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ANNUAL REPORT 2022-23

अखिल भारतीय समन्वित कृषि प्रणाली अनुसंधान परियोजना
AICRP on Integrated Farming Systems

ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut-250110 (UP)

ICAR-IIFSR

ICAR Indian Institute of Farming Systems Research (IIFSR) formerly Project Directorate for Farming Systems Research (PDFSR) was established by Indian Council of Agricultural Research New Delhi in April 1989 at Modipuram Meerut Uttar Pradesh.

Vision

Management of natural source of holistic improvement of small and marginal farmers through Integrated Farming Systems

Mission

Improve food, nutrition, livelihood and financial security 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.
- Co-ordinate and monitor integrated farming system research in the country

All India Coordinating Coordinated Research Project on Integrated Farming System (AICRP on IFS) is an integral part of ICAR-IIFSR with 74 centres to undertake on-station main (25 no's.) on-station sub (11 no's.) on-station voluntary (6 no's) and on-farm research (32 no's) spread across length and breadth of the country. The institute is also leading an All India Network Programme on Organic Farming (AI-NPOF) with 20 centres in 16 states.

ANNUAL REPORT 2022-23

भाकृअनुप
ICAR

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON INTEGRATED FARMING SYSTEMS

ICAR-Indian Institute of Farming Systems Research

Modipuram, Meerut – 250 110, India

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- This compilation is a joint contribution of all the associated scientists and technical staff of 74 AICRP-IFS centers (data generation), ICAR-IASRI New Delhi (statistical analysis) and ICAR-IIFSR, Modipuram (report writing, compilation, editing and printing).
- The report is based on experimental data generated during, kharif, rabi and summer seasons of 2021-22 (period ending June 2022), under 'on-station' and 'on-farm' research programmes of AICRP on Integrated Farming Systems. The other details are relevant to 31st March 2023.
- The report includes both processed and semi-processed data, generated in different sub-projects under AICRP on Integrated Farming Systems, and as such no material / data should be reproduced in any form without prior written permission of the Director, ICAR- Indian Institute of Farming Systems Research and due credit to the concerned scientists.

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All India Coordinated Research Project on Integrated Farming Systems (AICRP-IFS) initiated in 2010-11 is operating with 25 main, 11 sub, 6 ICAR institute-based and 32 on-farm centres in 25 States/Union territory. The results of experiments conducted during 2021-22 by all the co-operating centres are processed and compiled in the Annual Report 2022-23. I take this opportunity to record my sincere thanks to **Dr. Trilochan Mohapatra**, Former Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi and **Dr Himanshu Pathak**, Secretary (DARE) and Director General (ICAR) for their remarks and guidance during the review. I extend my gratitude to **Dr S K Chaudhari**, Deputy Director General (Natural Resource Management) for his constant support extended to the scheme. The time-to-time guidance received from **Dr. S. Bhaskar**, former Assistant Director General (Agronomy, Agroforestry and Climate Change) and **Dr. Rajbir Singh**, Assistant Director General (Agronomy, Agroforestry and Climate Change) for improving the performance and output of the scheme is duly acknowledged. Scientific inputs received from Quinquennial Review Team (QRT), Research Advisory Committee (RAC) and Institute Management Committee (IMC) are thankfully acknowledged as those inputs provided immense help in taking new initiatives, shaping and improvement of the programme for practical utility. I am highly thankful to each and every scientist and research fellows involved in the scheme at the all the centres for putting the meticulous effort to conduct a field experiment, lab analysis and generating data. Contribution and guidence given by **Dr. A.S. Panwar**, Former Director, ICAR-IIFSR and **Dr. Sunil Kumar**, Director, ICAR-IIFSR are duly acknowledged. The sincere efforts put forth by **Dr. N. Ravisankar**, Principal Scientist and Project Coordinator (Acting) during the period of report deserves appreciation for compilation of the report. I also extend my appreciation to **Dr. A. K. Prusty**, Principal Scientist, **Dr. M. Shamim**, Senior Scientist, **Dr Meraj Alam Ansari**, Senior Scientist, **Dr. Raghuveer Singh**, Senior Scientist, **Dr.Raghavendra K.J,** Scientist **Mr. Dhananjay Tripathi,** Chief Technical Officer, **Dr Vipin Kumar**, Chief Technical Officer, **Mrs.Himanshu Chauhan**, Senior Technical Officer and **Mrs. Jailata Sharma,** Personal Assistant for their Cooperation in compilation of the data, its statistical analysis, drafting and proof corrections and administration of the scheme. The contributions of all the other scientific, technical, administrative, and skilled supporting staff either directly or indirectly at various levels during preparation of this report also acknowledged. Significant findings obtained from the experiments of cropping and farming systems and its validation in the farmers field including FLDs will serve as useful method for implementation of cropping systems and farming systems by State agencies.

(Project Coordinator)

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1. INTRODUCTION

The Genesis of the" All India Coordinated Research Project on Integrated Farming Systems" may be traced back to all visit of Dr. A.B Stewart of Macaulay Institute of Soil Research, Aberdeen U.K., somewhere in mid-forties. He was invited by to the then Imperial Council of Agricultural Research' to (i) review the position in respect of soil fertility investigations, in general and manuring in particular, and (ii) suggest steps which might be taken in order to obtain, in shortest possible time, adequate information under different conditions of soil and climate to enable agricultural departments to give some advice to cultivators for increasing crop yield. His review reports, published in 1947, significantly affected philosophy and practices of fertilizers experimentation in the country, He stressed upon the need of conducting simple fertilizer trials on cultivators' fields and complex experiments at selected research centres. Prompted by these suggestions, a "Simple Fertilizer Trails at cultivators' fields" scheme was initiated in 1953 under the Indo American Technology Cooperation Agreement under "Soil Fertility and Fertilizer Use Project" with the following objectives.

i. To study crop responses to nitrogen, phosphorus and potassium when applied separately and in different combinations under the cultivators field conditions.

ii. To investigate the relative response of different fertilizers in various broad soil groups and to work out the optimum fertilizer combinations for different Agro climatic regions.

iii. To study the relative performance of different nitrogen and phosphatic fertilizers for indigenous production.

iv. To demonstrate to the farmers the value of fertilizers use for the production of crops.

Subsequently in 1956 experiments on carefully selected centres called 'Model Agronomic Experiments 'were added to the project and started as All India Coordinated Agronomic Experiment Scheme(AICAES). The objectives of Model Agronomic Experiments were;

i. To study the interaction of amounts of fertilizer application with intensity and frequency of irrigation, sowing date and plant density.

ii. To work out the manure requirement of important crop rotations, and their effect on soil fertility.

iii. To evaluate the relative efficiency of various sources of nitrogen and phosphorus for different crops and areas, and of different methods of application of nitrogenous and phosphatic fertilizers.

As knowledge progressed, new technology developed and the rate of growth in agriculture increased, the scheme went through various stages of evolution during which its scope expanded and its focus sharpened in accordance with newly required scientific knowledge. The scope of experimentation was, therefore, expanded to include agronomic research embracing cultural practices, irrigation and nutritional requirements, chemical weed control and multiple cropping But the emphasis continued on soil fertility and fertilizer use as influenced by soil and climatic factors and management.

In 1968 to 1969, the scheme was sanctioned as All India Coordinated Agronomic Research Project (AICARP) with two components, viz.; Model Agronomic Experiments' and Simple Fertilizer Trials, The main objectives of the experiments conducted at the research centres under the scheme were

i. To obtain information of the response of high yielding varieties of cereal to different economic factors such as fertilizers (including micronutrients), irrigation, weed control,liming etc.

ii. To study the menu requirements of important crop rotation and their effect on soil fertility.

iii. To evaluate various sources of Nitrogen and phosphorus for different crops and areas.

iv. To work out the production potential per unit area per unit time for different Agro climatic condition of the country and.

v. To determine the most suitable cropping patterns and fertilizer responses under rainfed condition.

Under the revised scheme with the main objectives of the simple fertilizer trial were.

i. To study the responsiveness of introduced high yielding and local Delhi improved varieties to nitrogen and phosphorus applied alone in the combination and to potassium in the presence of nitrogen and phosphorus and educated as well as dry and land location.

ii. To compare different methods of application of Nitrogen on series under dry farming conditions.

iii. To study the contribution of package of soil and moisture conservation practices to increase crop production in dry farming areas.

iv. To study the relationship between crop response to Fertilizer and soil test values and.

v. To formulate fertilizer recommendations for different soil and Agro climatic regions of the country.

But, during 1979 aforementioned objectives were further reviewed and redefined as under:

i. To develop, continuously update and test on cultivators' fields the technology for various crop based farming systems. For this patterns best suited for different agro-climatic zones may be identified, evolved for various emerging farming situations and package of practices developed to realize their production potential.

ii. To define/delineate all aspects of the use of fertilizers (recognizing that fertilizer is an important component of modern agricultural technology), including choice of materials maximize its use through recycling of agricultural wastes or employment of microbial aids,

iii. To provide facilities for testing new varieties at their pre-release stage, In mid-eighties, the policy planners duly recognized the importance of cropping systems approach of research to enhance resource use efficiencies for improved and sustainable crop productivity. Therefore, to strengthen all aspects of cropping systems research the 'Project Directorate for Cropping Systems Research' was established at Modipuram (Meerut) with effect from March 1989, with 'AICRP on Cropping Systems' as one of the constituent schemes of the Directorate with both the components, namely; 'On- Station Research' and 'On intact. However, within two decades of existence of PDCSR, the mandate of the Directorate Farm Research' remaining was broadened during 2009-10 to undertake research in integrated farming system mode and the Directorate was renamed as 'Project Directorate for Farming Systems Research (PDFSR)' and mandate redefined as:

    a. To characterize existing farming systems to know the productivity, viability and constraints.

    b. To develop resource efficient, economically viable and sustainable integrated farming system modules and models for different farming situations.

    c. To undertake basic and strategic research on production technologies for improving agricultural resource use efficiencies in farming system mode.

d. To develop and standardize package of production practices for emerging cropping/ farming concepts and evaluate their long-term sustainability.

e. To act as repository of information on all aspects of farming systems by creating appropriate databases.

f. To develop on-farm agro-processing and value addition techniques to enhance farm income and quality of finished products.

g. To undertake on-farm production technologies.

h. To develop capacity building of stakeholders in integrated Farming Systems through training.

The name and mandate of AICRP on Cropping Systems were also changed accordingly, with major emphasis on farming systems research and objectives modified as hereunder. The Project Directorate for Farming Systems Research was renamed as ICAR-Indian Institute of Farming Systems Research (IIFSR) during November 2014 and the mandate was redefined further as given below.

- 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.

All India Coordinated Research project on Integrated Farming Systems (AICRP on IFS) is an integral part of IIFSR with 74 centres to undertake on-station and on-farm research across length and breadth of the country. The institute is also leading a Network Project on Organic Farming (NPOF) with 20 centres.

2. OBJECTIVES

On-Station Research

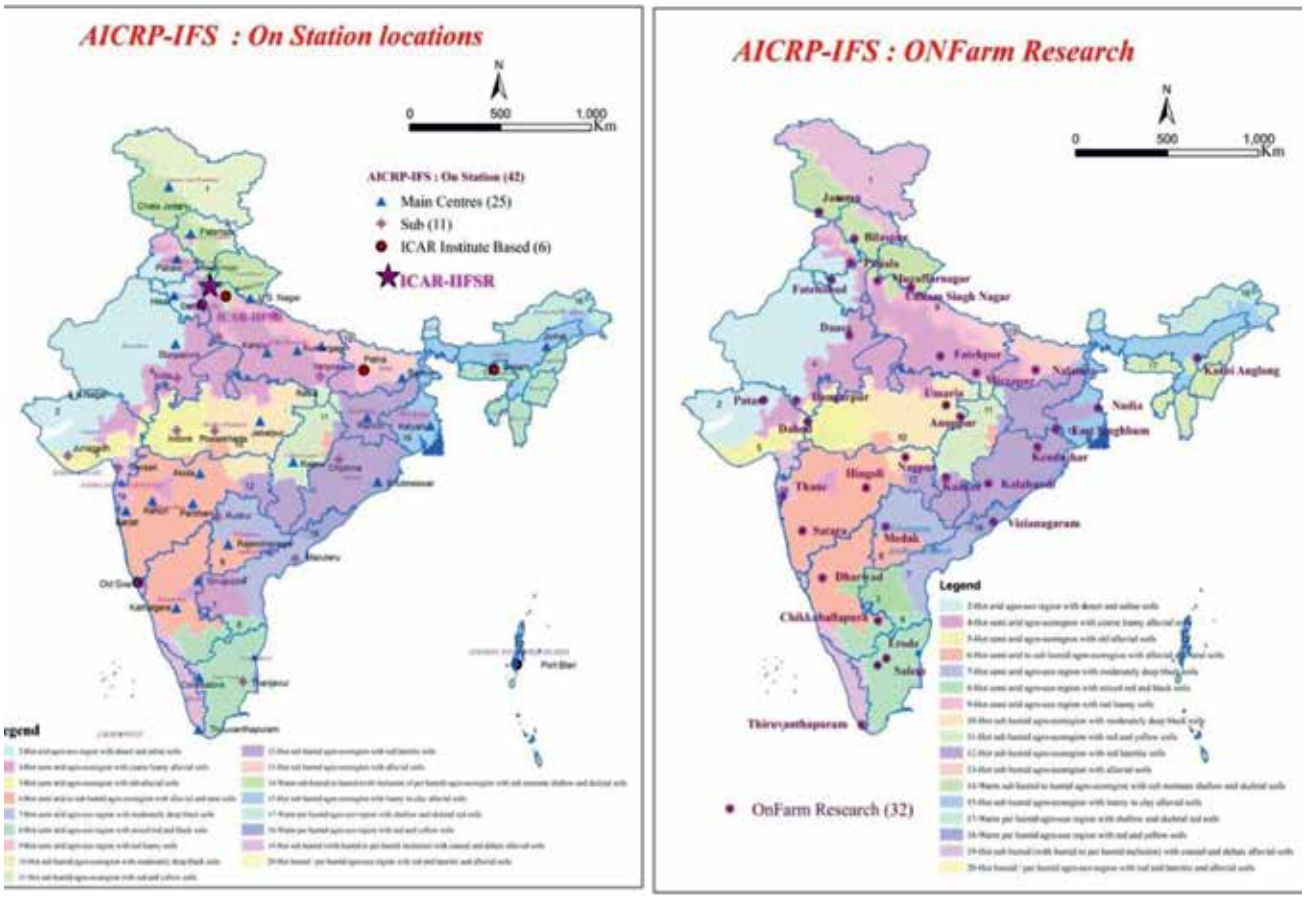
- To undertake applied and adaptive research in integrated farming systems (IFS), especially on production technologies for improving system productivity and resource use efficiencies.
- To develop efficient, economically viable and environmentally sustainable IFS models for different zones.
- To undertake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

On-Farm Research

- To undertake characterization of 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 farm enterprises for enhanced farm incomes, resource/ input use efficiencies, and employment opportunities.

