (2021-2026), but could not be implemented due to budget constraints.
- The previous QRT recommended upgrading the All-India Network Programme on Organic Farming (AI-NPOF) to the All-India Coordinated Research Project on Organic Agricultural Systems, managed by a Project Coordinator. A decision has already been made at the Council level, considering the recommendations of the AICRP Review Committee. However, creating the Project Coordinator post is subject to formal approval by the Cadre Review Committee. The scheme has been proposed as the All-India Network Programme on Organic and Natural Farming (AINP-ONF) in the EFC (2021-2026).
- The previous QRT recommended reorganizing the centres under AI-NPOF and sanctioning new on-station and outreach centres to reach underserved niche areas and crop regions. In line with this recommendation, 7 additional centres (CCSHAU-Hisar, OUAT-Bhubaneswar, UAS-Bengaluru, NIPHM-Rajendranagar, ANGRAU-Maruteru, SKUAST-Jammu, and RPCAU-Samastipur) and 8 outreach centers (ICAR-CIARI-Shaheed Island, TNAU-Nilgiri, ICAR-RC for Sikkim Centre-Sikkim, MPUAT-Dungarpur, ICFI-Dandamukundpur, UAHS-Shivamogga, GBPUAT-Hill District Uttarakhand, and ICAR-RC for NEH region-Agartala) have been proposed in the EFC (2021-2026) to raise awareness and promote organic farming campaigns in states and UTs with high potential, requiring immediate attention to achieve the scheme's goals and targets.

B. Research Relevance and Budget Allocation

Research on integrated farming systems, cropping systems, and organic and natural farming has been carried out through institute projects, AICRP on IFS, and AI-NPOF schemes. The overall output has been commendable, with the institute developing 33 region-specific integrated farming system models suitable for 14 agro-climatic regions, 8 integrated organic farming system models for 7 states, and identifying 12 alternative cropping systems for 6 states. The IFS models developed by the institute have been upscaled through state plan schemes, central sector schemes, and non-governmental organizations. A manual titled "Integrated Farming Systems for Agricultural Diversification, Enhanced Income, and Employment," detailing all IFS models, has been published in Hindi and English and shared with the Chief Secretaries of all states by the Secretary (DARE) and Director General, ICAR, to popularize IFS models on a large scale. Regular interface meetings were organized with officials from DAC&FW, GOI, New Delhi, and state government officials from all states to promote Integrated Farming Systems under the Rainfed Farming Systems scheme. During meetings held in May and June 2020, prototype and farmer-participatory IFS models for all states were shared. From 2017 to 2020, three states Jammu and Kashmir, Kerala, and Tamil Nadu promoted IFS models developed by ICAR-IIFSR, AICRP on IFS, and AI-NPOF programs with a financial outlay of ₹ 126.76 crores. The Kerala Government, through a state plan scheme under the Rebuild Kerala program, is implementing the establishment of

7,040 IFS models across various Panchayats. The Tamil Nadu Government has promoted IFS models in 34 districts, involving 10,090 farmers. IFS models have also been included as production system packages for promotion in other states.

Management packages were developed for the organic production of 30 cropping systems suitable for 9 states, along with the identification of suitable varieties for 14 crops. Cost-effective, reduced manuring practices were established through combinations of location-specific manures and innovative inputs. These packages include resource conservation practices and low external input organic farming models, providing technical support for two national schemes: Paramparagat Krishi Vikas Yojana (PKVY) and Mission Organic Value Chain Development (MOVCD-NEH). These practices also help reduce the yield gap during and after the conversion period in organic production systems. Resource conservation practices identified led to yield improvements ranging from 5-74% over conventional practices. The integrated organic farming system models reduced cultivation costs by 60-80%, while ensuring quality inputs at the farm level. These practice packages have been uploaded on the DAC&FW website ((http://agricoop.gov.in/divisiontype/integrated-nutrient-management/organic-packagepractises) for use by various state agencies under different schemes.

In terms of budget allocation, the committee observed the following important points which needs to be taken care in future.

- The limited increase in fund allocation during the EFC (2017-2020 and 2021-2026) for ICAR-IIFSR, AICRP on IFS, and AI-NPOF schemes, compared to the previous SFC (2012-2017), has posed significant challenges. Inadequate funding has impacted the ability to implement advanced research programs, maintain infrastructure, and effectively meet the expanding expectations of these projects
- In the AI-NPOF scheme, the introduction of natural farming experiments alongside ongoing organic farming research at all centres has placed substantial pressure on available resources, making it challenging to conduct both types of research effectively. This could further strain the centres' capacity to deliver high-quality outcomes in organic farming research.
- Natural farming experiments have also been initiated under AI-NPOF. However, the limited fund allocation under the grant-in-aid capital head for the AI-NPOF scheme has significantly impacted the ability to conduct basic research on organic farming. This funding constraint further complicates resource management for both natural and organic farming research.

The committee strongly emphasizes that the budget allocation in the EFC and the actual release should align to effectively meet the scheme's objectives and achieve targets on time. ICAR-IIFSR, being an important research institute with a multidisciplinary team and a pan-India presence, plays a key role in addressing SDGs, national priorities like doubling farmers' income, and fulfilling international commitments, such as achieving net-zero emissions by 2070. To support these efforts, adequate funds are essential. It is recommended that the budget allocation for organic and natural farming research be enhanced, given the global attention from policymakers and the rising demand for quality produce. Furthermore, research and operational expenses for integrated farming systems research should be increased to support a cluster approach, encourage farmers' participation, and facilitate scaling up across different landscapes.

C. Policies, Priorities and Strategies

The ICAR-IIFSR, AICRP-IFS, and AI-NPOF have worked on various aspects of integrated farming systems, cropping systems, organic and natural farming research at the institute level as well as at its centres across the country. However, it was observed that several studies need to be supported by multidisciplinary research and scientific evidence. Some of the observations on the programs being undertaken by the institute are outlined below.

- There is a need to identify ways and means to enhance resource use efficiency while minimizing the cost of production to make integrated farming systems more productive, profitable, and sustainably sound, especially for small and marginal farmers'. Recommendations from ICAR institutes, State Agricultural Universities (SAUs),

and other All India Coordinated Research Projects (AICRPs) on zone-wise suitable varieties of different crops, along with best practices in nutrient, weed, pest, and irrigation management, should be integrated into the IFS modules. By adopting these region-specific recommendations, the IFS modules can be tailored to local agro-climatic conditions, enhancing their effectiveness and sustainability.

- Research project is needed to monitor the changes in the soil and water quality of the suggested IFS model. This monitoring has to be done on farmers field for this collaboration could be established with IISS, and NBSSLUP.
- There is a need to assess the magnitude of nutrient application at the farmer's field and suggest suitable alternatives to reduce use of chemical fertilizers, as huge subsidies are given by the GoI for fertilizers alone.
- The on-farm research programmes undertaken by the institute lacks cluster approach for alternate enterprises, people participation for proper marketing and managing unforeseen weather events. Special emphasis needs to be given on these aspects.
- Large scale adoption acceptability of IFS by small farmers could necessaries a greater emphasis on small farm mechanization and post-harvest management and value addition. There is need to strengthen the collaboration with specialized institute such as CIAE, Bhopal and CIPHET, Ludhiana.
- Small landholders and small and marginal farmers generally draw their livelihood from farm enterprises. Support and encouragement for adoption of more scientific and remunerative farming system is the big opportunity for IIFSR. This would need a better understanding of such farmers requirement vis-à-vis resources to develop pragmatic and need based IFS solutions.
- In many states, the technologies or modules of IFS developed under AICRP-IFS have not yet been adopted by the state governments. The Council and/or GoI officials should provide proper suggestion to the concerned state governments to facilitate the adoption of these important modules and technologies for the betterment of the farming community.
- Introducing a new research program on cropping systems under AICRP-IFS in any region should clearly outline the objectives and provide proper justification for replacing existing systems. This ensures that the benefits and rationale for the transition are well-defined and understood. Crop intensification and diversification should be popularised in convergence mode with state governments and Krishi Vigyan Kendras.
- The institute requires a Krishi Vigyan Kendra (KVK) in its vicinity to demonstrate proven technologies in Integrated Farming Systems (IFS), Organic Farming, and Natural Farming. Additionally, this KVK could serve as a "Centre of Excellence" for showcasing and promoting these technologies.
- Carbon credit inventories should be prepared from IFS/IOFS modules of all the centers of AICRP-IFS and AI-NPOF. Key performance indicator (KPI) and similar other kind of index should be calculated by the scientists of each centre for assessing the performance and suitability of IFS model for the location/region.
- Livestock are essential components of Integrated Farming Systems (IFS), particularly in IOFS. Identifying the most productive livestock breeds for a specific region is crucial for the success of IFS/Organic IFS (IOFS) implementation. The primary focus should be on the proper utilization and recycling of crop residues & livestock excreta to enhance resource use efficiency and value addition within these systems.
- All IFS model adopters should be linked with markets to facilitate the sale of their produce. The support of Farmer Producer Organizations (FPOs) and Self-Help Groups (SHGs) can also be utilized to strengthen these market connections.
- AICRP-IFS and AI-NPOF centres must explore possibilities for securing funding from State Government, NGOs, and other similar agencies to upscale the developed modules and extend their reach to farmers' fields.
- The Government of India calls for the development of a climate-resilient prototype model for Integrated Farming Systems (IFS) tailored to the needs of small and marginal farmers. This model should address the challenges

posed by climate change by incorporating sustainable agricultural practices that enhance resilience. It should be designed to improve productivity and profitability while minimizing environmental impact.

- Hot spot identification of various pests and diseases should be planned based on surveys and surveillance in nearby farmers' fields. Following this, on-farm trials should be conducted by scientists to ensure efficient management of pests and diseases in organic production systems.
- The institute should focus on cluster-based approaches and Farmer Producer Organization (FPO) linkage-based approaches for the upscaling of Integrated Farming System (IFS) modules.
- The technologies generated by the AICRP-IFS and AI-NPOF schemes should be farmer-benefit-oriented. There is a need to identify such technologies that can be beneficial for farmers. Other than this, the institute should identify the most profitable model among the developed models.
- In the process of crop diversification in the sugarcane-ratoon-wheat system, an estimate is required as to how much area has been brought under the rice-wheat system. Further, there is a need to identify the niche areas where vegetable-based and fruit-based farming systems have been adopted instead of the S-R-W system.
- At present, the area under conservation agriculture is limited in the irrigated ecosystems; thus, the institute should identify and disseminate resource conservation technologies for conservation agriculture-based management systems.
- Research gaps and challenges in the field of natural and organic farming should be prioritized and addressed to enhance the adoption and effectiveness of sustainable agricultural practices.
- Horticulture is an integral part of the farming system; thus, the institute should identify such models for the Western Plain Zone of Uttar Pradesh.
- To manage the weeds in organic production systems and conservation agriculture-based systems, combinations of agronomic practices like different plant geometry, use of green mulching, use of weeds as green manures, intercropping, etc. needs to be followed.
- When selecting nutrient sources for organic farming, prioritize products that are readily available, cost-effective, and do not compete with human or animal food to ensure sustainable and ethical practices within the agricultural system.
- Screening and identification of suitable newly developed varieties which are resistant to biotic and abiotic stresses, particularly under organic conditions needs to be undertaken.
- Under organic and natural farming experiments, the emphasis should be given on the changes in soil quality and soil health and soil microbial diversity along with productivity and economics.
- For successful organic farming, it is essential to combine Indigenous Technological Knowledge (ITKs) with scientific knowledge in areas such as crop and variety selection, grasses, fodder, nutrient management, and the management of insects, pests, and diseases.
- There is need of proper documentation of success stories of the farmers who have successfully adopted institute technologies and benefitted by these technologies.
- Impact study of the training programme given to different stakeholders and visitors at IFS/IOFS models should be studied in terms of outcome and further adoption of technologies.
- Strengthening partnerships with the National Centre of Organic Farming (NCOF) is essential for facilitating the certification process, ensuring product quality, and enhancing the market value of organic produce, thereby promoting the adoption of Integrated Farming Systems (IFS) practices.

D. Linkages and Collaborations

The institute has established strong linkages with various national and international institutions. These linkages, however, need to be further strengthened in the domains of research and extension activities to bring global best practices into the local context. Currently, the institute has collaborations with 13 ICAR institutes, 8 AICRPs, and 3 ATARIs through Statements of Understanding (SOUs), facilitating the integration of best technologies and tools from other institutes. In addition, under the AICRP-IFS and AI-NPOF schemes, the institute is working with 34 SAUs, 10 ICAR institutes, 1 central university, and a special heritage university. During the review period, the institute also collaborated with 4 international organizations (BISA, CIMMYT, IWMI, ACIAR, and ICRISAT), which contributed to building the capacity of researchers in the fields of integrated farming and cropping systems.

E. Organization and Programmes

The institute is conducting on-station and on-farm research trials under four major themes: Integrated Farming Systems (IFS), Cropping Systems and Resource Management (CSRM), Organic Agriculture Systems (OAS), and Transfer of Technology and Assessment (TTA). Additionally, there is a Coordination Unit (CU) responsible for monitoring and coordinating two national-level schemes: the AICRP on Integrated Farming Systems (AICRP-IFS) and the All-India Network Project on Organic Farming (AI-NPOF). The AICRP on IFS, a plan scheme initiated in 2010-11, currently operates with 74 centres located across 15 distinct agro-climatic regions of the country. Similarly, the AI-NPOF, another plan scheme started in 2004-05, operates with 20 centres covering 10 agro-climatic regions. AICRP on IFS centres at universities are led by a Chief Agronomist, while AI-NPOF centres are headed by a Principal Investigator appointed by the respective universities and institutes.

F. Performance Assessment

Despite constraints in funds and manpower, the notable contribution and impact of the ICAR-IIFSR and its sub schemes namely AICRP on Integrated Farming Systems and All India Network Programme on Organic Farming are:

1. Developed 33 scientifically designed prototype IFS models suitable for 22 states and 1 union territory. Based on these models, an interface meeting on IFS was organized with all states during 2020-21 to implement IFS models through the Rainfed Area Development/Rainfed Farming Systems schemes. To date, the scheme has covered approximately 1.7 million hectares, benefiting around 2.70 lakh targeted beneficiaries.
2. Developed IFS models were promoted by the Government of Kerala (21040 farm households in 14 districts), Odisha (2826 farm households in 30 districts) and Tamil Nadu (41490 farm households in 35 districts) under State specific Plan schemes with a financial outlay of Rs 367.55 crores till March 2023. Other states/UTs such as Jammu and Kashmir, Telangana have also devised a strategy to promote IFS models among the farmers.
3. ICAR-IIFSR aided in preparing the guidelines for Integrated Farming System Clusters (IFC) under Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM). Guidelines were notified vide No. K-11060/02/2020-21/NRETP/FL dated 25 September 2020.
4. Cropping systems research resulted in development of crop plans for 14 major crops. Pilot Project for diversification of rice area by other crops are initiated by Department of Agriculture and Farmers Welfare in 75 districts of the country.
5. Scientific organic farming packages for 30 cropping systems suitable for 9 States developed, demonstrated, and are being popularized through Government schemes.
6. Identified the key performance indicator (KPI) and statistical methodology for evaluation of on-farm farming systems.
7. The AICRP on Integrated Farming Systems and the All-India Network Programme on Organic Farming centers were evaluated based on various criteria, including technology generation and upscaling, publications in high NAAS-rated journals, revenue generation, collaborations, training programs, and extension support to

government agencies. Based on their presentations to the committee and outcome, the centres were rated as outstanding, very good, or good. Detailed rating is given in Table 30 and Table 31.

Table 30. Performance of centres of AICRP on Integrated Farming System

Category	Sub Category	Rating of AICRP-IFS centres		
		Outstanding	Very Good	Good
On-station Research	Main centre	Jorhat (Assam)	Raipur (Chhattisgarh)	Sabour (Bihar)
		SK Nagar (Gujarat)	Palampur (Himachal Pradesh)	Hisar (Haryana)
		Jammu (Jammu and Kashmir)	Raichur (Karnataka)	Ranchi* (Jharkhand)
		Shivamoga (Karnataka)	Durgapura (Rajasthan)	Jabalpur* (Madhya Pradesh)
		Karamana (Kerala)	Faizabad (Uttar Pradesh)	Bhubaneswar (Odisha)
		Akola (Maharashtra)	Kalyani (West Bengal)	Kanpur* (Uttar Pradesh)
		Ludhiana (Punjab)	Pantnagar (Uttarakhand)	-
		Coimbatore (Tamil Nadu)	Rahuri (Maharashtra)	-
		Karjat (Maharashtra)	Parbhani(Maharashtra)	-
		Rajendranagar (Telangana)	-	-
	Sub centre	Kota (Rajasthan)	Navsari (Gujarat)	Powerkheda* (Madhya Pradesh)
		Thanjavur (Tamil Nadu)	Rewa (Madhya Pradesh)	-
		Varanasi (Uttar Pradesh)	Indore (Madhya Pradesh)	-
		Maruteru (Andhra Pradesh)	Chiplima (Odisha)	-
		Junagadh (Gujarat)	-	-
		Rudrur (Telangana)	-	
	ICAR Institute based centre	Port Blair (A & N Island)	New Delhi	-
		Patna (Bihar)	-	-
		Old Goa (Goa)	-	-
		Umiam (Meghalaya)	-	-
		Modipuram (Uttar Pradesh)	-	-
On-Farm Research	OFR districts	Karbi Anglong (Assam)	Vizianagaram (Andhra Pradesh)	Keonjhar (Odisha)
		Chikkaballapura (Karnataka)	Bilaspur (Himachal Pradesh)	Fatehabad (Haryana)
		Dharwad (Karnataka)	Thane (Maharashtra)	East Singhbhum* (Jharkhand)
		Patan (Gujarat)	Patiala (Punjab)	Anuppur* (Madhya Pradesh)
		Jammu (Jammu & Kashmir)	Mirzapur (Uttar Pradesh)	Umaria (Madhya Pradesh)
		Thiruvananthapuram (Kerala)	Baghpat (Uttar Pradesh)	US Nagar (Uttarakhand)
		Hingoli (Maharashtra)	Kanker (Chhattisgarh)	Fatehpur* (Uttar Pradesh)
		Erode (Tamil Nadu)	Nalanda (Bihar)	Dausa* (Rajasthan)

		Nagpur (Maharashtra)	Dahod (Gujarat)	-
		Kalahandi (Odisha)	Satara (Maharashtra)	-
		Dungarpur (Rajasthan)	South 24 Paragnas (West Bengal)	-
		Yethapur (Salem) (Tamil Nadu)	Medak (Telangana)	-

*Centres need to improve their performance

Table 31. Performance of centres of All India Network Programme on Organic Farming

Rating of AI-NPOF centres		
Outstanding	**Very Good**	**Good**
Calicut (Kerala)	Raipur (Chhattisgarh)	Ranchi (Jharkhand)
Bhopal (Madhya Pradesh)	Bajaura (Himachal Pradesh)	Almora (Uttarakhand)
Umiam (Meghalaya)	Ajmer (Rajasthan)	-
Ludhiana (Punjab)	Gangtok (Sikkim)	-
Udaipur (Rajasthan)	Modipuram (Uttar Pradesh)	-
Coimbatore (Tamil Nadu)	SK Nagar (Gujarat)	-
Pantnagar (Uttarakhand)	Jabalpur (Madhya Pradesh)	-
Thiruvananthapuram (Kerala)	-	-
Narendrapur (West Bengal)	-	-
Karjat (Maharashtra)	-	-
Dharwad (Karnataka)	-	-

G. Constraints

- The committee identified several key constraints hindering the progress of ICAR-IIFSR and AICRP on IFS centres, including a significant shortage of scientific manpower and insufficient budget allocation.
- Adequate funding should be allocated to support both capital investments in organic farming research infrastructure and the ongoing operational requirements of research activities.
- Infrastructure and staff welfare activities are very limited at the headquarters and centres of AICRP on IFS and AI-NPOF. This requires special attention from the council.
- Coordination between different AICRPs.

06 RECOMMENDATIONS

The QRT reviewed and evaluated the achievements of ICAR-IIFSR (including AICRP-IFS and AI-NPOF) from 2018 to 2023. Despite facing various challenges and resource constraints, the institute has made commendable progress, largely meeting the expectations of ICAR and its stakeholders. The team assessed IIFSR's overall performance in two key areas: its success in fulfilling its mandate and its institutional management. The review highlighted the institute's significant contributions to contemporary issues and national priorities. While the QRT recognized the impressive performance of IIFSR, it emphasized that the institute must elevate its standards to meet the increasing expectations on both national and international levels and develop a actionable road map along with measurable indicator that should guide institute in the days to come. It is crucial to enhance the institute's role and contributions toward ICAR's broader goals and the agricultural development. The QRT has provided several analysis-based recommendations in the following section.

A. General

1. Introducing New Technologies and Innovations in Existing IFS Models to Boost Productivity and Income

To enhance productivity and resource use efficiency in Integrated Farming System (IFS) models, it is essential to incorporate innovative technologies. By leveraging advancements such as artificial intelligence (AI), solar farming, precision sensor-based agriculture, drone technology, and nanotechnology, the performance of key components including field crops, horticultural crops, and livestock can be improved. Additionally, these technologies can contribute to soil health enrichment and support climate change adaptation and mitigation strategies. Implementing these innovations will not only strengthen and diversify IFS models, develop futuristic models but also facilitate their wider adoption, ultimately enhancing farmer incomes.

2. Success Stories of On-farm Farming System Research Need to be Showcased and Replicated

Given the increasing fragmentation of land holdings and the rising number of marginal farmers, there is a pressing need for the widespread adoption of successful farming models developed particularly on one-acre plot. To achieve this, effective communication and social media tools need to be harnessed utilizing ICT platforms and documenting these success stories through print and media. The success stories should be broadcasted/ uploaded in regional languages periodically to ensure they reach and benefit the broader farming community and other stakeholders.

3. Strategies to Augment the Productivity and Profitability between On-station and Farmer-adopted IFS Models

To address the productivity and profitability gap between on-station Integrated Farming System (IFS) models and those adopted by farmers, it is crucial to analyze the economics of IFS in comparison to conventional farming, both in scientifically managed experiments and farmer's conditions across various regions. Strategies should be developed to bridge this gap by promoting the adoption of IFS models that are tailored to the diverse needs of different farmer categories and farm typologies. This approach will ensure that IFS models are relevant, accessible, and aligned with the specific capacities of farmers, ultimately enhancing long-term acceptance and fostering wider adoption.

4. Studying the Soil-Plant-Animal-Human-Environmental Continuum in IFS Models

A comprehensive study of the soil-plant-animal-human-environmental continuum within the Integrated Farming System (IFS) framework is essential to understand the interactions and relationships among soil health, plant growth, animal welfare, human activities, and environmental conditions. Gaining insights into this continuum will aid in developing integrated and sustainable farming practices that enhance productivity, improve ecosystem services, and promote overall environmental sustainability, as well as the One Health concept.

B. Research

5. Leveraging Data from Integrated Farming Systems Models for Ecosystem Services Valuation and a User-Friendly Digital Platform

The data collected over the past decade from Integrated Farming Systems (IFS) should be leveraged for the valuation and monetization of ecosystem services, such as improved soil health, enhanced biodiversity, water conservation, and carbon sequestration.

a) To support this initiative, a user-friendly digital platform should be developed to efficiently document and share significant achievements from each centre. Additionally, the quantification of IFS practices across states should be generated for each agro-climatic zone (ACZ) in a seamless data format in collaboration with AICRP-IFS centres and relevant state departments, utilizing remote sensing data.

b) It is reiterated that meta-analysis of this digitized data on integrated farming, cropping and organic farming need to be taken up on priority and mapped.

c) Furthermore, region-specific areas for organic and natural farming should be identified, mapped and tailored packages of practices developed accordingly. This platform will allow researchers to systematically upload data, reports, and key outcomes, ensuring easy access for future reference and facilitating effective technology synthesis.

6. Impact Study of the Adoption of IFS Models

A comprehensive resource economics assessment should be conducted for each cropping season and on an annual basis for all IFS models developed at the institute and its centres over the past decade. The study should analyze the socio-economic impact of IFS models by evaluating all parameters related to technology adoption, constraints, opportunities, lessons learned, and inputs for policy interventions. Additionally, the environmental benefits, such as the quantification and upscaling of generated carbon credits, should be systematically documented to provide a clearer picture of the models' overall impact.

7. Region-Specific Selection of Promising Livestock and Poultry Breeds for Efficient Resource Use in IFS

Livestock and poultry are essential components, particularly in Integrated Organic Farming Systems (IOFS) and natural farming. Selecting region-specific, high-performing breeds is crucial for the successful implementation of IFS, IOFS, and natural farming practices. The primary focus should be on the efficient use of fodder crops and the recycling of crop residues and livestock manure to enhance resource use efficiency, increase production, add value, and reduce methane emissions, all contributing to sustainable farming.

8. Addressing Issues of Organic Farming in Niche Areas

Advancing the science of organic farming is essential to addressing yield stability under both low and high input management systems. This requires focused research on developing alternative nutrient sources, as well as crop varieties specifically suited for organic farming. Region-specific, data-driven studies on nutrient dynamics should be prioritized. Additionally, the benefits of ecosystem services, such as species diversification and livestock complementarity, should be analyzed under key limiting factors like water, nutrients, and climate, to enable more precise and informed decisions.

9. Comprehensive Strategies to Scaleup Natural Farming

Research on natural farming is currently limited, highlighting the need to evaluate, standardize, and validate its practices, including the use of bio-concoctions, with a regional focus. Integrating the best practices from other non-chemical farming systems should also be considered where applicable. Fundamental research on soil microbiomes, carbon and energy footprints, nutrient budgeting, and the long-term impact of natural farming on soil health and environmental parameters is essential for its sustainable development.

10. Strengthening Multidisciplinary Research Programmes

By fostering collaboration among multidisciplinary scientists, including those from basic sciences, the nuanced and complex challenges in farming system research can be effectively addressed. This synergy will enhance the quality and relevance of the research while also contributing to advancements in sustainable farming systems and increasing their recognition in scientific arena.

C. Organization and Management

11. Strengthening ICAR-IIFSR through the Establishment of Five Regional Centres for Strategic and Applied Research Across India's Agro-Ecologies

ICAR-IIFSR should be strengthened by creating five Regional Centres (RC) to comprehensively address region-specific strategic and applied research needs over the long term. Proposed locations for these centres include the North (Jammu), Central (Jhansi), East (Samastipur), West (Godhra), and South (Bengaluru). While AICRP-IFS centres at SAUs primarily focus on state-specific technologies, their research efforts are often limited in scope. ICAR-IIFSR is positioned as a key institution for tackling national priorities such as doubling farmers' incomes, promoting climate-resilient agriculture, achieving net-zero emissions, advancing organic farming, and transitioning to natural farming protocols. By establishing a robust multi-station institute, ICAR-IIFSR will enhance its ability to develop diversified, multi-enterprise agricultural models at a landscape level, effectively addressing food security, nutritional needs, employment opportunities, income generation, and environmental sustainability for the future of Indian agriculture.