3. LOCATION

Under the aegis of AICRP -IFS there are 25 main centers, 11 sub centers, 32 on-farm research centres and 5 voluntary centres. All main and sub centres are engaged in basic and applied research and are necessarily located at SAUS or their Regional Research Stations or Agricultural colleges of those general universities, where strong agricultural research base is available. Whereas, on-farm research centres (earlier known as Experiments on Cultivators' Field /ECF agro climatic centres) are engaged in farmers participatory research and are located in different zones. These OFR centres remain shifted from one zone /farming situation to another, every 4-5 years. The voluntary centres are situated in ICAR institutes and are taking up only IFS model development activity. The location of different AICRP- IFS centres during the year under report (2020-21) is depicted in Map - 1 & 2, and details are given in table 3.



Map of AICRP-IFS centre

Table-3/1: Location of Different AICRP-IFS centres during the year under report (2021-22)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
1.	A&N	CIARI,, Portblair	Voluntary	Island	Island region	Northern Zone AN-1
2	Assam	Jorhat	Main Centre	Humid	Eastern Himalayan Region/Upper Brahmaputra Valley Sub-Region	Upper Brahmaputra Valley Zone (AS-2)
3.		Goalpara	OFR Centre	Humid	Eastern Himalayan Region	Central Brahmaputra Valley (AS-3)
4.	Andhra Pradesh	Maruteru (Dist. W. Godavari)	Sub Centre	Coastal	East Coast Plains and Hills Region/ South Coastal Andhra Sub-Region	Krishna Godavari Delta Zone (AP-1)
5.		Vizianagaram	OFR Centre	Sub-Humid	East Coast Plains and Hills Region	Andhra Pradesh- (AP-7)
6.	Bihar	Sabour (Dist. Bhagalpur)	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ South Bihar Plains Sub-Region	South Bihar Alluvial Plain Zone (B1-3)
7.		Nalanda	OFR Centre	Sub-Humid	Middle Gangetic Plains Region	South Bihar Alluvial Plain Zone (BI-3)
8.		Patna	Vol. Centre	Sub-Humid	Middle Gangetic Plains Region	South Bihar Alluvial Plain Zone (B1-3)
9.	Chhattisgarh	Raipur	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	Chhattisgarh Plain Zone (CG-1)
10.		Kanker	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Chhattisgarh Plain Zone (CG-1)
11.	Delhi	New Delhi	Vol. Centre	Semi-Arid	Trans Gangetic Plains region	Western Semi Arid (ND1)
12	Goa	Old Goa	Vol. Centre	Coastal	West Coast Plains &Hills Region	South Konkan Coastal
13.	Gujarat	S.K. Nagar (Dist. Banaskantha	Main Centre	Arid	Gujarat Plains and Hills Region/North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
14.		Junagadh	Sub-Centre	Semi-Arid	Gujarat Plains and Hills Region/ South Saurashtra Sub-Region	South Saurashtra Zone (GJ-7)
15.		Navsari	Sub-Centre	Coastal	Gujarat Plains and Hills Region/ Southern Hills Sub-Region	South Gujarat Heavy Rainfall Zone (GJ-1)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
16.		Dahod, Devgadh	OFR Centre	Semi-Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	Middle Gujarat Zone (GJ-3)
17.		Adiya, Patan	OFR Centre	Arid	Gujarat Plains and Hills Region/North west Sub-Region	North West Agroclimatic zone (GJ-5)
18.	Haryana	Hisar	Main Centre	Arid	Trans –Gangetic Plains Region/ Arid Sub-Region	Western Zone (HR-2)
19.		Fatehabad	OFR Centre	Semi-Arid	Trans –Gangetic Plains Region	Western (HR-2)
20.	Himachal Pradesh	Palampur (Dist. Kangra)	Main Centre	Humid	Western Himalayan Region/ High Altitude Temperature Sub-Region	Mid-Hill Sub-Humid Zone (HP-2)
21.		Bilaspur	OFR Centre	Humid	Western Himalayan Region	Sub-Montane and Low Hills Sub-Tropical (HP-1)
22.	J & K	Chatha (Jammu)	Main Centre	Humid	Western Himalayan Region/High Altitude Temperature Sub-Region	Mid to High Altitude Plain Zone
23.		Jammu	OFR Centre	Humid	Western Himalayan Region/High Altitude Temperature Sub-Region	Mid to High Altitude Plain Zone
24.	Jharkhand	Kanke (Ranchi)	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/Chhota Nagpur, South and West Bengal Hills & Plateau Sub-Region	Western Plateau Zone (B1-5)
25.		East Singhbhum	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	South-eastern Plateau Zone
26.	Karnataka	Kathalgere (Dist. Davangere)	Main Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Transition Zone (KA-7)
27.		Chikkaballapura	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Central Dry Zone (KA-4)
28.		Siruguppa (Dist. Bellary)	Main Centre	Arid	Southern Plateau and Hills Region/Northern Dry Region of Karnataka	Northern Dry Zone (KA-3)
29.		Dharwad	OFR Centre	Semi-arid & arid	Southern Plateau and Hills Region	Northern Transition Zone -KA-8
30.	Kerala	Karamana (Dist. Thiruvanthapuram)	Main Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
31.		Thiruvananthapuram	OFR Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)
32.	Madhya Pradesh	Jabalpur	Main Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
33.		Indore	Sub-Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Malwa Plateau Zone (MP-10)
34.		Powarkheda (Dist. Hoshangabad)	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/Central Narmada Valley Sub-Region	Central Narmada Valley Zone (MP-6)
35.		Rewa	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
36.		Anuppur	OFR Centre	Semi-Arid	Eastern Plateau and Hills	Northern hill zone of Chattisgarh (CG-3)
37.		Umaria	OFR Centre	Semi-Arid	Central Plateau & Hills Region	Kymore Plateau and Satpura Hills (MP-1)
38.	Maharashtra	Akola	Main Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Western Vidarbha Zone(MH-8)
39.		Katol, Nagpur	OFR Centre	Semi-Arid	Western Plateau and Hills	Central Vidarbha Zone
40.		Karjat (Dist. Raigad)	Main Centre	Coastal	Western Plains & Ghat Regions/ Coastal Hilly Sub-Region	North Konkan Coastal Zone (MH-2)
41.		Thane	OFR Centre	Coastal	West Coast Plains and Ghats	North Konkan Coastal Zone (MH-2)
42.		Parbhani	Main Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Central Maharashtra Plateau Zone (MH-7)
43.		Hingoli	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Central Vidarbha Zone
44.		Rahuri (Dist. Ahemadnagar)	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Scarcity Sub-Region	Scarcity Zone (MH-6)
45.		Padegaon, Satara	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Western Maharashtra Plain Zone

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
46	Meghlaya	Umiam	Vol. Centre	Sub-humid To Humid	Eastern Himalayan Region	Sub-Tropical Hill Zone
47.	Odisha	Bhubaneswar	Main Centre	Sub-Humid	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South –Eastern Coastal Plain Zone (OR-4)
48.		Chiplima (Dist. Sambalpur)	Sub-Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	West-Central Table Land Zone (OR-9)
49.		Kendujhar	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	North-central Plateau Zone
50.		Kalahandi	OFR Centre	Coastal	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	Western Undulating Zone
51.	Punjab	Ludhiana	Main Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
52.		Patiala	OFR Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Western Plain Zone
53.	Rajasthan	Durgapura (Jaipur)	Main Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Semi-Arid Eastern Plain Zone (RJ-5)
54.		Dausa	OFR Centre	Semi-Arid	Western Dry Region	Eastern Plain Zone
55.		Kota	Sub Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Humid South –Eastern Plain Zone (South-Eastern Humid Plain Zone (RJ-9)
56.		Dungarpur	OFR centre	Semi-Arid	Central Plateau & Hills Region/ Southern Plains of Rajasthan	Sub-Humid Southern Plain & Aravali Hills Zone (RJ-7)
57.	Tamil Nadu	Coimbatore	Main Centre	Semi-Arid	Southern Plateau and Hills Region/ Central Plateau of Tamil Nadu Sub-Region	Western Zone (TN-3)
58.		Thanjavur	Sub Centre	Coastal	East Coast Plains and Hills Region/ Thanjavur Sub-Region	Cauvery Delta Zone (TN-4)
59.		Yethapur	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	North western Zone (TN-2)
60.		Bhavanisagar	OFR Centre	Semi-Arid	East Coast Plains and Hills Region	Sothern Zone (TN-5)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
61	Telangana	Rajenderaanagar	Main centre	Semi-Arid	Southern Plateau and Hills Region/ South Telangana Sub-Region	Southern Telangana Zone (AP-5)
62		Rudrur (Dist. Nizamabad)	Sub Centre	Semi-Arid	Southern Plateau and Hills Region/ North Telangana Sub-Region	Northern Telangana Zone (AP-4)
63		Medak	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Telangana (AP-5)
64.	Uttar Pradesh	Kanpur	Main Centre	Semi-Arid	Upper Gangetic Plains Region/South Western Plains Sub-Region	Central Plain Zone (UP-6)
65.		Fatehpur	OFR Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-4)
66.		Faizabad	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-9)
67.		Mirzapur	OFR Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-7)
68.		Varanasi	Sub Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains	Eastern Plain Zone (UP-9)
69.		Modipuram	Vol. Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan(UP-3)
70.		Muzaffarnagar	OFR Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan Dry sub-humid to semi-arid / (UP-3)
71.	Uttarakhand	Pantnagar (Dist. US Nagar)	Main Centre	Sub-Humid	Western Himalayan Region/ Valley Temperate Sub-Region	Bhawar and Tarai Zone (UP-2)
72.		Udam Singh Nagar	OFR Centre	Sub-Humid	Western Himalayan Region/High hill Temperate Sub-Region	Hill Zone (UK-1)
73.	West Bengal	Kalyani (Dist. Nadia)	Main Centre	Humid	Lower Gangetic Plains Region/ Central Alluvial Plains Sub-Region	New Alluvial Zone (WB-3)
74.		Nadia	OFR Centre	Humid	Lower Gangetic Plains Region/ Central Alluvial Plains Sub-Region	New Alluvial Zone (WB-3)

4. SOIL AND CLIMATE

The major group of soil (centre-wise) on which on- station experiment of CSR/FSR were conducted during the year 2021-22 and geographical coordinates (latitude and longitude)of the different research location are given in table 4.1.The general climatic conditions for the experimental location are described below in brief.

Table 4.1: Soils type of geographical coordinates of different on – station FSR Centres.

Centre	Soil Type	Latitude	Longitude
Rajendranagar	Udic Ustochrepts, black soils	18˚ 59' N	78˚ 55' E
Maruteru	Chromusterts clayey, medium black soils	16˚ 38' N	81˚ 44' E
Rudrur	Chromusterts clayey, deep (90 cm depth), deep black soils	18˚ 30' N	77˚ 51' E
Jorhat	Fluaquents/ Udicaquents association, very deep (90 cm depth), alluvial sandy clay loam soils	26˚ 47' N	94˚ 12' E
Sabour	Eutrocherpts (Very deep), low and clay soils	25˚ 23' N	87˚ 07' E
Raipur	Ochraquals association, deep black soils	21˚ 16' N	81˚ 36' E
S K Nagar	Haplaquals, deep medium black soils	24˚ 90' N	72˚ 19' E
junagadh	Ustochrepts, deep medium black soils	21˚ 30' N	70˚ 30' E
Hisar	Vertic Ustochrepts deep medium black soils	20˚ 57' N	72˚ 54' E
Palampur	Ustochrepts, very deep silty alluvial soils	29˚ 08' 55" N	74˚ 41' 16" E
Navsari	Udic Haplustalfs, red soils	32˚ 06' N	76˚ 03' E
Chatha (Jammu)	Eutrochrepts very deep clay soils	32˚ 05' N	74˚ 04' E
Ranchi	Ultic Palustaifs very deep (90 cm) red soils	23˚ 79' N	85˚ 19' E
Kathalagere	Aificols, dark reddish brown sandy clay loam	13˚ 02' N	76˚ 15' E
Siruguppa	Type Chromusterts, very deep (90 cm) black soils	15˚ 38' N	76˚ 54' E
Karamana	Typic Tropoflivents, very deep (90 cm depth)	11˚ N	77˚ E
Jabalpur	Chromusterts, very deep (90 cm depth), medium to deep black	23˚ 10' N	79˚ 57' E
Indore	Vertisols, medium and dark deep black soil	22˚ 04' N	79˚ 57' E
Powarkheda	Deep black soil,clay to sandy loam	23˚ 25' N	73˚ 98' E
Rewa	Ustochrepts-Vertic Ustochrepts association, fine loamy soils	24˚ 41' N	81˚ 15' E

Centre	Soil Type	Latitude	Longitude
Akola	Medium deep black clayey soil	20° 42' N	77° 02' E
Karjat	Haplustults Udic-Fluvents, red soils	18° 33' N	75° 03' E
Parbhani	Chromusterts,deep (90 cm depts.), deep black soils	19° 08' N	76° 05' E
Rahuri	Chromusterts, fine clayey soils	19° 47' N	74° 18' E
Bhubaneshwar	Haplustaifs very deep (90 cm depth), mediumtextured lateritic soils	20° 15' N	85° 52' E
Chiplima	Haplaquents, very deep (90 cm depth) clay, ill-drained soils	20° 21' N	80° 55' E
Ludhiana	Ustochrepts-Ustic Psamments Assciation, very deep (90 cm depth), alluvial sandy and sandy-loam soils	30° 56' N	75° 52' E
Durgapura (Jaipur)	Torrid-Psamments/ Torrid-Fluvents Association, sandy loam soils	26° 55' N	75° 49' E
Kota	Chromsterts-Paleusterts association, very deep (90 cm depth) clay loam soils	25° 26' N	75° 30' E
Coimbatore	Udic Rhodustalts, fine loamy red sandy soils	11° 59' N	78° 55' E
Thanjavur	Typic Pellusterts, clayey very deep (90 cm depth)/ deep black soils of deltaic origin	10° 47' N	79° 10' E
Kanpur	Udic Ustochrepts, alluvial soils	26° 28' N	80° 21' E
Faizabad	Udic fluvents-Fluaquents Association, loqland clayey soils	26° 47' N	82° 12' E
Varanasi	Aeric Chroquals very deep (90 cm depth) alluvial clayey soils	25° 18' N	83° 03' E
Pantnagar	Hapludolls, very deep (90 cm depth) alluvium coarse loam soils	29° 08' N	79° 05' E
Kalyani	Fluventic Eutrochrepts, very deep (90 cm depth) alluvial soils	23° 40' N	88° 52' E
PDFSR, Modipuram	Ustochrept	29.4' N	77.46' E
ICAR-RC, Patna	Alluvial soil	25° 50' N	84° 45' E
ICAR-RC, Umiam	Slfisols, Entisols, Inceptisols	25° 59' N	85° 08' E
ICAR-RC, Goa	Lithic dystropepts karmali soils series	15° 13' N	75° 55' E
ICAR-RC, Port Blair	Costal alluvial soil	11° 38' N	92° 39' E

Prevailing Weather at various AICRP centers of IFS for the reporting period of 2021-22

The weather conditions, including key elements such as rainfall and air temperature (monthly minimum and maximum), were assessed for the reporting year (RY) spanning from June 2021 to May 2022 across various Integrated Farming Systems Research (IFS) Centers of the AICRP. Rainfall data was categorized into four seasons: Winter (January-February), Pre-monsoon (March-May), Southwest Monsoon (June-September), and Post-monsoon (October-December). Furthermore, the Southwest Monsoon's contribution was expressed as a percentage of the total annual rainfall for RY 2021-22 at each AICRP-IFS center. The deviation (in percentage) of annual rainfall from normal reported by India Meteorological Department (IMD) was also calculated for each center. Seasonal rainfalls are depicted in Figure 1, while Figure 2 showcases the

Southwest Monsoon's contribution (in percentage) relative to the total annual rainfall, along with the percentage deviation from the IMD normal rainfall. Additionally, the annual maximum and minimum air temperatures for each station were analyzed and are presented in Figure 3.

In regards to the rainfall, the complied results suggested that five (05) of the AICRP IFS centers, namely, Junagadh, Kalyani, Kathalagere, Navsari, and Sirugappa received no rainfall during the winter season. The maximum annual rainfall was received at Karjat, Raigad (4010 mm), while the least was recorded at Sirugappa, Balari (615.7 mm). In the context of the SW Monsoon, the highest was received at Karjat, Raigad (3636.6 mm), while, the least was recorded at Coimbatore (117.5 mm), respectively. Percent-wise the SW Monsoon contributes maximum to the annual rainfall at Powerkheda (94.97 %) and least for Coimbatore (16.36 %). The highest positive deviation was observed for Hisar (+105.02 %), whereas the highest negative deviation was detected for Coimbatore (-45.82 %). The Sabour, Bhagalpur station (0.44 %) has the least deviation from the IMD normal rainfall over annual time scales.

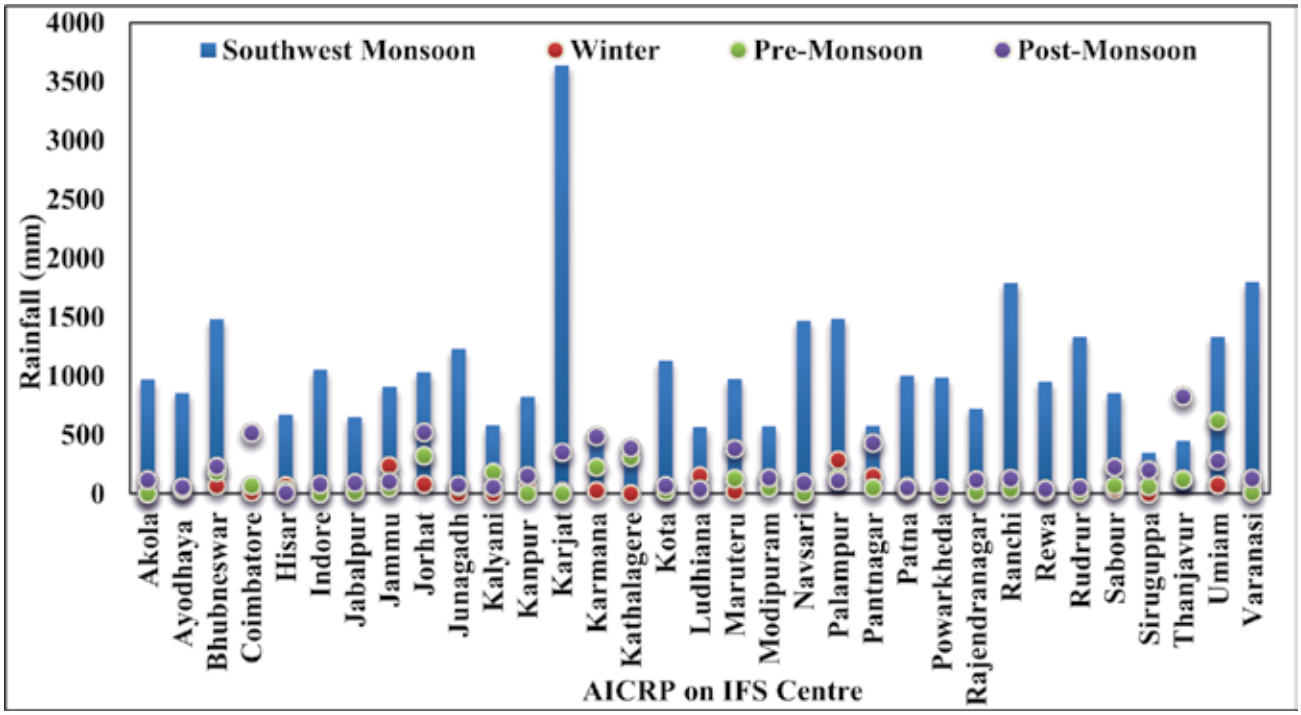
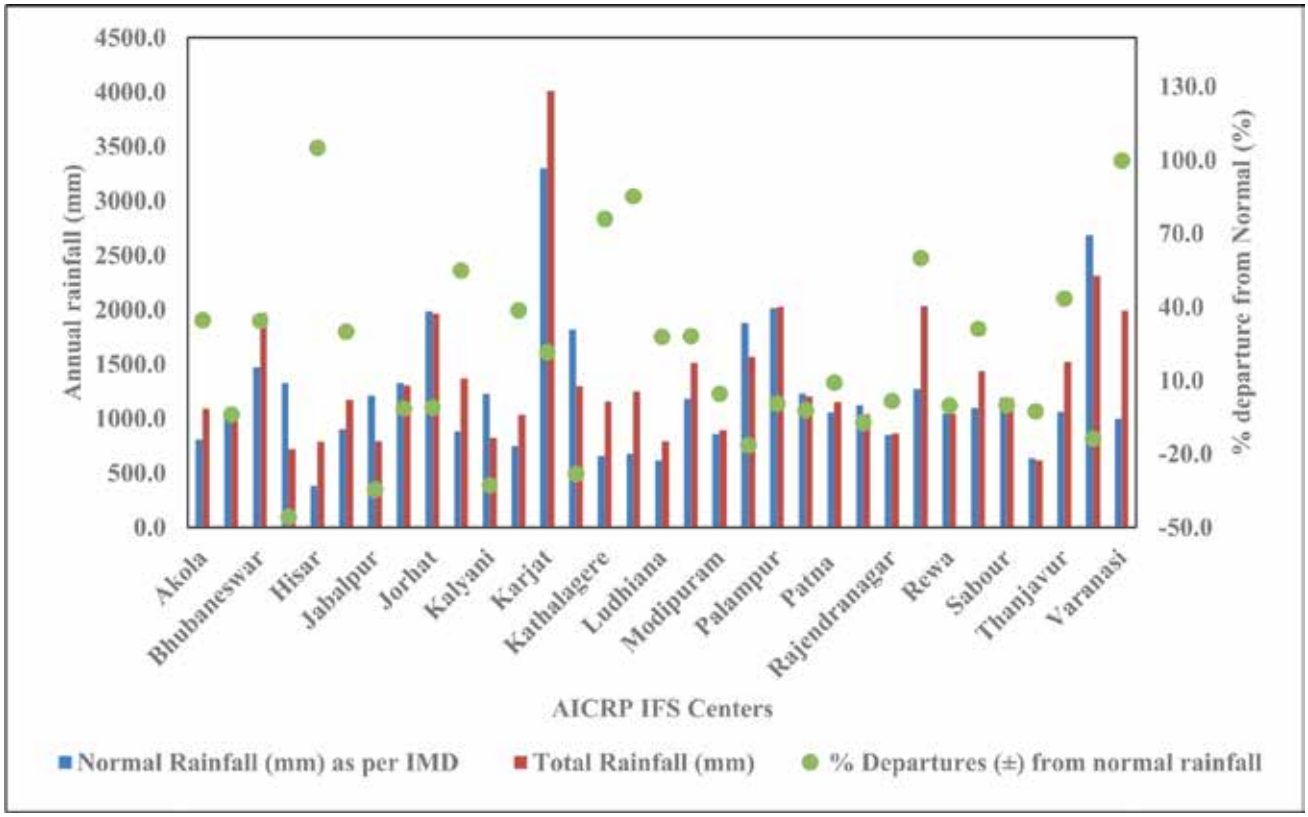
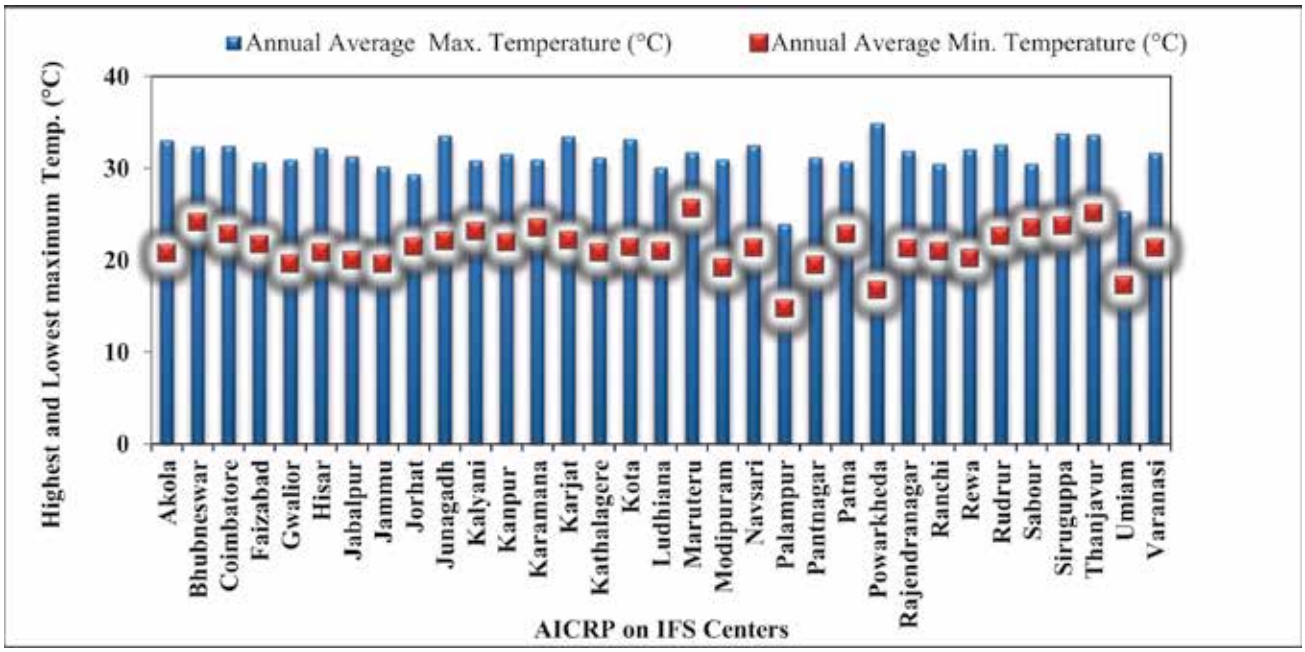


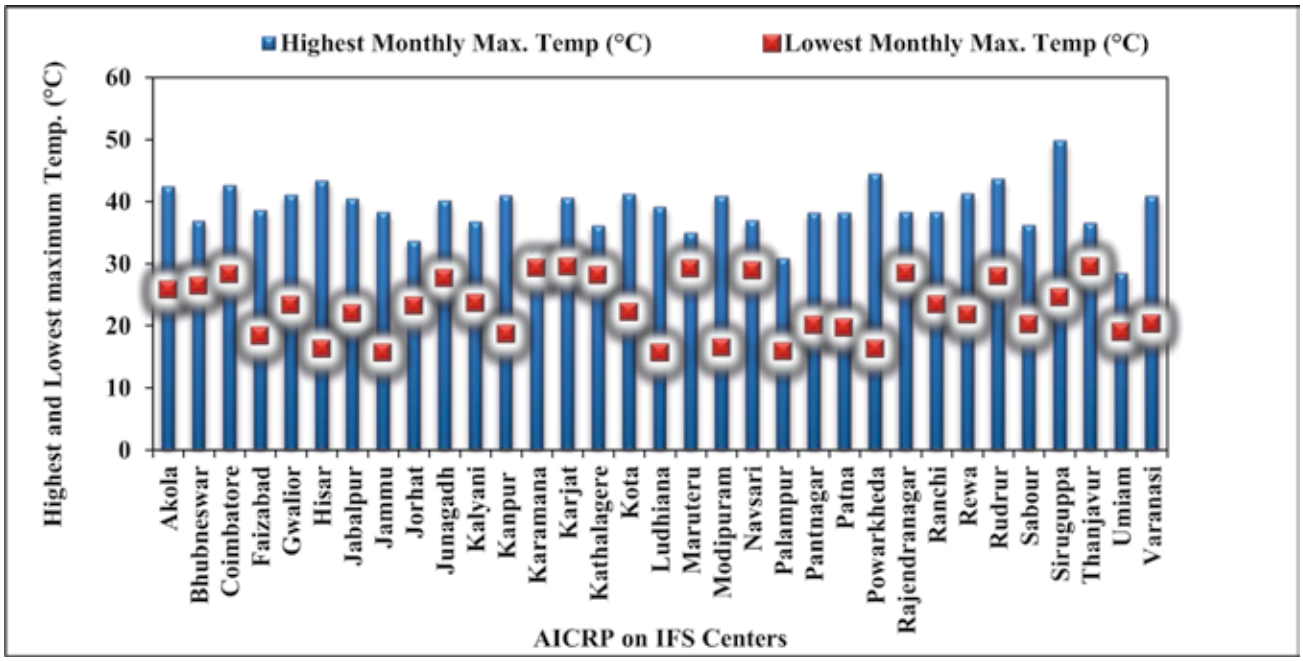
Fig. 1: Seasonal rainfall indices (mm) at various AICRP centers of IFS for the reporting period

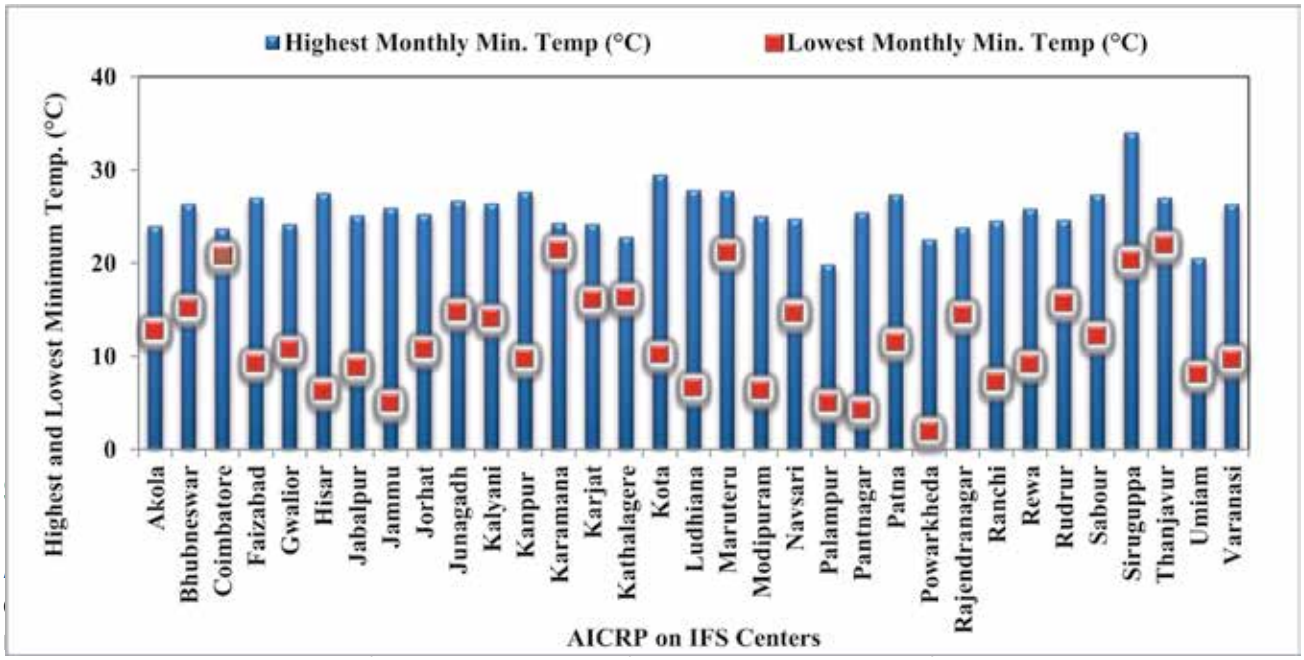
Concerning the air temperatures, Siruguppa (49.8 °C) was the hottest AIRCP center, while Powarkheda (2 °C) was the coldest during the reporting period. Additionally, the Powarkheda station, with its maximum and minimum temperature of 44.5 °C & 2 °C also expressed the largest temperature range (42.5 °C), while the least was recorded for Karamana (10.7 °C) in the RY 2021-22. **Fig. 4** and **Fig. 5** illustrate the daily maximum & minimum temperatures during the months for the AIRCP centers.