12. Reorganization of Existing Centres and Opening of New Centres of AICRP-IFS and AI-NPOF should be undertaken to Further Strengthen the Basic and Applied Research on Diverse Farming Systems of India

a. The previous QRT (2012-2017) recommendations are reaffirmed, advocating for the establishment of new voluntary centres, supported solely with research and operational contingency funds, at ICAR-Central Arid Zone Research Institute (Rajasthan), YS Parmar University of Horticulture and Forestry, Solan (Himachal Pradesh), and Acharya NG Ranga Agricultural University, Amravati (Andhra Pradesh), with the centre to be located at Ananthapuramu. Reorganize existing centres by upgrading the Maruteru Centre to a main centre, utilizing existing staff positions, as Andhra Pradesh currently lacks a main centre following its bifurcation. Additionally, shift the Rewa sub-centre and Umaria OFR centre of Jawaharlal Nehru Krishi Vishwavidyalaya (JNKVV) to Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKVV), Gwalior (MP).

b. The committee also reaffirmed for filling up of the vacant technical posts at the OFR Centre, ICAR-IIFSR, Modipuram under AICRP on IFS need on a contractual basis.

c. The AI-NPOF, Bajaura Centre should be shifted to CSKHPKVV, Palampur (University Headquarters) to enhance the visibility and adoption of organic farming technologies from CSKHPKVV centre with good infrastructure.

d. New centre of AICRP-IFS should be established in the Bundelkhand (RLB CAU, Jhansi) and Kashmir (Srinagar) regions to provide region-specific technologies and solutions.

13. Re-organization of AI-NPOF and New On-station and Outreach Centres

The recommendation of previous QRT (2012-2017) is reaffirmed. The number of centres under AI-NPOF should be increased to reach the unreached States and areas besides changing the location of one centre as per need. Hence, in addition to shifting of location of centre under JNKVV from Jabalpur to Mandla, 7 new on-station centres and 8 outreach centres with only research and operational expenses for niche areas where organic farming are already intensified by state governments are recommended as detailed below.

#	University/Institute/ Organization (State)	Recommended location of centre
Shifting of existing centres		
1.	Jawaharlal Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh)	Jabalpur to Mandla
New centres (on-station) recommended		
1.	CCS Haryana Agricultural University, Hisar (Haryana)	Hisar
2.	Odisha University of Agriculture and Technology, Bhubaneswar (Odisha)	Bhubaneswar
3.	University of Agricultural Sciences, Bengaluru (Karnataka)	Bengaluru
4.	National Institute of Plant Health Management, Hyderabad (Telangana)	Rajendranagar

5.	Acharya NG Ranga Agricultural University, Guntur (Andhra Pradesh)	Maruteru
6.	Sher-e-Kashmir University of Agriculture and Technology, Jammu (Jammu and Kashmir)	Jammu
7.	Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur (Bihar)	Samastipur
Out Reach Centres (for farmer participatory refinement of organic farming packages)		
1.	ICAR-Central Island Agricultural Research Institute, Port Blair (Andaman and Nicobar Islands)	Shaheed Island
2.	Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)	Nilgiri
3.	Regional Centre of ICAR-Research Complex for North Eastern Hill region, Gangtok (Sikkim)	Sikkim
4.	Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan)	Dungarpur
5.	I Concept Farmer initiatives (Odisha)	Dandamukundpur
6.	University of Agricultural and Horticultural Sciences, Shivamoga (Karnataka)	Shivamoga
7.	GB Pant University of Agriculture and Technology, Pantnagar	Hill district of Uttarakhand
8.	Regional Centre of ICAR-Research Complex for North Eastern Hill region, Tripura Centre, Agartala (Tripura)	Agartala

14. Performance of the AICRP-IFS and AI-NPOF Centres

The performance of the centres has been given in Table 30 and 31 few centres need to improve their performance in a definite time frame failing which ICAR may take appropriate action after midterm review.

15. Strong Capacity Building of IIFSR and its Network Scientists

Capacity building for scientists at IIFSR and those involved in AICRP be undertaken on cutting-edge, state-of-the-art technologies and advancements at both national and international levels. This renewed push will enhance their expertise and provide exposure to global developments in farming systems research. Additionally, it will foster linkages and collaborative research initiatives supported by dedicated funding.

16. Filling of Vacant Positions of Institute and AICRP-IFS

The institute is facing a shortage of scientific and technical manpower. Positions in several disciplines, such as Extension, Entomology, Livestock, Farm Machinery, Environmental Science, and Soil Science, remain unfilled. Similarly, the technical staff strength (sanctioned: 26) has drastically reduced to 11, and by March 2025, it is expected to decrease to eight (08). These positions need to be filled urgently to carry out the institute's mandated activities. At AICRP centres, the recruitment process for various posts that have been vacant for over three years should be initiated immediately to achieve the required targets in the mandated areas. A mid-term review should be conducted to monitor the progress of these recruitment efforts, and if positions remain vacant for more than two years, appropriate action should be taken by the Council.

17. Strengthening Monitoring Mechanisms for AICRP-IFS and AI-NPOF Centres through Multidisciplinary Collaboration and Funding

The monitoring mechanism for each centre should be strengthened by involving multidisciplinary scientists from various divisions and sections of the institute, as well as from AICRP and AI-NPOF centres, with additional budget allocations from ICAR.

18. Upgradation of All India Network Programme on Organic Farming (AI-NPOF)

The recommendation of the previous QRT (2012-2017) is reaffirmed to upgrade the All-India Network Programme on Organic Farming (AI-NPOF) to an All-India Coordinated Research Project on Organic Agricultural Systems, to be managed by a separate Project Coordinator.

19. Establishment of a Separate Natural Farming Network Programme with Additional Budgetary Support

Organic Farming and Natural Farming should be distinct from the All-India Network Programme on Organic Farming (AI-NPOF), requiring a dedicated budget to effectively implement Natural Farming initiatives.

20. Establishing Global Centre of Excellence on IFS and Natural Farming and propose 2027 as International Year of Natural Farming (IYNF)

The institute should transform into a "Global Centre of Excellence for Integrated Farming Systems (IFS) and Natural Farming," with an initial corpus funding of ₹ 100 crores. This centre will highlight iconic models of natural farming through participatory approaches, aligning with national priorities and promoting South-South collaboration giving nation an edge globally. IIFSR should establish itself as a global hub for capacity development in this field, converting its farms into living laboratories for demonstration and implementing robust outreach programs. The funding will be allocated for developing state-of-the-art research and farm laboratories, an organic/natural farming technology incubation centre, bio-resource development units, an Agricultural Technology Information Centre (ATIC), and an International Training Hostel. These facilities will significantly enhance support for various stakeholders. The QRT has also recommended that IIFSR formulate strategies to designate 2027 as the "International Year of Natural Farming.

D. Infrastructure

21. Conversion of Old Residential Quarters into a New Multi-Storeyed Residential Complex for Limited Accommodation within the IIFSR Campus

The residential quarters of IIFSR, located sporadically in Pallavpuram, Meerut, are outdated, liable to encroachment, inhabited and the high maintenance and repair costs have become unmanageable. A thorough assessment should be conducted to determine the feasibility of demolishing these quarters in accordance with Government of India procedures. The funds generated from this process can be utilized to construct a limited multi-storeyed residential complex for various categories of staff within the ICAR-IIFSR campus. This development will support the maintenance of a well-managed farm and enhance the overall infrastructure, thereby improving the image of IIFSR.

E. Financial

22. Increased Fund Allocation for the Institute, AICRP-IFS, and AI-NPOF: A Critical Requirement for Successful Program Implementation

a. Enhancing fund allocation for the institute to maintain existing infrastructure and cover operational contingencies for research purposes (approximately Rs 4.5 crore/year), AICRP-IFS (Main Centre - Rs 10.0 lakh/centre/year; Sub Centre - Rs 8.0 lakh/centre/year; OFR Centre - Rs 15 lakh/centre/year), and AI-NPOF (Rs 20 lakh/centre/year) is essential. Adequate budgetary support is crucial for the successful implementation of the research programs. This adjustment is necessary to accommodate year-round research activities and to address the complexities of multi-commodity research, including livestock and other enterprises. Currently, the budgetary provision for contingencies in the AI-NPOF project is very limited, primarily covering only the salaries of contractual staff. Moreover, while the number of experiments and trials has increased over the years, the budgetary allocation has not changed, necessitating this enhancement.

b. Commissioning of new International Standard Organic Referral Laboratory, constructed by NCRTC and strengthening the existing farm and other research facilities would require a one-time grant of Rs 20.0 crore. Given the institute's role as a National Institute for Research and Development support for “Future Farming Systems,” such financial support is highly necessary.

Annexure-I

Recommendations made by QRT (2012 to 2017), Council's View and Action Taken Report in respect of ICAR-IIFSR including AICRP-IFS and AI-NPOF

S. No.	Recommendations of QRT	Council's Comments	Action Taken
1.	Reports generated on various aspects since inception of the scheme i.e 1952-53 should be digitized. Meta-analysis on Integrated, cropping and Organic farming systems needs to be undertaken.	Agreed Time frame: 2020-22 Technically a very valid recommendation as Institute not only generated but accumulated voluminous data which need urgent big data analyses.	LTE data and reports digitized and published in the form of book (Long term integrated nutrient management in cereal based cropping systems). Three review paper has been published ➢ Integrated Farming Systems as an Adaptation Strategy to Climate Change: Case Studies from Diverse Agro-Climatic Zones of India. (2022). Sustainability, 14, 11629. https://doi.org/10.3390/ su141811629. ➢ Organic farming research in India: Potential technologies and way forward (2021). Indian Journal of Agronomy 66 (5th IAC Special Issue):S142-S162 ➢ Ecosystem Network Analysis in a Smallholder Integrated Crop-Livestock System for Coastal Lowland Situation in Tropical Humid Conditions of India (2020). Sustainability 2020, 12, 5017; doi:10.3390 /su12125017
2.	Social impact of Integrated Farming System models, Organic Farming packages and cropping systems should be assessed for different categories of farmers.	Agreed Time frame: 2020-23 There is a need to assess the impact of refinement of existing farming system in OFR mode across different categories of farmers. If need be, we can also go for third party evaluation as attempted in NICRA project	Impact of Integrated farming Systems implemented in Tamil Nadu, Kerala and Telangana studied through institute-AICRP-IFS linked project in which different dimensions of impact including social impact are covered. Third party evaluation by Administrative Staff College of India (ASCI) was made for integrated farming systems, organic and cropping systems research undertaken by ICAR-IIFSR, AICRP-IFS and AI-NPOF.
3.	Policy for promotion of organic farming should be revisited and refined based on the information generated through All India Network Programme on Organic Farming.	Agreed. Time frame: 2020-22 For preparing a policy to promote organic farming in IFS as institute is striving to develop Integrated Organic Farming Systems (IOFS) in system mode rather than on commodity approach.	➢ A Policy paper on "Organic Farming in India: Production Constraints and Policy Recommendations" prepared in collaboration with ICAR-National Academy of Agricultural Research Management, Hyderabad and ICAR-Central Research Institute for Dryland Agriculture, Hyderabad.

			(Ramesh Naik M., Umesh Hudedamani, K.A. Gopinath, A.V. Ramanjaneyulu, N. Ravisankar, Tavva Srinivas, V.K. Singh, G. Venkateshwarlu and Ch. Srinivasa Rao. 2022. Organic Farming in India: Production Constraints and Policy Recommendations, ICAR-National Academy of Agricultural Research Management, Hyderabad, India. Pp 32).
4.	Science of farming systems should be unraveled through research on farming system typology, and modeling tools to develop alternative systems.	Agreed. Time frame: 2020-23 To strengthen the research using modern modelling tools and techniques. Capacity building of scientists engaged in FSR is very much essential to reorient the research.	➢ Farming System typology analysis and optimization tools such as Farm Design were applied through capacity building of Scientist of AICRP-IFS in collaboration with CIMMYT (Mexico) and Wageningen University of Research (The Netherlands). During 2023, capacity building of Scientists on Whole-Farm design and Integrative Sustainability Assessment Tool was organized in collaboration with ICRISAT, Hyderabad. Following research papers are published in high impact journals as a result of efforts made. 1. Ashisa K. Prusty, Ravisankar Natesan, et al.2022. Redesigning of farming systems using a multi- criterion assessment tool for sustainable intensification and nutritional security in Northwestern India, Sustainability 14, 3892. https://doi.org/10.3390/su14073892h 2. Anitrosa Innazent, D. Jacob, J.S. et al.2022. Farm typology of smallholders integrated farming systems in Southern Coastal Plains of Kerala, India, Scientific Reports 12:333, https://doi.org/10.1038 /s41598-021-04148-0
			3. Jashanjot Kaur, A.K. Prusty, N. Ravisankar et al. 2021. Farm typology for planning targeted farming systems interventions for small holders in Indo-Gengetic Plains of India, Scientific Reports 11:20978, https://doi.org /10.1038 /s41598-021-00372-w

5.	Carbon sequestration dynamics in various cropping systems, integrated farming systems and organic farming under varied environment should be studied.	Agreed. Time frame: 2020-23 To build facilities for C sequestration dynamic in IFS. Already research work has been initiated to characterize the IFS models in terms of C neutrality.	➢ Studies have been/are being conducted for organic farming system on the aspect and research papers published. ➢ Institute funded project approved and completed on "Carbon crediting and Greenhouse gases emission integrated farming system models under AICRP on Integrated Farming Systems" (2018-2022). Long term impact of organic and inorganic fertilizers on soil organic carbon dynamics in a rice-wheat system. (2022). Land Degradation & Development 33(11):1862-1877. Influence of Different Nutrient Management Practices and Cropping Systems on Organic Carbon Pools in Typic Ustochrept Soil of Indo-Gangetic Plains in India. (2022). Journal of Soil Science and Plant Nutrition 22(2): 1403-1421.
6.	Micro irrigation systems and its role in different types of integrated and organic farming systems should be evaluated and new irrigation management strategy needs to be developed.	Agreed. Time frame: 2020-22 To integrate climatic smart including water smart technologies for attaining higher input use efficiencies	Work started and Micro irrigation (drip) system included in the development of POPs for cabbage in one of contract research project. Different water saving technologies (plastic/crop residue mulching/ land configuration/planting systems etc.) are integral part and included in different POPs for organic conditions.
7.	Futuristic crop and farming system planning using advanced knowledge and techniques must be explored.	Agreed. Time frame: 2020-24 To initiate precision farming technologies wherever feasible as the holding sizes are very small.	Crop plan developed for 14 major crops namely rice, wheat, maize, pearlmillet, sorghum, chickpea, pigeonpea, soybean, groundnut, mustard, cotton, sugarcane, potato and onion. Based on the analysis made, Department of Agriculture and Farmers Welfare approved Pilot Project for Crop Diversification in 75 districts in 17 States.
8.	Integrated and Organic Farming system models for absentee farmers and contract farming should be developed.	Agreed. Time frame: 2020-24 It is already being carried out in OFR research	Under On-Farm Research Component of AICRP on Integrated Farming Systems, absentee farmers are included for refinement of integrated farming systems from 2022-23.

9.	Integration of bio-fortified varieties of crops, nutritional kitchen garden, roof top garden, home garden etc and its efficiency in farming systems perspective needs to be evaluated.	Agreed. Time frame: 2020-22 It is very essential to evaluate bio-fortified varieties in varying faming systems for achieving nutritional security. In fact, the modules / models are designed scientifically considering WHO standard of nutritional requirement of a farming.	OAS division has started the works on integration of bio-fortified varieties of crops in POPs for organic production. DBW 187 of wheat (rich in iron and protein content) has already been included in AI-NPOF experiments. Evaluation of bio-fortified varieties such as HHB-299 of pearlmillet, WB-02 of wheat at Fathehabad (Haryana), DRR Dhan-45 of rice at Vellayani (Kerala), Medak (Telangana), Erode (Tamil Nadu), BhuSona of Sweet Potato and Sree Vijaiya of Tapioca at Salem (Tamil Nadu), PBW Zn1 of wheat at Patiala (Punjab), Adishakthi of pearlmillet at Padegaon (Maharashtra), Parbhani Shakti of Sorghum at Hingoli (Maharashtra), JAKI-9218 of Chickpea at Nagpur (Maharashtra), NLR-34449 of rice at Vizianagaram (Andhra Pradesh) were undertaken under integrated production systems through AICRP-IFS centres. Nutritional kitchen garden is included in all the IFS models. Roof top garden and home garden are included in Karamana (Kerala).
10.	Research on integration of fisheries in different farming systems needs further strengthening with concerted efforts.	Agreed. Time frame: 2020-23 Wherever feasible looking into biophysical and socio economic factors, the IFS involving fisheries will be developed.	The fisheries component is integrated into 21 IFS models under AICRP-IFS are being evaluated.
11.	Agro-eco tourism-based farming systems should be developed for eco-centric education and recreational purpose at selected locations.	Agreed. Time frame: 2020-23 Already being developed in places like NEH, Goa, Kerala etc. where large number of farmers are visiting.	IFS models at Goa, Karamana and Port Blair have been identified for promotion of Agro-ecotourism. Consultancy Project for preparing Detailed Project Report for establishing Model Agro-Tourism Farm in 4 Government Farms of Odisha State Government obtained and DPR for 3 farms submitted. Odisha State government is developing Model Agro-Tourism farms.
12.	Ecological sites at on-station and on-farm (village clusters) should be developed, studied and documented for capturing the long-term benefits of soil, plant, livestock and human health through maintenance of biodiversity.	Agreed. Time frame: 2020-22 To make observation for capturing the long term benefits including biodiversity in on-going and concluded OFR sites.	A project on “Assessing the role and contribution of Integrated Farming Systems for addressing One Health at household and landscape levels” initiated by identifying 5 IFS models such as Karamana, SK Nagar, Modipuram, Patna and Jorhat representing different agroecosystems. With respect to OFR sites, proposal included in the EFC (2021 to 2026), but due to budget constraints, the activity is yet to be initiated.

13.	Impact study period of on-farm research should be extended.	Agreed. Time frame: 2020-23 To have data on impact of these years along with third party evaluation.	Impact study of OFR districts covered during 2017-2022 have been made during 2021-22. This is continued during 2022-23 and 2023-24 also based on limited random sampling.
14.	Basic research on Organic Farming needs to be strengthened and supported.	Agreed. Time frame: 2020-21 As so many questions are being asked on chemical composition of inputs of O.F. like cow urine, cow dung, etc. As funds are not available in the ongoing SFC/ EFC and would be proposed during next SFC.	The Division has initiated research on characterizing organic inputs for nutrient and pest management in organic and natural farming, along with studies on residue decomposition and plant growth promotion using microbial consortia. Mustard varieties suitable for low-input organic farming were developed from F2 progenies of Indian mustard (Brassica juncea) and tested up to the F8 generation. Nine promising homozygous strains were identified, with MM16A241 and MM16A082 yielding 11.64% higher than the standard check RH-749. Several research papers have been published based on this work. Microbiological properties of Beejamrit, an ancient Indian traditional knowledge, uncover a dynamic plant beneicial microbial network, World Journal of Microbiology and Biotechnology, 38 (111): 1-12 Metabolomic analysis, functional group identification and completecharacterization of panchagavya (organic foliar nutrition), Indian Journal of Agronomy 66 (3):264-271 Identification of organic functional groups and proximate analysis of crop residues, Indian Journal of Agronomy 66 (3):279-285
15.	Long term research on Integrated Organic Farming Systems should be initiated in niche and non-niche areas.	Agreed. Time frame: 2020-22 Already initiated and it would be considered in the next EFC / SFC.	An IOFS Model is being developed for WPZ of U.P. in which we are taking related observations. Periodical surveys are also being conducted on Geo-referenced characterization of Organic Farmers in which observations are being recorded for this region. A total of 5 Integrated Organic Farming System models suitable for Chhattisgarh, Gujarat, Kerala (Thiruvananthapuram), Rajasthan and Sikkim have been developed during the period. Three are in progress. All the relevant observations are being taken. Research papers are published besides documentation by Indian Council of Agricultural Research.

			Jayanta Layek, Anup Das, Meraj A. Ansari, et al.,.2023. An integrated organic farming: innovations for farm diversification, sustainability, and livelihood improvement of hill farmers, Frontiers in Sustainable Food Systems, 7:1151113. doi: 10.3389/fsufs.2023.1151113 Somasundaram, E., K. Ganesan, N. Ravisankar and A.S. Panwar.2021. Integrated organic farming system approach to sustain productivity, income and employment of marginal farm holdings of Southern India, Indian Journal of Agronomy 66 (3):286-294
16.	Institute should be strengthened by creating 3 divisions and 1 section to provide leadership role in 3 critical areas of research viz., Integrated Farming Systems, Cropping Systems and Organic Farming which are critical and backbone areas of Indian Agriculture.	Agreed. Time frame: Immediately As per the decision of cadre review exercise.	Three divisions and one section has been created and all the Heads of the Divisions has been assumed their duties after selection form ASRB, New Delhi in 2023.
17.	Project Coordinator for AICRP on Integrated Farming Systems should be created from the existing Principal Scientist posts of institute.	Agreed. Time frame: Immediately As we are already working in 74 centres. Besides NPOF has been upgraded into AICRP by the committee for restructuring AICRPs. There is also lot of demand from different states for opening of more and more Organic Farming Centres. However, the final decision would be based on recommendations of cadre review.	The post of Project Coordinator for AICRP on Integrated Farming Systems has been created and new PC assumed their duties after got selection form ASRB, New Delhi in June 2023.
18.	Re-organization of existing centres and opening of new centres of AICRP on Integrated Farming Systems should be undertaken to further strengthen the basic and applied research on diverse farming systems of India. Technical posts of the scheme withdrawn from April 2018 should be restored.	Not agreed till the end of this SFC/EFC.	Due to budget ceiling of 5.5 times of 2019-20 expenditure for the next EFC period (2021-2026), this could not be proposed in the EFC under consideration.

19.	Designation of Scientific positions along with disciplines in the AICRP on IFS scheme should be changed to match the current and suggested future research areas. Student Fellowships should be encouraged in Integrated Farming Systems and Organic Farming Research through AICRP-IFS and AI-NPOF schemes to encourage the human resource development and quality research output.	Not agreed till the end of ongoing SFC up to 2017-20.	Proposed in the EFC (2021-2026). EFC is under process at Council.
20.	Technical posts of OFR centre, ICAR-IIFSR, Modipuram under AICRP on IFS needs to be re-organized and provided on contractual basis.	Agreed. Time frame: Immediately For smooth implementation of the program at no additional cost to the schemes.	Proposed in the EFC (2021-2026). EFC is under process at Council. Dr P.C. Jat, In-charge, TTA is working as OFR Agronomist, Modipuram centre. Due to budget constraints, provision of 4 YP-1 could not be made.
21.	All India Network Programme on Organic Farming (AI-NPOF) should be upgraded to All India Coordinated Research Project on Organic Agricultural Systems managed by Project Coordinator.	Agreed. Time frame: 2020-21 Decision is already taken at Council level, considering the recommendations of AICRP Review Committee. However, the creation of PC is based on formal approval of recommendations by Cadre Review Committee.	As per the direction of ICAR, the scheme is proposed as All India Network Programme on Organic and Natural Farming (AINP-ONF) in the EFC (2021-2026). Network Programme is looked after by National Principal Investigator (NPI).
22.	The centres of AI-NPOF needs re-organization and new on-station and outreach centres should be sanctioned to reach the unreached niche areas and crops.	Agreed. Time frame: 2020-21 In view of increasing awareness/ campaign of organic farming vis-à-vis demand from different states / UTs which have potential for promotion of O.F.	Proposed in the EFC (2021-2026). EFC is under process at Council.
23.	Certificate course on Integrated Farming Systems and Organic Farming should be started.	Agreed. Time frame: 2020-22 Based on the demand of innovative farmers on several fora.	Certified Farm Advisor (CFA) on Organic Farming initiated in collaboration with National Institute of Agricultural Extension Management, Hyderabad. A total of 246 candidates from 23 States/UTs are involved in the course. Certificate course on Integrated Farming Systems initiated in collaboration with Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri.

24.	Infrastructure and staff welfare activities need to be strengthened at the Institute and centres of AICRP on IFS and AI-NPOF schemes. The following recommendations are made to enhance the efficiency of available human resources.	Not agreed	NA
25.	Enhancement in funds allocation for the institute, AICRP-IFS and AI-NPOF is recommended considering the year-round activities of research and dealing the multi-commodity research including livestock and other enterprises. The revenue generated by the Institute and its AICRP on IFS/AINPOF centres should be given back for establishing new modules of farming systems.	Not agreed	NA

Annexure-II

PROGRAMMES ORGANIZED AND ATTENDED BY STAFF

a. Winter/Summer schools/Short Course organized

S. No.	Name of activity	Date	Venue
1.	ICAR sponsored short course on "Empowerment of Small and Marginal Women farmers through Agri- Entrepreneurship"	July 06-15, 2018	ICAR-IIFSR, Modipuram
2.	Model Training Course sponsored by Directorate of Extension, Ministry of Agriculture and Farmer Welfare, New Delhi on "Package and practices for small farm mechanization"	September 04-11, 2018	ICAR-IIFSR, Modipuram
3.	ICAR sponsored short course on "Phenomics, the next generation phenotyping (NGP), the trait dissection and crop improvement"	October 22-31, 2018	ICAR-IARI, New Delhi

b. Training organized

S. No.	Name of activity	Date	Venue
1.	Training on "GHG emission/carbon sequestration estimation using ß version of excel tool" for on-station and on-farm Centres of AICRP-IFS	26-28 June, 2018	ICAR-IIFSR, Modipuram
2.	IPNI sponsored training on "4R Nutrient stewardship: Concepts, principles and application"	29 June, 2018	ICAR-IIFSR, Modipuram
3.	Quantitative farming system typologies applications with the R statistical computing	17-21 September, 2018	ICAR-IIFSR, Modipuram
4.	Certified Farm Advisor (CFA) on Organic Farming (Module-II) sponsored by MANAGE, Hyderabad, Telangana	4-18 October, 2018	ICAR-IIFSR, Modipuram
5.	National Rainfed Area Authority, GoI, New Delhi sponsored training on Integrated Farming Systems and Conservation Agriculture for officials of NRAA	19-23 November, 2018	ICAR-IIFSR, Modipuram
6.	Brain storming session on Indigenous organic practices including zero budget natural farming (ZBNF) vs Scientific organic farming involving ZBNF practicing farmers	28 November, 2018	TNAU, Coimbatore
7.	Advances in experimental Designs and Analysis	06-26 December, 2018	ICAR-IASRI, New Delhi
8.	Training on scientific goat farming to the adopted farmers under the Climate resilient sustainable IFS model for optimizing farm productivity"	3-6 January, 2019	Jayapur, Nagepur and Sewo in Varanasi
9.	Entrepreneurship Development in Farming System through Round the Year Mushroom Production Technology	15-22 Jan, 2019	ICAR-IIFSR, Meerut
10.	Training on packaging and labelling of value-added products to Women's Self-help Group	15 February, 2019	ICAR-IIFSR, Modipuram
11.	Training cum exposure visit on Organic farming for farmers of Nilgiri districts, Tamil Nadu	21-23 February, 2019	ICAR-IIFSR, Modipuram