Fig. 2: Total annual rainfall, IMD normal rainfall along with % deviation for the reporting period


4500.0
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
Annual rainfall (mm)
130.0
100.0
70.0
40.0
10.0
-20.0
-50.0
% departure from Normal (%)
Akola
Bhubaneswar
Hisar
Jabalpur
Jorhat
Kalyani
Karjat
Kathalagere
Ludhiana
Modipuram
Palampur
Patna
Rajendranagar
Rewa
Sabour
Thanjavur
Varanasi
AICRP IFS Centers
Normal Rainfall (mm) as per IMD
Total Rainfall (mm)
% Departures (±) from normal rainfall


Annual Average Max. Temperature (°C)
Annual Average Min. Temperature (°C)
Highest and Lowest maximum Temp. (°C)
40
30
20
10
0
Akola
Bhubneswar
Coimbatore
Faizabad
Gwalior
Hisar
Jabalpur
Jammu
Jorhat
Junagadh
Kalyani
Kanpur
Karamana
Karjat
Kathalagere
Kota
Ludhiana
Maruteru
Modipuram
Navsari
Palampur
Pantnagar
Patna
Powarkheda
Rajendranagar
Ranchi
Rewa
Rudrur
Sabour
Siruguppa
Thanjavur
Umiam
Varanasi
AICRP on IFS Centers





air temperature, the daily maximum ranged from 42.4 °C and 25.9 °C in April & January, respectively. While concerning the daily minimum temperature a range of 27.1 °C and 11.3 °C was observed in May and January, respectively.

Ayodhya: During the reporting period, Ayodhya experienced an annual precipitation of 988.2 mm, which deviated from the normal rainfall by -4%. The Southwest Monsoon contributed the majority, approximately 86%, accounting for 854 mm of the total precipitation. Post-Monsoon, Winter, and Pre-Monsoon contributed 59 mm, 35 mm, and 40 mm of rainfall, respectively. September recorded the highest monthly rainfall with 352.8 mm. Regarding air temperature, the daily maximum ranged from 38.6 °C in April to 18.4 °C in January. Similarly, the daily minimum varied from 27.0 °C in July to 8.4 °C in January.

Bhubaneswar: For the reporting period, a cumulative annual precipitation of 1970.5 mm was perceived at Bhubaneshwar

station. A +34.2 % deviation was noticed from the normal amount with the SW Monsoon contributing to 1482 mm or 75 %. Additionally, 232 mm, 70 mm, and 186 mm were received from Post-Monsoon, Winter, and Pre-Monsoon, respectively. Monthly rainfall data suggested that September received the most rainfall for the observance duration which was 579.4 mm. In regards to the air temperature daily maximum ranged from 36.9 °C and 26.5 °C during April and January, respectively. Correspondingly, the daily minimum varied from 26.5 °C and 14.7 °C again during April and January, respectively.

Coimbatore: At the Coimbatore station, the total annual precipitation for the reporting period amounted to 718 mm. This marked a -45.8% variation from the average, with the Southwest Monsoon contributing 118 mm, which accounts for 44.12% of the total rainfall. Additionally, the Pre-Monsoon, Winter, and Post-Monsoon seasons contributed 67 mm, 17 mm, and 517 mm to the annual rainfall, respectively. Based on the monthly data, November experienced the highest rainfall during the observation period, recording 271.9 mm. Concerning daily maximum air temperature, it ranged from 42.7 °C in May to 28.4 °C in November. Similarly, the daily minimum temperature fluctuated between 24.6 °C and 20.7 °C in April and January, respectively.

Hisar: Annual precipitation observed at Hisar for the recording period was 783 mm with the SW monsoon contributing to 86.0 % of the total. Further, a +105 % deviation of rainfall from the normal is also observed. Contributions from the Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 7.1 mm, 69.8 mm, and 33.1 mm, respectively. Month-wise September was contemplated as the wettest month with a monthly cumulative rain of 428.2 mm. In the context of the daily maximum air temperature, a range of 43.4 °C and 23.4 °C during the months of July and January, respectively. In addition, the daily minimum range of 27.5 °C and 6.3 °C was recorded in July and December, respectively.

Indore: Indore experienced 1168.3 mm of annual precipitation over the recorded period, deviating by +29.9 % from the long-term average. About 90.1 %, or 1052.5 mm, of the total precipitation, was imparted by the SW Monsoon, with the remaining amounts being contributed from the Post-Monsoon and Winter rainfalls, which were 84.1 mm and 31.7, respectively. Further, Pre-Monsoon rainfall was null for the Indore station in the reporting period. With a total of 377.6 mm, September had the greatest monthly rainfall. In terms of air temperature May & December had the greatest daily readings, with numerical values of 41.1 °C and 23.4 °C, respectively. Parallel to this, the daily minimum was between 27.1 °C and 9.6 °C in May & February, respectively.

Jabalpur: Throughout the recording period, Jabalpur received 790.1 mm of annual precipitation, which is a deviation of -34.8 % from the long-term average. The SW Monsoon provisioned around 82.6 % of the total precipitation, with the remaining amounts accounted for from the Pre-Monsoon, Winter, and Post-Monsoon rainfalls, which were 17.4, 27.7, and 92.6 mm, respectively. The highest monthly rainfall totaling 242.6 mm was observed for July. With the numerical values of 40.5 °C and 22.0 °C, respectively, April and January had the highest daily measurements of air temperature. In parallel with this, the daily minimum was observed for July and January, which was found to be 25.1 °C and 8.4 °C, respectively.

Jammu: Jammu perceived 1304.2 mm of annual precipitation during the reporting period, which is -1.6 % more than the long-term average. 69.7 % of the total precipitation was supported by the SW Monsoon, with the remaining portion coming from the Pre-Monsoon, Winter, and Post-Monsoon rainfalls. These were 50.2 mm, 236.4 mm, and 108.0 mm, respectively. Further, the highest monthly cumulative was observed to be 488.4 mm in the month of July. The range of the daily maximum air temperature readings was recorded in May and June, reaching 38.3 °C and 15.7 °C, respectively. Simultaneously, in July and December daily minimum temperatures were recorded, and they turned out to be 25.9 °C and 5.0 °C, respectively.

Jorhat: For the reported period, Jorhat experienced 1962.4 mm of annual precipitation, -1.2 % less than the long-term average. The SW Monsoon contributed 52.6 % of the total precipitation, with the Pre-Monsoon, Winter, and Post-Monsoon rainfalls accounting for the remaining amount, with the measured values of 322.2 mm, 81.5 mm, and 526.6 mm in that order. Furthermore, it was found that June had the greatest monthly cumulative, measuring 321.8 mm. In September and January,

the daily maximum air temperature readings ranged from 33.7 °C and 23.3 °C, respectively. The daily low temperatures were observed simultaneously in the months of July and January and were found to be 25.2 °C and 9.6 °C, respectively.

Junagarh: Annual precipitation observed at the station was 1368.1 mm with a positive deviation of 54.9 % from the normal. Approximately, 89.7 % of the annual was showered by the SW Monsoon. The rest amounts were provisioned by the Pre-Monsoon and Post-Monsoon precipitation, which contributed 62.7 mm and 77.6 mm, respectively. Whereas very minuscule rain occurred during the winter (0.2 mm). With a total of 843.3 mm, September had the highest monthly rainfall recording period. The daily maximum air temperature readings were recorded in April and January, reaching 40.1 °C and 27.7 °C, respectively. Likewise, June and January have the daily minimum temperatures in the range of 26.7 °C and 11.8 °C, respectively.

Kalyani: Kalyani station experienced 822.9 mm of annual precipitation, -32.9 % more than normal. The SW Monsoon contributed to 70.7 % of the total precipitation, with the Pre-Monsoon and Post-Monsoon rainfalls accounting for the remaining amount. These rainfall measurements were 182.7 mm and 58.8 mm, respectively. In comparison to that the Winter received no rainfall. Furthermore, it was found that June had the largest monthly cumulative rain, measuring 168.1 mm. In April and January, the daily maximum air temperature readings ranged from 36.7 °C and 23.7 °C, respectively. Similarly, the daily minimum temperatures stretch from 26.4 °C and 12.4 °C in July and January, respectively.

Kanpur: An annual precipitation of 1031.6 mm was received at the station, with a positive deviation of 38.6 % from the normal. The SW Monsoon contributed 79.7 % to the total annual rainfall. The Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 154.6 mm, 54.1 mm, and 0.2 mm, respectively. The maximum monthly rainfall was received in July with a monthly cumulative value of 349.3 mm. In the context of the air temperature, among the months the daily maximum temperature ranged from 41.0 °C and 18.7 °C in April and January. Correspondingly, the daily minimum was in the range of 27.6 °C and 7.7 °C in July and January, respectively.

Karjat: During the reported period, Karjat received an annual precipitation of 4010.0 mm, marking a deviation of +21.5% from the long-term average. The Southwest Monsoon accounted for approximately 90.7%, or 3636.6 mm, of the total precipitation, while the Post-Monsoon, Winter, and Pre-Monsoon seasons contributed 351.6 mm, 21 mm, and 0.8 mm, respectively. July recorded the highest monthly rainfall, reaching 1644.3 mm. Regarding air temperature, the highest daily temperatures were noted in April and June, measuring 40.6 °C and 29.6 °C, respectively. Similarly, the lowest daily temperatures were observed in May and January, registering at 24.5 °C and 14.6 °C, respectively.

Karmana: Throughout the recording period, Karmana received 1298 mm of annual precipitation, which is a negative deviation of -28.4 % from the long-term average. The SW Monsoon provisioned around 42.6 % of the total precipitation, with the remaining amounts accounted for from the Pre-Monsoon, Winter, and Post-Monsoon rainfalls, which were 229.4 mm, 29.2 mm, and 486.2 mm, respectively. The highest monthly rainfall totaling 311.9 mm was observed for the month of October. With the numerical values of 32.2 °C and 29.4 °C, respectively, June and November had the highest daily measurements of air temperature. In parallel with this, the daily minimum was observed for May and June, which was found to be 25.1 °C and 21.5 °C, respectively.

Kathalagere: The station received an annual rainfall of 1156.2 mm, with a deviation of +76 % from the normal. The SW Monsoon contributed 39.5 % (456.2 mm) to the total annual rainfall. The Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 390.1 mm, 0.0 mm, and 309.9 mm, respectively. The maximum monthly rainfall was received in October (272.7 mm). In the context of the air temperature, among the months the daily maximum temperature ranged from 36.2 °C and 28.3 °C in April and August, while, the daily minimum was in the range of 22.8 °C and 15.8 °C in June and January, respectively.

Kota: In reference to the air temperature at the Kota station, the daily maximum ranged from 41.2 °C and 21.3 °C in June and January, respectively. On the contrary, the daily minimum is observed in the range of 29.5 °C and 9.2 °C in June

and January, respectively. Concerning the precipitation, a cumulative annual of 1244.6 mm was recorded. This deviated by a positive 85.2 % from the normal trend for the region. 90.7 % of the same was contributed by the SW monsoon. The beneficence from the Post-Monsoon, Winter, and Pre-Monsoon rainfalls was relatively low, which are 68 mm, 24 mm, and 23.2 mm, respectively. Month-wise most of the precipitation was concentrated during July with a cumulative value of 489.2 mm.

Ludhiana: An annual precipitation of 786.2 mm was observed at Ludhiana for the reporting period with a negative 27.8 % deviation from the normal rainfall. Approximately, 71.9 % of the total precipitation was contributed by the SW Monsoon, while, Post-Monsoon, Winter, and Pre-Monsoon rainfalls accounted for 37.6 mm, 156.9 mm, and 26.4 mm of the rainfall, respectively. July was observed to be the wettest month with a cumulative monthly rainfall of 271.2 mm. Concerning the air temperature, the daily maximum temperature ranged from 39.2 °C and 15.7 °C in the months of May and January, respectively. Consequently, the daily minimum was in the range of 27.8 °C and 6.7 °C during July and December, respectively.

Modipuram: Concerning the air temperature indices, the daily maximum varied from 40.9 °C to 16.5 °C in the months of October & January, while the daily minimum ranged from 25.0 °C and 6.4 °C in July and December & January, respectively. In regards to the annual precipitation, 892.6 mm was recorded at the gauging site. The annual rainfall displayed a negative deviation of 4.5 % from the normal trend. Of the total rainfall received, 63.9 % was contributed from the SW Monsoon. The apportionments from Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 136.7 mm, 132.5 mm, and 53.4 mm, respectively. Maximum monthly rainfall of 274.4 mm was recorded during July.

Maruteru: Maruteru received an annual precipitation of 1511.6 mm during the recorded period, representing a positive deviation of 28.1% from the long-term average. The Southwest Monsoon contributed approximately 64.3% of the total precipitation, with the remaining portions coming from the Post-Monsoon and Pre-Monsoon rainfalls, which amounted to 384.7 mm and 131.3 mm, respectively. Additionally, winter rainfall during the reporting period totaled 23.6 mm. July recorded the highest monthly rainfall with a total of 381.1 mm. Regarding air temperature, April and January recorded the highest daily readings, with values of 35.0 °C and 29.3 °C, respectively. Similarly, the daily minimum temperatures ranged from 27.7 °C in June to 19.6 °C in December.

Navsari: The total annual rainfall received during the reporting period was 1565 mm, which displayed a negative deviation (-16.6 %) from the normal rainfall trend. The post-monsoon contributed to 95.0 mm of rain, whereas the SW monsoon contemplated 1470.0 mm of rain corresponding to 93.9 % of the total annual. No rainfall was recorded during the winter and pre-monsoon season. Cumulatively maximum monthly rain was registered during September which was 493 mm. The highest monthly maximum air temperature was observed in March (37.0 °C), whereas the lowest minimum of 13.7 °C was recorded during February.

Palampur: Annual precipitation observed at Palampur for the recording period was 2025.3 mm with the SW monsoon contributing to 73.3 % of the total. Further, a positive 0.5 % deviation of rainfall from the normal is also observed indicating a little more rain was recorded during the period of observance with respect to the long-term average. Contributions from the Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 112 mm, 284.6 mm, and 144.5 mm, respectively. Month-wise July was contemplated as the wettest month with a monthly cumulative rain of 575.6 mm. In the context of the daily maximum air temperature, a range of 30.9 °C and 16.0 °C during June and January, respectively. In addition, the daily minimum range of 19.8 °C and 4.5 °C was recorded in July and January.

Pantnagar: The station experienced an annual precipitation of 1203.8 mm, with a deviation of -2.1% from the normal rainfall. The Southwest Monsoon contributed 47.7% (573.9 mm) to the total annual rainfall, while the Post-Monsoon, Winter, and Pre-Monsoon seasons contributed 432.5 mm, 149.3 mm, and 48.1 mm, respectively. The highest monthly rainfall occurred in October, totaling 427.5 mm. In terms of air temperature, the daily maximum ranged from 38.2 °C in April to 20.2

°C in January. Similarly, the daily minimum temperature varied between 25.4 °C in August and 4.3 °C in December.

Patna: The center received a total annual precipitation of 1150.5 mm of rainfall for the period of observance. During the Post-Monsoon, Winter, and Pre-Monsoon seasons, rainfall amounts of 52.0 mm, 63.4 mm, and 34.6 mm were recorded. Further, 87.0 % was contributed from the SW Monsoon. A 9.1 % positive deviation at the center suggests that the rainfall was relatively higher for the reporting period than the normal trend. The lowest minimum temperature was recorded during January (10.8 °C), while the highest monthly mean maximum temperature was observed during April (38.2 °C).

Powarkheda: Most of the annual rainfall (1038.2 mm) at the Powarkheda center was concentrated in the SW Monsoon, which contributes to 95.0 % of the total. Additionally, a negative deviation of -7.4 % was observed for the reporting period suggesting that the concerned tenure has received somewhat lesser rainfall than what is observed under the typical pattern. The Post-Monsoon, Winter, and Pre-Monsoon rainfalls aggregate 52.2 mm of rain, while calendar month-wise June receives the most, which is 303.9 mm. In reference to air temperature, the daily minimum was in the range of 22.5 °C and 2 °C observed in Sep & Dec, respectively. Parallelly, the daily maximum temperature ranges from 44.5 °C and 16.4 °C during April & February.

Rajendranagar: For the reporting period, a cumulative annual precipitation of 859.6 mm was perceived at the Rajendranagar center. A positive 1.6 % deviation was noticed from the normal amount with the SW Monsoon contributing to 84.1 % of the total annual amount. Additionally, 119 mm, 4.6 mm, and 13.0 mm were received from Post-Monsoon, Winter, and Pre-Monsoon showers, respectively. Monthly rainfall data suggested that July received the most rainfall for the observance duration which was 305.8 mm. In regards to the air temperature daily maximum ranged from 38.3 °C and 28.5 °C during April and December & January, respectively. Correspondingly, the daily minimum varied from 25.2 °C and 14.5 °C during May and December, respectively.

Ranchi: Concerning the air temperature indices, the daily maximum varied from 38.3 °C and 23.5 °C in April and January, while the daily minimum ranged from 24.8 °C and 7.3 °C in May and December, respectively. In regards to the annual precipitation, 2035.2 mm was recorded at the gauging site. The annual rainfall displayed a large positive deviation of 59.9 % from the normal trend. Of the total rainfall received, 87.9 % was contributed from the SW Monsoon. The apportionments from Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 132.6 mm, 77.6 mm, and 36.5 mm, respectively. Maximum monthly rainfall of 686.3 mm was recorded during the month of July.

Rewa: The total annual rainfall received during the reporting period was 1046.5 mm, which displayed a very little negative deviation (-0.3 %) from the normal rainfall trend. The Pre-Monsoon and Post-Monsoon contributed to 56.6 mm of rain, whereas the SW monsoon contemplated 949.3 mm of rain corresponding to 90.7 % of the total annual. Additionally, 40.6 mm of rain was recorded during the winter season. Cumulatively maximum monthly rain was registered during August which was 395.6 mm. The highest monthly maximum air temperature was observed in May (41.4 °C), whereas the lowest minimum of 8.4 °C was recorded during January.

Rudrur: The station's yearly precipitation was 1435.9 mm, deviating from +31.0 % with respect to the normal. Of the total yearly rainfall 92.8 %, corresponding to 1332.9 mm, is due to the SW Monsoon. The precipitation amounts during the Post-Monsoon, Winter, and Pre-Monsoon are 50.6 mm, 45.9 mm, and 6.5 mm, respectively. July saw the highest monthly rainfall of 515.7 mm. Regarding the air temperature, the highest daily temperature was recorded in May which was 43.7 °C, while in December it was 28.0 °C. In terms of the daily lowest, variations of 27.0 °C to 14.9 °C were contemplated in May and January, respectively.

Sabour: Sabour experienced 1190.2 mm of annual precipitation over the recorded period, deviating by a minor negative of -0.2 % from the normal. About 71.7 %, of the total precipitation, was imparted by the SW Monsoon, with the remaining amounts being contributed from the Post-Monsoon, Winter, and Pre-Monsoon rainfalls, which were 225.6 mm, 40.1 mm,

and 70.6 mm, respectively. With a total of 331.2 mm, July had the largest cumulative monthly rainfall. In reference to the air temperatures, April & January had the greatest daily maximum readings, with numerical values of 36.3 °C and 20.3 °C, respectively. Parallel to this, the daily minimum was between 27.3 °C and 10.8 °C in August & September and January, respectively.

Siruguppa: Concerning the air temperature indices, the daily maximum varied from 49.8 °C and 24.6 °C in April & December, while the daily minimum ranged from 34.1 °C and 18.6 °C in September and January, respectively. In regards to the annual precipitation, 615.7 mm was recorded at the gauging site. The annual rainfall displayed a negative deviation of -2.7 % from the normal trend. Of the total rainfall received, 56.6 % was contributed from the SW Monsoon. The apportionments from Post-Monsoon and Pre-Monsoon rainfalls were 204.9 mm and 62.5 mm, respectively. Winters did not receive any rainfall during the observation period/ Maximum monthly rainfall of 163 mm was recorded during the month of July.

Thanjavur: An annual precipitation of 1518.3 mm was observed at Thanjavur for the reporting period with a positive 43.4 % deviation from the normal. Approximately, 29.5 % of the total precipitation was contributed by the SW Monsoon, while, Post-Monsoon, Winter, and Pre-Monsoon rainfalls accounted for 823.5 mm, 122.9 mm, and 123.9 mm of the rainfall, respectively. November was observed to be the wettest month with a cumulative monthly rainfall of 538 mm. Concerning the air temperature, the daily maximum temperature ranged from 36.6 °C and 29.6 °C in May and November, respectively. Consequently, the daily minimum was in the range of 27.0 °C and 20.3 °C, during the months of June and February.

Umiam: The station received an annual rainfall of 2309.7 mm, with a deviation of -13.9 % from the normal. The SW Monsoon contributed 57.7 % (1333.4 mm) to the total annual rainfall. The Post-Monsoon, Winter, and Pre-Monsoon rainfalls were 283.5 mm, 73.2 mm, and 619.6 mm, respectively. The maximum monthly rainfall was received in May (499.2 mm). In the context of the air temperature, among the months the daily maximum temperature ranged from 28.5 °C and 19.0 °C in September & February, while, the daily minimum was in the range of 20.5 °C and 7.1 °C in July and February, respectively.

Varanasi: In reference to the air temperature at the Varanasi station, the daily maximum ranged from 40.9 °C and 20.3 °C in April and January, respectively. On the contrary, the daily minimum is observed in the range of 26.3 °C and 9.0 °C in July and January, respectively. Concerning the precipitation, a cumulative annual of 1991.0 mm was recorded. This deviated by a large positive of 99.7 % from the normal trend for the region. 90.2 % of the same was contributed by the SW monsoon. The beneficence from the Post-Monsoon and Pre-Monsoon rainfalls were relatively low, which are 129.3 mm and 5.8 mm, respectively. The winter season contributed to only 60.6 mm of rain during the gauging period. Month-wise most of the precipitation was concentrated during the month of June with a cumulative value of 671.3 mm.

5. STAFF POSITION

Out of 327 total staff sanctioned for different centres,241 staff were actually in position as on 31st March 2022,suggesting that 26.3 percent total post were vacant.(Table 5 and Appendix-III)

Table 5: Staff position under AICRP-IFS (University –wise) as on 31.3.2022

S.N.	Name of the University	Scientific		Technical	
		Sanctioned	Filled	Sanctioned	Filled
1	ANGRAU,Guntur	2	2	6	5
2	PJTSAU, Hyderabad	6	6	7	6
3	AAU, Jorhat	5	5	6	6
4	BAU , Sabour	5	4	6	0
5	BAU, Ranchi	4	4	6	5
6	IGKV, Raipur	4	4	6	1
7	CSKHPKVV, Palampur	4	4	6	6
8	CSAUA & T, Kanpur	4	2	6	5
9	NDUA & T, Ayodhya	4	1	6	2
10	BHU, Varanasi	1	1	1	0
11	GBPUA&T,Pantnagar	5	4	6	5
12	PAU, Ludhiana	4	4	6	2
13	CCSHAU, Hisar	5	3	6	4
14	SKNAU, Jobner	4	4	6	2
15	SDAU, S.K. Nagar	5	5	6	4
16	NAU, Navsari	1	1	1	1
17	JAU, Junagarh	1	1	1	1
18	AAU, Anand	1	1	5	5
19	JNKVV, Jabalpur	7	6	13	3
20	RVSKVV, Gwalior	1	1	1	1
21	BCKVV, Kalyani	5	4	6	4
22	OUAT, Bhubaneswar	7	6	12	3
23	PDKV, Akola	4	3	6	3
24	MAU, Parbhani	4	3	6	4

S.N.	Name of the University	Scientific		Technical	
		Sanctioned	Filled	Sanctioned	Filled
25	MPKU, Rahuri	5	5	6	4
26	KKV, Dapoli	4	4	6	6
27	UAS, Raichur	3	3	1	1
28	UAS, Dharwad	1	1	5	5
29	UAS, Banglore	2	2	5	5
30	UAHS, Shimoga	3	3	1	1
31	TNAU, Coimbtore	7	6	12	12
32	SKUAST, Jammu	4	4	6	5
33	KAU, Thrissur	5	5	6	3
34	MPUAT, Udaipur	2	2	5	5
35	AU, Kota	1	1	1	1
36	ICAR-IIFSR, Modipuram	1	0	5	0
	Total	131	115	196	126

6. BUDGET

Revised Estimate 2022-23 of AICRP on Integrated Farming Systems (ICAR share Rs. in Lakhs)

Sl. No.	Name of University/ Institute		A. Non-STC (Other than TSP/ SCSP/NEH)												B. STC (TSP)								
		Grant-in-Aid 'Salaries'	Grant-in-Aid 'General'				Grant-in -Aid 'Capital'#							Total (Other than STC (TSP)/ SCSP/NEH)	Grant-in-Aid 'General'			Grant-in -Aid 'Capital'#					Total STC (TSP)
			Domestic T.A.	Operational Charges	Research Expenses	Sub Total	Equipments (1)	Works (2)	Information Technology (3)	Livestock (4)	Furniture & Fixture (5)	Vehicle (6)	Sub Total		Operational Charges	Research Expenses	Sub Total	Equipment (7)	Livestock (8)	Works (9)	Information Technology (10)	Sub Total	
1	ANGRAU, Guntur	113.30	0.73	4.67	1.38	6.78	2.00	1.50	0.00	0.00	0.00	0.00	3.50	123.58	9.00	6.00	15.00	1.50	1.50	0.00	0.00	3.00	18.00
2	PJTSAU, Hyderabad	131.69	0.88	12.69	3.62	17.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	148.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	HPKVV, Palampur	110.24	0.79	4.12	2.49	7.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	GBPUA&T, Pantnagar	86.45	0.59	6.82	4.03	11.44	2.00	0.00	0.00	0.00	0.00	0.00	2.00	99.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	CSAU&T, Kanpur	94.97	0.65	4.00	2.00	6.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	NDUA&T, Faizabad	64.29	0.78	4.00	2.00	6.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	BHU, Varanasi	0.00	0.28	5.11	2.28	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	BAU, Ranchi	80.36	0.70	7.05	3.00	10.75	2.00	0.00	0.00	0.00	0.00	0.00	2.00	93.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	BAU, Sabour	91.86	1.00	3.84	3.85	8.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	BCKVV, Kalyani	97.01	0.51	4.78	4.00	9.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	106.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	AAU, Jorhat	99.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	PAU, Ludhiana	88.94	0.50	8.69	7.35	16.54	2.00	0.00	0.00	0.00	0.00	0.00	2.00	107.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	HAU, Hisar	114.22	1.00	6.30	3.00	10.30	2.00	0.00	0.00	0.00	0.00	0.00	2.00	126.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	SKNAU, Jobner	56.40	0.61	5.19	3.00	8.80	2.00	4.00	0.00	0.00	0.00	0.00	6.00	71.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	SDAU, S.K. Nagar	60.07	0.36	6.18	2.02	8.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	NAU, Navsari	23.97	0.08	4.67	1.24	5.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	JAU, Junagadh	26.67	0.10	3.79	1.24	5.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	AAU, Anand	23.69	0.35	0.36	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.40	9.00	6.00	15.00	1.50	1.50	0.00	0.00	3.00	18.00
19	JNKVV,Jabalpur	136.40	0.81	9.59	5.23	15.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	152.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	RVSKVV, Gwalior	40.04	0.09	3.79	1.24	5.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	IGKV, Raipur	100.35	0.96	6.99	2.48	10.43	0.00	6.00	0.00	1.00	0.50	0.00	7.50	118.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	OUAT, Bhubaneswar	110.92	0.50	7.27	3.00	10.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.69	3.00	2.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00
23	PDKV, Akola	48.49	0.30	4.19	2.78	7.27	2.00	0.00	0.00	0.00	0.00	0.00	2.00	57.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	MAU, Parbhani	52.54	0.36	3.99	3.03	7.38	2.00	0.00	0.00	0.00	0.00	0.00	2.00	61.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	MPKV, Rahuri	71.01	0.09	5.17	2.18	7.44	2.00	0.00	0.00	0.00	0.00	0.00	2.00	80.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	KKV, Dapoli	76.89	0.31	4.29	2.78	7.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.27	9.00	6.00	15.00	1.50	1.37	0.00	0.00	2.87	17.87
27	UAS, Raichur	80.04	0.33	1.74	4.58	6.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	UAS, Dharwad	46.56	0.80	1.08	4.75	6.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	UAS, Bangalore	47.42	0.36	0.75	0.75	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	UAHS, Shimoga	49.68	0.21	3.84	3.08	7.13	2.00	0.00	0.00	0.00	0.00	0.00	2.00	58.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	TNAU, Coimbatore	185.62	2.81	13.16	5.84	21.81	2.00	0.00	0.00	0.00	0.00	0.00	2.00	209.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	SKUAST, Jammu	119.15	0.54	7.99	3.80	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	131.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	KAU, Thrissur	129.89	1.43	9.79	3.89	15.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	145.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	MPUAT, Udaipur	44.83	0.31	2.58	3.16	6.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	AU, Kota (*)	33.22	0.09	4.00	2.79	6.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	ICAR-IIFSR, Modipuram	0.00	1.82	17.84	1.45	21.11	2.58	0.00	0.00	0.00	0.00	0.00	2.58	23.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	P.C.Unit,IIFSR, Modipuram	0.00	2.72	11.16	0.00	13.88	0.31	0.00	0.00	0.00	2.49	0.00	2.80	16.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	ICAR Res. Comp., Patna	0.00	0.59	5.82	2.53	8.94	1.00	0.00	0.00	0.00	0.00	0.00	1.00	9.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	ICAR Res. Comp., Umiam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	ICAR -CCARI, Old Goa	0.00	0.44	5.24	2.50	8.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	ICAR-CIARI- Port Blair	0.00	0.00	4.34	3.27	7.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	ICAR-IASRI, New Delhi	0.00	0.39	3.12	0.00	3.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	2737.1178	26.17	229.99	111.61	367.77	25.89	11.50	0.00	1.00	2.99	0.00	41.38	3146.27	30.00	20.00	50.00	4.50	4.37	0.00	0.00	8.87	58.87
	RBS Agra	2.88220												2.88220									
	Total	2740.00000												3149.15000									