12.	Writing Lab for identified centres of AICRP on IFS	25 Feb. to 01 March, 2019	Punjab Agricultural University, Ludhiana
13.	New technologies and developments in oilseeds cultivation for changing climate	18-19 March, 2019	ICAR-IIFSR, Modipuram
14.	Training-cum-exposure visit on Organic Farming for Farmers' of Nilgiri district	21-23 Feb, 2019	ICAR-IIFSR, Meerut
15.	Writing Lab for identified centres of AICRP on IFS	25 Feb- 01 Mar, 2019	PAU, Ludhiana
16.	New technologies and developments in oilseeds cultivation for changing climate	18-19 March, 2019	ICAR-IIFSR, Meerut
17.	Training programme on "Diversification of tribal farming systems through mushroom production, vermicomposting and improved livestock production techniques" under TSP	30 May -1 June, 2019	Thari, Veerpur Tara and Mallapuri, Ramnagar, Block
18.	On-line submission and analysis of on-farm farming systems data for up-scaling of IFS	27-29 August, 2019	ICAR-IIFSR & ICAR-IASRI, New Delhi
19.	Training on packaging and lebelling cum exhibition and sale of value added products to Women's Self-help Group	31 Aug – 01 Sept, 2019	ICAR-IIFSR, Meerut
20.	Training on production of low chilling apple in subtropical zones	13-17 Dec, 2019	ICAR-IIFSR, Meerut
21.	Skill development training on organic growers Batch-I	10 February-05 March, 2020	ICAR-IIFSR, Modipuram, Meerut
22.	Skill development training on organic grower Batch II	10 February-05 March, 2020	ICAR-IIFSR, Modipuram, Meerut
23.	Training Management Information System (TIMS)	08 May, 2020	ICAR-IIFSR & ICAR-IASRI, New Delhi
24.	"Plant protection research and technologies for Organic Farming" in BIOFACH India 2020(International Trade Fair on Organic Farming) organized in partnership with APEDA on Science Conference on "Organic Farming Research, Technologies and Extension"	31 October, 2020	APEDA and ICAR-IIFSR (Webinar)
25.	BIOFACH India 2020(International Trade Fair on Organic Farming) organized in partnership with APEDA on Science Conference on "Organic Farming Research, Technologies and Extension"	31 October, 2020	APEDA and ICAR-IIFSR (Webinar)
26.	Customized training programme on Integrated Farming System for NABARD officials (Sponsored by BIRD, Lucknow)	27-29 January, 2021	ICAR-IIFSR, Modipuram & NABARD (Virtual)
27.	Training programme on Integrated Farming System for DDMs and Staff members of NABARD, Madhya Pradesh Regional Office (MPRO)	28 January, 2021	Virtual
28.	Certified Farm Advisor on Organic Farming (Module-II)-First Batch sponsored by MANAGE, Hyderabad	2-16 February, 2021	ICAR-IIFSR, Modipuram
29.	Skill Development training on Organic Growers	18 February–14 March, 2021	ICAR-IIFSR, Modipuram

30.	Training on "Improvement in the working efficiency of skilled supporting staff"	22-26 February, 2021	ICAR-IIFSR, Modipuram
31.	Certified Farm Advisor on Organic Farming (Module-II)-Second Batch sponsored by MANAGE, Hyderabad	23 February-9 March, 2021	ICAR-IIFSR, Modipuram
32.	Training on "Skill Development Training on Organic Grower"	01-25 March, 2021	ICAR-IIFSR, Modipuram. Meerut
33.	Bharat ka Amrut Mahotsav-Mass Awareness Campaign on Organic Farming	13-26 May, 2021	ICAR-IIFSR, Modipuram (Virtual)
34.	Training of Extension Officials on Upscaling of organic farming technology and Natural farming practices through BPKP for Sustainable Agriculture sponsored by SAMETI, Kerala	27-29 July, 2021	ICAR-IIFSR, Modipuram (Virtual)
35.	Bharat ka Amrut Mahotsav-Mass Awareness Campaign on Organic Farming	2-7 August, 2021	ICAR-IIFSR, Modipuram (Virtual)
36.	National Webinar on Integrated farming system for Sustainable livelihood and Nutritional Security.	12 August, 2021	ICAR-IIFSR, Modipuram (Virtual)
37.	Training on Entrepreneurship Development through Organic Farming	16-18 August, 2021	ICAR-IIFSR, Modipuram (Virtual)
38.	National Training Programme entitled "Production and Postproduction Technologies of Mushrooms for entrepreneurship development under ABI Scheme"	05-06 October, 2021	ICAR-IIFSR, Modipuram (Virtual)
39.	Good Agricultural Practices (GAP) for dissemination of Improved IFS technologies under Farmer First	21-23 October, 2021	ICAR-IIFSR, Meerut
40.	Crop diversification and remunerative cropping systems involving oilseeds (Mustard)	26 October, 2021	Bhadurpur village, Meerut, Uttar Pradesh
41.	Trainers Training on Natural and Organic Farming for KVKs of SVPUAT, Meerut Modipuram	Virtual: 2-3 March, 2022; Physical: 22-23 March, 2022	Virtual & Physical at ICAR-IIFSR, Modipuram
42.	"Crop diversification and remunerative cropping system involving oilseeds" for farmers sponsored by NFSM (Oilseeds & Oil palm) (5 trainings in 5 States)	January to March, 2022	Modipuram, Kalahandi, Medak, Vizianagaram, Palghar
43.	Certified Farm Advisor (CFA) on Organic Farming (Module-II: Virtual for 9 days) sponsored by National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana	15-24 Feb, 2022	Virtual
44.	"New technologies and developments in oilseeds" for extension officers/workers/input dealers sponsored by NFSM (Oilseeds & Oil palm) (4 trainings in 3 States)	January to March, 2022	Umaria, Dungarpur, Kota and Dahod
45.	Certified Farm Advisor (CFA) on Organic Farming: Module-II	2-7 May, 2022	ICAR-IIFSR, Modipuram
46.	Certified Farm Advisor (CFA) on Organic Farming: Module-II	23-28 May, 2022	ICAR-IIFSR, Modipuram
47.	International Training Workshop on Farming Systems Design Towards Zero Hunger and Zero carbon as Resource person	8-12 Nov, 2022	ICRISAT, Hyderabad

48.	Certified Farm Advisor (CFA) on Organic Farming: Module-II	06-20 Dec, 2022	ICAR-IIFSR, Modipuram, Meerut
49.	Agricultural System Modelling for Natural Resource Management	19 Sep, 2022	ICAR-NAARM, Hyderabad
50.	Organized the National Campaign on farm mechanization	28 April, 2022	Khanuda and Dhanju villages
51.	Certified Farm Advisor (CFA) on Organic Farming: Module-II	7-21 February, 2023	ICAR-IIFSR, Modipuram
52.	Training on Agro-Ecology and Integrated Farming Systems sponsored by NBSC, Lucknow	10-12 April, 2023	ICAR-IIFSR, Modipuram

c. Conference/Workshop/Seminar/Symposia organized

S. No.	Name of activity	Date	Venue
1.	Brainstorming Workshop on "Elevated temperature and its impact on fragrance of basmati rice and strategies for mitigation	2 February, 2018	College of biotechnology, SVPUA&T Meerut
2.	Training cum workshop on NHB-ICAR, Horticulture	5-6 February, 2018	NASC Complex, New Delhi
3.	International Symposium on Advances in Agro meteorology for Managing Climatic Risks of Farmers (INAGMET-(2019)).	11-13 February, 2018	JNU, New Delhi
4.	Discussion meet on the side-lines of International workshop on technical cooperation in agribusiness between India and Argentina (15-17 Feb. (2019)	17 February, 2018	ICAR-IIFSR, Modipuram Meerut
5.	ICAR-IIFSR-CIMMYT Joint TRAINING WORKSHOP SERIES on "Quantitative farming systems typologies applications with the R statistical computing software for OFR centres of AICRP on IFS organized with International experts	3-7 Sept, 2018 10-14 Sept, 2018 17-21 Sept, 2018 24-28 Sept, 2018	AU, Kota TNAU, Coimbatore, ICAR-IIFSR, Modipuram ICAR-RC-ER, Patna
6.	प्रथम प्राकृतिक चिकित्सा दिवस, जैविक खाद्य उत्पाद सेमिनार	12 November, 2018	ICAR-IIFSR, Meerut
7.	World Soil Day at Gaindikhata, Haridwar	30 December, 2018	Gaindikhata, Haridwar
8.	V Biennial Workshop (XXXIII of project) of AICRP on Integrated Farming Systems	20-23 December, 2018	UAS, Bengaluru
9.	National Symposium on IFS for 3Es	20-24 December, 2018	UAS, Bengaluru
10.	Discussion meet on side lines of International workshop on Technical cooperation in Agri-business between India and Argentina	17 Feb, 2019	ICAR-IIFSR, Meerut
11.	Farm Management training	17-23 Sept, 2019	ICAR-IIFSR
12.	International Seminar on Climate Smart Farming Systems (BIMSTEC delegates) Complex/ICAR-IIFSR	11-13 Dec, 2019	NASC, New Delhi
13.	National Webinar on Bio-Decomposer: Wealth from Waste in Farming Systems	20 July, 2021	ICAR-IIFSR, Modipuram (Virtual)

14.	International Webinar Conference on "Alternate cropping systems for climate change and resource conservation"	29 September - 01 October, 2021	ICAR-IIFSR Meerut
15.	Technical session on "Success stories on implementation of organic farming technologies"	31 October, 2021	ICAR-IIFSR, Modipuram (Virtual)
16.	Webinar on Composting and vermicomposting	18 December, 2021	ICAR- Headquarters, New Delhi
17.	Biennial workshop of AICRP on integrated farming systems	18-21 Jan, 2023	MPKV, Rahuri, Maharashtra
18.	National Conference on Agro-Ecology-based Agri-Food Transformation Systems	27-28 January, 2023	ICAR-IIFSR, Modipuram
19.	Capacity building and skill up gradation programme from technical staffs on farm management	22-28 February, 2023	ICAR-IIFSR, Modipuram
20.	World Water Day-2023	22 March, 2023	ICAR-IIFSR, Modipuram
21.	International Day of Yoga under 'Azadi ka Amrit Mahotsav' Kutumbkam"	21 June, 2023	ICAR-IIFSR, Modipuram
22.	ICAR-IIFSR Incubate/ Entrepreneurs Visit during ICAR-Industry meet on 17 July, 2023	17 July, 2023	NASC Complex, Delhi
23.	Stakeholder workshop on Draft results of TEEB AgriFood Initiative in Uttar Pradesh	1 August, 2023	ICAR-IISR, Lucknow
24.	Seminar on Effect of Congress Grass (Parthenium) on food production and human health during Parthenium Awareness Week, 16-22 August, 2023	22 August, 2023	ICAR-IIFSR, Modipuram
25.	Whole Farm Bio-economic modelling and Integrative Sustainability Assessment Tool	11-15 September, 2023	ICRISAT, Hyderabad
26.	World Soil Day "Soil and Water: A Source of Life"	05 December, 2023	ICAR-IIFSR, Modipuram, Meerut

d. Other Activities Organized

S. No.	Name of activity	Date	Venue
1.	All India Farmers fair and animal exhibition as krishi dham expo-(2018)	12-14 October, 2018	SVPUAT, Meerut
2.	Organized Mahila Krishak Diwas	15 October, 2018	ICAR-IIFSR, Modipuram, Meerut
3.	Refinement of OFR-2 and 3 datasheet of AICRP on IFS	10-17 August, 2018	ICAR-IIFSR, Modipuram, Meerut
4.	Exhibition of the improved Integrated farming systems for livelihood and nutritional security of farmers in Krishi dham expo 2019	15-17 Feb, 2019	ICAR CPRS, Modipuram
5.	Demonstration of IFS Technologies in Pusa Krishi Vigyan Mela	5-7 Mar, 2019	IARI, New Delhi
6.	Distribution of small agricultural implements and advisory for reduction in drudgery	7 June, 2019	Bhalwa, Paldi and Ramnagar
7.	Introduction about SCSP Project	11 June, 2019	Village - Nannu, Dholdi Block – Jani, Meerut
8.	Distribution of small tools and animal minerals for enhancing milk production	11 June, 2019	Bhalwa, Paldi and Ramnagar

9.	Introduction about SCSP Project	6 Aug, 2019	Village - Basateekri, and Khanpur, Block – Jani, Meerut
10.	Distribution of Black Gram seed (PU31) to ensure nutritional security and economic viability	20 Aug, 2019	Bhalwa, Paldi and Ramnagar
11.	Mera Gaon Mera Gaurav	26 Aug, 2019	Village - Surajpur, Kithor, Meerut
12.	Farmer Scientist interaction	1 Sept, 2019	ICAR-IIFSR
13.	Awarness program on Swacchata Hi Sewa	11 Sept, 2019	Village - Surajpur, Kithor, Meerut
14.	Organised the field visit of Dr Punjab Singh, President, NAAS, New Delhi	16 Sept, 2019	ICAR-IIFSR
15.	Celebration of Swachhta hi Sewa at TSP sites, Uttarakhand	18-19 Sept, 2019	Thari, Veerpur Tara and Mallapuri village, Block Ramnagar, Nainital, Uttarakhand
16.	Livestock and crop management for higher production in farming systems. Livestock and crop management for higher production in farming systems.	28 Sept and 1 Oct 2019	Vill. Rasulpur, Charthawal Block (M. Nager) Vill. Kashiara, Charthawal Block (M. Nager)
17.	Swacchata Hi Sewa program	02 Oct, 2019	ICAR-IIFSR
18.	Swacchata Hi Sewa program at ICAR- IIFSR Farmer Scientist Interaction	02 Oct, 2019	Khanpur
19.	Swachhta hi Sewa Programme Krushak- Vaigyanik Sangosti	02 Oct, 2019	ICAR-IIFSR
20.	Technical assistance regarding IFS Models, Banda University of Agriculture and Technology (UP).	10 Oct, 2019	ICAR-IIFSR
21.	Agriculture tour for progressive farmer of Gujarat state (Banaskantha district)	19 Oct, 2019	ICAR-IIFSR
22.	Vigilance Awareness Week	27 October, 2019	ICAR-IIFSR, Modipuram, Meerut
23.	Distribution of Mustard (RH749) and Barseem (Kent) for diversifying farming system	31 Oct, 2019	Bhalwa, Paldi and Ramnagar
24.	Introduction of New sugarcane variety CoS 08272 for varietal diversification	02 Nov, 2019	Bhalwa and Paldi
25.	Demonstration of IFS Technologies in All India Farmer's Fair and Agri-Industrial exhibition organised by SVPUAT, Modipuram	8-10 Nov, 2019	SVPUAT, Modipuram, Meerut
26.	Progress of mustard seed in field Farmer Scientist Interaction	18 Nov, 2019	Khanpur Dholdi
27.	Introduction of New wheat variety HD 3086 for enhancing wheat production and straw for dairy farming	29 Nov, 2019	Bhalwa, Ramnagar and Paldi
28.	Subtropical Fruit culture including low chilling apple	14 Dec, 2024	ICAR-IIFSR
29.	Management of mango and low chilling apple to farmers' team from Gujarat	18 Dec, 2019	ICAR-IIFSR

30.	Kisan Diwas	23 Dec, 2019	ICAR-IIFSR
31.	Awareness generation on recycling of waste water and collection of plastic under Swacchta Pakhwada programme	28 Dec, 2019	Pallav Puram, phase II, Colony premises, Modipuram
32.	Swachta hi Sewa programme 2020	29 December, 2019	Pallavpuram Phase –II Colony, Modipuram
33.	Farmer-Scientist interaction	30 January, 2020	Farmers field at Hastinapur, Kishorpur and Chandpur
34.	Training and field visit of research staff of PDKV, Akola	20-22 January, 2020	ICAR-IIFSR, Modipuram
35.	Skill Development Training for farmers/rural youth on "Organic Grower" sponsored by Agriculture Skill Council of India (ASCI)	10 February to 05 March, 2020	ICAR-IIFSR, Modipuram
36.	Enhancing productivity and income through Integrated farming system ITC Mission , Sunhera Kal, Bhopal, Madhya Pradesh	13-15 Feb, 2020	ICAR-IIFSR Modipuram
37.	"Good Agricultural Practices for Crop + dairy farming system" and "Cleanliness awareness" under SCSP programme	21 February, 2020	ICAR-IIFSR, Modipuram
38.	Integrated farming systems for doubling farmers income, Deputy Director, Agriculture & Farmers Welfare Department, Gurugram, Haryana	27 February to 02 March, 2020	ICAR-IIFSR Modipuram
39.	Integrated Farming systems for real employment and regular income Project coordinator, ATMA Department of Agriculture, Vidisha, Madhya Pradesh	02-06 March, 2020	ICAR-IIFSR Modipuram
40.	Training programme on "Samanvit Krishi Pranali se svarojgar evam niymit amdani	02-06 March, 2020	ICAR-IIFSR, Modipuram
41.	Organic growers ICAR-ATARI, Kanpur Under Skill India Development training on organic growers	06-30 March, 2020	ICAR-IIFSR, Modipuram
42.	"Improved Livestock, poultry production and management, drudgery reduction technologies in farming system perspective"	18-19 March 2020	Thari, Veerpur Tara and Mallapuri, Ramnagar Block
43.	Demonstration of dibbler cum single wheel weeder for efficient sowing and weeding cum drudgery reduction under TSP.	18-19 March, 2020	Thari, Veerpur Tara and Mallapuri, Ramnagar Block
44.	Webinar on Technological backstopping for Mission Organic Value Chain Development for North Eastern Region (MOVCD-NER) scheme	12 and 14 May, 2020	Virtual
45.	Webinar on Integrated Farming Systems	22, 28-29 May and 1 June, 2020	Virtual
46.	World Environment Day Celebration Webinar	05 June, 2020	ICAR-IIFSR
47.	Web based training on Methodology for Synthesis of district specific IFS" for AICRP-IFS, AI-NPOF and AICRP-DA centres	06 June, 2020	Virtual
48.	Hindi Karyasala (online)	11 June, 2020	ICAR-IIFSR

49.	E-office implementation (for Scientists and Technical Officials)	01-03 July, 2020	ICAR-IIFSR
50.	Online training of for tribal farmers under TSP project on Year round mushroom Cultivation technology	14-16 September, 2020	GBPUAT, Pantanagar
51.	Practical training on use of Tricho Cards in sugarcane	17 September, 2020	Farmers field at Hastinapur and Kishorpur
52.	Hindi Pakhwada	14-28 September, 2020	ICAR-IIFSR, Modipuram
53.	Establishment of nursery as a community intervention cum introduction of seedling transplanter for drudgery reduction	22-23 September, 2020	Thari, Veerpur Tara and Mallapuri, Ramnagar Block
54.	Chaupal Charcha under Farmer FIRST Programme	25 September, 2020	Sathedi, Muzzafarnagar
55.	Lecture series on the eve of 150th Birth Anniversary of the Father of the Nation Mahatma Gandhi	02 October, 2020	Virtual
56.	SCSP: Animal Health Camp kisangosthi on Rabi season crop modules of farming systems	17 October, 2020	Balwa
57.	International Science Conference on Organic Farming Research, Technologies and Extension	31 October, 2020	Virtual (APEDA)
58.	KisanGosthi	09 Nov, 2020	Nayagaon
59.	Swachhta Awareness Programme	09 Nov, 2020	Nayagaon
60.	KisanGosthi	09 Nov, 2020	Mohallapuri
61.	Swachhta Awareness Programme	09 Nov, 2020	Mohallapuri
62.	KisanGosthi and Training on Swachhta	09-10 Nov, 2020	Dalupuri, Haridwar
63.	SCSP: Animal Health Camp and kisan gosthi on Rabi season crop modules of farming systems	10 November, 2020	Dhanju
64.	SCSP: Animal Health Camp kisangosthi on Rabi season crop modules of farming systems	10 November, 2020	Eklota
65.	Farmer-Scientist interaction: Issues and problems in wheat cultivation	11 November, 2020	Farmers field at Hastinapur, Kishorpur and Chandpur
66.	XV Annual Group Meeting of All India Network Programme on Organic Farming	25-26 November, 2020	Virtual
67.	Annual Day Celebration	27 November, 2020	ICAR-IIFSR, Modipuram, Meerut
68.	Interaction meeting with farmers	04 Dec, 2020	Dalupuri, Haridwar
69.	Demonstration of IFS Technologies in exhibition stall at Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut	13-15 December, 2020	SVPUAT, Meerut.
70.	VI (XXX IV of project) Biennial Workshop of AICRP on Integrated Farming Systems	15-18 December, 2020	Virtual
71.	MGMG: Swachhta drive & KisanGosthi on Farming Systems	18 December, 2020	Village -Pamnwali Block -Katholi District -Muzaffarnagar U.P.

72.	Awareness programme on multiple use of domestic waste and prevention from corona virus on 29-12-2020 under Under Swachh Bharat Abhiyan 2020	29 Dec, 2020	Pallav Puram phase II, Colony premises, Modipuram
73.	Swachhata Pakhwara Programme	30 December, 2020	Village - Jaisola Block -Katholi District -Muzaffarnagar U.P.
74.	Organized Mass Awareness Program on "Value addition and Processing on Agricultural Produces for Entrepreneurship development" for Final Year B.Sc. (Agriculture) students	14 Feb, 2022	Shri Ram College, Muzaffarnagar
75.	Improvement in the working efficiency of Skill Supporting Staff	22-26 Feb, 2022	ICAR-IIFSR, Modipuram
76.	Organized one-day Mass Awareness Program (23/04/2022) on Natural Farming and ABI Centre of ICAR-IIFSR	23 April, 2022	Bhartiya Inter College, Nangle- Mandaud, Muzaffarnagar (U.P.)
77.	Poultry chicks and other input distribution for demonstration.	23 April, 2022	Khanauda village (Meerut)
78.	Poultry chicks and other input distribution for demonstration.	26 April, 22	Kasiara and Rasoolpur village (M. Nager)
79.	Kisan Gosthi, Swachata programme & input (wheat) distribution for demonstration.	13 December, 2022	Kasiara and Rasoolpur village (M. Nager)
80.	Interstate Exposure Visit of Farmers for IFS from Udagai, Nilgiris district of Tamil Nadu.	21-22 Dec, 2022	CAR-IIFSR, Modipuram. Meerut
81.	Interstate Exposure Visit of Farmers for IFS from Tirunelveli district of Tamil Nadu.	22-23 Dec, 2022	CAR-IIFSR, Modipuram. Meerut
82.	Kisan Diwas Organised under the Sawchata Pankhawada	23 Dec, 2022	Bhadurpur village, Meerut, Uttar Pradesh
83.	Organized Agro Innovator Meet during National Conference, FSRDA	27 Jan, 2023	ICAR IIFSR, Modipuram
84.	National Conference on Agro-Ecology Based Agri-Food Transformation System	27-28 Jan, 2023	ICAR IIFSR, Modipuram
85.	Capacity and skill up gradation programme for Technical staffs on 'Farm Management'	22-28 Feb, 2023	ICAR IIFSR, Modipuram
86.	Global Science for Global Wellbeing	28 February, 2023	ICAR-IIFSR, Modipuram
87.	Exposure Visit cum Hands on Training for Mushroom Farmers/ Entrepreneurs under ABI Project/ICAR-ABI, Modipuram, Meerut	03 March, 2023	Regional Mushroom Research Centre (RMRC), MHU, Murthal, Haryana
88.	Live Question and Answer Programme on IFS, Organic and Natural Farming	19 April, 2023	All India Radio-Kodai FM (Kodaikanal, Tamil Nadu)
89.	IIFSR-Kisano ki Sewa Mein	02 June, 2023	DD Kisan; Vigyan aur Kisan
90.	Importance of integrated farming system in clean environment	05 June, 2023	DD Kisan

91.	TV Talk on "Integrated Farming System" for Hello Kisan Programme Live Broadcasting on 09.06.2023 at 06-7.0PM.	09 June, 2023	CPC Doordarshan, Asian Village Complex, New Delhi – 110 049.
92.	Stakeholder consultation meeting under DST project on Hindon river water utilization	28 July, 2023	ICAR-IIFSR, Modipuram
93.	Har Ghar Tiranga" campaign under under 'Azadi ka Amrit Mahotsav'	13-15 August, 2023	ICAR-IIFSR, Modipuram
94.	हिंदी पखवाड़ा	14-28 September, 2023	ICAR-IIFSR, Modipuram
95.	One day Farmers-Scientists interaction (Farmers FIRST and OFR Scheme)	21 September, 2023	ICAR-IIFSR, Modipuram
96.	Vigilance Awareness Week	31 October to 6 November 2023	ICAR-IIFSR, Modipuram, Meerut
97.	Expert regarding impact of pollution on field crops	24 Nov. 2023	News 18 Television network
98.	Round the year fodder production for Western Uttar Pradesh	24 Nov. 2023	News 18 Television network
99.	Interstate Exposure Visit of Farmers for IFS from Tiruvannamalai district of Tamil Nadu.	7-8 Dec, 2023	ICAR-IIFSR, Modipuram, Meerut
100.	Swacchta hi Sewa programme	17 December, 2022	Village Tabita
101.	एक दिवसीय हिंदी कार्यशाला	19 December, 2023	ICAR-IIFSR, Modipuram
102.	Farm Design for component optimization using multi objective tools	20 December, 2023	Virtual

e. Trainings, winter/summer schools attended by ICAR-IIFSR staff

S. No.	Name of participants	Training programme attended
1.	L.K. Meena, Amit Kumar	Training on "GHG emission/carbon sequestration estimation using ß version of excel tool"
2.	N. Ravisankar	Training on "GHG emission/carbon sequestration estimation using • version of excel tool" for on-station and on-farm centres of AICRP on Integrated Farming Systems at ICAR-IIFSR, Modipuram
3.	L.K. Meena, Amit Kumar	Training on "4R Nutrient stewardship: Concepts, principles and application"
4.	N. Ravisankar	IPNI sponsored training on "4R nutrient management strategy"
5.	Poonam, P.C. Jat, Sunil Kumar, Nisha Verma, Khushal Singh	Participated the Advance Training programme on Conservation Agriculture- Asia
6.	N. Ravisankar	Training workshop for vigilance officers of ICAR institutes
7.	M. Shamim	GIS approach in soil, water and plant health management
8.	L.R. Meena	NHB-ICAR Horti. Institutions, SAU/SHU/CAU and Horticulture Training Institute conference
9.	A.K. Prusty, M. Shamim	Science administration and Research management
10.	Raghuveer Singh	CAFT training "Statistical advances in designing agricultural experiments and data analysis"

11.	L.R. Meena	Hands on training On-line submission and analysis of on-farm farming systems research data and preparation of NARP zone wise promising farming systems for scaling up.
12.	N. Subash, Sunil Kumar	J-Gate@ Cera Regional Training Program
13.	L.R. Meena, Suresh Malik, P.C. Ghasal	Training of Trainers (TOT) under Agril. Skill Council of India(ASCI)
14.	N. Subash	MDP on Leadership Development (a pre-RMP)
15.	N.Subash	107th Indian Science Congress Organized by ISCA and UAS, Bangalore
16.	Amit Kumar	The Biofach India Show – We Go Digital Edition
17.	A. K. Prusty	Whole farm systems modelling and Farming Systems Sustainability assessment
18.	N. Subash	NICRA Technical Program Finalization Workshop (NRM)
19.	N. Subash	NICRA Technical Program Finalization Workshop (Modelling)
20.	N. Ravisankar	Technical programme finalization for AICRP-Dryland agriculture and AICRPDA-NICRA for 2020-21
21.	N. Ravisankar, A.K. Prusty, M. Shamim, Raghuveer Singh	Empirically validating the results of SPNF model
22.	Peyush Punia	MDP on implementation of accessand benefit sharing-Regulation in agricultural research
23.	Peyush Punia	IP evaluation and technology management
24.	Peyush Punia	Export challenges amdmitigation strategies for fresh and processed F&V in Covid-19 times
25.	Vipin Choudhary	Generic online Training in Cyber Security
26.	Vipin Choudhary	Cyber security (DIAT certified Information Assurance participation)
27.	N. Subash	Applications of Artificial Intelligence and Cloud Computing in Agriculture
28.	P.C. Ghasal	9th Regional Training Course on The New Concept of Weeds and Their Management (Online)
29.	Nirmal	Agroforestry for environmental sustainability and climate resilience
30.	Peyush Punia	Management Development programme (MDP) on Biodiversity and environmental Laws
31.	Deevendra Kumar	Online Management Development programme on Leadership development
32.	N. Subash, M Shamim	Enhancing Agricultural Resilience through Index Based Flood Insurance and Pos-tflood Management Interventions in India jointly organized by ICAR -IIWM, Bhubaneswar and IWMI, New Delhi
33.	Poonam Kashyap	3 days collaborative training programme on Extension of Horticultural technologies organised by ICAR -IIHR, Bangalore and MANAGE, Hyderabad
34.	A.L. Meena, P.C. Ghasal, Raghavendra KJ	Data Analysis in Social Sciences Research
35.	P.C. Ghasal	Analysis of Multi-Location Experiments