Revised Estimate 2022-23 of AICRP on Integrated Farming Systems (ICAR share Rs. in Lakhs)

Sl. No.	Name of University/ Institute	C. SCSP									D. NEH												GRAND TOTAL (A+B+ C+D)
		Grant-in-Aid 'General'			Grant-in -Aid 'Capital'#					Total (SCSP)	Grant-in-Aid 'Salaries'	Grant-in-Aid General				Grant-in-Aid 'Capital'#						Total NEH	
		Research Expenses	Operatonal Charges	Sub Total	Equipment (11)	Livestock (12)	Works (13)	Information Technology (14)	Sub Total			Domestic T.A.	Operational Charges	Research Expenses	Sub Total	Equipments (15)	Works (16)	Livestock (17)	Furniture& Fixtures (18)	Information Technology (19)	Sub Total		
1	ANGRAU, Guntur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	123.58
2	PJTSAU, Hyderabad	2.19	3.45	5.64	4.48	1.00	0.00	0.00	5.48	11.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	160.00
3	HPKVV, Palampur	0.82	0.82	1.64	0.00	0.00	0.00	0.00	0.00	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119.28
4	GBPUA&T, Pantnagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99.89
5	CSAU&T, Kanpur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101.62
6	NDUA&T, Faizabad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.07
7	BHU, Varanasi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67
8	BAU, Ranchi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.11
9	BAU, Sabour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.55
10	BCKVV, Kalyani	2.00	3.95	5.95	1.48	1.00	0.00	0.00	2.48	8.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	114.73
11	AAU, Jorhat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	6.47	3.08	10.47	4.00	0.00	0.00	0.00	0.00	4.00	14.47	114.41
12	PAU, Ludhiana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	107.48
13	HAU, Hisar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	126.52
14	SKNAU, Jobner	2.39	3.70	6.09	0.00	0.00	0.00	0.00	0.00	6.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.29
15	SDAU, S.K. Nagar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.63
16	NAU, Navsari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.96
17	JAU, Junagadh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.80
18	AAU, Anand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.40
19	JNKVV,Jabalpur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	152.03
20	RVSKVV, Gwalior	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.16
21	IGKV, Raipur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	118.28
22	OUAT, Bhubaneswar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.69
23	PDKV, Akola	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.76
24	MAU, Parbhani	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.92
25	MPKV, Rahuri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.45
26	KKV, Dapoli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.27
27	UAS, Raichur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.69
28	UAS, Dharwad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.19
29	UAS, Bangalore	4.27	7.41	11.68	2.50	1.00	0.00	0.00	3.50	15.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.46
30	UAHS, Shimoga	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.81
31	TNAU, Coimbatore	3.64	3.95	7.59	1.00	0.60	0.00	0.00	1.60	9.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	218.62
32	SKUAST, Jammu	1.82	4.14	5.96	0.00	0.00	0.00	0.00	0.00	5.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137.44
33	KAU, Thrissur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	145.00
34	MPUAT, Udaipur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.88
35	AU, Kota (*)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.10
37	ICAR-IIFSR, Modipuram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.69
38	P.C.Unit,IIFSR, Modipuram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.68
39	ICAR Res. Comp., Patna	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.94
40	ICAR Res. Comp., Umiam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.17	4.10	11.27	28.00	0.00	0.00	0.00	0.00	28.00	39.27	39.27
41	ICAR -CCARI, Old Goa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.18
42	ICAR-CIARI- Port Blair	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.61
43	ICAR-IASRI, New Delhi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51
	Total	17.13	27.42	44.55	9.46	3.60	0.00	0.00	13.06	57.61	0.00	0.92	13.64	7.18	21.74	32.00	0.00	0.00	0.00	0.00	32.00	53.74	3257.62
	RBS Agra																						2.8822
	Total																						3260.50000

7. RESEARCH RESULT

7 INTEGRATED FARMING SYSTEMS

7.1 Sustainable resource management for climate smart IFS

Under All Indian Coordinated Research Project (AICRP) on Integrated Farming Systems (IFS) on station experimentation Sustainable resource management for climate smart IFS were implemented starting from 2017-18 with revised objectives, across different agro-climatic zones, and continued through reporting period of 2022-23 which are as follows:

- To identify ecologically and economically viable enterprises for different regions under climate change scenario.
- To undertake resource budgeting in systems perspective with special reference to soil, water, nutrients and energy.
- To evaluate the low carbon production modules in the system.
- To identify and evaluate secondary agriculture avenues in farming systems perspective for attracting rural youth.

Location of IFS models in different agro-climatic zones

Agro-climatic region	Locations (State)	Number of IFS models
Western Himalaya	Chatha (J&K), Palampur (HP). Pantnagar (UK)	3
Eastern Himalaya	Umiam (Meghalaya), Jorhat (Assam)	2
Trans Gangetic Plains	Hisar (Haryana), Ludhiana (Punjab)	2
Upper Gangetic Plains	Modipuram (UP), Kanpur (UP)	2
Middle Gangetic Plains	Varanasi (UP), Ayodhya (UP), Patna (Bihar), Sabour (Bihar)	5
Lower Gangetic Plains	Kalyani (WB)	1
Eastern Plateau and Hills	Raipur (Chhattisgarh), Ranchi (Jharkhand), Chipilima (Odisha)	3
Central Plateau and Hills	Jabalpur (MP), Rewa (MP), Durgapura (Rajasthan), Kota (Rajasthan)	4
Western Plateau and Hills	Akola (MS), Parbhani (Maharashtra), Rahuri (Maharashtra)	3
Southern Plateau and Hills	Rajenderanagar (Telangana), Coimbatore (TN), Kathalgere (Karnataka), Siriguppa (Karnataka), Maruteru (AP), Rudrur (AP)	6
East Coast Plains and Hills	Thanjavur (TN), Bhubaneswar (Odisha)	2
West Coast Plains and Hills	Goa, Karjat (Maharashtra). Karamana (Kerala)	7
Gujarat Plains and Hills	SK Nagar (Gujarat), Junagarh (Gujarat)	2
Islands	Portblair (A&N)	1
Total		43

1. WESTERN HIMALAYAN REGION (WHR)

In this Agro Climatic Region three on-station Integrated Farming Systems (IFS) models namely Jammu (J&K), Palampur (Himachal Pradesh) and Pantnagar (Uttarakhand) with objectives of climate smart IFS initiated during 2017-18. The results obtained from these IFS models during the reporting period of 2022-23 revealed that mean gross income of Rs. 682832 while the mean net return with family labour employed was found to be Rs.469319. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 409788 from IFS models with mean area of 1.0 ha. Details of IFS model components and cost is presented in Table 7.1.1. which indicated mean total cost for the IFS models was Rs. 395565 while it varied from Rs 307665 at Pantnagar to Rs 570299 at Jammu.

Table 7.1.1 Details of IFS model along with total cost per model in WHR

Location	IFS model	Area (ha)	Total cost (Rs)
Jammu	Cropping Systems +Fodder+ Horticulture + Livestock (3 nos)+ Vermi-compost+ Biogas+ Fish cum poultry (0.1 ha) + Mushroom + Boundary plantation	1.0	570299
Palampur	Cropping system (0.65 ha) + Horticulture (0.175 ha) + Fodder (0.1 ha) + Dairy (2 nos) +Poultry (200 in two batches) Vermi-compost + Boundary Plantations + Kitchen Gardening+ Mushroom	1.0	308733
Pantnagar	Crops (0.47 ha) + Dairy (I Sahiwal + 1 HF) + Horticulture (0.22 ha) + Agroforestry as boundary plantation+ Fisheries (0.06 ha) + Biogas	1.0	307665
Mean		1.0	395565

View of IFS model (1.0 ha) at Jammu

The models could generate mean employment generation of 392 mandays through different modules while the IFS models were also found to be carbon negative in terms of GHG emission at -8066.60 CO2 equivalent. Further, study of different fractions of cost revealed about 31% share of recycled inputs in total cost of the IFS whereas cost of outside purchase

was to the tune of 40% of the cost. The cost incurred towards hired labour was 14%. These models revealed mean REY of 33.47 tonnes besides soil health improvement to the tune of 33.2 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 2.11.

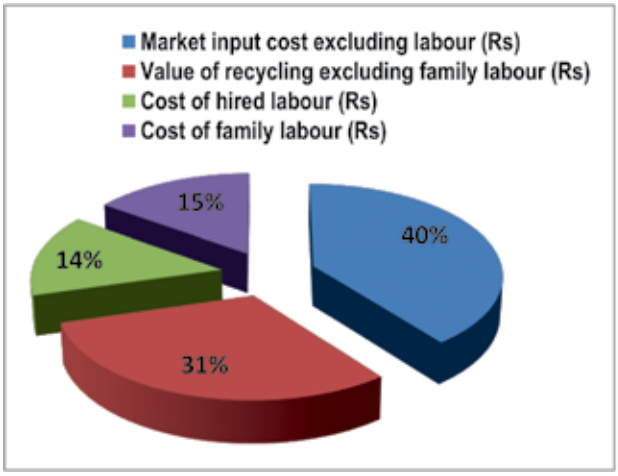


Fig 1. Different fraction of total cost in IFS models of WHR

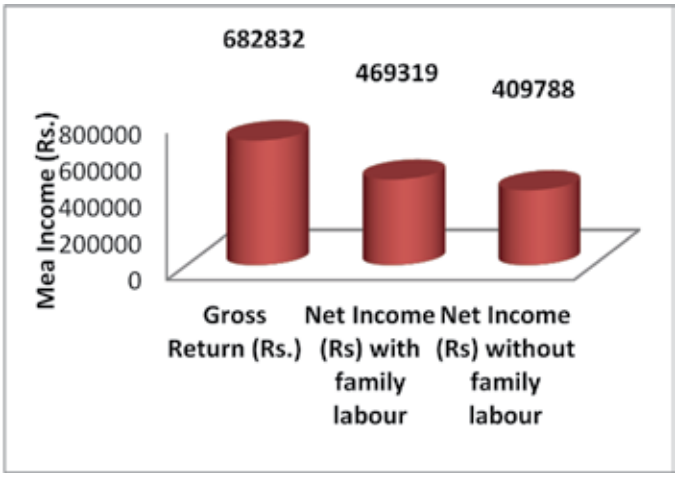


Fig 2. Economics of IFS models of WHR

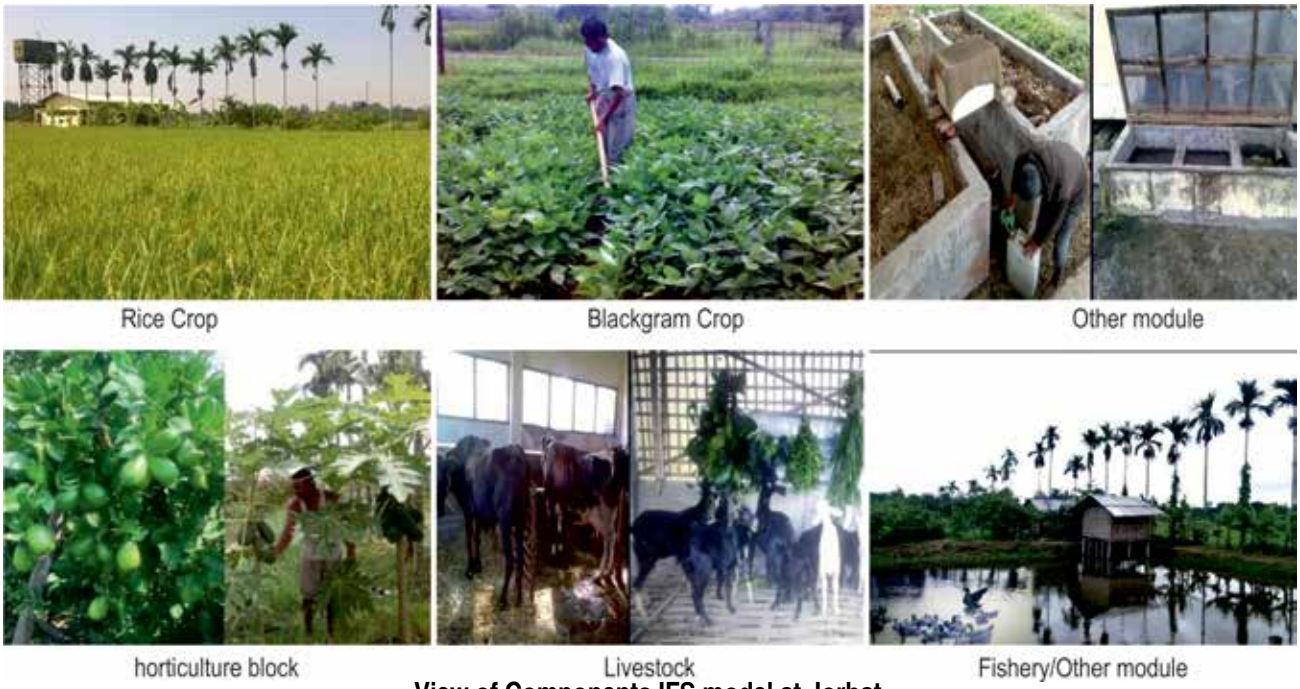
2. EASTERN HIMALAYAN REGION (EHR)

In this Agro Climatic Region two AICRP-IFS centers Umiam (Meghalaya) and Jorhat (Assam) are located and climate smart IFS model studies initiated during 2017-18. The results obtained from these IFS models during the reporting period of 2022-23 revealed that mean gross income of Rs. 572172 while the mean net return excluding family labour cost was found to be Rs.482422. However, when family labour was accounted for in the cost, the mean net return was found to be Rs.373543. Details of IFS model components and cost is presented in Table 7.1.2 which indicated mean total cost for the IFS models was Rs. 246649 while it varied from Rs 178858 at Umiam to Rs 314440 at Jorhat for 1.0 ha IFS models.

Table 7.1.2 Details of IFS model along with total cost per model in EHR

Location	IFS model	Area (ha)	Total cost (Rs)
Jorhat	Crops (0.43 ha)+ Dairy (3 jersy) + Horticulture (0.17 ha)+ Fishery (0.092 ha)+ Poultry (5 batches of 25)+ Duckery (55 Layers) + Goatery (7 M+10 F) + Apiary (5 boxes) + Vermi-compost + Biogas + Liquid Manure + FYM production	1.0	314440
Umiam	Cropping systems (0.70 ha)+ Livestock (pig 3 nos) + Poultry (broiler + layers) + Horticulture + Fishery (0.05 ha)	1.0	178858
Mean		1.0	246649

The models could generate mean employment generation of 440.5 mandays through different modules. Further, study of different fractions of cost revealed about 19% share of recycled inputs in total cost of the IFS which could be further enhanced whereas cost of outside purchase was to the tune of 30% of the cost. The cost incurred towards hired labour was 7%. These models revealed mean REY of 28.05 tonnes besides soil health improvement to the tune of 43 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 3.62. The mean sustainable value index (SVI) for these models was found to be 0.8.



View of Components IFS model at Jorhat

View of Components IFS model at Umiam

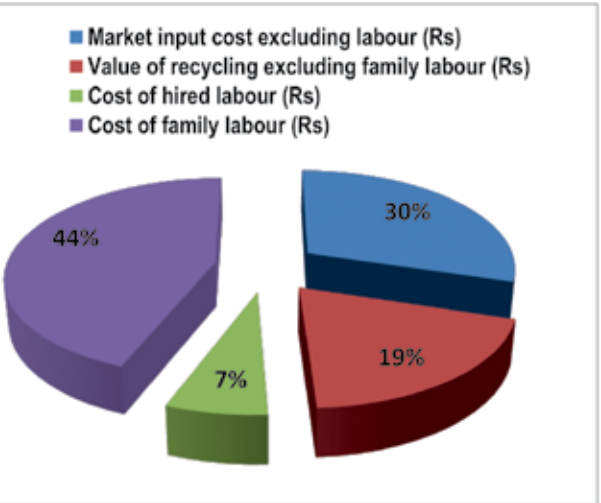


Fig 3. Different fraction of total cost in IFS models of EHR

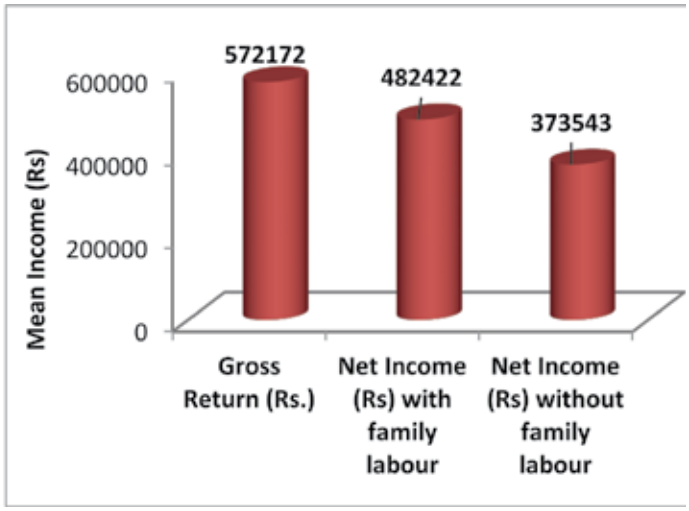


Fig 4. Economics of IFS models of HER

3. TRANS GANGETIC PLAINS REGION (TGP)

Trans Gangetic Plains Region is represented by the states of Punjab and Haryana. Under AICRP-IFS, two independent centers one at PAU, Ludhiana (Punjab) and another one in CCHAU, Hisar are given the responsibility of development of "Climate smart IFS models" at respective centers. The results obtained from these IFS models during the reporting period of 2022-23 revealed that mean gross income of Rs. 750600 while the mean net return excluding family labour cost was found to be Rs.443231. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 428148. Details of IFS model components and cost is presented in Table 7.1.3. which indicated mean total cost for the IFS models was Rs. 418192 while it varied from Rs 171695 at Hisar to Rs 664689 at Ludhiana for 1.0 ha IFS models.

Table 7.1.3 Details of IFS model along with total cost per model in TGP

Location	IFS model	Area (ha)	Total cost (Rs)
Hisar	Cropping systems (0.81 ha) + Horticulture (0.15 ha) + Dairy (1Buffalo +1Cow) + +Vermicompost+ Boundary Plantations (Bael + karonda) + Mushroom+ Biogas	1.0	171695
Ludhiana	Cropping systems (0.64 ha) +Dairy (2 C+ 1 B) + Goatery (9 +1) + Horticulture (0.19 ha)+ Fishery (0.1 ha) + Agroforestry (Poplar with Turmeric – wheat) + Kitchen Gardening	1.0	664689
Mean		1.0	418192

View of IFS model at Hisar

View of IFS model at Ludhiana

The models could generate mean employment generation of 351 mandays through different modules while the IFS models were found to be carbon negative in terms of GHG emission at -3326.35 CO_2 equivalent. Further, study of different fractions of cost revealed about 23% share of recycled inputs in total cost of the IFS which could be further enhanced whereas cost of outside purchase was to the tune of 63% of the cost. The cost incurred towards hired labour was 10%. These models revealed mean REY of 36.79 tonnes besides net returns per rupee invested being 1.42. The mean sustainable value index (SVI) for these models was found to be 0.5.

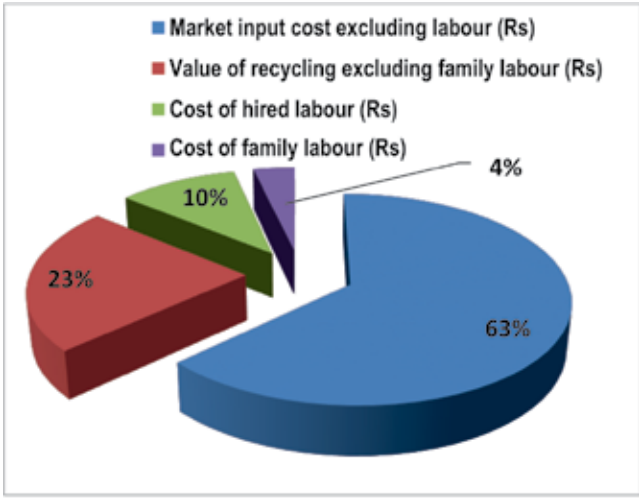


Fig 5. Different fraction of total cost in IFS models of TGP

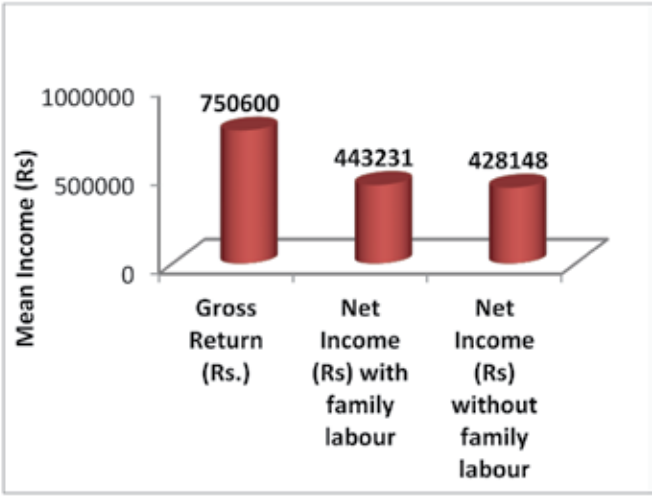


Fig 6. Economics of IFS models of TGP

4. UPPER GANGETIC PLAINS REGION (UGP)

In this Agro Climatic Region two AICRP-IFS centers namely ICAR-IIFSR, Modipuram, Meerut a voluntary ICAR institute and ii) CSAUA&T, Kanpur, both in Uttar Pradesh are working on the aspect of "Development of Climate smart IFS Models". The IFS model at IIFSR, Modipuram was spread over 0.72 ha while the IFS model at Kanpur was having 1.0 ha area. The findings of IFS models from these centres during the reporting period of 2022-23 revealed that mean gross income of Rs. 402570 while the mean net return excluding family labour cost was found to be Rs.219133 However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 182350. Details of IFS model components and cost is presented in Table 7.1.4. which indicated mean total cost for the IFS models was Rs. 336528 while it varied from Rs. 214146 at Modipuram for 0.72 ha model to Rs 458911 at Kanpur for 1.0 ha IFS model.

Table 7.1.4 Details of IFS model along with total cost per model in UGP

Location	IFS model	Area (ha)	Total cost (Rs)
Kanpur	Cropping systems (0.72 ha) + Dairy (2 Cows + heifer) + Horticulture (0.192 ha)+Vermicomposting + Boundary Plantations	1.0	458911
Modipuram	Cropping systems (0.38 ha) + multilayer farming (0.18 ha)+agri-horti system (0.12 ha)+ Dairy (1B+1C) + Boundary Plantations +farmpond (0.02ha)+ value addition	0.72	214146
Mean		0.86	336528

View of IFS model components at Kanpur

Components IFS model at Modipuram

The models could generate mean employment generation of 656 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -38284.30 CO2 equivalent. Further, study of different fractions of cost revealed about 37% share of recycled inputs excluding family labour in total cost of the IFS which could be further enhanced whereas cost of outside purchase was to the tune of 23% of the cost excluding labour. These models revealed mean REY of 19.73 tonnes besides soil health improvement to the tune of 15 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.25.

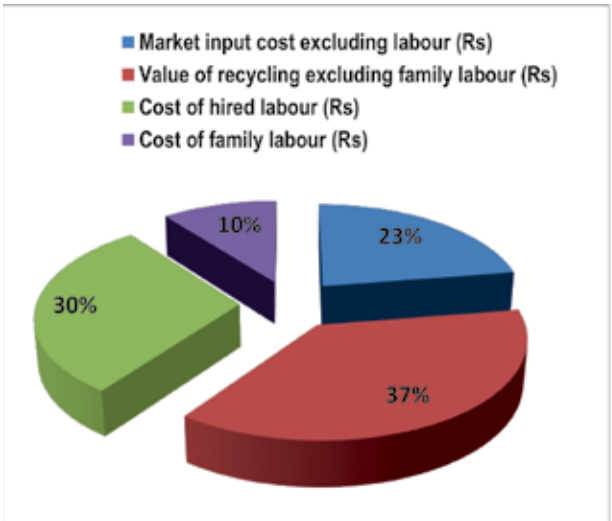


Fig 7. Different fraction of total cost in IFS models of UGP

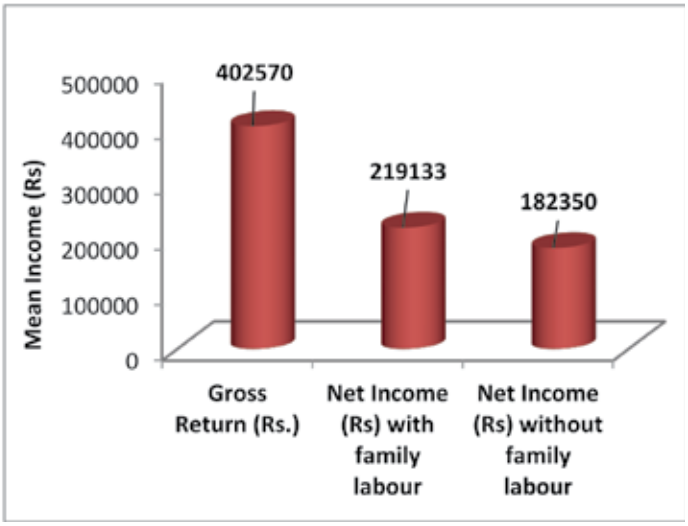


Fig 8. Economics of IFS models of UGP

5. MIDDLE GANGETIC PLAINS REGION (MGP)

Four AICRP –IFS Centers, two in eastern part of Uttar Pradesh namely i) IAS,BHU, Varanasi and NDUA&T, Kumarganj –Ayodhya and two in Bihar i) ICAR Research Complex for eastern region, Patna., and BAU, Sabour-Bhagalpur (Bihar)

Table 7.1.5 Details of IFS model along with total cost per model in MGP

Location	IFS model	Area (ha)	Total cost (Rs)
Ayodhya	Cropping systems (0.7 ha) + Dairy (3 buffalo with heifer) + Horticulture (0.2 ha) + Fishery (0.1 ha) with 15 ducks + Vermi-compost + boundary plantation	1.01	359735
Patna	Cropping systems (0.27 ha)+ Horticulture (0.09 ha) + Goatery (20+1)+ Poultry (7 batches of 100 birds)+ Mushroom, vermicomposting and boundary plantation	0.4	104675
Patna	Cropping systems (0.55 ha) + Dairy (2cow + 1 Buffalo)+ Horticulture (0.1 ha) +Fish cum duckery (0.12 ha) with 40 ducks+ Biogas, vermi-compost and boundary plantation	0.8	188560
Sabour	Cropping systems (0.78 ha) + Dairy (2 HF)+ Goatery (black Bengal 10 nos) +Fish cum duckery (20 nos)+ fruits (0.14 ha)+ vermi-compost+ boundary plantation	1.0	426708
Varanasi	Cropping systems (0.8 ha) + Dairy (4 cow+ 3 calves) + Horticulture (0.06ha) + Poultry (6 batches of 200 birds) + Fishery (0.1 ha) + Boundary plantation, mushroom and vermicompsoting	1.0	604635
Mean		0.84	336862

are given responsibilities of developing climate smart IFS Models with revised objectives for respective states since 2017-18. Significance of IFS approach towards production, profitability and livelihood of small land holders in the regions as reflected form the results of study during 2022-23. Details of different components of IFS are presented in Table 7.1.5. The results revealed mean gross income of Rs. 552693 while the mean net return excluding family labour cost was found to be Rs.322347. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 287234. Details of IFS model cost components presented in Table 7.1.5 indicated mean total cost for the IFS models to be Rs. 336862 while it varied from Rs 104675 at Patna (0.4 ha model) to Rs 604635 at Varanasi for 1.0 ha IFS model.

View of components IFS model at Ayodhya

View of 0.8 ha IFS model at Patna

The models could generate mean employment generation of 381 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -2455.6 CO2 equivalent. Further, study of different fractions of cost revealed about 21% share of recycled inputs excluding family labour in total cost of the IFS whereas cost of outside purchase excluding labour was 34%. The cost incurred towards hired labour was 35% while cost of family labour was 10 % of the cost. These models revealed mean REY of 27.09 tonnes besides soil health improvement to the tune of 9.2 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 1.24 with mean SVI of 0.8.