36.	P.C. Ghasal	Mechanized weed managementin different Field crops
37.	M.A. Ansari	Geospatial Analysis using QGIS & R
38.	A.K. Prusty	Data Visualization using R
39.	A.K. Prusty	Interactive Trainings on the E-Flows Assessment (under the ageis of NMCG, CWC and India - EU Water Partnership Action - Phase 2)
40.	Raghavendra KJ	"Analytical techniques for Impact Evaluation Methods"
41.	Raghuveer Singh	International Training Workshop on Farming Systems Design Towards Zero Hunger and Zero carbon
42.	A.L. Meena, P.C. Ghasal, Jairam Choudhary	Concepts and mechanisms of soil carbon sequestration and stabilization for soil health improvement and climate change mitigation
43.	P.C. Ghasal	International training workshop on Farming Systems Design Toward Zero Hunger and zero carbon
44.	P.C. Ghasal	Descriptive Data Analysis Using MS-EXCEL & SPSS Software
45.	Nirmal	Recent development in Agroforestry dimensions for managing salt affected ecologies
46.	Nirmal	Simulation modelling and climate change research
47.	Amit Nath	Virtual Karyashala cum High-End International Workshop on Integrating Innovations with Cost-effectiveness for Competing Electromagnetic Energy Assisted Food Processing and Packaging Technologies
48.	Amit Nath	Attended the training program on "Science Administration and Research Management"
49.	Amit Nath	Attended the AAHAR International Food and Hospitality Fair 2022 at Pragati Maidan, New Delhi
50.	Suresh Malik	Training programme for HRD Nodal officers of ICAR
51.	Nisha Verma	Role of Farmer Producer Organizations (FPO's) in Linking farmers to market.
52.	Nisha Verma	Online training course on "Ergonomics and Safety in Agricultural Operations to Enhance Farmer's Productivity and well being
53.	P.C. Ghasal	Data Visualization using R (Online mode)
54.	Dr. Sunil Kumar, N. Ravisankar, A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, Raghavendra KJ	Training on Agro-Ecology and Integrated Farming Systems sponsored by NBSC, Lucknow
55.	Sunil Kumar	Technology trends and the revolution in mobile
56.	Poonam Kashyap	Monetising the carbon credit on farmlands for benefitting Indian Farmers
57.	Sunil Kumar	MANAGE Training Programme on "Value Chain based Agricultural Extension by FPOs and Agri-Startups"
58.	Sunil Kumar	Vocational training programme on "IFS for sustainable agriculture at Junagadh- Gujarat"
59.	Sunil Kumar, N. Ravisankar	Discussion on Implementation of Pilot Project for Crop Diversification

60.	M.A. Ansari, A.L. Meena, P.C. Ghasal	SAARC Regional Training on Climate Smart Agriculture in South Asia: Technologies, Policies and Digital Innovation
61.	Sunil Kumar, N. Ravisankar, Raghavendra Singh, A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, Raghavendra K.J.	Stakeholder consultation meeting under DST project on Hindon river water utilization
62.	Sunil Kumar, N. Ravisankar, Raghavendra Singh, A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, Raghavendra K.J.	Stakeholder workshop on Draft results of TEEB AgriFood Initiative in Uttar Pradesh
63.	N. Ravisankar, M. Shamim Raghuveer Singh, Raghavendra K.J., P.C. Ghasal	Whole Farm Bio-economic modelling and Integrative Sustainability Assessment Tool
64.	Sunil kumar	J-Gate@CeRA
65.	A.L. Meena	Advance course on Conservation Agriculture for Asia and North Africa (16 days training)
66.	A.K. Prusty	Farm Design for component optimization using multi objective tools

Annexure-III

PARTICIPATION OF SCIENTISTS IN NATIONAL AND INTERNATIONAL CONFERENCES/ SEMINARS/ SYMPOSIA/ WORKSHOPS

Scientists	Participation of scientists in National and International Conferences/ Seminars/ Symposia/ Workshops, duration and venue, venue
V.P. Chaudhary	All India seminar on hi-tech cultivation of vegetable & flowers held during 10-11 March,2018 at The Institutions of Engineers (India) Dehradun.
N. Ravisankar	National Seminar on "Innovative technologies and management strategies for doubling farmers income" during 9 June, 2018 at MPUAT, Udaipur
N. Ravisankar	Brain storming session on "Holistic strategy for assessment of Soil health" at NASC, New Delhi" during 26 June,2018 at NASC, New Delhi
Poonam Kashyap, Sunil Kumar	Attended a 4 days workshop on "Quantitative farming system typologies applications with the R statistical computing. During 17-21 September, 2018 at ICAR-IIFSR, Modipuram, Meerut
Debashis Dutta, Nisha Verma	Workshop on preparation of manual and strategy Document on Crop plan during 18 September, 2018 held at NASC complex, New Delhi
L.R. Meena, Sunil Kumar M.Shamim, AS Panwar, P. Kashyap and A.K.Prusty	IInd International Conference Advances in Agricultural, Biological and Applied Sciences for Sustainable Future (ABAS-(2018)). During 20-22 October, 2018 at Sardar Patel Auditorium, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh
R.P. Mishra, Debashis Dutta, P.C. Ghasal, N. Ravisankar, M. Shamim P.C. Jat	XXI Biennial National Symposium of Indian Society of Agronomy during 24–26 October, 2018 at MPUAT, Udaipur, Rajasthan
Raghuveer Singh	International Conference Global Research Initiatives for Sustainable Agriculture &Allied Sciences (GRISAAS-(2018) During 28-30 October, 2018 at Durgapura, Jaipur, Rajasthan
Debashis Dutta	International Symposium and IPNI Cooperators' meet on Advancement in Soil, Water and Plant Nutrition Research during 2-3 November, 2018 at Dr. Panjabrao Deshmukh Krishi Vidyapeeth ,Akola, Nagpur, Maharashtra
V.P. Chaudhary, P.C. Jat, Debashis Dutta	9th National Extension Education Congress-(2018), on "Climate Smart Agricultural Technologies: Innovations and Interventions during 15-17 November, 2018 at CAPHET, Sikkim
Raghuveer Singh	ISWS Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities during 21-24 November, 2018 at ICAR-DWR, ICAR- Jabalpur
N. Ravisankar	Fertilizer Association of India (FAI)Annual Seminar during 5 December, 2018 at New Delhi
L.R. Meena	National symposium on "Forage and livestock based technological innovations for doubling farmers' income" during 13-14 December, 2018 at UAS, Dharwad, Karnataka
L.R. Meena R.P. Mishra Debashis Dutta, Chandra Bhanu, P.C. Ghasal, Nisha Verma, Amit Nath	V(XXXIII) Biennial workshop of AICRP on integrated Farming systems during 20-23 December, 2018 at University of Agricultural Sciences Bengaluru, Karnataka

N. Ravisankar, A.K. Prusty, M.Shamim Poonam Kashyap Nisha Verma L.R. Meena R.P. Mishra, Debashis Dutta, C. Bhanu, P.C. Ghasal, Amit Nath	National Symposium on IFS for 3Es during 23-24 December, 2018 at University of Agricultural Sciences, Bengaluru
M. Shamim	Indian Horticulture Congress 2018 during 17-21 January, 2019 at IGKV, Raipur, Chhattisgarh
Chethan Kumar G, L. K. Meena Debashis Dutta, P.C. Ghasal, M Shamim, D. Dutta	Brainstorming Workshop on "Elevated temperature and its impact on fragrance of basmati rice and strategies for mitigation" during 2 February, 2019 at College of Biotechnology, SVPUAT, Meerut
Nisha Verma	National Conference on Women Empowerment Through Agro-Entrepreneurship for Livelihood Security during 7-8 February, 2019 at SKUAST, Jammu
M. Shamim	International Symposium on Advances in Agro meteorology for Managing Climatic Risks of Farmers (INAGMET-2019) during 11 - 13 February, 2019 at JNU, New Delhi, India
N. Ravisankar and Amit Nath	Workshop on Technical Collaboration on Agribusiness between India and Argentina on15 February, 2019 at NASC, New Delhi
V.P. Chaudhary	XIV Agricultural Science Congress Innovations for Agricultural Transformation during 20-23 February, 2019 at NASC Complex, New Delhi
Vipin Kumar Choudhary	Meeting-cum-workshop of Scientist in IT/Computer Application during 6 March, 2019 at NASC Complex, New Delhi
P.C. Ghasal	2nd International Training Workshop on Precision Nitrogen Nutrition in wheat 07-12 March, 2019 at BISA-CIMMYT, Ludhiana
A. K. Prusty, A. S. Panwar	Brain storming session on sustainability of livestock and fishery production systems in India on 20 April, 2019 at ICAR-NDRI,Karnal
L.R. Meena, Dushyant Mishra, Nisha Verma	National conference identification, convergence, implementation & extension of science-tech-research for sustainable development (ICIESSD-2019) during 20-21 April, 2019 at SVPUAT, Meerut
Vinod Kumar, P.C. Jat	1st International Conference on Food, Agriculture & Innovations during 19-23 June, 2019 at Bangkok, Pattaya, Thailand
L.R.Meena	9th International Conference on Agriculture, Horticulture and plant science during 27-28 June, 2019 at Inn Resort, Dharamshala, (H.P.), India
P.C. Ghasal	Workshop on Awareness on Intellectual Property Right (IPR) and its management on 23 July, 2019 at ICAR-CIRC, Meerut
M. Shamim	XXV meeting of ICAR-Regional Committee No. VII during 10-11 August, 2019 at ICAR-NBSS& LUP, Nagpur
A. K. Prusty	6th Farming systems design conference during 18-21 August, 2019 at Montevideo, Uruguay
N. Ravisankar	Brainstorming Session on Zero Budget Natural Farming: Myth or Reality on 21 August, 2019 at NAAS, New Delhi
N. Subas Debashis Dutta	Review Workshop on GHG emissions studies and future planning under NICRA on 29 August, 2019 at ICAR-NRRI, Cuttack
M. Shamim	2nd International Conference on "Recent Advances in Agricultural, Environmental & Applied Sciences for Global Development (RAAEASGD-2019)" during 27-29 September, 2019 at Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh

Dushyant Mishra, A.L.Meena, L.K. Meena, Chandra Bhanu, Sunil Kumar	Second naturopathy day / Organic agriculture workshop on 6 November, 2019 at ICAR-IIFSR
N. Ravisankar, A. K. Prusty M. Shamim, P.C. Ghasal, Raghuveer Singh, Vipin Kumar	Annual Group Meeting (AGM) of AI-NPOF during 12-14 November, 2019 at ICAR-CARI, Port Blair
Jairam Choudhary	60th Annual conference and international symposium on "Microbial technologies in sustainable development of energy, environment agriculture and health during 15-18 November, 2019 at CUH, Mahendergarh, Haryana 123031
N. Ravisankar, A. K. Prusty M. Shamim, Raghuveer Singh Vipin Kumar, Brij Mohan, Debashis Dutta, Nisha Verma	Annual Group Meeting (AGM) of AICRP-IFS during 27-29 November, 2019 at JAU, Junagarh
Amit Kumar	VI (XXXIV of project) Biennial workshop of AICRP on Integrated farming systems during 15-18 December, 2020 at ICAR-IIFSR, Modipuram, Meerut
N. Subash	National Seminar on Agro meteorological Interventions for Enhancing Farmers Income (AGMET-2020) during 20-22 January, 2020 at KAU, Thrissur
N. Subash	107th Indian Science Congress Organized by ISCA and UAS, Bangalore 3-7 January, 2020 at UAS, GKVK Campus, Bangalore
N. Ravisankar	XVII working group meeting of AICRP-Dryland agriculture and VIII NICRA-AICRP-DA Annual review workshop on 28 May, 2020 in Virtual
P.C. Ghasal	National Webinar on "Integrated Farming System Approach for Entrepreneurship Development during COVID-19 Pandemic during 23- 24 June, 2020 at Swami Keshwanand Rajasthan agricultural University, Bikaner (Rajasthan)
Poonam Kashyap	Webinar on Value addition and Entrepreneurship development in Banana on 22 July, 2020 at ICAR-NRC on Banana, Tiruchirapalli, TN
P.C. Ghasal	National Webinar on Plant Biological Interventions for Climate Smart Agriculture on 30 July, 2020 at Bihar Agricultural University, Sabour, Bhagalpur
Mohammad Shamim	International Webinar on Achieving Land Degradation Neutrality during 22-24 July, 2020 in Virtual
N. Subash	NICRA Technical Program Finalization Workshop (NRM) on 17 August, 2020 At ICAR-CRIDA (virtual)
P.C. Ghasal	Workshop on ABC of scientific writing during 18 August – 2 September, 2020 at ICAR-National Rice Research Institute, Cuttack
P.C. Ghasal	International webinar on "Women in Science and Their Role in Sculpting Modern Agriculture"" on 26 August, 2020 at Bihar Agricultural University, Sabour, Bhagalpur
Poonam Kashyap	International webinar on Moringa- A Super food – Boon to mankind on 5 October, 2020 at PerikulyamHortiBuisness Incubation Forum, TNAU, Chennai
N. Subash	AgMIP8 Virtual Global Workshop during 13-15 October, 2020 at Colombia University, New York, USA (virtual)
N. Ravisankar	Workshop on Course Curricula refinement for Climate Smart Organic Farming and Integrated Farming System for Sustainable Agriculture on 27 October, 2020 in Virtual
P.C. Ghasal	International Webinar on 'Soil health for Ensuring Food Security on 23 November, 2020 at Tamil Nadu Agricultural University

Poonam Kashyap	National webinar on Root rot disease Management in Horticultural crops during 24 November, 2020 at PG Dept of pathology, RCAU Patna
N Ravisankar, A. K. Prusty, M Shamim, Raghuveer Singh, Vipin Kumar, D Tripathi	Annual Group Meeting (AGM) of AI-NPOF during 25-26 November, 2020 in Virtual
N Ravisankar, A. K. Prusty, M Shamim, Raghuveer Singh	NIC GOVTTECH THON 2020 on 01 December, 2020 in Virtual
N. Subash	TROPMET-2020 National virtual symposium on "Weather and climate services over Mountainous Regions" jointly organized by the North Eastern Space Application Centre and Indian Meteorological Society – Shillong Chapter during 14-17 December, 2020 at NESAC, Umiam (virtual)
N Ravisankar, A. K. Prusty M Shamim, RSingh, M D Tripathi	Biennial workshop of AICRP-IFS during 15-18 December, 2020 in Virtual
P.C. Ghasal	4th International Conference on Global Approaches in Natural Resource management for Climate Smart Agriculture (GNRSA-2020) during Pandemic Era of Covid-19 during 26-28 February, 2021 at Shobhit University, Modipuram, Meerut
M Shamim	XXVI Meeting of ICAR Regional Committee – VI during 13 March, 2021 Virtual
N. Subash	Strategic reorientation for climate smart agriculture V-Agmet 2021 during 17-19 March, 2021 in Virtual
N. Ravisankar, M. Shamim	TEEB Agri food Asia symposium during 24-26 March, 2021 in Virtual
Peyush Punia	Hindi workshop at IIFSR on 25 March, 2021 in Virtual
N. Subash	Global symposium on soil biodiversity -GSOBI21 Food & Agriculture Organization, United Nations during 19-22 April, 2021 in Virtual
N. Ravisankar	V International Agronomy Congress on 12 June, 2021 in Virtual
M Shamim	XXVI Meeting of ICAR Regional Committee No. VII on 25 August, 2021 in Virtual
A.K. Prusty, M Shamim, Sunil Kumar	4th Global Meet on Science and Technology for Staying Healthy & Feeding Ever-growing Population World -Wide during 12-13 September, 2021 at SVP University of Agriculture and Technology Meerut (UP)
N. Ravisankar	National level stakeholder consultation for a new global initiative of one CGIAR on transformational agroecology across food, land and water systems on 23 September, 2021 in Virtual
N. Subash	7thGo Green Summit: Unfolding the concepts of green technology to achieve zero emission during 14-15 October, 2021 in Virtual
N. Subash	2nd International web-conference of ANCRM on Smart Agriculture for Resource Conservation and Ecological Stability during 29-30 October, 2021 in Virtual
L.R. Meena, N. Ravisankar, Amit Nath R.P. Mishra, P.C. Jat, A.K. Prusty, M.A. Ansari P.C. Ghasal, Yogendra Singh	V-International Agronomy Congress on Agri-innovations to combat food and nutrition challenges during 23-25 November, 2021 at PJTSAU, Hyderabad/ Virtual
N. Subash	Tropical Meteorology (INTROMET 2021) on Changing Climate: Consequences and Challenges during 23-26 November, 2021 at Cochin University of Science and Technology, Cochin, Kerala

N Ravisankar, R.P. Mishra D. Dutta, Poonam Kashyap, A. K. Prusty, M Shamim, MA Ansari, Raghuveer Singh, P.C. Ghasal, Jairam Choudhary Raghavendra KJ Vipin Kumar, D Tripathi	Annual Group Meeting (AGM) of AI- NPOF during 03-04 December, 2021 at ICAR-IIFSR, Modipuram
N. Subash	30th National Web Conference on Soil and Water Management Technologies for Climate Resilience, Agricultural and Environmental Sustainability during 14-16 December, 2021 in Virtual
L.R.Meena, A. Nath, D. Dutta, P.C. Jat, C. Bhanu, P. Kashyap, A.K. Prusty, N. Verma, P.C. Ghasal	Annual group meeting of AICRP on integrated farming system in hybrid mode during 18-20 December, 2021 at ICAR-IIFSR, Modipuram
N. Subash	INTROMET 2021: International Symposium on Tropical Meteorology – Changing Climate- Consequences and Challenges during 23-26 December, 2021 in Virtual
Kamlesh Kumar	1st International Symposium on "Cereals for Food Security and Climate Resilience " held online during January 18-20, 2022 at SAWBAR, Karnal, Haryana, India (Virtual)
N. Subash	AMW-2021 Annual Monsoon E-Workshop (AMW 2021) and National E-Symposium on “Changing climate and extreme events: impacts, mitigation & Role of oceans during 21- 23 February, 2022 at IITM, Pune
Kamlesh Kumar	Virtual participation in ISPEC 9th international conference on Agriculture, Animal science and Rural Development (March 19-20, 2022), Burdur, Turkey during 19-20 March, 2022 at ISPEC, Turkey (Virtual)
Kamlesh Kumar	Regional Conference on “Conservation agriculture in maize-wheat based systems for sustainability” sustainability” in the regional conference April 29-30, 2022 Lucknow, Uttar Pradesh during 29-30 April, 2022 at NEEDEF and ICAR-IISR
N. Ravisankar, A. K. Prusty, M. A. Ansari	Biennial National conference-2022 on Natural Farming for sustainable agriculture during 31 May to 02 June, 2022 at Solan, Himanchal Pradesh
N. Subash, Debashis Dutta	NICRA Theme (NRM) Technical Review Workshop during 21-22 July, 2022 at NASC Complex, New Delhi
P. C. Jat	International Conference on “Harnessing Indian Agriculture for Domestic and Global Prosperity during 22-23 July, 2022 at NASC, New Delhi
P.C. Ghasal	Brainstorming Session on organic farming practices for cold arid Ladakh region during 24-26 July, 2022 at DIHAR, Leh
Poonam Kashyap, Nisha Verma	International Conference on “Advances in Agriculture and Food System Towards Sustainable Development Goals”(AAFS2022) during 22-24 August, 2022 at UAS Bangalore
N. Subash	NICRA Theme (Modelling) Technical Review Workshop during 13-15 September, 2022 at ICAR-CSSRI, Karnal
A.K. Prusty M. Shamin, M. A. Ansari, Raghuveer Singh	5th Global meet on science and technology (GMST-2021) for minimizing innovation cost and time: to make a long story short during 8-9 October, 2022 at Meerut (virtual), U.P.
Chandra Bhanu, P.C. Ghasal	Orientation workshop of KVKs on Chemical free natural farming in the present context: Challenges and prospects during 10-11 October, 2022 at DDRI, Chitrakoot
R. P. Mishra, P.C. Ghasal	Annual Co-operators’ conference during 17-18 October, 2022 at ICAR-CRIDA, Hyderabad

N. Ravisankar, A.K.Prusty, M. Shamim, M.A. Ansari	National Stakeholder Workshop, TEEB, UNEP during 9-10 November, 2022 at New Delhi
Nisha Verma	20th International Conference on Humanizing work and work Environment during 24-26 November, 2022 at Dept of Sports Science, Punjabi University, Patiala.
A. L. Meena	One-day symposium (Hybrid mode) on "Soils: Where Food Begins during 30 November, 2022 at ICAR-Indian Agricultural Research Institute, New Delhi
N. Subash	First International Conference- ICRA2022 Reimagining Rainfed Agro-ecosystems: Challenges & Opportunities during 22-24 December, 2022 at ICAR-CRIDA, Hyderabad, Telangana, India
N. Ravisankar, A.K. Prusty M. Shamim. M. A. Ansari, R Singh, Raghavendra KJ	Annual Group Meeting (XVII) of the All- India Network Programme on Organic Farming (AI-NPOF) during 28-30 December, 2022 at RKMVERI, Narendrapur, W.B.
P.P. Singh	National workshop Awareness on Intellectual Property Rights (IPRs) and its management on 17 January, 2023 at ICAR IIFSR Meerut
Chandra Bhanu	National Conference on Plant Parasitic Nematodes during 16-18 January, 2023 at Hotel Lila Bhartiya, Bangaluru, Bayer Crop Science
N. Ravisankar, A. K. Prusty, M. Shamim, M. A. Ansari, Raghuveer Singh, Raghavendra K.J., Chandra Bhanu, P.C. Ghasal, Nisha Verma, D Dutta	Biennial Workshop of AICRP-IFS during 18-21 January, 2023 at MPKV, Rahuri
N. Ravisankar, R. P. Mishra, P. C. Jat, Chandra Bhanu, Poonam Kashyap, A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, P. C. Ghasal, Raghavendra K.J., Jairam Choudhary, Nisha Verma	National Conference on Agro-ecology based Agri-Food Transformation System during 27-28 January, 2023 at ICAR-IIFSR, Modipuram
N. Ravisankar A.K. Prusty	International training workshop on Quantitative Systems Analysis for the Sustainable Intensification of Mixed Farming Systems during15-17 February, 2023 at CIMMYT, Nepal
P.C. Ghasal	International Conference on Innovations to Transform Drylands during 21-23 February, 2023 at ICRISAT, Hyderabad
Sunil Kumar, N. Ravisankar	Workshop/Consultation on Invigorating Organic Farming for Sustainable Food Systems and Atmanirbhar Bharat (organized by NITI Aayog and Department of Fertilizers on 6 March, 2023 at NITI Aayog, New Delhi
Sunil Kumar	G20 MACP Meet during 17-20 April, 2023 at New Delhi
A.K. Prusty	G20 Meeting (MACP) during 18-19 April, 2023 at Varanasi
Sunil Kumar	National Campaign on Soil Health Management during 22-23 May, 2023 at ICAR-Indian Institute of Soil Science, Bhopal
Amrit Lal Meena	Mainstreaming Agro biodiversity-An integrated approach to reduce climate vulnerability, improve nutrition, livelihoods, and ecosystem services on 23 May, 2023 at MPUAT, Udaipur
Devendra Kumar, Chandra Bhanu, P. C. Ghasal	Global Organic Expo 2023 and Millets Conference during 3-4 June, 2023 at India Expo Centre and Mart, Greater Noida (U.P.)
P C Jat	XXXIII AGM of AICRN on Potential Crops on 7 June, 2023 at UAS, Bengaluru
Sunil Kumar	Webinar on "Navigating Cyber security Challenges in the Era of Digital Transformation on 20 July, 2023 in Online mode

N. Ravisankar	Regional Advisory Group Meeting of NABARD on Farms, Farmers and Rural Areas on 31 July, 2023 at NABARD, Regional Office, Patna (Virtual)
Sunil Kumar, N. Ravisankar Raghavendra Singh, P. P. Singh, M. Shamim, M. A. Ansari, A. L. Meena, P. C. Ghasal, Jairam Choudhary	State Stakeholder Workshop of "TEEB Agri Food Initiative in Uttar Pradesh" on 1 August, 2023 at ICAR-IISR, Lucknow
Raghavendra Singh M. A. Ansari	National workshop of the ICAR-BISA collaborative project "Atlas on Climate Adaptation in South Asian Agriculture (ACASA)" during 21-22 August, 2023 at ICAR-CRIDA, Hyderabad
Sunil Kumar, P.C. Jat	National Seminar on "A biotic Stress Management for Sustainable Millet based Production Systems" during 22–23 August, 2023 at ICAR-NIASM, Baramati (Pune)
Sunil Kumar, P.C. Jat	National Seminar on Abiotic Stress Management for Sustainable Millet- based Production Systems during 22–23 August, 2023 at ICAR-NIASM, Baramati (Pune)
Sunil Kumar	G20 Spouse Event during 07-09 September, 2023 at NASC, New Delhi
Sunil Kumar, Nisha Verma Nirmal	International Conference on Prospects and challenges of Environment and Biological Sciences in Food Production System for Livelihood Security of Farmers (ICFPLS 2023) organized by PISRF Trust, Meerut and ASA, Portblair during 18-20 September, 2023 at ICAR-CIARI, Portblair
Raghavendra Singh, Lalit Kumar	Two days' workshop on "Stakeholder dialogue on enhancing fertilizer use efficiency for sustainable soil health" during 28-29 September 2023 at TAAS and ICAR at NAAS complex
Sunil Kumar, M. Shamim, Raghavendra KJ	XVI Agricultural Science Congress, NAAS during 09-13 October, 2023 at Kochi
Sunil Kumar, N. Ravisankar, A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, Raghavendra KJ	TEEB Agri Food Global Symposia 2023 during 7-9 November, 2023 at UNCC, Bangkok, Thailand
P.C. Jat	IXth AGM of AICRN on Potential Crops on 9 November, 2023 at Agricultural University, Jodhpur
Sunil Kumar, N. Ravisankar A.K. Prusty, M. Shamim, M.A. Ansari, Raghuveer Singh, Raghavendra KJ	TEEB Agri Food National Symposium during 16-17 November, 2023 at Dr Ambedkar International Centre, New Delhi
Sunil Kumar, N. Ravisankar, R. P. Mishra, Raghavendra Singh, P. P. Singh, A.K. Prusty, M. Shamim, M. A. Ansari, A. L. Meena, P. C. Ghasal, Jairam Choudhary	XXII Biennial National Symposium of Indian Society of Agronomy during 22-24 November, 2023 at ICAR-CCARI, Goa
P C Jat, Raghuveer Singh	National review meeting of Farmer FIRST project during 27-30 November, 2023 at CSKHPKV Palampur
Sunil Kumar, R. P. Mishra, Raghavendra Singh, P.C. Ghasal	Research Co-operators' Conference on Ensuring nutritional and environmental sustainability using multi nutrient mineral fertilizers during 11-13 December, 2023 at NAAS, NASC Complex, ICAR, New Delhi
M. A. Ansari	ACASA (Atlas of Climate Adaptation in South Asian Agriculture) Annual Project Review and Planning Meeting during 12-14 December, 2023 at Kathmandu, Nepal

Annexure - IV

A. LIST OF RESEARCH PAPER (>6.0 NAAS RATING) PUBLISHED BY ICAR-IIFSR, MODIPURAM

S. No.	National and International Research papers	NAAS Rating
1.	A. Patidar., S.S. Walia and Mohammad Shamim (2018). LAI and PAR interception in maize as influenced by fertilizer management in Punjab. Journal of Agrometeorolgy 20(4) 338-339.	6.0
2.	D. Dutta., D.K. Singh., N. Subash., N. Ravisankar., V. Kumar., A.L. Meena., R.P. Mishra., Shweta Singh., Vaibhav Kumar and A.S. Panwar. (2018). Effect of long-term use of organic, inorganic and integrated management practices on carbon sequestration and soil carbon pools in different cropping systems in Tarai region of Kumayun Hills. Indian Journal of Agricultural Sciences. 88(4): 9-15	6.37
3.	D. Kumar, L.R. Meena, L.K. Meena and S.P. Singh. (2018). Stability analysis for cane and sugar yield of advanced sugarcane (Sacchrum officenarum) genotypes. Indian Journal of Agriculture Sciences 88(3):515-519.	6.37
4.	D. Kumar., Sanjeev Kumar., L.K. Meena., L.R. Meena and S.P. Singh. (2018). Stability analysis of sugarcane genotype for metric and quality traits by AMMI Model. Indian Journal of Agriculture Sciences 88(4):657-664.	6.37
5.	L.R. Meena., S.A. Kochewad., Vinod Kumar., Suresh Malik., Sanjeev Kumar., L.K. Meena., Amrit Lal Meena and A.S. Panwar. (2018). Status of fodder production in the existing farming systems in Muzaffarnagar district of Uttar Pradesh. Range Management and Agroforestry 39(2): 313-318.	6.58
6.	M.D. Parihar., C.M. Parihar., H.R. Jewlia., R.K. Nanwal., A.K. Singh., S.L. Jat., H.S. Nayak., P.C. Ghasal. and M. Choudhary. (2018). Effect of different tillage and residue management practices on crop and water productivity and economics in maize (Zea mays) based rotations. Indian Journal of Agricultural Sciences 89 (2): 360–366.	6.37
7.	M. Shamim, B. Gangwar, N.K. Jat, Vipin Kumar, Sunil Kumar, N.M. Alam and Vinay Prasad Mandal. (2018). Morpho-physiological characterization of aromatic rice (oryza sativa) genotype for grain yield under timely sown irrigated condition of upper IGPs. Journal of Arometeorology 20: 129-134.	6.0
8.	R.L. Jat., P. Jha, M.L. Dotaniya, B.L. Lakariya, I. Rashmi, B.P. Meena, A.O. Shirale and A.L Meena. (2018). Carbon and nitrogen mineralization in Vertisol as mediatedby type and placement method of residue. Environment Monitoring and Assessment 190:439 (1-7).	9.00
9.	R.K. Singh, Shiva Dhar, Anchal Dass, Vinod K. Sharma, Amit Kumar, Gaurendra Gupta and Bipin Kumar. (2018). Productivity and profitability of soybean (Glycine max) and wheat (Triticum aestivum) genotypes grown in sequence under system of crop intensification. Indian Journal of Agriculture Sciences 88(9):1407-1412.	6.37
10.	S.A. Kochewad, Traghunandan, Ksarjan Rao, K. Kondal Reddy, Nnalini Kumari, D.B.V. Ramana, Sanjeev Kumar, L.R. Meena and S.P. Singh. (2018). Reproductive performance and body condition score of Deccani sheep during various physiological stages in different farming systems. Indian Journal of Animal Sciences 88(12): 1379–1382.	6.29
11.	S.A. Kochewad, T. Raghunandan, K SarjanRao, K. Kondal Reddy, N Nalini Kumari, D.B.V. Ramana, D. Anil Kumar, Yogeshwar Kankarne, Sanjeev Kumar, L.R. Meena, Magan Singh. (2018). Productive performance, body condition score and carcass characteristics of Deccani lambs reared under different farming systems. Indian Journal of Animal Research 52(3): 444-448.	6.29
12.	A.S. Panwar, M. Shamim, S. Babu, N. Ravisankar, A.K. Prusty, N.M. Alam, D. K. Singh, J.S. Bindhu, J. Kaur, L.N. Dashora, M.D. Latheef Pasha, Soumitra Chaterjee, M.T. Sanjay and L.J. Desai (2019). Enhancement in Productivity, Nutrients Use Efficiency, and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach, Sustainability 11(122): 1-26	9.89

13.	A.L. Meena, R.N. Pandey, D. Kumar, V.K. Sharma, S.P. Dutta, and G. Singh. (2019). Relative impacts of long-term nutrient management practices on nitrogen dynamics in rice (Oryza sativa) based organic cropping systems of Indo-Gangetic Plains. Indian Journal of Agricultural Sciences 89(1): 79–86.	6.37
14.	L.R. Meena, Devendra Kumar, L.K. Meena and S.P. Singh. (2019). Productivity and economics of ber (Ziziphus mauritiana) based horti-pasture system as influenced by integrated nutrient management under rainfed condition of Rajasthan. Indian Journal of Agricultural Sciences 89(2): 322–6.	6.37
15.	V.P. Mandal, N. Ravisankar, B. Gangwar, N. Subash, M. Shamim, Brij Mohan, Sujay Dutta, K.R. Manhunath and J.S. Parihar. (2019). Methodology for Early Estimation of Sugarcane Area of Uttar Pradesh using Remote Sensing and Ground Truth Tools. Journal of Agrometeorolgy 21:97-103.	6.0
16.	A.L. Meena, P. Jha, M.L. Dotaniya, B. Kumar, B.P. Meena and R.L. Jat. (2019). Carbon, Nitrogen and Phosphorus Mineralization as Influenced by Type of Organic Residues and Soil Contact Variation in Vertisol of of Central India. Agricultural Research 1-9.	6.00
17.	A.S. Panwar, M. Shamim, S. Babu, N. Ravisankar, A.K. Prusty, N.M. Alam, D.K. Singh, J.S. Bindhu, J. Kaur, L.N. Dashora, M.D. Latheef Pasha, Soumitra Chaterjee, M.T. Sanjay and L.J. Desai. (2019). Enhancement in Productivity, Nutrients Use Efficiency and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach. Sustainability 11(122):1-26.	9.25
18.	B.V.R. Rao, N. Subash and S.K. Bal. 2019. Microclimatological inputs in crop growth modelling. Journal of Agrometeorology 21(4): 403-404.	6.0
19.	D. Dutta, N. Ravisankar, R.P. Mishra, N.K. Jat, A. Kumar, P.C. Ghasal, A.L. Meena, R.B. Tewari, V. Kumar, K. Chaudhary, S. Singh and A.S. Panwar. (2019). Long-term influence of different production systems on potassium buffering capacity of Typic Ustochrept soil. Journal of Plant Nutrition 42(13): 1472-1482.	7.71
20.	J. Choudhary, S. Singh, R. Tiwari, R. Goel and Lata Nain. (2019). An iTRAQ Based Comparative Proteomic Profiling of Thermo-Tolerant Saccharomyces cerevisiae JRC6 in Response to High Temperature Fermentation. Current Proteomics 16(4):289-296.	6.84
21.	J. Husain, Poonam Kashyap, A.K. Prusty, D. Dutta, S.S. Sharma, A.S. Panwar and Sunil Kumar. 2019. Effect of phosphorus fertilization on growth, yield and quality of pea (Pisum sativum). Indian Journal of Agricultural Sciences 89(8): 1303- 1307.	6.37
22.	L.R. Meena, Devendra Kumar, L.K. Meena and S.P. Singh. (2019). Productivity and economics of ber (Ziziphus mauritiana) based horti-pasture system as influenced by integrated nutrient management under rainfed condition of Rajasthan. Indian Journal of Agricultural Sciences 89(2): 322–6.	6.84
23.	N.K. Jat, R.S. Yadav, Sudhir Kumar, M. Shamim, N. Ravisankar, Subhash Babu and A.S. Panwar (2019). Influence of different nutrient management practices on productivity, nutrient dynamics and profitability in basmati rice-wheat cropping systems under Western Indo Gangetic Plains of India. Indian Journal of Agricultural Sciences 89(5): 793-799	6.37
24.	N.K. Jat, Sudhir Kumar, M. Shamim, Subhash Babu, N. Ravisankar and A.S. Panwar (2019). Evaluation of Maize (Zea mays) Cultivars under Organic Production System in North Western Indo-Gangetic plains of India, The Indian Journal of Agricultural Sciences, 89 (5): 828–833.	6.37
25.	N. Subash, H. Singh, Simina Nishat, G. Baigorria, V. Kumar, A. Ruane, K. Boote, R. Valdivia, C. Rosenweig and C. Mutter. 2019. Integrated modelling for assessing climate change impact on future agricultural production system – A farm level multi-modeling approach to assess food security and livelihoods in future. Journal of Agrometeorology 21: 87-94.	6.0
26.	R. Singh, D.B. Yadav, N. Ravisankar, A. Yadav and H. Singh. (2019). Crop residue management in rice-wheat cropping system for resource conservation and environmental protection in north-western India. Environment, Development and Sustainability (Springer Nature), https://doi.org/ 10.1007/s10668-019-00370-z	9.22

27.	R. Das, T.J. Purakayastha, D. Das, N. Ahmed, R. Kumar, S. Biswas, S.S. Walia, R. Singh, V.K. Shukla, M.S. Yadava, N. Ravisankar and S.C. Datta. (2019). Long-term fertilization and manuring with different organics alter stability of carbon in clay-humus complex in soils of varying clay mineralogy. Science of the Total Environment 684: 682-693	13.96
28.	V. Paramesha, R. Parajulib, E.B. Chakurkara, G.B. Sreekantha, H.B. Chetan Kumara, P.P. Gokuldasa, Gopal. R. Mahajana, K.K. Manoharaa, Viswanatha Reddy, K. and N. Ravisankar. (2019). Sustainability, energy budgeting, and life cycle assessment of cropdairy-fish-poultry mixed farming system for coastal lowlands under humid tropic condition of India. Energy 108: 116101	13.15
29.	V.P. Mandal, N. Ravisankar, B. Gangwar, N. Subash, M. Shamim, Brij Mohan, Sujay Dutta, K.R. Manhunath and J.S. Parihar. (2019). Early Estimation of Sugarcane Area of Uttar Pradesh using Remote Sensing and Ground truth. Journal of Agrometeorology 21: 97-103.	6.0
30.	V.S. Meena, K. Jalgaonkar, M.K. Mahawar, B. Bhushan, Bhushan Bibwe and Poonam Kashyap. (2019). Optimization of process variables for preparation of pomegranate juice-fortified aonla candy. Current Science 117: 1-5	7.10
31.	Shivay, Y.S., Pooniya, V., Pal, M., Ghasal, P.C., Bana, R. and Jat, S.L. (2019). Coated Urea Materials for Improving Yields, Profitability, and Nutrient Use Efficiencies of Aromatic Rice. Global Challenges, 3(12): 1900013. DOI: 10.1002/gch2.201900013.	9.84
32.	Dutta, D., Meena, A.L., Mishra, R.P., Ghasal, P.C., Kumar, A., Chaudhary, J., Bhanu. C., Kumar. V., Kumar. A., Tewari. R.B. and Panwar, A.S. (2020). Long Term Effect of Organic, Inorganic and Integrated Nutrient Management on Phosphorous Dynamics under Different Cropping Systems of Typic Ustochrept Soil of India. Communications in Soil Science and Plant Analysis 51(21): 2746-2763.	7.33
33.	S. Prasad, S. Kumar, K.K. Yadav, J. Choudhary, Hesam Kamyab, Quang-Vu Bach, K.R. Sheetal, Sudha Kannojiya and Neha Gupta. (2020). Screening and evaluation of cellulytic fungal strains for saccharification and bioethanol production from rice residue. Energy 190: 116422.	13.15
34.	Meena, A.L., Pandey, R.N., Kumar, D., Dotaniya, M.L., Sharma, V.K., Singh, G., Meena. B.P., Kumar. A., and Bhanu, C. (2020). Impact of 12-year-long rice based organic farming on soil quality in terms of soil physical properties, available micronutrients and rice yield in a typic Ustochrept soil of India. Communications in Soil Science and Plant Analysis 51(18): 2331-2348.	7.33
35.	Meena, V.S., Jalgaonkar, K., Mahawar, M.K., Bhushan, B., Bibwe, B., and Kashyup, P. (2020). Optimization of process variables for preparation of pomegranate juice-fortified aonla candy. Current Science 118(1): 114-119.	7.10
36.	Paramesh, V., Dhar, S., Dass, A., Kumar, B., Kumar, A., El-Ansary, D.O., and Elansary, H.O. (2020). Role of integrated nutrient management and agronomic fortification of zinc on yield, nutrient uptake and quality of wheat. Sustainability 12(9): 3513. doi:10.3390/su12093513.	9.25
37.	Paramesh, V., Sreekanth, G.B., Chakurkar, E.B., Chetan Kumar, H.B., Gokuldas, P.P., Manohara, K.K., Mahajan, G.R., Rajkumar, R.S., Ravisankar, N., Panwar. A.S. (2020). Ecosystem Network Analysis in a Smallholder Integrated Crop-Livestock System for Coastal Lowland Situation in Tropical Humid Conditions of India, Sustainability 12(12): 5017; doi:10.3390 /su12125017	9.25
38.	Toorop, R.A., Ridaura, S.L., Birjaniya, D., Kalawantawanit, E., Jat, R.K., Prusty, A.K., Jat, M.L. and Groot, J.C.J. (2020). Farm-level exploration of economic and environmental impacts of sustianble intensification of rice-wheat cropping systems in the Eastern Indo-Gangetic plains. European Journal of Agronomy 121:126157	11.22
39.	Verma, N., Singh, M.P., Nath, A., Kashyap, P., Singh, S.P. and Panwar, A.S. (2020). Feminine farm operational methods, involvement, hardships and sensitivity in farming systems analysis. Indian Journal of Agricultural Sciences 90(1): 96-101.	6.37

40.	Verma, R.K., Shivay, Y.S., Prasanna, R., Choudhary, M. and Ghasal, P.C. (2020). Nutrient management options modulating soil physico-chemical and biological properties under direct-seeded rice-based cropping systems. Archives of Agronomy and Soil Science 1-16. DOI: 10.1080/03650340.2020.1808627.	9.09
41.	Kumar, A., Dhar, S., Dass, A. and Ranjana. R. (2020). Growth, productivity and rhizospheric behaviour of wheat (Triticum aestivum) varieties under delayed planting and zinc application. Indian Journal of Agricultural Sciences 90(9): 1747–52.	6.37
42.	Kumar, R., Yadav, M.R., Arif, M., Mahala, D.M., Kumar, D., Ghasal, P.C., Yadav, K.C. and Verma. R.K. (2020). Multiple agroecosystem services of forage legumes towards agriculture sustainability: An overview. Indian Journal of Agricultural Sciences 90(8): 1367–77.	6.37
43.	Raghavendra, K.J. and Suresh. A. (2020). An analysis of economic benefits from adoption of drought tolerant soybean (Glycine max) in Madhya Pradesh. Indian Journal of Agricultural Sciences 90(10): 1888-93.	6.37
44.	Shivaswamy, G.P., Raghavendra, K.J., Anuja, A.R., Singh, K.N., Rajesh, T. and Harish Kumar, H.V. (2020). Impact of institutional credit on agricultural productivity in India: A time series analysis. Indian Journal of Agricultural Sciences 90(2): 412-7.	6.37
45.	Verma, R.K., Shivay, Y.S., Choudhary, M., Ghasal, P.C. and Madar, R. (2020). Nutrient mobilization and crop assimilation as influenced by nutrient management strategies under direct seeded basmati rice (Oryza sativa) – based cropping systems. Indian Journal of Agricultural Sciences 90(10): 1894–1901.	6.37
46.	N. Verma, M.P. Singh, A. Nath, P. Kashyap, S.P. Singh and A.S. Panwar (2020). Feminine farm operational methods, involvement, hardships and sensitivity in farming systems analysis. Indian Journal of Agricultural Sciences 90(1): 96-101.	6.37
47.	Ansari M.A., Saha S., Das A., Lal R., Das B., Choudhury B.U., Roy S.S., Sharma S.K., Singh I M, Meitei C.B., Changloi K.L., Singh L.S., Singh N.A., Saraswat P.K., Ramakrishna Y, Singh D., Hazarika S., Punitha P., Sandhu S.K. and Prakash N. (2021). Energy and carbon budgeting of traditional land use change with groundnut-based cropping system for environmental quality, resilient soil health and farmers income in eastern Indian Himalayas. Journal of Environmental Management 293: 112892.	12.78
48.	Choudhury B.U., Ansari M.A., Chakraborty M. and Meetei T.T. (2021). Effect of land-use change along altitudinal gradients on soil micronutrients in the mountain ecosystem of Indian (Eastern) Himalaya. Scientific Reports 11: 14279. https:// doi.org/10.1038/s41598-021-93788-3.	10.38
49.	Kaur J, Prusty A.K., Ravisankar N., Panwar A.S., Shamim M, Walia S.S., Chatterjee S, Pasha M.L., Babu S, Jat M.L., López Ridaura S, Groot J.C.J., Toorop R.A., Escoto L.B., Noopur K. and Kashyap P. (2021). Farm typology for planning targeted farming systems interventions for smallholders in Indo-Gangetic Plains of India. Scientific Reports 11: 20978.	10.38
50.	Kumar M., Maharishi T., Sneh P., Simona G., Fátima A., Choudhary J. and Singh S. (2021). Cottonseed: A sustainable contributor to global protein requirements. Trends in Food Science & Technology 111: 100-113.	18.56
51.	Kumar S., Dhar S., Barthakur S., Rajawat M.V.S., Kochewad S.A., Kumar S., Kumar D. and Meena L.R. (2021). Farmyard manure as k-fertilizer modulates soil biological activities and yield of wheat using the integrated fertilization approach. Frontier in Environmental Science 9: 764489.	10.58
52.	Pooniya V., Biswakarm N., Parihar C.M., Karivaradharajan S., Lama A., Zhiipao R.R., Nath A., Pal M., Jat S.L., Satyanarayana T., Majumdar K, Jat R.D., Shivay Y.S., Ghasal P.C. and Singh K. (2021). Six years of conservation agriculture and nutrient management in maize–mustard rotation: impact on soil properties, system productivity and profitability. Field Crops Research 260: 108002 https://doi.org/10.1016/j.fcr.2020.108002.	11.22

53.	Pooniya V., Zhiipao R.R., Biswakarma N, Jat S.L., Kumar D., Swarnalakshmi K., Lama A., Verma A.K., Roy D, Das K, Satyanarayana T, Jat R.D., Ghasal P.C., Ram H, Jat R, Parihar C.M., Majumdar K and Nath A. (2021). Long term conservation agriculture and best nutrient management improves productivity and profitability coupled with soil properties of a maize–chickpea rotation. Scientific Report 11: 10386. https://doi.org/10.1038/s41598-021- 89737-9.	10.38
54.	Rajiv C, Roy S.S., Tamreihao K, Kshetri P, Singh T.S., Devi H.S., Sharma S.K., Ansari M.A., Devi E.D., Devi A.K., Langamba P, Singh H.N., Akoijam R, Tania C, Sonia C. (2021). Anticarcinogenic and antioxidant action of an edible aquatic flora Jussiaea repens L. Using in vitro bioassays and in vivo zebrafish model. Molecules 26(8): 2291. https://doi.org/10.3390/molecules26082291.	10.41
55.	Shen Yuan, Linquist B.A., Wilson L.T., Cassman K.G., Stuart A.M., Pede V., Miro B, Saito K, Agustiani N, Vina Eka Aristya, Krisnadi L.Y., Zanon A.J., Heinemann A.B., Carracelas G, Subash N, Brahmanand P.S., Li T, Peng S and Grassini P. (2021). Sustainable intensification for a larger global rice Bowl. Nature Communications 12: 7163. https://doi.org/10.1038/s41467-021- 27424-z.	20.00
56.	Singh R, Yadav D.B., Yadav A and Punia S.S. (2021). Characterization of herbicide use and factors responsible for herbicide resistance in Phalaris minor in wheat in Haryana, India. Crop Protection 144: 105581. https://doi.org/10.1016/ j.cropro.2021.105581.	8.57
57.	Verma R.K., Shivay Y.S., Prasanna R, Choudhary M and Ghasal P.C. (2021). Nutrient management options modulating soil physico-chemical and biological properties under direct seeded rice– based cropping systems. Archives of Agronomy and Soil Science 67(13): 1783-1798. https:// doi.org/10.1080 /03650340.2020.1808627.	9.09
58.	Ansari M.A., Sharma S.K., Roy S.S., Ramakrishna Y, Datt S, Ningombam A, Singh N.A, Solei L and Prakash N. (2021). Documenting the agriculture based indigenous traditional knowledge in Manipur State of North Eastern India. Indian Journal of Traditional Knowledge 20(4): 1065- 1074.	6.76
59.	Bhadu K., Sharma S.K., Choudhary R., Yadav S.K., Jain R.K., Jat G. and Ravisankar N. (2021). Effect of Jeevamrut on productivity and profitability of wheat under organic farming. Indian Journal of Agricultural Sciences 91(6): 924-928.	6.37
60.	Das Ruma, Purakayastha T.J., Das D, Ahmed N, Kumar R, Walia S.S., Singh R, Shukla V.K., Yadava M.S., Ravisankar N and Datta S.C. (2021). Effect of Chemical Pre-treatment for Identification of Clay Minerals in Four Soil Orders by X-ray Diffraction Technique. National Academy Science Letters-India 45: 39-44. https://doi.org/10.1007/ s40009-021-01077-4.	6.79
61.	Kohima N., Ansari M.A. and Panwar A.S. (2021). Selfreliant in year-round vegetable production through kitchen garden in Indo-Gangetic Plains. Indian Journal of Agricultural Sciences 91(12): 1773–7.	6.37
62.	Narwal Ekta, Annapurna K., Choudhary J., Dhakar R. and Singh Y.V. (2021). Bioprospecting aerobic rice (Oryza sativa) and mycorrhizal interaction for nutrient uptake and plant growth. Indian Journal of Agricultural Sciences 91(8): 1236–41.	6.37
63.	Paramesh V., Chakurkar E.B., Bhagat T., Sreekanth G.B., Kumar H.B.C., Rajkumar S., Gokuldas P.P., Mahajan G.R., Manohara K.K. and Ravisankar N. (2021). Impact of integrated farming system on residue recycling, nutrient budgeting and soil health. Indian Journal of Agricultural Sciences 91(1): 44-48.	6.37
64.	Shweta, Singh J., Kashyap P., Kumar P., Kumar R., Panwar A.S. and Baranwal V.K. (2021). Molecular identification of citrus greening bacterium associated with Kinnow Mandarin in Western Uttar Pradesh, India. Indian Phytopathology 74: 1135-1141. https://doi.org/10.1007/s42360-021- 00396-2.	6.00
65.	Singh R., Yadav D.B, Sharma R, Sharma S. (2021). Current status of herbicide resistance in Phalaris minor in wheat in Haryana. Indian Journal of Agricultural Sciences 91(9): 1396-1400.	6.37

66.	Yadav R.K., Purakayastha T.J., Ahmed N, Das R, Chakrabarty B, Sunanda B, Sharma V.K., Singh P, Talukdar D, Mourya K.K., Walia S.S., Singh R, Shukla V.K., Yadava M.S., Ravisankar N and Yadav B.D. (2021). Long-term effect of fertilization and manuring on soil aggregate carbon mineralization. Indian Journal of Agricultural Sciences 91(2): 254-257.	6.37
67.	A.L. Meena, R.N. Pandey, D. Kumar, V.K. Sharma, M.D. Meena, M. Karwal, Debashis Dutta, L.K. Meena, Ekta Narwal, R.P. Mishra, A.S. Panwar and A. Ghosh. (2022). Impacts of long-term rice-based organic farming on fractions and forms of soil organic carbon and nitrogen in the Indo-Gangetic Plain. Soil Research 61(2): 159-175.	8.10
68.	A. Innazent, D. Jacob, J.S. Bindhu, Brigit Joseph, K.N. Anith, N. Ravisankar, A.K. Prusty, Venkatesh Paramesh and A.S. Panwar. (2022). Farm typology of smallholders integrated farming systems in Southern Coastal Plains of Kerala, India, Scientific reports 12:333, https://doi.org/10.1038 /s41598-021-04148-0.	11.00
69.	Ansari M.A., Babu S., Choudhary J., Ravisankar N. and Panwar A.S. (2022). Soil quality restoration and yield stabilization in acidic soils of northeastern Himalayas: Five years impact of green manuring and crop residue management. Frontiers in Environmental Science 10:940349. Pp: 1-18. https://doi.org/10.3389/fenvs.2022.940349.	11.41
70.	Ansari, M.A., Choudhury B. U., Mandal S. Jat S.L., Meitei Ch Bungbungcha. 2022. Converting primary forests to cultivated lands: Long-term effects on the vertical distribution of soil carbon and biological activity in the foothills of Eastern Himalaya. Journal of Environment Management 301: 113886. https://doi.org/10.1016/j.jenvman.2021. 113886.	14.91
71.	Ansari, M.A., Choudhury, B.U., Layek, J., Das, A., Lal, R. and Mishra, V.K. (2022b). Green manuring and crop residue management: effect on soil organic carbon stock, aggregation, and system productivity in the foothills of Eastern Himalaya (India). Soil & Tillage Research 218: 105318. https://doi.org/10.1016/j.still.2022.105318.	13.37
72.	Azad S. Panwar, Meraj A. Ansari, Natesan Ravisankar, Subhash Babu, Ashisa K. Prusty, Prakash C. Ghasal, Jairam Choudhary, Mohammad Shamim, Raghuveer Singh, K. J. Raghavendra, Gautam V. Chauhan, Debashis Dutta, Majhrool H. Ansari, Amrit L. Meena, Raghavendra Singh, C. S. Aulakh, D. K. Singh and P. B. Sharma. (2022). Effect of organic farming on the restoration of soil quality, ecosystem services, and productivity in rice–wheat agro-ecosystems, Frontiers in Environmental Science. 10:1918 DOI 10.3389/fenvs.2022.972394.	11.41
73.	Chaudhary Ved Prakash, Ram Chandra, Derrick Mario Denis, Tinku Casper D'Silva and Adya Isha (2022). Locally available waste biomass-based bio-energy supply model: A circular economy approach for self-resilient rural India. Biofuels, Bioproducts and Biorefining, 1-13. DOI: 10.1002/bbb.2373.	11.24
74.	D Dutta, VK Singh, PK Upadhyay, AL Meena, A Kumar, R P Mishra, B S Dwivedi, Arvind K Shukla, Gulab S Yadav, Rahas B Tewari, Vaibhav Kumar, Ankur Kumar and A S Panwar (2022). Long term impact of organic and inorganic fertilizers on soil organic carbon dynamics in a rice-wheat system. Land Degradation & Development 33(11):1862-1877.	10.38
75.	D Dutta, AL Meena, A Kumar, N Subash, R P Mishra, PC Ghasal, Jairam Choudhary, Chandra Bhanu, Raghavendra KJ, Chethan Kumar G, Ankur Kumar, Vaibhav Kumar, R B Tewari and Panwar, A.S. (2022). Influence of Different Nutrient Management Practices and Cropping Systems on Organic Carbon Pools in Typic Ustochrept Soil of Indo-Gangetic Plains in India. Journal of Soil Science and Plant Nutrition 22(2): 1403-1421.	9.90
76.	Dutta, A., Bhattacharyya, Ranjan, Chaudhary, V.P., Sharma, C., Nath, C.P., Kumar, S.N. and Parmar, B. (2022). Impact of long-term residue burning versus retention on soil organic carbon sequestration under a rice-wheat cropping system. Soil and Tillage Research 221: 105421, 1-8.	13.37

77.	Dutta, D., Meena, A.L., Kumar, A., Subash, N., Mishra, R.P., Ghasal, P.C., Chaoudhary, J., Chandra Bhanu., Raghavendra K.J., Kumar. C.G., Kumar. Ankur., Kumar. Vaibhav., Tewari. R. B., and Panwar, A.S. (2022). Influence of Different Nutrient Management Practices and Cropping Systems on Organic Carbon Pools in Typic Ustochrept Soil of Indo-Gangetic Plains in India. Journal of Soil Science and Plant Nutrition 22(2): 1403-1421.	9.90
78.	Kashyap P, Meraj A. Ansari, and Mohammad Shamim. (2022). Redesigning of Farming Systems Using a Multi-Criterion Assessment Tool for Sustainable Intensification and Nutritional Security in North-Western India. Sustainability 14: 3892. https://doi.org/10.3390/su14073892.	9.89
79.	LR Meena, N Subash, Anjali, D Kumar and Nirmal. (2022). Integrated Farming System Models Development for Small and Marginal Households for Sustainable Production and Livelihood Improvement in India: An Overview. Medicon Agriculture & Environmental Sciences 3(1): 05-18.	7.14
80.	Neeraj Kumari, Suraj Prakash, Manoj Kumar, Radha, Baohong Zhang, Vijay Sheri, Nadeem Rais, Deepak Chandran, Abhijit Dey, Tanmay Sarkar, Sangram Dhumal, Sunil Kumar, Dipendra Kumar Mahato, Marthandan Vishvanathan, Pran Mohankumar, Mirian Pateiro and José M Lorenzo. (2022). Seed Waste from Custard Apple (Annona squamosa L.): A Comprehensive Insight on Bioactive Compounds, Health Promoting Activity and Safety Profile. Processes 10(10): 2119.	8.85
81.	Poonam Kashyap, Ashisa K. Prusty, Azad S. Panwar, Venkatesh Paramesh, Ravisankar Natesan, M. Shamim, Nisha Verma, Phool Chand Jat and Mahendra Pal Singh (2022). Achieving Food and Livelihood Security and Enhancing Profitability through an Integrated Farming System Approach: A Case Study from Western Plains of Uttar Pradesh, India. Sustainability 14: 6653. https://doi.org/10.3390/su14116653.	9.89
82.	Prusty, A.K., Ravisankar, N., Panwar, A.S., Jat, M.L., Tetarwal, J.P., López-Ridaura, S., Adelhart Toorop, R., Akker, J.V.D., Kaur, J., Ghasal, P.C., Groot, J.C.J., Barba-Escoto, L., Kashyap, P., Ansari, M.A. and Shamim, M. (2022). Redesigning of Farming Systems Using a Multi-Criterion Assessment Tool for Sustainable Intensification and Nutritional Security in North-Western India. Sustainability. 14, 3892. https://doi.org/10.3390/su14073892.	9.89
83.	Rakesh Kumar Verma, Yashbir Singh Shivay, Radha Prasanna, Prakash Chand Ghasal, Chiter Mal Parihar, Mukesh Choudhary and Raghavendra Madar. (2022). Bio-energy auditing, system productivity, energy efficiencies and economics of different direct-seeded basmati rice-based cropping systems and nutrient management options. CABI Agriculture and Bioscience, 3(1): 1-14.	9.90
84.	Ravisankar, N., Ansari, M.A, Shamim, M., Prusty, A.K., Singh, R., Panwar, A.S., Dutta, D., Bhaskar, S., Bindhu, J.S., Sanjay, M.T., Kaur, J., Varghese, C., Dash, S., Bhowmik, A. and Bal., S.K. (2022). Sustainable livelihood security of small farmers improved through resilient farming systems in the Semi-Arid Region of India. Land Degradation & Development. 33(15), 2830-2842. https://doi.org/10.1002/ldr.4358.	10.38
85.	Shibasis Mukherjee, Suchana Sen, Md. Nasim Ali, Rupak Goswami, Argha Chakraborty, Krishnendu Ray, Rantim Bhattacharjee, Bhubaneswar Pradhan, N. Ravisankar and Gautam Chatterjee. (2022). Microbiological properties of Beejamrit, an ancient Indian traditional knowledge, uncover a dynamic plant beneicial microbial network, World Journal of Microbiology and Biotechnology 38(111): 1-12	10.25
86.	Venkatesh Paramesh, Parveen Kumar, Mohammad Shamim, Natesan Ravisankar, Vadivel Arunachalam, Arun Jyoti Nath, Trivesh Mayekar, Raghuveer Singh, Ashisa K. Prusty, Racharla Solomon Rajkumar, Azad Singh Panwar, Viswanatha K. Reddy, Malay Pramanik, Anup Das, Kallakeri Kannappa Manohara, Subhash Babu and Poonam Kashyap.2022. Integrated Farming Systems as an Adaptation Strategy to Climate Change: Case Studies from Diverse Agro-Climatic Zones of India, Sustainability, 14, 11629. https://doi.org/10.3390/ su141811629.	9.89

87.	Walia SS, Babu S, Gill RS, Kaur T, Kohima N, Panwar AS, Yadav DK, Ansari MA, Ravishankar N, Kumar S, Kaur K and Ansari MH. (2022). Designing resource-efficient and environmentally safe cropping systems for sustainable energy use and economic returns in Indo-Gangetic Plains, India. Sustainability. 14: 14636. https://doi.org/ 10.3390/su142114636.	9.89
88.	Gupta, G., Dhar, S., Kumar, A., Choudhary, A. K., Dass, A., Sharma, V.K, Kumar Kamlesh and Rajawat, M.V.S. (2022). Microbes-mediated integrated nutrient management for improved rhizo-modulation, pigeonpea productivity, and soil bio-fertility in a semi-arid agro-ecology. Frontiers in Microbiology, 13.	11.64
89.	Chandra Bhanu, N. Ravisankar, P.C. Ghasal, Jairam Choudhary, Raghuveer Singh, K.J. Raghavendra, A.L. Meena, L.K. Meena, D. Dutta, R.P. Mishra, N. Balasubramani, A. Sadalaxmi and A.S. Panwar. (2022). Knowledge based assessment of trained certified farm advisors (CFA) on Organic Farming, Indian Journal of Agricultural Sciences. 92(1): 85-89.	6.37
90.	Choudhury, B.U., Nengzouzam, G., Ansari, M.A. and Islam, A. (2022). Causes and consequences of soil erosion in North-Eastern Himalaya, India. Current Science, 122(7): 772-789. https://doi.10.18520/cs/v122/i7/772-789.	7.17
91.	Raghavendra KJ, LR Meena, AL Meena, D Dutta, D Kumar and Panwar A.S. (2022). Understanding farm diversity through typology for technological interventions in western plain zone of Uttar Pradesh, India. Indian Journal of Extension Education 58(1): 125-129	6.00
92.	Jat, N.K., M. Shamim, Sudhir Kumar, N. Ravisankar, R.S. Yadav, Subhash Babu and A.S. Panwar. (2022). Agrometeorological evaluation of mustard (Brassica juncea) under organic production in North Western Indo-Gangetic Plains, Indian Journal of Agricultural Sciences 92 (3): 339-343.	6.40
93.	Kumar Devendra, L.R. Meena, Nirmal, Lalit K. Meena, Raghvendra, K.J., Arpan Bhowmic and Anjali (2022). Assessment of genetic divergence and correlation analysis of sugarcane clones (Saccharum spp.L.) in North-Western Plain Zone of Uttar Pradesh. Medicon Agriculture & Environmental Sciences. 3(1): 29-38	6.14
94.	LR Meena, SA Kochewad, AK Prusty, Chandra Bhanu, Sanjeev Kumar, AL Meena, Lalit Krishan Meena, KJ Raghavendra, Devendra Kumar, N Subash and SP Singh. (2022). Sustainable integrated farming system model for small farm holders of Uttar Pradesh. Indian Journal of Agricultural Sciences 92(9):1080-1085.	6.40
95.	LR Meena, S Malik, D Mishra, A Nath, AK Prusty, Chandra Bhanu, Sanjeev Kumar, A L Meena, N Subash, SR Meena and Alice Singh. (2022). Development of a successful IFS model for livelihood sustenance of small households of Uttar Pradesh. Indian Journal of Agricultural Sciences 92(10): 1175–1180.	6.40
96.	M Shamim, AS Panwar, N Ravisankar, PC Jat, A K Prusty, M P Singh, Poonam Kashyap, Nisha Verma, Shiv Datt, M A Ansari and Sunil Kumar. (2022). On-farm Agro-meteorological evaluation of late sown wheat (Triticum aestivum) under irrigated agro-ecosystem of Upper Indo-Gangetic Plains, Indian Journal of Agricultural Sciences 92(6): 732–6	6.40
97.	Meena L.R., N. Subhash, Anjali, Kumar Devendra and Nirmal (2022). Integrated Farming System models development for small and marginal households for sustainable production and livelihood improvement: An overview. Medicon Agriculture & Environmental Sciences. 3.1:05-18	6.14
98.	A.L. Meena, R.N. Pandey, D. Kumar, D. Dutta, Sharma V.K. Sharma, M. Karwal , Meraj Alam Ansari, Mahaveer Nogiya, K.J. Raghavendra, P.C. Ghasal, Jairam Choudhary, R.P. Mishra, Chandra Bhanu, P.C. Jat, Sunil Kumar and A.S. Panwar. (2023). The Long-Term (13 years) Effect of Rice Based Organic Farming on Soil Sulphur Dynamics in a Typic Ustochrept Soil of Indo Gangetic Plain of India. Journal of Soil Science and Plant Nutrition 1-17	9.90

99.	Ansari MA, Ravisankar N, Ansari MH, Babu S, Layek J, Panwar A.S. (2023). Integrating conservation agriculture with intensive crop diversification in the maize-based organic system: Impact on sustaining food and nutritional security. Frontiers in Nutrition 10:1137247. doi: 10.3389/fnut.2023.1137247	11.00
100.	Babu S, Singh Raghavendra, Avasthe RK, Rathore SS, Kumar S, Das A, Layek J, Sharma V, Wani OA and Singh VK. (2023). Conservation tillage and diversified cropping enhance system productivity and eco-efficiency and reduce greenhouse gas intensity in organic farming. Frontiers in Sustainable Food Systems 7:1114617. doi: 10.3389/fsufs.2023.1114617	10.70
101.	Babu S, Singh Raghavendra, Avasthe R, Kumar S, Rathore SS, Singh VK, Ansari MA, Valente D and Petrosillo I. (2023). Soil carbon dynamics under organic farming: Impact of tillage and cropping diversity. Ecological Indicators 147:109940.	12.90
102.	Babu S, Singh Raghavendra, Kumar S, Rathore SS, Yadav D, Yadav SK, Yadav V, Ansari MA, Das A, Rajanna GA and Wali O A. (2023). Biochar implications in cleaner agricultural production and environmental sustainability. Environmental Science: Advances, 115(1): 1–7.	9.50
103.	Chaudhary M, Kumar S, Dixit AK, Singh T, Kantwa SR. (2023). Inclusion of Egyptian clover improves the value of sorghum-based cropping systems. Crop and Pasture Science, 74: 1307-1317.	7.9
104.	Choudhary P, Prasad M, Choudhary M, Kumar A, Kumar S, Srinivasan R and Mahawer SK. (2023). Exploring invasive weed Biochar as soil amendment: A study on fodder oats productivity and soil biological properties. Environmental Research 216: 114527.	14.43
105.	Jitendra K, Kalita H, Rekhung W, Rajesh A Alone, Thejangulie Angami, Doni Jini, Badapmain Makdoh, Letngam Touthang, Nirmal Khatri, A P Singh, Nishant K Sinha, Dhiraj Kumar and R S Chaudhary. (2023). Dynamics of soil organic carbon of Jhum agriculture land use system in the heterogeneous hill of Arunachal Pradesh, India. Scientific Reports 13:12156.	11.00
106.	Kumar A, Behera U, Dhar S, Shukla L, Singh Raghavendra, Babu S. and Kumar A. (2023). Conservation tillage and microbially mediated integrated phosphorus management enhance productivity, profitability, and energy use efficiency of maize. Journal of Agricultural Science 1-44. doi:10.1017/S0021859623000266	8.00
107.	Kumar S, Dixit AK, Prasad M, Rai SK, Mahanta SK, Singh S, Radotra S and Ghosh PK. (2023). Effects of grazing intensity and pasture type on soil organic carbon stock in the semiarid tropics of India. Tropical Grasslands Forrajes Tropicales 11(1): 41-51.	6.76
108.	Kumar S, Kumar TK, Prasad M, Singh, JB, Choudhary M, Dixit AK and Ghosh PK. (2023). Alley cropping system in degraded land of central India: Evaluation of crop performance, economic benefit and soil nutrients availability. International Journal of Plant Production, 17(1): 8193.	8.61
109.	Kumar S, Meena A L, Punia P, Raghvendra KJ, Choudhary VK, Kumar CG, Meena LK, Kumar L, Mishra RP, Khajuria V, Udita, Kundu M and Chandra MS. (2023). Methodology of identification and characterization for sustainable development of small and marginal farmers in Jammu. Agricultural Mechanization in Asia (AMA ISSN 00845841) 54(7): 14357-14367.	6.29
110.	Layek J, Das A, Ansari MA, Mishra VK, Rangappa K, Ravisankar N, Patra S, Baiswar P, Ramesh T, Hazarika S, Panwar AS, Devi S, Ansari MH and Paramanik B. (2023). An integrated organic farming system: innovations for farm diversification, sustainability, and livelihood improvement of hill farmers. Frontiers in Sustainable Food Systems 7:1-20.	10.70
111.	Layek J, Rangappa K, Das A, Ansari MA, Choudhary S, Rajbonshi N, Patra S, Kumar A, Mishra VK, Ravisankar N, Kumar S, Hazarika S, Dutta SK, Babu S, Tahasildar M and Shettigar N. (2023). Evaluation of millets for physio-chemical and root morphological traits suitable for resilient farming and nutritional security in Eastern Himalayas, Frontiers in Nutrition 10:1198023: 1-17.	11.00

112.	Layek, J, Das A, Mishra VK, Lal R, Krishnappa R, Hazarika S, Mohapatra KP, Ansari MA, Pramanick B, Kumar M, Ramkrushna GI, Saha S, Babu S and Tahashildar M. (2023). Improved agronomic practices and high yielding rice varieties maintain soil health and enhance yield and energy use efficiency under shifting cultivation landscapes of eastern Himalayas. Land Degradation & Development. 1–17. https://doi.org/10.1002/ldr.4807	10.70
113.	Meena MD, Dotaniya ML, Meena BL, Rai PK, Antil RS, Meena HS, Meena LK, Dotaniya CK, Meena VS, Ghosh A, Meena KN, Singh AK, Meena VD, Moharana PC, Meena SK, Srinivasarao Ch, Meena AL, Chatterjee S, Meena DK, Prajapat M, Meena RB. (2023). Municipal solid waste: Opportunities, challenges and management policies in India: A review. Waste Management Bulletin, 1: 4-18.	14.10
114.	Mourya KK, Purakayastha TJ, Ahmed N, Kumar S, Trivedi A, Husain K and Ravisankar N. (2023). Assessment of carbon pools and stocks in an Inceptisol under long-term manuring and fertilization in rice-wheat cropping system: Comparison of different methods, Communications in Soil Science and Plant Analysis 10: 1-14.	7.80
115.	Mukherjee S, Basak A, Chakraborty A, Goswami R, Ray K, Ali MN, Santra S, Hazra AK, Tripathi S, Banerjee H, Layek J, Panwar AS, Ravisankar N, Ansari MA and Chatterjee G. (2023). Revisiting the oldest manure of India, Kunapajala: Assessment of its animal waste recycling potential as a source of bio stimulant, Frontiers in Sustainable Food Systems 6: 1073010. https://doi.org/10.3389/fsufs.2022.1073010	10.70
116.	Palsaniya DR, Kumar P, Das MM, Kumar S, Rai SK, Chaudhary M, Kumar S, Sahay CS, Ahmad A, Tirumala KK and Chand K. (2023). Rain water harvesting, agroforestry and goat based intensification for livelihood resilience in drought prone rainfed smallholder farming system: a case for semiarid tropics. Agroforestry Systems 97: 14051419.	8.42
117.	Palsaniya DR, Triumala KK, Chaudhary M, Chaudhary M, Prasad M and Kumar S. (2023). Tillage practices and mulching affect system productivity, profitability and energy use in Sesbania alley based food fodder systems under rainfed agroecosystems of semiarid tropics. Field Crops Research 302: 1-9.	12.15
118.	Rai AK, Das SK, Basak N, Dixit AK, Rai SK, Singh JB, Kumar S, Tirumala KK, Chandra P and Sundha P. (2023). Changes in soil microbial biomass and organic C pools improve the sustainability of perennial grass and legume system under organic nutrient management. Frontiers in Microbiology 14.	12.06
119.	Singh Raghavendra, Kumar A, Babu S, Avasthe RK, Das A, Rathore SS, Kumar S, Singh C, Sharma V, Bhupenchandra I. 2023. Development of organic nutrients management system for profitable and soil-supportive French bean (Phaseolus vulgaris L.) farming in North Eastern Himalayas, India. Frontiers in Sustainable Food Systems 7:1115521. doi: 10.3389/fsufs.2023.1115521.	10.70
120.	Subash N, Dutta D, Ghasal PC, Punia P, Mandal VP, Brahmadut and Chaudhary VP. (2023). Relevance of climatological information on spatial and temporal variability of Indian summer monsoon rainfall (ISMR) in recent El Nino years and its impact on four important kharif crops over India. Climate Services, 30: 100370.	9.20
121.	Subash N, Dutta D, Ghasal PC, Ravisankar N, Chaudhary VP, Kumar S, Meena LR, Singh O, Mandal VP, Singh S, Kumari S and Brahmdutt. (2023). A composite index to assess the climate-carbon-yield-sustainability of cereal based cropping system. International Journal of Plant Production. https://doi.org/10.1007/s42106-023-00268-x.	8.61
122.	Wani OA, Sharma V, Kumar SS, Babu S, Sharma KR, Rathore SS, Marwah S, Ganai NA, Darf SR, Yeasin M, Singh Raghavendra and Tomar J. (2023). Climate plays a dominant role over land management in governing soil carbon dynamics in North Western Himalayas. Journal of Environment Management https://doi.org/10.1016/j.jenvman.2023.117740.	14.70
123.	Kumar K, Parihar CM, Nayak HS, Godara S, Avinash G, Patra K, Sena DR, Reddy KS, Das TK, Jat L and Gathala M K. (2023). Enhancing maize yield in a conservation agriculture-based maize-wheat system through efficient nitrogen management. Indian Journal of Agricultural Sciences, 93(4): 420–424.	6.40

124.	Kumar M, Singh Raghavendra, Avasthe RK, Babu S, Pathak PK and Singh J K.2023. Economic and sustainable appraisal of organic growers through no-till garden pea (Pisum sativum L.) under rice-fallow. Indian Journal of Agricultural Sciences 93(2): 195-99.	6.40

B. LIST OF RESEARCH PAPERS (>6.00 NAAS RATING) PUBLISHED BY AICRP-IFS

S. No.	National and International Publications	NAAS rating
1.	Singh Balwinder, Aulakh C S and Walia S S 2017. Productivity and water use of organic wheat–chickpea intercropping system under limited moisture conditions in Northwest India, Renewable Agriculture and Food Systems, doi:10.1017/S1742170517000370:1-10	8.70
2.	Todar Mal, Walia S S and Saini K S, 2017. Productivity and economics of different cropping systems in relation to tillage, mulching and fertilizer management practices in North-Western Indo-Gangetic Plains of India, Indian Journal of Agricultural Sciences, Acceptance letter No. 2017 dated 20-10-2017	6.40
3.	Dwivedi, S.K., Basu Sahana, Kumar Santosh, Kumar Gautam, Ved Prakash, Kumar Sanjeev, Mishra, J.S., Bhatt, B.P., Malviya, N., Singh, G.P. and Arora, A. 2017. Heat stress induced 206: 106-114 9.03 impairment of starch mobilization regulates pollen viability and grain yield in wheat: Study in Eastern IndoGangetic Plains, Field Crops Research, 206: 106-114	11.8
4.	Datta Ashim, Mandal Bisrnalwapati, Basak Nirmalendu, Badole Shrikant, Chaitany Krishna, Majumder S.M., Thakur N. P., Kumar Parshotam and Kachroo Dileep (2017). Soil carbon pools under long-term rice-wheat cropping system in Incptisols of Indian Himalayas, Archives of Agronomy and Soil Science, https://doi.org/10.1080/03650340.2017.1419196	8.40
5.	Arora, G., Chaturvedi, S., Kausal, R., Tewari, S.K. and Chaturvedi, O.P.2017. Growth, Biomass, Carbon Stocks and Sequestration in Age Series Populus deldoides Plantations, Turkish Journal of Agriculture and Forestry, 38: 550-560	8.90
6.	Ashim data, Biswapati mandal ,Shrikant badole ,Krishna chitanya, S.P.Mujumdar, Dnaneshwar Padau, Nirmalendu Barak Ajit Burman Ritesh Kundu ,W.N.Narkhede 2018. Interrelationship of biomass yield ,carbon input ,aggregation ,carbon pool and its sequestration in vertisol under long term sorghum-wheat cropping system in semiarid tropics, Soil and Tillage, 0167-1987	12.50
7.	S. Panwar, M. Shamim, Subhash Babu, N. Ravishankar, Ashisa Kumar Prusty, N. M. Alam, D. K. Singh, J. S. Bindhu, Jashanjot Kaur, L. N. Dashora, M. D. Latheef Pasha, Soumitra Chaterjee, M. T. Sanjay and L. J. Desai (2018). Enhancement in Productivity, Nutrients Use Efficiency, and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach, Sustainability, 11, 122, doi:10.3390/su11010122	9.90
8.	Gosal S. K., Gill G. K., Sandeep Sharma and Walia S S (2018). Soil nutrient status and yield of rice as affected by long-term integrated use of organic and inorganic fertilizers, Journal of Plant Nutrition, 41(4): 539-544.	8.10
9.	Kumar Sanjeev, Shivani, Mishra J S, Kumar Santosh, Kumar Ujjwal and Bharti R C. 2018. Efficacy of pre- and post- 6.22 emergence herbicides on complex weed flora in direct-seeded rice (Oryza sativa) in the eastern plains, Indian Journal of Agricultural Sciences, 88 (3): 387-92.	6.40
10.	Meshram N.A. Syed Ismail, Shirale S.T. and Patil V.D. 2018. Impact of long term fertilizer experiment on Soil fertility, nutrient uptake, growth and productivity of Soybean –Safflower Cropping Sequence in Vertisol, legume Research an International Journal, 42(2)2019 182-189	6.80
11.	Puniya, R., Palasaniya, Sher Singh, Lakh Chand, Sharma, A., Thakur N.P. and Bazaya, Bodh Ram (2018). Influence of sowing dates and varieties on the , heat use e ciency, energy utilization and economics of summer mungbean, Legume research, 41(5):710-715	6.80

12.	Sammauria, R. Balyan, J K and Bairwa P C. 2019. Time, intensity of detasseling rainfed maize (Zea mays) for improving productivity, economics and rainwater-use efficiency, Indian Journal of Agricultural Sciences, 89(12):2053-8	6.40
13.	Saiful Islama, Mahesh K. Gathalaa, Thakur P. Tiwari , Jagadish Timsina,k , Alison M Lain , Sofina Maharjan , Apurba K. Chowdhury, Prateek M Bhattacharya, Tapamay Dhar, Biplab Mitra, Sanjay Kumar, Pawan K Srivastwa, Swaraj K. Dutta, Renuka Shrestha, Sarita Manandha, Shukra Raj Sherestha, Prakash Paneru, Nur-EAlam Siddquie, Akbar Hossain, Rashadul Islam, Anup Kumar Ghosh, Mohammad Atiqur Rahman, Ujjwal Kumar, Karnena Koteswara Rao, Bruno Gérard (2019). Conservation agriculture based sustainable intensification: Increasing yields and water productivity for smallholders of the Eastern Gangeti SDAU Plains, Field Crop Research 238 (2019) 1–17	11.80
14.	Saha Sushanta, Saha Bholanath, Seth Trisita, Shubhadip gupta Das, Ray Manabendra, Pal Biplab, Pati Sajal, Kumar Swapan Mukhopadhyay and Hazra Gorachand 2019. Micronutrients Availability in Soil–Plant System in Response to LongTerm Integrated Nutrient Management Under Rice– Wheat Cropping System, Journal of Soil Science and Plant Nutrition (2019), 19:712–724	9.90
15.	Rod, N. K.., Gudadhe N. N., Mehta, P. V., Karmakar N. and Narwade,. A. V.2019. Little dose of cobalt chloride enhances crop duration and increases production and productivity of chickpea, Journal of Plant Nutrition, 42(1):40-57 (2019) S. Saha, B. Saha, M. Ray, S.K.Mukhopadhyay, P. Halder, A. Das, S. Chatterjee and M. Pramanick (2018). Integrated nutrient management (INM) on yield trends and sustainability, nutrient balance and soil fertility in a long-term (30 years) ricewheat system in the Indo-Gangetic plains of India, Journal of Plant Nutrition, https://doi.org/10.1080/ 01904167.2018.1510509	8.10
16.	Panwar, A.S., Shamim, M., Babu, Subhash, Ravishankar, N., Prusty, Ashisa Kumar, Alam, N. M., Singh, D. K., Bindhu, J., Kaur, Jashanjot, Dashora, L. N., M. D. Pasha, Latheef, Chaterjee, Soumitra, Sanjay M. T. and Desai L. J. 2019. Enhancement in Productivity, Nutrients Use Efficiency, and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach, Sustainability (2019), Sustainability 2019, 11, 122pp. 1-26	9.90
17.	Panwar, A.S., Shamim, M., Babu, S., Ravishankar, N., Prusty, A.K., Alam, N.M., Singh, D.K., Bindhu, J.S., Kaur, J., Dashora, L.N., Pasha, M.D.L., Chaterjee, S., Sanjay, M.T., Desai, L.J. 2019. Enhancement in Productivity, Nutrients Use Efficiency, and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach, Sustainability, 11(1), 122; https://doi. org/10.3390/ su11010122	9.90
18.	Kumar S, Sharma P K, Yadav M R, Sexena R, Gupta K C, Kumar R, Garg N K and Yadav H L. 2019. Effect of irrigation levels and moisture conserving polymers on growth, productivity and profitability of wheat, Indian Journal of Agricultural Sciences, 89(3):509-514	6.40
19.	Kumar S, Sharma Yadav P K, Sexena M R, Gupta R, Garg K C, N K and Yadav H L. 2019. Impact of nutrient management practices and plant growth regulators on growth, productivity and profitability of wheat (Triticum aestivum), Indian Journal of Agricultural Sciences, 89(4):604-609	6.40
20.	Kumar Anjan, M. J. AND Gundappa 2019. Hyderabad Karnataka region building construction migrant labour migrated to Bangalore city: Study for socio economic work praxis, International Journal for Research and Review, 6 (2):922-926	-
21.	Gupta Meenakshi, Sharma B.C., Thakur N.P., Kour Sarabdeep and Bharat Rajeev 2019. Effect of graded levels of NPK on growth, yield and quality of fine rice (Oryza sativa L.) Var. Pusa Basmati 1121, The Bioscan, 14(2); 085-089	-

22.	Das Ruma, Mandal Biswapati, Sarkar Dibyendu, Kumar Amit Datta Pradhan, Ashim, Padhan Dhaneshwar, Seth Anindita, Kumar Rahul, DeNirmal, Mishra V.N., Polara K.B., Sharma Sanjay, .Thakur N.P, Kachroo Dileep, Ray M. , Sharma Anil, Patel K.P., Garnayak Lalit Mohan and Narkhede W.N. 2019. Boron availability in soils and its nutrition of crops under long- term fertility experiments in India, Geoderma (2019), 351: 116-129.	12.10
23.	Yadav M R, Kumar Y, Pooniya V, Gupta K C, Saxena R and Garg N K. 2019. Performance of groundnut (Arachis hypogaea) under different phosphorus management options in semi-arid environment of Rajasthan, Indian Journal of Agricultural Sciences, 89(6):946-50	6.40
24.	Das Ruma, Mandal Biswapati, Sarkar Dibyendu, Kumar Amit Pradhan, Datta Ashim, Padhan Dhaneshwar, Seth Anindita, Kumar Rahul, Birmal De, Mishra V.N., Polara K.B., Sharma Sanjay, Thakur N.P., Kachroo Dileep, Ray M., Sharma Anil, Patel K.P., Mohan Lalit Narkhed Garnayak, W.N.2019. Boron availability in soils and its nutrition of crops under long-term fertility experiments in India, Geoderma, (351); 116-129	12.10
25.	Das Ruma, Purakayastha TJ, Das Debarup, Ahmed Nayan, Kumar Rahul, Biswas Sunanda, Walia SS, Singh Rohitashav, Shukla VK, Yadava MS, Ravisankar N, Datta SC (2019). Long-term fertilization and manuring with different organics alter stability of carbon in colloidal organomineral fraction in soils of varying clay mineralogy, Science of The Total Environment, 684: 682-693	15.80
26.	Deb S, Kumar D, Chakraborty S, Weindorf D C, P Banik, Deb D, Choudhury P De, A, Saha S, Patra, A K Majhi M, Naskar P and Panda P 2019. Comparative carbon stability in surface soils and subsoils under submerged rice and upland non-rice crop ecologies: A physical fractionation study, Catena, 175: 400-410 (2019)	12.20
27.	Ashok Kumar Gaddi, Basavanneppa M.A. and prabhuling tevari, 2020. Effects of long term use of organic and inorganic fertilizers on soil fertility and productivity under paddy- sesame cropping system, Bangladesh J. Bot, 49(3): 585-591	6.30
28.	Bhupenchandrl. a , Basumatary A, , Datta S. , Singh L.K. , Bora S.S. , Devi S.H., Gogoi Bhabesh, Kalita P. , Das J. and Tamuli B.. (2020). Micronutrient content in plant, its uptake, and crop yield in cauliflower–cowpea-okra cropping sequence as impacted by graded level of boron fertilization, Communications in Soil Science and Plant Analysis, https://doi.org/10.1 080/00103624.2020 .1798989.	7.80
29.	Dutta, S. K., Laing, A. M., Kumar, S., Gathala, M. K., Singh, A. K., Gaydon, D. S., &Poulton, P. (2020). Improved water management practices improve cropping system profitability and smallholder farmer's incomes, Agricultural Water Management, 242, 106411. https://doi. org/10.1016/j. agwat.2020.106411	12.70
30.	Gathala, M. K., Laing, A. M., Tiwari, T. P., Timsina, J., Islam, S., Bhattacharya, P. M., Dhar, T., Ghosh, A., Sinha, A. K., Chowdhury, A. K., Hossain, S., Hossain, I., Molla, S., Rashid, M., Kumar, S., Kumar, R., Dutta, S. K., Srivastwa, P. K., Chaudhary, B., Jha, S. K., Ghimire, P., Bastola, B., Chaubey, R. K., Kumar, U. and Gérard, B. (2020). Energy-efficient, sustainable crop production practices benefit smallholder farmers and the environment across three countries in the Eastern Gangetic Plains, South Asia, Journal of Cleaner Production, 246, 118982. https:// doi.org/10.1016/j. jclepro.2019.118982	17.10
31.	Jain S. K., Sharma LD, Gupta KC, Kumar Vipin and Yadav MR. 2020. Principal Component and Genetic Diversity Analysis for Seed Yield and Its Related Components in the Genotypes of Chickpea (Cicer arietinum L.). Accepted, Legume Research. (LR 4489), Published online	6.80
32.	Jain S. K., Sharma LD, Gupta KC, Kumar Vipin and Yadav MR. 2020. Variability and character association for yield and quantitative traits under late sown conditions in Chickpea (Cicer arietinum L.). DOI:10.18805/LR-4432, Legume Research, Published online	6.80
33.	Jat, M.K., Yadav, P.K., Singh, R., Tikkoo, A., Yadav, S.S. and Dadarwal, R.S, 2020. Response of green gram (VignaradiataL.) to potassium fertilization in coarse textured soils of Southern Haryana, Indian Journal of Environmental Biology, Vol. 41(6), 1621	6.70

34.	Kumar Sudesh, Yadav MR, Gupta KC, Saxena R, Meena OP, Singh Jogendra, Yadav KC and Khrub AS. 2020. Amelioration of lodging in barley (Hordeum vulgare) using plant growth regulators, Indian Journal of Agricultural Sciences, 90(2):407-11	6.40
35.	Saha S, Saha BN, Mohanty S, Ray M, Hazra GC, Chatterjee S, Mukhopadhyay S.K. 2020. Identifying suitable soil quality indicators in an Indian rice-wheat system as influenced by long term (30 years) inorganic-organic fertilization, Archives of Agronomy and Soil Science (2020), https://doi.org/10.1 080/03650340.2020 .1851684	8.40
36.	Sajeena, A., Deepthi S. N., Teja Sri Peteti, T. S., John, J., Sudha, B., and Meera, A.V. 2020. First report of basal stem rot and blight of yardlong bean (Vigna unguiculata subsp. sesquipedalis) caused by Athelia rolfsii in India, Journal of Plant Pathology, https://doi. org/10.1007/ s42161-020-00663-7	8.20
37.	Sammauria R.,Kumawat S., Kumawat P, Singh Jogender, and Kumar Tarun. 2020. Microbial Inoculants: Potential tool for sustainability of agricultural production systems, Archives of Microbiology, 202, 677-93	8.80
38.	Sammauria, R., Meena, O. P., Yadav, M.R., Gupta, K.C., Gupta, A. K and Yadav, H.L. 2020. Crop Diversification of Predominant Pearl Millet Based Cropping System for Higher Productivity, ResourceUse Efficiency and Profitability in Semi-Arid Rajasthan, Legume Research, 43(4):568-572	6.80
39.	Shabnam and Sharma Sanjay K. 2020. Fractions of copper in soil and their contribution to copper availability and uptake in maize–wheat cropping system under Typic hapludalfs, Cereal Research Communications, 48:555–563	7.60
40.	Singh Pratibha, Dwivedi M, Srivastava P C, Pachauri S P, Shukla A K and Singh A P. 2020. Boron Fertilization and Crop Production in India: A Review, Indian Journal of Agricultural Sciences, 90 (1): 9-16	6.40
41.	Yadav, R. K., Purakayastha, T.J., Nayan Ahmed, Ruma Das, Bidisha Chakrabarty, Sunanda Biswas, Sharma, V.K., Pooja Singh, Daizee Talukdar, Mourya, K.K., Walia, S.S., Rohitasav Singh, Shukla, V.K., Yadava, M.S., Ravisankar, N., Yadav, Basu Devi 2021. Long-term effect of fertilization and manuring on soil aggregate carbon mineralization, The Indian Journal of Agricultural Sciences, Vol. 91(2)	6.40
42.	A. Chavan, W. N. Narkhede and H.S. Garud.2021. Evaluation of organic weed management practices on growth, yield and weed control efficiency in soyabean- chickpea sequence under irrigated condition, Legume Research - An International journal, Vol.44 issue 8-921-928 .	6.80
43.	A.S.Dhonde,.S.Raskar, U.S.Surve.2021. Effect of organic farming packages on yield, biochemical properties and energy balance study under diversified cropping systems, Agricultural Mechanization in Asia, Africa and Latin America (AMA) (ISSN:00945841), Volume 52, Issue 01	6.30
44.	Ashu Sharma, dileep Kachroo, R.Punia, N.P. Thakur, Anil Kumar, Amit Mahajan, Lobzang Stanzen, Rakesh Sharma and Sapna Bhagat 2021. Weed dynamics and productivity of potato as influenced by organic sources of nutrients and weed management, Agricultural Mechanization in Asia, 52(1) 2702-2713.	6.30
45.	Bhabesh Gogoi, Borah N., Baishya A., . Dutta S, Nath D.J., Das R., Bhattacharryya D., Sharma K.K., Mishra G., Francaviglia R.. (2021). Yield trends, soil carbon fractions and sequestration in a rice-rice system of North-East India: Effect of 32 years of INM practices, Field Crops Research, 272. (2021).	11.80
46.	Bhosale S. S. and Jondhale D. G.,2021. Long term effect of INM on yield and nutrient uptake of rice – rice cropping system in North konkan, Int. J. of Trend in Scientific Research and Development, 4(1):513 – 519	-
47.	Bihari Bipin, Singh Y. K., Shambhavi S., Mandal, J., Kumar Sanjay and Kumar, R. (2021). Nutrient Use efficiency indices of N, P, and K under rice-wheat cropping system in LTFE after 34th crop cycle, Journal of Plant Nutrition, DOI.org/10.1080/01904167.2021.1943674	8.10

48.	Das R, Purakayastha T, Das D, Ahmed N, Kumar R, Walia S S, Singh R, Shukla V K, Yadava M S, Ravisankar N and Dutta S C 2021. Effect of Chemical Pre-treatment for Identification of Clay Minerals in Four Soil Orders by X-ray Diffraction Technique, National Academy of Sciences Letters, https://doi.org/10.1007/s40009-021-01077-4.	7.10
49.	Dhaliwal S S,Sharma S, Sharma V, Shulka A K, Walia S S, Alhomrani M, Gaber A, Toor A S, Verma V, Randhawa M, Pandher L, Singh P and Hussain A. 2021. Long-Term Integrated Nutrient Management in the Maize-Wheat Cropping System in Alluvial Soils of North-Western India: Influence on Soil Organic Carbon, Microbial Activity and Nutrient Status, Agronomy, Vol. 11, 2258. https://doi.org/ 10.3390/agronomy 11112258.	8.10
50.	Gogoi, B.; Borah, N.; Baishya, A.; Nath, D.J.; Dutta,S.; Das,R.; Bhattacharyya, D.; Sharma, K.K.; Valente, D and Petrosillo, I.2021. Enhancing soil ecosystem services through sustainable integrated nutrient management in double rice –cropping system of North – East India, Ecological Indicators, 132(10):1-10.	12.90
51.	H. S. Garud, A.S.Asewar, and A. A. Chavan, D. N. Gokhale, W. N. Narkhede.2021. Production potential of pigeon pea based intercropping systems under various land configurations in Marathwada region of Maharashtra, Legume Research - An International journal, Vol.44 issue 8-947-951 (August 2021).	6.80
52.	Jashanjot Kaur, A.K. Prusty, N. Ravisankar, A.S. Panwar, M. Shamim, S.S. Walia, S. Chatterjee, M.L. Pascha, Subhash Babu, M.L. Jat, Santiago Lopez-Ridaura, Jeroen C.J. Groot, Roos Adelhert Toorop, Luis Barba-Escoto, Kohima Noopur and Poonam Kashyap.2021. Farm typology for planning targeted farming systems interventions for small holders in Indo-Gengetic Plains of India, Scientific reports 11:20978, https://doi.org /10.1038 /s41598-021-00372-w	10.60
53.	Kaur J, Prusty A K, Ravisankar N, Panwar A S, Shamim M, Walia S S, Chatterjee S, Pasha M L, Babu S, Jat M L, Lopez-Ridaura S, Groot JCJ, Toorop R A, Escoto LB, Nopur K and Kashyap P 2021. Farm typology for planning targeted farming systems interventions for smallholders in IndoGangetic Plains of India, Scientific Reports, Vol. 11: 20978 https: //doi.org/10.1038/s41598-021-00372-wwww.nature.com/ scientific reports.	10.60
54.	Kautilya, Chaudhary, Tripathi, H. C., Singh, Kuldeep, Shweta and Kumar, Ashok. (2021). Response of INM in rice in rice–wheat cropping system, Indian Journal of Agricultural Sciences, 91(1): 39–43. Kavita, Ajay Kumar, Parminder Singh, Sumit and Mehta, V. P. 2021. Indian agricultural trade in WTO regime, Indian Journal of Agricultural Sciences, 91 (2): 274–78	6.40
55.	Kumar Nagesh, Ramya M.V., , Govindaraj V., , Sameer M., Kumar, C.V., Maheshwaramma, S., Seshu, G., Prabhakar, M., Krishna, H., Srishar, M., Venkata Ramana, Kumar M., Avil, K. and Jagadeeshwar, R.2021. Harnessing sorghum land races to breed high yielding grain mold tolerant cultivars with high protein for drought prone environments, Frontiers in Plant Science, 12	11.60
56.	Kumar Nagesh, Ramya M.V., , Kumar V., Sameer, Raju C.V., , Kumar T., Sunil, Seshu N.M., , G., Sathish, Bhadru.G. , D. and Ramana, M.V.2021. Identification of pigeonpea genotypes with wider adaptability to rainfed environments through AMMI and GGE biplot analyses, Indian Journal of Genetics and Plant Breeding, 81(1): 1-11	7.00
57.	Nair, D.S., Sajeena A., Johnson, J.M., Mathew, D., John J., Sarada ,S. 2021. First report of leaf blight of yardlong bean caused by Diaporthe tectonae in India, Journal of Plant Pathology	8.20
58.	Panwar, A.S., N. Ravisankar, Raghuveer Singh, A.K. Prusty, M. Shamim, M.A. Ansari and Kohima Noopur.2021. Potential integrated farming system modules for diverse ecosystem of India. Indian Journal of Agronomy 66 (5th IAC Special Issue):S15-S32	5.21
59.	Paramesh, Venkatesh, E. B. Chakurkar, Tejasvi Bhagat, G. B. Sreekanth, HB Chetan Kumar, Solomon Rajkumar, P. P. Gokuldas, Gopal R. Mahajan, K. K. Manohara, and N. Ravisankar 2021. Impact of integrated farming system on residue recycling, nutrient budgeting and soil health, Indian Journal of Agricultural Sciences, 91, 44-52	6.40

60.	Reddy,D.R., Pillai, P.S., John, J., Sajeena,, A., Aswathy, J.C. .2021. Growth and yield of pulses as influenced by intercropping with finger millet [Eleusine coracana (L.) Gaertn.] in the southern laterites of Kerala, Legume Research, DOI: 10.18805/LR-4480	6.80
61.	Venkatesh Paramesh, N. Ravisankar, U. K. Behera, Vadivel Arunachalam, Shiva Dhar Misra, Mohan Kumar, A. K. Prusty, D. Jacob, A. S. Panwar, Viswanatha K. Reddy & Trivesh Mayekar. 2021. Integrated farming system for achieving food and nutritional security, enhancing Profitability, employment opportunity, and climate resilience in India, A Review. Food and Energy Security, Vol 11 Issue 2,1-16	11.00
62.	Venkatsh Paramesh, N. Ravisankar, Umakant Behera, V. Arunachalam, Parveen Kumar, Racharla Solomon Rajkumar, Shiv Dhar Misra, Revappa Mohan Kumar, A.K. Prusty, D. Jacob, A.S. Panwar, Trivesh Mayenkar, Viswanatha K. Reddy and Susitha Rajkumar.2021. Integrated farming system approaches to achieve food and nutritional security for enhancing profitability, employment, and climate resilience in India Food and Energy Security https://doi.org /10.1002/fes3.321page 1-16	11.00
63.	Venkatesh Paramesh, Parveen Kumar, Mohammad Shamim, Natesan Ravisankar, Vadivel Arunachalam, Arun Jyoti Nath, Trivesh Mayekar, Raghuveer Singh, Ashisa K. Prusty, Racharla Solomon Rajkumar, Azad Singh Panwar, Viswanatha K. Reddy, Malay Pramanik, Anup Das, Kallakeri Kannappa Manohara, Subhash Babu and Poonam Kashyap.2022. Integrated Farming Systems as an Adaptation Strategy to Climate Change: Case Studies from Diverse Agro-Climatic Zones of India, Sustainability 2022, 14, 11629. https://doi.org/10.3390/ su141811629	9.90
64.	Walia SS, Babu S, Gill RS, Kaur T, Kohima N, Panwar AS, Yadav DK, Ansari MA, Ravisankar N, Kumar S, Kaur K and Ansari MH. 2022. Designing resource-efficient and environmentally safe cropping systems for sustainable energy use and economic returns in Indo-Gangetic Plains, India. Sustainability (14) 14636.	9.90
65.	Anitrosa Innazent, D. Jacob, J.S. Bindhu, Brigit Joseph, K.N. Anith, N. Ravisankar, A.K. Prusty, Venkatesh Paramesh and A.S. Panwar.2022. Farm typology of smallholders integrated farming systems in Southern Coastal Plains of Kerala, India, Scientific reports 12:333, https://doi.org/10.1038 /s41598-021-04148-0	10.60
66.	Ashisa K.Prusty, Ravisankar Natesan, Azad S. Panwar, Mangi L. Jat, Jagdish P. Tetarwal, Santiago Lopez-Ridaura, Roos Adelhart Toorop, Jelle van den Akker, Jashanjot Kaur, Prakash C. Ghasal, Jeroen C.J. Groot, Luis Barba-Escoto, Poonam Kashyap, Meraj A. Ansari and Mohammad Shamim.2022. Redesigning of farming systems using a multi-criterion assessment tool for sustainable intensification and nutritional security in Northwestern India, Sustainability 14, 3892.https://doi.org/10.3390/ su14073892h	9.90
67.	Babu, S., Das, A., Singh, R., Mohapatra, K. P., Kumar, S., Rathore, S.S., Yadav, S. K., Yadav, P., Ansari, M. A., Panwar, A. S., Wani, O.A., Singh, M., Ravisankar, N., Layek, J., Chandra, P. and Singh, V. K. 2022. Designing an energy efficient, economically feasible, and environmentally robust integrated farming system model for sustainable food production in the Indian Himalayas, Sustainable Food Technology, http://dx.doi.org/10.1039/D2FB00016D	-
68.	Layek J, Rangappa K, Das A, Ansari MA, Choudhary S, Rajbonshi N, Patra S, Kumar A, Mishra VK, Ravisankar N, Kumar S, Hazarika S, Dutta SK, Babu S, Tahasildar M and Shettigar N (2023) Evaluation of millets for physio-chemical and root morphological traits suitable for resilient farming and nutritional security in Eastern Himalayas, Frontiers in Nutrition, 10:1198023: 1-17	11.00
69.	Mourya K. K., T. J. Purakayastha, N. Ahmed, S. Kumar, A. Trivedi, K. Husain & N. Ravisankar (2023): Assessment of Carbon Pools and Stocks in an Inceptisol Under Long-Term Manuring and Fertilization in Rice-Wheat Cropping System: Comparison of Different Methods, Communications in Soil Science and Plant Analysis, 10:1-14	7.80

70.	Shripad Bhat, Dinesh Kumar, Venkatesh Paramesh, Parveen Kumar, N. Ravisankar, Sunil Kumar, Poonam Kashyap, V. Arunachalam. (2023).Enhancing farm profitability and sustainability through integrated farming systems: A case study of coastal Karnataka, India, Farming System, 1(100052): 1-11	-
71.	Subash Nataraja Pillai, Debashis Dutta, Prakash Chand Ghasal, Ravisankar Natesan, Ved Prakash Chaudhary, Sunil Kumar, Laxman Ram Meena, Omkar Singh, Vinay Prasad Mandal, Sweta Singh, Kumari Sunita. 2023. A Composite Index to Assess the Climate-Carbon-Yield-Sustainability of Cereal Based Cropping System, International Journal of Plant Production, 10:1-27	8.50

C. LIST OF RESEARCH PAPERS (>6.00 NAAS RATING) PUBLISHED BY AI-NPOF

S. No.	National and International Publications	NAAS rating
1.	L. Ditzler, T.A. Breland, C. Francis, M. Chakraborty, D.K. Singh, A. Srivastava, F. Eyhorn, J.C.J. Groot, J. Six, C. Decock (2017) Identifying viable nutrient management intervention at the farm level: the case of smallholder organic Basmati rice production in Uttarakhand, India. Agricultural Systems 161: 61-71.	12.60
2.	Bharani A., D.Udhaya Nandhini and E.Somasundaram. (2018) Influence of long-term organic manure application on soil organic carbon in rice-based cropping system, Res. J. of Chem. Env. Sci, 6(1): 81 – 83.	12.90
3.	D.K. Singh, P.C. Pandey, Gangadhar Nanda and Shilpi Gupta (2018) Long-term effect of inorganic fertilizer and farmyard manure application on productivity, sustainability and profitability of rice-wheat system in Millisols. Archives of Agronomy and Soil Science. 65(2): 139-151. (DOI:1080/03650340.2018.1491032).	8.40
4.	Avijit Ghosh, A B Singh, R V Kumar, M C Manna, Rajan Bhattacharyya, M Mrahman, Poonam Sharma, P S Rajput and Sukanya Misra (2019). Soil Enzymes and microbial elemental stoichiometry as bio-indicators of Soil quality in diverse cropping systems and nutrient management practices of Indian Vertisols. Applied Soil Ecology, 1-13.	10.80
5.	Bharat Prakash Meena A.K. Biswas, Muneshwar Singh, R S Chaudhary, A.B. Singh, H. Das and A K Patra (2019). Long-term sustaining crop productivity and soil health in maize–chickpea system through integrated nutrient management practices in Vertisols of central Indi .Field Crops Research, 232: 62-76.	11.80
6.	Nitin Rawat, Mansi Sharma, D. C. Suyal, D.K. Singh, Divya Joshi, Pranjali Singh and Reeta Goyel (2019) PsyhcrotoJerant Bio-inocuJants and their Co-inoculation to imrove Cicer arietinum growth and soil nutrient status for sustainable mountain agriculture. Journal of Soil Science Plant Nutrition, (DOI: 10.1007/s42729-019-00064-5).	9.90
7.	Ruma Das, T.J. Purakayastha, Debarup Das, Nayan Ahmed, Rahul Kumar, Sunanda Biswas, S.S. Walia, Rohitashav Singh, V.K. Shukla, M.S. Yadava, N. Ravisankar, S.C. Datta 2019. Long-term fertilization and manuring with different organics alter stability of carbon in colloidal organo-mineral fraction in soils of varying clay mineralogy. In Science of the Total Environment 684 (2019) Pages 682-693.	15.80
8.	Manna, M. C., Rahman, M. M., Naidu, R., Fazzle Bari, A. S. M.., Singh, A. B., Thakur, J. K., Ghosh, A., Patra, A. K., Chaudhai, S. K. and A. Subbarao (2020) Organic Farming: A Prospect for Food, Environment and Livelihood Security in Indian agriculture. Advances in Agronomy, Volume 166 (in press).	6.00
9.	Ramana S., Tripathi A.K., Ajay, Singh AB, Bharti, K, Sahu A., Rajput P.S., Saha J.K., Srivastava S., Dey P., Patra, A.K. (2021) Potential of cotton for remediation of Cd contaminated soils. Environmental Monitoring and Assessment, 193:186. https://doi.org/10.1007/s10661-021-08976-5.	9.00
10.	Aher, S.B., Lakaria, B.L., Swami, K., and A. B. Singh (2022). Concentration and Uptake of Micronutrients (Fe, Zn, Cu and Mn) in Soybean and Wheat under Organic, Biodynamic and Inorganic Nutrient Management in Semi-arid Tropical Conditions of Central India, Communications is Soil Science and Plant Analysis, DOI:10.1080/00103624.2022.2071434	7.80

11.	Azad S. Panwar, Meraj A. Ansari, Natesan Ravisankar, Subhash Babu, Ashisa K. Prusty, Prakash C. Ghasal, Jairam Choudhary, Mohammad Shamim, Raghuveer Singh, K. J. Raghavendra, Gautam V. Chauhan, Debashis Dutta, Majhrool H. Ansari, Amrit L. Meena, Raghavendra Singh, C. S. Aulakh, D. K. Singh and P. B. Sharma.2022. Effect of organic farming on the restoration of soil quality, ecosystem services, and productivity in rice–wheat agro-ecosystems, Frontiers in Environmental Science, DOI 10.3389/fenvs.2022.972394	10.60
12.	Debashis Dutta, A.L. Meena, Amit Kumar, N Subash, RP Mishra, PC Ghasal, Jairam Choudhary, Chandra Bhanu, Raghavendra KJ, Chetan Kumar G, Ankur Kumar, Vaibhav Kumar, RB Tewari, and AS Panwar (2022). Influence of different nutrient management practices and cropping systems on organic carbon pools in Typic Ustochrept soil of Indo-Gangetic Plains in India. Journal of Soil Science and Plant Nutrition 22:1403–1421.	9.90
13.	Jat, N.K., M. Shamim, Sudhir Kumar, N. Ravisankar, R.S. Yadav, Subhash Babu and A.S. Panwar.2022. Agrometeorological evaluation of mustard (Brassica juncea) under organic production in North Western Indo-Gangetic Plains, Indian Journal of Agricultural Sciences 92 (3):339-343	6.40
14.	Kollah, B., Usha A., Parmar, R., Devi, H.M., Atoliya, N., Shinoji, K. C., Patra, A.K., Singh, A.B., Dubey, G.and S. R.Mohanty (2022). How do biochar size fractions and organic fertilizers interactively influence nitrous oxide emission from a tropical vertisol, Journal of Plant Nutrition and Soil Science, https://doi.org/10.1002/jpln.202100150.	8.50
15.	Shibasis Mukherjee, Suchana Sen, Md. Nasim Ali, Rupak Goswami, Argha Chakraborty, Krishnendu Ray, Rantim Bhattacharjee, Bhubaneswar Pradhan, N. Ravisankar, Gautam Chatterjee.2022. Microbiological properties of Beejamrit, an ancient Indian traditional knowledge, uncover a dynamic plant beneicial microbial network, World Journal of Microbiology and Biotechnology, 38 (111): 1-12	8.80
16.	Jayanta Layek, Anup Das, Meraj A. Ansari, Vinay K. Mishra, Krishnappa Rangappa, Natesan Ravisankar, Sandip Patra, Pankaj Baiswar, Thangam Ramesh, Samarendra Hazarika, Azad S. Panwar, Shidayaichenbi Devi, Majhrool H. Ansari and Bappa Paramanik.2023. An integrated organic farming: innovations for farm diversification, sustainability, and livelihood improvement of hill farmers, Frontiers in Sustainable Food Systems, 7:1151113.doi: 10.3389/fsufs.2023.1151113	10.70
17.	Mukherjee S, Basak A, Chakraborty A, Goswami R, Ray K, Ali MN, Santra S, Hazra AK, Tripathi S, Banerjee H, Layek J, Panwar AS, Ravisankar N, Ansari MA and Chatterjee G (2023) Revisiting the oldest manure of India, Kunapajala: Assessment of its animal waste recycling potential as a source of bio stimulant, Frontiers in Sustainable Food Systems, https://doi.org/10.3389/fsufs.2022.1073010	10.70
18.	Remya, K. and Suja, G. 2023 Crop-weed dynamics, nutrient uptake and soil microclimate in elephant foot yam under conservation agriculture. Journal of Plant Nutrition https://doi.org/10.1080/01904167.2023.2275079	8.10
19.	Suja, G., Byju, G., Veena, S.S., Sunitha, S. Ramesh,V., Lintu Maria, C. and Rakhi K. Raj.2023. Organic management is a viable alternative for arrowroot. Biological Agriculture & Horticulture, https://doi.org/10.1080/01448765.2023.2253778, published online on 5 September 2023	7.50

Annexure-V

A. CADRE STRENGTH OF AICRP-IFS CENTRES

State	University / Institute	Sanctioned								
		Chief Agronomist	Agronomist	Jr. Agronomist	Jr. Soil Scientist	Jr. Agril Economists	Technical Assist.	Field Assist	Driver	Total
Andhra Pradesh	ANGRAU, Guntur		2				1	4	1	8
Assam	AAU,Jorhat	1	1	1	1	1	1	4	1	11
Bihar	BAU, Sabour	1	1	1	1	1	1	4	1	11
Chhattisgarh	IGKV, Raipur	1	1	1	1		1	4	1	10
Gujarat	AAU, Anand		1					4	1	6
	JAU, Junagadh		1				1			2
	NAU, Navsari		1				1			2
	SDAU, SK Nagar	1	1	1	1	1	1	4	1	11
Haryana	CCSHAU, Hisar	1	1	1	1	1	1	4	1	11
Himachal Pradesh	CSKHPKVV, Palampur	1	1	1	1		1	4	1	10
Jammu and Kashmir	SKUAST, Jammu	1	1	1	1		1	4	1	10
Jharkhand	BAU, Ranchi	1	1	1	1		1	4	1	10
Karnataka	UAS, Raichur	1		1	1		1			4
	UAS, Dharwad		1					4	1	6
	UAS, Bengaluru		1			1		4	1	7
	KSNUAHS, Shivamogga	1		1	1		1			4
Kerala	KAU, Thrissur	1	1	1	1	1	1	4	1	11
Madhya Pradesh	JNKVV, Jabalpur	1	4	1	1		3	8	2	20
	RVSKVV, Gwalior		1				1			2
Maharashtra	DBSKKV, Dapoli	1	1	1	1		1	4	1	10
	VNMKV, Parbhani	1	1	1	1		1	4	1	10
	MPKV, Rahuri	1	1	1	1	1	1	4	1	11
	Dr PDKV, Akola	1	1	1	1		1	4	1	10
Meghalaya	ICAR-RC-NEH, Umiam									
Odisha	OUAT, Bhubaneswar	1	3	1	1	1	2	8	2	19
Punjab	PAU, Ludhiana	1	1	1	1		1	4	1	10

Rajasthan	MPUAT, Udaipur		1			1		4	1	7
	SKNAU	1	1	1	1		1	4	1	10
	AU, Kota		1				1			2
Tamil Nadu	TNAU	1	3	1	1	1	2	8	2	19
Telangana	PJYSAU, Hyderabad	1	2	1	1	1	2	4	1	13
Uttar Pradesh	ICAR-IIFSR, Modipuram		1					4	1	6
	BHU, Varanasi		1				1			2
	ANDUAT, Ayodhya	1	1	1	1		1	4	1	10
	CSAUAT, Kanpur	1	1	1	1		1	4	1	10
Uttarakhand	GBPUAT, Pantnagar	1	1	1	1	1	1	4	1	11
West Bengal	BCKV, Kalyani	1	1	1	1	1	1	4	1	11
Total		**25**	**43**	**25**	**25**	**13**	**36**	**128**	**32**	**327**

B. STAFF POSITION OF AICRP-IFS CENTRES (AS ON DATE)

State	University	Filled								
		Chief Agronomist	Agronomist	Jr. Agronomist	Jr. Soil Scientist	Jr. Agril Economists	Technical Assist.	Field Assitt	Driver	Total
Andhra Pradesh	ANGRAU, Guntur		2				1	4	1	8
Assam	AAU,Jorhat	1	1	1	1	1		4	1	10
Bihar	BAU, Sabour	1	1	1	1	1				5
Chhattisgarh	IGKV, Raipur	1	1	1	1				1	5
Gujarat	AAU, Anand		1					4	1	6
	JAU, Junagadh		1				1			2
	NAU, Navsari		1				1			2
	SDAU, SK Nagar	1			1			3	1	6
Haryana	CCSHAU, Hisar	1	1	1	1	1		3	1	9
Himachal Pradesh	CSKHPKVV, Palampur			1	1		1	2	1	6
Jammu and Kashmir	SKUAST, Jammu		1	1	1		1	4	1	9
Jharkhand	BAU, Ranchi				1			4	1	6
Karnataka	UAS, Raichur	1		1	1		1			4
	UAS, Dharwad		1					4	1	6
	UAS, Bengaluru		1			1		4		6
	KSNUAHS, Shivamogga	1		1	1		1			4

Kerala	KAU, Thrissur	1	1	1	1	1	1	4		10
Madhya Pradesh	JNKVV, Jabalpur	1	4	1			1	1		8
	RVSKVV, Gwalior		1							1
Maharashtra	DBSKKV, Dapoli			1				4		5
	VNMKV, Parbhani	1		1	1		1	2		6
	MPKV, Rahuri			1	1	1	1	2		6
	Dr PDKV, Akola	1	1	1	1		1	4	1	10
Meghalaya	ICAR-RC-NEH, Umiam									
Odisha	OUAT, Bhubaneswar	1	2		1		2	1		7
Punjab	PAU, Ludhiana	1	1	1	1		1	4	1	10
Rajasthan	MPUAT, Udaipur					1		4	1	6
	SKNAU	1	1	1	1			4	1	9
	AU, Kota		1				1			2
Tamil Nadu	TNAU	1	3	1	1	1	2	8	2	19
Telangana	PJYSAU, Hyderabad	1	2	1	1	1	1	2	1	10
Uttar Pradesh	ICAR-IIFSR, Modipuram									
	BHU, Varanasi									
	ANDUAT, Ayodhya		1		1		1	1	1	5
	CSAUAT, Kanpur	1		1			1	3	1	7
Uttarakhand	GBPUAT, Pantnagar	1	1	1	1				1	5
West Bengal	BCKV, Kalyani		1		1	1				3
Total		**18**	**32**	**20**	**22**	**10**	**21**	**80**	**20**	**223**

C. CENTRE WISE VACANT POSITION > 03 OF AICRP-IFS

State	University	Vacant for >3 years								
		Chief Agronomist	Agronomist	Jr. Agronomist	Jr. Soil Scientist	Jr. Agril Economists	Technical Assist.	Field Assitt	Driver	Total
Bihar	BAU, Sabour						1	4	1	6
Chhattisgarh	IGKV, Raipur						1	4		5
Gujarat	SDAU, SK Nagar		1				1			2
Haryana	CCSHAU, Hisar						1			1
Himachal Pradesh	CSKHPKVV, Palampur		1					2		3

Jharkhand	BAU, Ranchi		1	1						2
Karnataka	UAS, Bengaluru								1	1
Kerala	KAU, Thrissur								1	1
Madhya Pradesh	JNKVV, Jabalpur				1		2	4	2	9
Maharashtra	VNMKV, Parbhani		1					2	1	4
	MPKV, Rahuri	1						1	1	3
Odisha	OUAT, Bhubaneswar		1	1		1		7	2	12
Rajasthan	MPUAT, Udaipur		1							1
Telangana	PJYSAU, Hyderabad						1	2		3
Uttar Pradesh	ICAR-IIFSR, Modipuram		1					4	1	6
	BHU, Varanasi		1				1			2
	ANDUAT, Ayodhya	1		1						2
	CSAUAT, Kanpur							1		1
Uttarakhand	GBPUAT, Pantnagar					1				1
West Bengal	BCKV, Kalyani	1		1				2	1	5
Total		**3**	**8**	**4**	**1**	**2**	**8**	**33**	**11**	**70**

Annexure - VI

KEY PERFORMANCE INDICATOR (S) OF PROMISING INTEGRATED FARMING SYSTEM MODELS DEVELOPED UNDER AICRP-INTEGRATED FARMING SYSTEMS

1	2	3	4	5	6	7	8	9	10	11	12
A&N Islands*	Coconut intercropped with spices+tubers +goat + back-yard poultry	1.00	182868	68	0.9	0.72	-5864.2	60	202	0.64	627
Assam*	Crop+Dairy+ Goat + Fishery + Poultry+ Duckery + Apiary +biogas	1.00	376242	584	1.2	1.0	-240	93	460	0.73	4400
Andhra Pradesh	Crop+Dairy+Fishery+Poultry	0.60	142075	137	2.3	1.1	-5308	65	462	0.88	12750
	Raised and Sunken bed based IFS (Rice+vegetables+fish+-fodder)	0.28	222360	270	1.22	0.7	-1208	46	280	0.76	12750
Bihar*	Crop+ Dairy + Goat+Duck+fish	1.00	325142	337	2.0	5.5	-995	52	684	0.74	6252
Chhattisgarh	Crop+dairy + fish+duck+-goat+poultry	1.00	278689	340	1.97	0.59	-17534	64	385	0.74	1572
Goa	Lowland rice based cropping system + dairy + fishery	0.5	162000	277	2.17	0.18	-424	46	368	0.72	3500
Gujarat	Crop + Dairy	1.00	187095	60	0.9	0.4	-4850	52	169	0.60	12144
	Crop+orchard+dairy	0.60	137585	50	0.5	0.7	-8708	39	208	0.54	866
	Crop+ orchard +Dairy + fish	1.00	150794	28	0.7	0.8	-2432	24	317	0.54	777
Haryana*	Crop + Dairy +orchard + mushroom + biogas	1.00	233205	71		0.4	-1169	28	412	0.68	32195
Himachal Pradesh*	Crop+orchard+dairy+poul-try+mushroom	1.00	172370	235	0.9	1.2	-2747	50	424	0.60	2173
Jammu and Kashmir*	Crop+orchard + dairy + poultry cum fishery + biogas + mush-room + agroforestry	1.00	305133	77	1.7	0.8	-13803	95	481	0.72	3691
Jharkhand*	Crop + Dairy +Mushroom + Fishery + Apiary	1.00	158045	41	0.8	0.4	-4216	0	367	0.58	1132
Karnataka*	Crop (Plantation)+-dairy+sheep+poultry	1.00	225302	245	1.9	0.6	-3835	32	480	0.65	6563
Kerala*	Banana Based IFS(Crops/ Cropping system+Diary+Fish-ery)	0.20	37503	248	0.2	1.1	-5218	48	82	0.75	9699
Madhya Pradesh	Crop+Orchard+Dairy	0.40	139352	64	2.0	0.5	-2436	56	526	0.90	57
Maharashtra*	Crop+orchard+goat+poultry	1.00	166300	57	0.8	0.5	-5446	0	498	0.73	1528
	Crop+orchard+dairy+-goat+poultry	1.00	629361	94	2.3	0.6	-14240	30	440	0.86	122
	Crop + orchard+ dairy +goat	1.00	261685	168	2.0	0.7	-1374	50	737	0.63	852
Meghalaya*	Crop+dairy+orchard+fishery	1.00	257112	174	1.4	2.0	-698	22	459	0.86	1387

Odisha*	Crops + orchard + dairy + poultry + Fishery	1.20	238684	166	1.5	0.7	-302	68	427	0.43	2520
	Crops + orchard + dairy + poultry + duckery+ fishery+agro-forestry	0.40	116250	49	0.99	0.52	-23.2	40	409	0.56	549
Punjab*	Crop+ orchard + dairy + fishery + goat + agroforestry + bio-gas	1.00	558253	157	1.5	0.6	-5623	100	280	0.83	6991
Rajasthan	Crop + orchard + dairy + goat + poultry	1.00	336531	111	1.5	0.6	-892	99	477	0.61	2230
	Crops + dairy + orchard + goatry + poultry	1.45	235240	42	2.7	0.3	-3209	40	938	0.54	2200
Tamil Nadu*	Crop + orchard +dairy + fiishery + poultry	0.80	218888	126	0.8	0.6	-2488	59	403	0.77	3982
Telangana*	Crop + orchard + dairy + sheep + poultry	1.00	257706	145	0.9	0.5	7634	20	511	0.72	3158
	crop + orchard + dairy + sheep + poultry	1.00	189336	72	4.1	0.5	-5651	32	568	0.60	24
Uttar Pradesh*	Crop+orchard+dairy	1.00	192079	89	1.3	0.5	-4898	10	328	0.51	522
	Crop + orchard + dairy + fishery + duck	1.00	187432.2	159	2.0	0.4	-6084	52	512	0.46	2687
Uttarakhand*	Crop+dairy+orchard+fishery	1.00	346093	172	1.1	1.1	-1382	40	380	0.72	12500
West Bengal*	Crop+orchard+dairy+fishery	0.66	80030	53	0.4	1.0	-3470	60	428	0.66	1473

*Bankable IFS models; **Details of component-wise area share available in publication Integrated Farming Systems for Agricultural Diversification, Enhanced Income and Employment, Indian Council of Agricultural Research, New Delhi

1- State; 2- Component composition; 3-Area (ha); 4- Net income from IFS (Rs); 5-% enhancement in income over benchmark; 6- Net return per rupee invested; 7- SOC (%) after 5 years; 8- GHG emission (kg CO_2 equivalent); 9- Reduction fertilizer use (%); 10- Employment generation (man days); 11- Sustainable value index; 12- Number of stakeholders visit to IFS model

Annexure-VII

A. PARTICIPANTS OF QRT MEETING FROM AICRP-IFS CENTRES

S. No.	Name	Designation & Address	AICRP-IFS/AI-NPOF Centres
UAS, Dharwad, during January 10-11, 2024			
1.	Dr. M. Govardhan	Chief Agronomist, PJTSAU, Hyderabad	Rajendranagar, Rudrur, Medak
2.	Dr. M. Srinivas	Agronomist, ANGRAU, Guntur	Maruteru, Srikakulam
3.	Dr. P.M. Shanmugam	Chief Agronomist, TNAU, Coimbatore	Thanjavur, Salem, Erode
4.	Dr. H.G. Sannathimmabba	Chief Agronomist, UA&HS, Shimoga	Kathelgere
5.	Dr. C.M. Kalibavi	Chief Agronomist, UAS, Raichur	Siruguppa
6.	Dr. R.B. Negalur	Agronomist, UAS, Dharwad	Dharwad
7.	Dr. M.T. Sanjay	Agronomist, UAS, Bengaluru	Chikkaballapura
8.	Dr. Parmesh V.	Principal Investigator, ICAR-CCARI, Goa	Goa
ICAR-RC-NEH, Umiam during May 6-7, 2024			
9.	Dr. Badapmain Makdoh	PI, AICRP-IFS, Umiam	Umiam
10.	Dr. A.K. Patra	Chief Agronomist, OUAT, Bhubaneswar	Bhubaneswar
11.	Dr. S.K. Mukhopadhyay	Chief Agronomist, BCKV, Kalyani	Kalyani
12.	Dr. Sanjay Kumar	Chief Agronomist, BAU, Sabour	Sabour
13.	Dr. Debashis Borah	Chief Agronomist, AAU, Jorhat	Jorhat
14.	Dr. T. Subramani	PI, AICRP-IFS, ICAR-CIARI, Port Blair	Port Blair
15.	Dr. Sanjeev Kumar	PI, AICRP-IFS, ICAR-RC-ER, Patna	Patna
16.	Dr. Ajoy Sankar Borah	OFR, Agronomist, Golaghat	Golaghat
IGKV, Raipur during May 17-18, 2024			
17.	Dr. Adikant Pradhan	Chief Agronomist, AICRP-IFS, Raipur	Raipur
18.	Dr. U. S. Surve	Chief Agronomist, MPKV, Rahuri	Rahuri
19.	Dr. A.S. Karle	Chief Agronomist, VNMAU, Parbhani	Prabhani
20.	Dr. J.P. Deshmukh	Chief Agronomist, PDKV, Akola	Akola
21.	Dr. Namdev Mhaskar	Agronomist, DBSKKV, Dapoli	Dapoli
22.	Dr. P. K. Mishra	Chief Agronomist, JNKVV, Jabalpur	Jabalpur
23.	Dr. Narendra Kumawat	Agronomist, RVSKVV Gwalior (Indore)	Gwalior
24.	Dr. S. Karmakar	Chief Agronomist, BAU, Ranchi	Ranchi
25.	Dr. B.M. Maurya	IFS Sub Centre, CoA, Rewa	Rewa
26.	Dr. Vikas Gupta	IFS Main Centre, CoA, Jabalpur	Jabalpur
ICAR- CTCRI, Thiruvananthapuram during June 7-8, 2024			
27.	Dr. Jacob John	Director (EE) & Chief Agronomist, AICRP-IFS, Karamana	Karamana
28.	Dr. L.J. Desai	Chief Agronomist, SDAU, SK Nagar	SK Nagar and Patan
29.	Dr. R.M. Solanki	Agronomist, JAU, Junagadh	Junagadh
30.	Dr. L. K. Aravadiya	Agronomist, NAU, Navsari	Navsari

31.	Dr. Y.B. Chauhan	Agronomist (I/C), AAU, Anand	Dahod
ANDUAT, Kumarganj, Ayodhya during June 22-23, 2024			
30.	Dr. A.K. Singh	Incharge, Chief Agronomist, AICRP-IFS, Kumarganj	Kumarganj
31.	Dr. Mohd. Zaffer Siddiqui	Chief Agronomist, CSAUAT, Kanpur (Kanpur, Fatehpur)	Kanpur, Fatehpur
32.	Dr. Neeraj Kumar	In-charge Agronomist, ANDAUT, Kumarganj (Kumarganj and Mirzapur)	Kumarganj and Mirzapur
33.	Dr. U.P. Singh	In-charge Agronomist, BHU, Varanasi	BHU, Varanasi
34.	Dr. J.P. Tetarwal	Agronomist, AU, Kota	Kota
35.	Dr. Hari Singh	In-charge Agronomist, MPUAT, Udaipur	Dungarpur
36.	Dr. R.S. Dadarwal	Chief Agronomist. CCSHAU, Hisar	Hisar, Fathehabad
37.	Dr. Ummed Singh	Chief Agronomist, SKNAU, Jobner	Durgapura, Dausa
38.	Dr. Raj Bahadur	OFR, Agronomist, ANDUAT, Ayodhya	Ayodhya
CSKHKVV, Palampur during July 6-7, 2024			
39.	Dr. Sanjay Sharma	Chief Agronomist, AICRP-IFS & Local Organizing Secretary, CSKHKVV, Palampur	Palampur
40.	Dr. N.P. Thakur	Chief Agronomist, AICRP-IFS, SKUAST, Jammu	Jammu
41.	Dr. A.K. Gupta	Chief Scientist (Agri.) SKUAST-J	Jammu
42.	Dr. (Mrs.) Cini Varghese	Principal Scientist & Principal Investigator, AICRP-IFS, ICAR-IASRI, New Delhi	New Delhi
43.	Dr. Rohitshav Singh	Chief Agronomist, AICRP-IFS, GBPUAT, Pantnagar	Pantnagar
44.	Dr. Ajeet Pratap Singh	Professor, Soil Science GBPUAT, Pantnagar	Pantnagar

B. PARTICIPANT'S FROM AI-NPOF CENTRES

S. No.	Name	Designation & Address	AI-NPOF Centres
UAS, Dharwad during January 10-11, 2024			
1.	Dr. C.P. Chandrashekhara	Principal Investigator (AI-NPOF), UAS, Dharwad	Dharwad
2.	Dr. R. Krishnan	Principal Investigator (AI-NPOF), TNAU, Coimbatore	Coimbatore
ICAR-RC-NEH, Umiam during May 6-7, 2024			
3.	Dr. Niraj Biswakarma	Principal Investigator (AI-NPOF), ICAR-RC-NEH, Umiam	Umiam
4.	Dr. Shaon Kumar Das	Principal Investigator (AI-NPOF), ICAR-RC-NEH, Gangtok	Gangtok
5.	Dr. Gautam Chatterjee	Principal Investigator (AI-NPOF), RKMVERI, Narendrapur	Narendrapur
IGKV, Raipur during May 17-18, 2024			
6.	Dr. (Mrs.) Nargis Kumari	Principal Investigator (AI-NPOF), BAU, Ranchi	Ranchi
7.	Dr. J.K. Thakur	PI, ICAR-IISS, Bhopal	Bhopal
8.	Dr. P.K. Mishra	PI, JNKVV, Jabalpur	Jabalpur

9.	Dr. Namdev Mhaskar	Co-PI, DBSKVV, Dapoli	Dapoli
10.	Dr. Adikant Pradhan	PI, IGKV, Raipur	Raipur
ICAR- CTCRI, Thiruvananthapuram during June 7-8, 2024			
11.	Dr. (Mrs.) G. Suja	Head (Crop Production) & Principal Investigator (AINP-OF), ICAR-CTCRI, Thiruvananthpuram	Thiruvananthapuram
12.	Dr. L.J. Desai	Principal Investigator (AI-NPOF), SDAU, SK Nagar	SK Nagar and Patan
13.	Dr.(Mrs.) C.K. Thankamani	Principal Investigator (AINP-OF), ICAR-IISR, Calicut (Calicut)	
14.	Dr. S.S. Veena	Co-PI-AI-NPOF, ICAR-CTCRI, Thiruvananthpuram	Thiruvananthapuram
ANDUAT, Kumarganj during June 22-23, 2024			
15.	Dr. Shiv Lal	Senior Scientist & Principal Investigator (AI-NPOF), ICAR-NRCSS, Ajmer (Ajmer)	Ajmer
CSKHKVV, Palampur during July 6-7, 2024			
16.	Dr. Surinder Thakur	Principal Investigator, AINP-OF, CSKHPKVV, HAREC, Bajaura Palampur	Palampur
17.	Dr. S.S. Walia	Chief Agronomist, AICRP-IFS, PAU, Ludhiana	Ludhiana
18.	Dr. (Prof.) D.K. Singh	Principal Investigator, AI-NPOF, GBPUAT, Pantnagar	Pantnagar
19.	Dr. Ravikant Sharma	Principal Investigator, AINP-OF, MPUAT, Udaipur	Udaipur
ICAR-IIFSR, Modipuram October 23-24, 2024			
20.	Dr. Amit Kumar	PI, AI-NPOF, ICAR-VPKAS	Almora

Annexure-VIII

SUCCESS STORIES GENERATED FROM OFR COMPONENT OF AICRP-IFS

State	District	Title	Number of farmers
Andhra Pradesh	Srikakulam	Crop+Dairy+Poultry	1
		Crop+Horti+ Dairy+Poultry	1
		Crop+Horti+ Dairy+Poultry	1
		Crop+ Dairy+Poultry	1
Assam	Kamrup Rural	IFS interventions substantially enhanced net income of small farm household	1
Bihar	Purnea	Low cost-based farming system (Crop + Dairy) is boon for doubling of farmers income.	1
		Low cost-based farming system (Crop + Dairy + Goat + Poultry + Fishery) is boon for doubling of farmers income	1
		Integrated farming systems for marginal farmers	1
		Low cost-based farming system (Crop + Dairy + Fishery) is boon for doubling of farmers income.	2
Chhattisgarh	Uttar Bastar	Impacts of integrated farming system on socio- economic status of small farmers in Chhattisgarh	1
		Impacts of integrated farming system on socio- economic status of marginal farmers in Chhattisgarh	1
		Impacts of integrated farming system on socio- economic status of small farmers in Chhattisgarh	1
		Impacts of integrated farming system on socio- economic status of marginal farmers in Chhattisgarh	17
		Improvement of socio-economics status of marginal farmers through integrated farming system approach in Chhattisgarh	1
		Integrated farming system approaches for improvement of economic status of marginal farmers in Chhattisgarh	1
Gujarat	Panchmahal	Integrated farming systems	6
	Mehsana	Interventions in farming system increased the farmer's income	1
		Interventions in farming system improves the farmer's income & Livelihood	1
Haryana	Sirsa	Income enhancement through cropping system+-dairy farming system	12
		Integrated farming systems	1
		Income enhancement through cropping system+-dairy farming system	1
Himachal Pradesh	Kangra	Low-cost interventions in farming systems perspective triples net income	1

Jammu & Kashmir	Samba	Integrated farming system changes lifestyle of marginal farmer	1
		Farming system multiply the income of marginal farmer	1
		Diversified farming system approach provides additional farm income and nutritional security.	1
Jharkhand	Pakur	Crop + Pig Systems, OFR – 3	1
	East Singhbhum	Crop + Dairy + Poultry + Pig	1
	Pakur	Crop + Goat	1
Karanataka	Kolar	Crop + dairy enterprise for sustainable production and income	3
Kerala	Alapuzha, Kottayam, Pathanamthitta	Profitability of diversified Crop + Hort + Poultry farming system in marginal households of Kuttanad	13
		Profitability of diversified Crop + Hort + Dairy farming system in marginal households of Kuttanad	6
		Profitability of diversified Crop + Hort + Dairy farming system in small households of Kuttanad	5
		Profitability of diversified Crop + Hort + Dairy + Poultry farming system in marginal households of Kuttanad	5
		Profitability of diversified Crop + Hort + Dairy + Poultry farming system in small households of Kuttanad	2
		Profitability of diversified Hort +Dairy farming system in small households of Pathanamthitta	5
Madhya Pradesh	Dindori	Achieved goal of P M double the income in three years of period	1
	Katni	Doubling farmers income through low-cost interventions in farming system	24
Maharashtra	Amravati	Diversification of summer Sesame	1
	Palghr	Crop + Dairy farming system for sustaining farmers Income of Triable Marginal Household	7
		Low-cost Interventions based Farming Systems (crop + dairy + poultry) for double the Income of Triable Marginal Household	11
		Crop + dairy farming system for sustaining farmers Income of Triable Marginal Household	13
		Low-cost Interventions based Farming Systems (crop + dairy + poultry) for Double the Income of Triable Marginal Household	11
	Pune	On-farm evaluation of farming system modules for improving profitability and livelihood of small and marginal farmers	1
		Diversification of existing Farming Systems under marginal household conditions	1
		On-farm evaluation of farming system modules for improving profitability and livelihood of small and marginal farmers	1
Odisha	Angul	Crop +Dairy	1
	Kendrapara	High returns from low-cost interventions (crop + dairy + fishery)	1
Punjab	Amritsar	Promising approaches for doubling farmer income	1

Rajasthan	Udaipur	Adopt Integrated Farming System and Earn More Income	1
		Adopt Integrated Farming System and Earn more Income	1
Tamil Nadu	Dharmapuri	Realizing Respectable income through IFS approach	1
	Sivaganga	Integrated Farming System approach provides better profit to marginal farm households	10
		Integrated Farming System approach provides better profit to marginal farm households	10
		Low-cost technologies through integrated farming system approach enhances economic benefit to the farm households	8
	Pudukkottai	Integrated farming system a key for uplifting the economic status of small and marginal farmers	3
	Sivaganga and Pudukkottai	Diversification in the existing farming system improves income stability in the marginal farmers holdings	9
Telangana	Warangal	Enhancement of profitability of marginal household through crop and livestock diversification in farming system	1
Uttar Pradesh	Ambedkar Nagar	Success Stories from OFR experiments Ambedkar Nagar Farmer Ram Ujagir	1
		Success story of Farmers of OFR2 and OFR3 From Ambedkar Nagar	5
	Kanpur Dehat	Integrated Farming Systems	1
		Integrated Farming Systems	1
	Muzaffarnagar	Cost effective integrated farming for marginal farmer of Uttar Pradesh	1
		Cost effective integrated farming for marginal farmer of Uttar Pradesh	1
Uttarakhand	Nainital	Integrated Farming Systems	1

Glimpses of QRT Meetings at various locations


QRT meeting at ICAR-IIFSR, Modipuram during December 08-09, 2023


QRT meeting at UAS, Dharwad during January 10-11, 2024


QRT team field visit at OFR Centre of UAS, Dharwad on January 11, 2024


QRT meeting at ICAR RC for NEH Region, Umiam, Meghalaya during May 06-07, 2024

QRT meeting at IGKV, Raipur during May 17-18, 2024

QRT meeting at ICAR-CTCRI, Thiruvananthpuram during June 07-08, 2024

QRT meeting at ANDUAT, Kumarganj, Ayodhya during June 22-23, 2024

QRT meeting at CSKHPKVV, Palampur during July 06-07, 2024

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