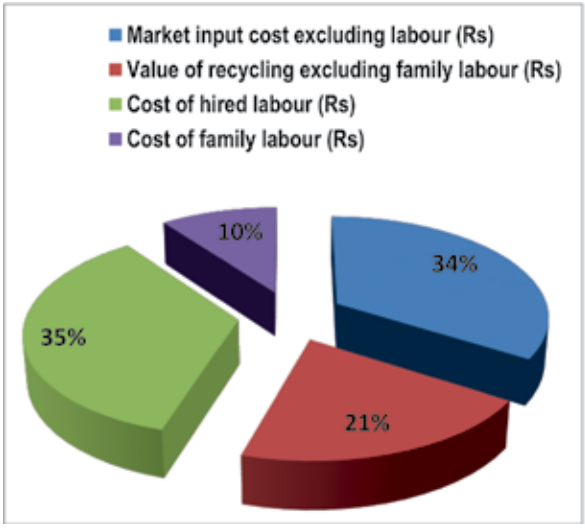


Fig 9. Different fraction of total cost in IFS models of MGP

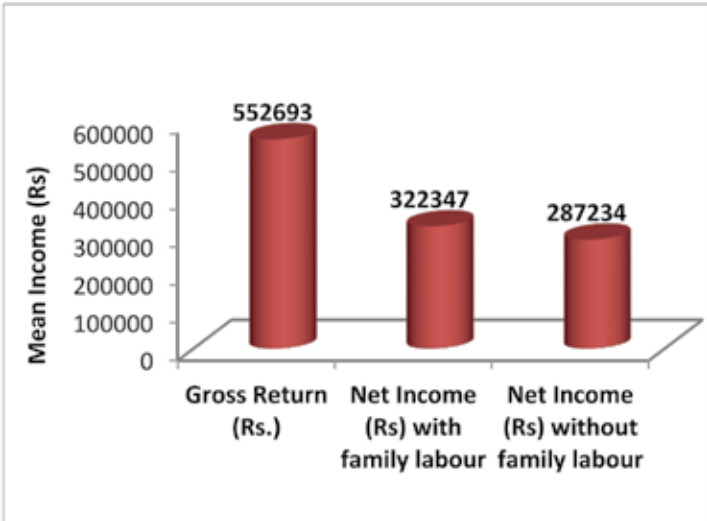


Fig 10. Economics of IFS models of MGP

6. LOWER GANGETIC PLAINS REGION (LGP)

To demonstrate the benefits of diversified climate smart farming a climate smart IFS Model was initiated in 2017-18 in order cater to the needs of six-member farm family so as to sustain their livelihood under irrigated ecosystem of New Alluvial zone of West Bengal. In order to meet the requirements of the farm families and livestock, the IFS Model has been developed for 0.66 ha land holding to support a family of small and marginal farmer having six family members. The model encompasses components 0.2 ha converted into five pairs of raised and sunken beds alternately, each bed measuring 200 m2 for paddy cum fish cultivation in the sunken beds and for cultivation of vegetables and arable field crops in the raised beds. Slope in the junction of raised and sunken beds has been utilized for fodder cultivation (hybrid napier). Some vegetable creepers (dolichos bean, bottle gourd etc.) are also grown above the sunken beds on netted scaffolds. The results of study during 2022-23 revealed gross income of only Rs. 231661 while the mean net return excluding family labour cost was found to be Rs.182291. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 134091. Details of IFS model cost components presented in Table 7.1.6 indicated total cost for the IFS models to be Rs. 133190.

Table 7.1.6 Details of IFS model along with total cost of model in LGP

Location	IFS model	Area (ha)	Total cost (Rs)
Kalyani	Cropping systems (0.18 ha) + Raised and sunken bed ().2 ha)+ Dairy + Horticulture (0.12 ha) + Vermi-compost + Biogas + fishery (0.09 ha)	0.66	133190
Mean		0.66	133190

Components of IFS model at Kalyani

The models could generate employment generation of 329 mandays through different modules while the IFS model was found to be carbon negative in terms of mean GHG emission at -4797.7 CO_2 equivalent. Further, study of different fractions of cost revealed about 27% share of recycled inputs excluding family labour in total cost of the IFS whereas cost of outside purchase excluding labour was 17%. These models revealed mean REY of 11.36 tonnes as compared to benchmark with net returns per rupee invested being 1.99 with mean SVI of 0.80.

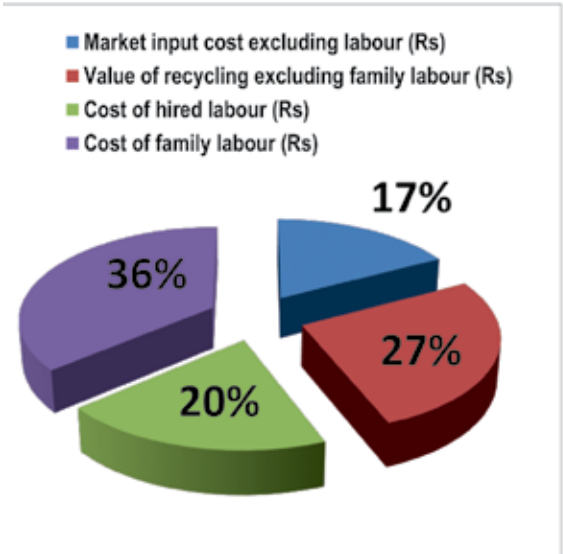


Fig 11. Different fraction of total cost in IFS model of LGP

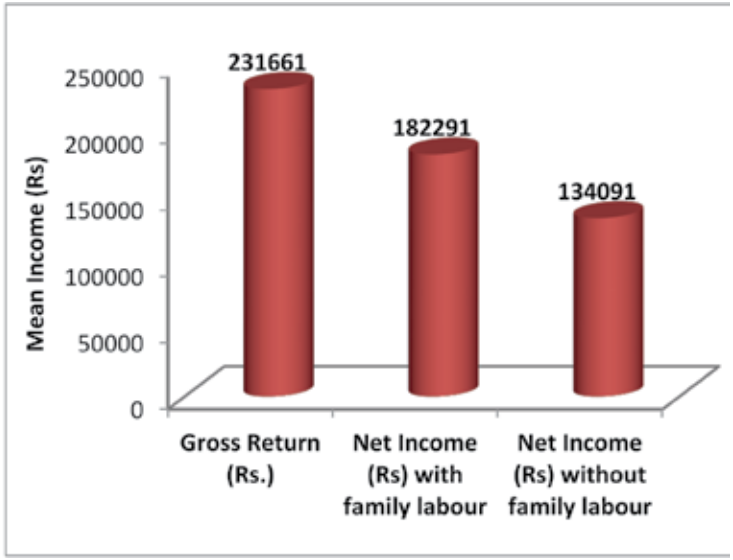


Fig 12. Economics of IFS model of LGP

Table 7.1.7 Details of IFS model along with total cost per model in EPH

Location	IFS model	Area (ha)	Total cost (Rs)
Raipur	Cropping systems (0.63) + Dairy (2 Sahiwal + 1 calf) Vermicompost + Boundary Plantations + Kitchen Gardening (revised technical programme new model) + Goatery proposed	1.0	93499
Ranchi	Cropping systems (0.8 ha) + Dairy (2 HF) + Vermi-compost + Mushroom + Apiary (6 boxes) + Fishery (0.1 ha) + Goatery (4 F+1M since 2022)+ boundary plantation (Drumstick, Papaya)	1.0	257165
Chiplima	Cropping systems (0.1 ha)+ Dairy (Red Sindhi 3 nos) + Horticulture (0.1 ha)+ poultry/duckery (60+30)+ fishery (0.1 ha)+ Composting, boundary plantation	0.4	296089
Mean		0.8	215584

The models could generate mean employment generation of 330 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -12.40 CO_2 equivalent. Further, study of different fractions of cost revealed about 19% share of recycled inputs in total cost of the IFS which could be further enhanced whereas cost of outside purchase was to the tune of 29% of the cost. The cost incurred towards hired labour was 30% while 22% of cost saved due to family labour. These models revealed mean REY of 16.32 tonnes besides soil health improvement to the tune of 6.2 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.64 with mean SVI of 0.60.

Components of IFS model at Ranchi

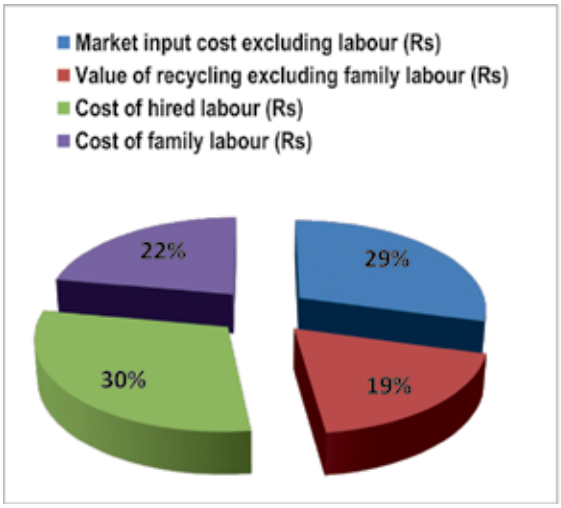


Fig 13. Different fraction of total cost in IFS models of EPH

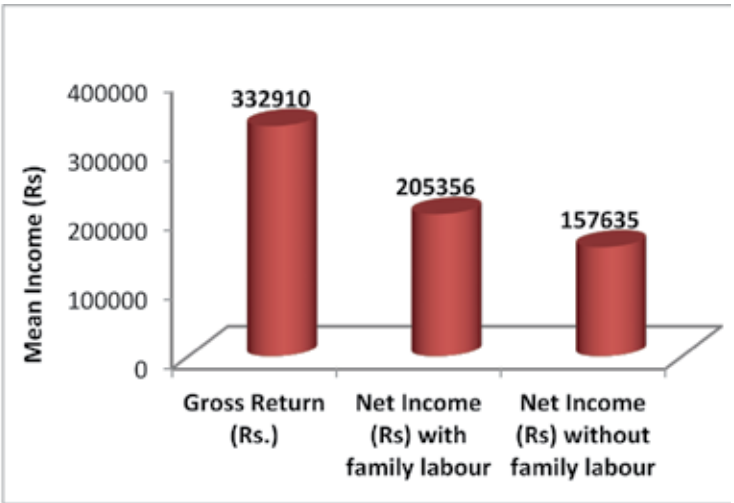


Fig 14. Economics of IFS models of EPH

View of IFS model components at Chipilima, Odisha

8. CENTRAL PLATEAU AND HILLS (CPH)

AICRP-IFS Centre Jabalpur (MP), Durgapura (Rajasthan), Rewa (MP) and Kota (Rajasthan) falls under Central Plateau and hills region of the country. The average family size of the region is 5 members (3 male + 2 female) with the holding size of 0.70 ha for marginal and 1.20 ha for the small farmers. IFS model of 1.0 ha was initiated at Jabalpur for climate smart farming systems study during 2017. In the IFS model cropping component covers 0.64 ha, dairy component covers 0.007 ha with 3 cow + 1 calf, fisheries component 0.06 ha, poultry component and mandatory other enterprises like kitchen garden, boundary plantation etc. The IFS model at Durgapura consisted of crops, diary, horticulture, goatary, poultry as well as other complementary and supplementary modules in 1.45 ha area. The results of study during 2022-23 revealed gross income of Rs. 503127 while the return excluding family labour cost was found to be Rs.309025. However, when family labour was accounted for in the cost, the net return was found to be Rs 253094. Details of IFS model cost components presented in Table 7.1.8 indicated mean total cost for the IFS models to be Rs. 310600.

Table 7.1.8 Details of IFS model along with total cost per model in CPH

Location	IFS model	Area (ha)	Total cost (Rs)
Jabalpur	Cropping systems (0.64 ha) + Dairy (3 Cow+ 1 calf)+ Poultry (10 nos) + Fishery (0.06 ha)+ Horticulture (0.18 ha)	1.0	181164
Durgapura	Cropping systems (1.0 ha)+ Dairy (2 Gir cow)+ Horticulture (0.12 ha) + Goatery (5+1 Sirohi)+ Poultry (RIR 100 birds)+ Vermicomposting, Azolla, boundary plantation	1.45	468985
Rewa	Cropping systems (0.36 ha)+Dairy (2 Cross bred cow)+Boundary plantation +Compost	0.4	249390
Kota Crops +Dairy+Horticulture+ Compost +Boundary plantation +Azolla unit		1.0	342864
Mean		0.96	310600

View of IFS model at Kota, Rajasthan

The models could generate employment generation of 501 mandays through different modules while the IFS model was found to be carbon emissive in terms of mean GHG emission at -5421.4 CO_2 equivalent. Further, study of different fractions of cost revealed about 20% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was 29%.

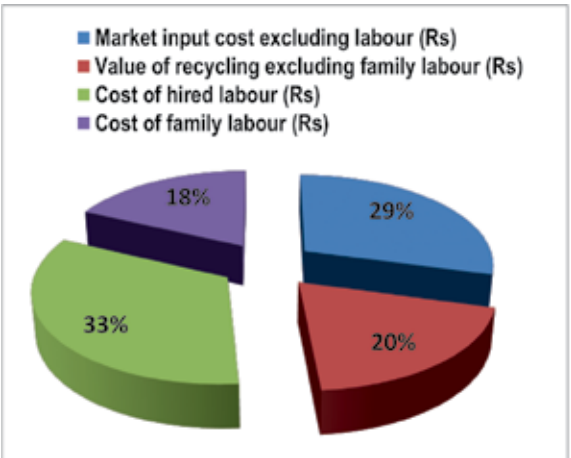


Fig 15. Different fraction of total cost

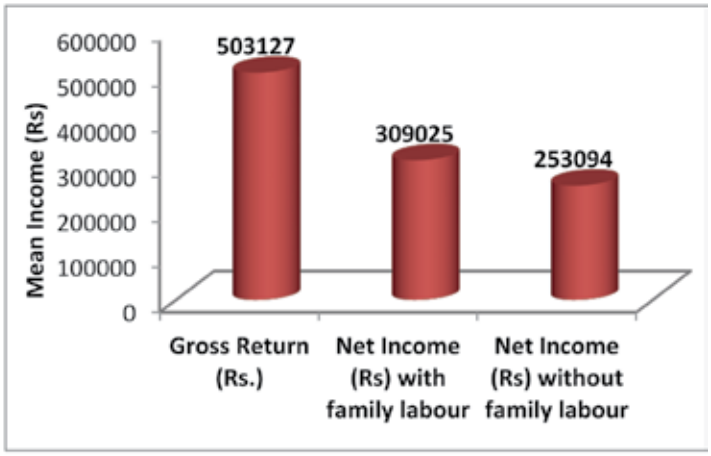


Fig 16. Economics of IFS models of CPH

The cost incurred towards hired labour was to the tune of 33%. These models revealed mean REY of 24.66 tonnes besides soil health improvement of 18 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.68.

9. WESTERN PLATEAU AND HILLS (WPH)

AICRP-IFS programme running in three representative districts of Western Plateau and Hill Region include i) AICRP-IFS Centre- Parbhani, ii) AICRP-IFS Centre – Akola and iii) AICRP-IFS center at Rahuri. Climate smart IFS models are being developed at all the three respective centers. The results of study during 2022-23 at 3 centres along with components of IFS are presented in Table 7.1.9. which revealed mean gross income of Rs. 696648 while the mean net return excluding family labour cost was found to be Rs.483037. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 441973. Details of IFS model cost components presented in Table 7.1.9 indicated mean total cost for the IFS models to be Rs. 336819 while it varied from Rs 281562 at Parbhani model to Rs 416816 at Rahuri for 1.0 ha IFS model.

Components of IFS model at Rahuri, Maharshtra

Table 7.1.9 Details of IFS model along with total cost per model in WPH

Location	IFS model	Area (ha)	Total cost (Rs)
Akola	Cropping systems (0.70 ha) + Fruit & Vegetables (0.25 ha) + Goat (Berari 20 nos)+ Cow (1 Gir) + Poultry (Vanraja/ Giriraj 200 nos)+ Compost + Kitchen Garden + Boundary plantations	1.0	312080

Location	IFS model	Area (ha)	Total cost (Rs)
Parbhani	Cropping systems (0.46 ha)+ Fodder (0.15 ha)+ Dairy (2cow)+ Goat (10+1) Horticulture (0.30 ha)+ Vermicompost + Boundary Plantation	1.0	281562
Rahuri	Cropping systems (0.75 ha) + Dairy (2 cow Phule Triveni)+ Horticulture (0.20 ha)+ Poultry (4 batches of 100 birds each)+ Goat (Sangamneri 10+1)+ Vermicompost	1.0	416816
Mean		1.0	336819

The models could generate mean employment generation of 476 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -8291.5 CO_2 equivalent. Further, study of different fractions of cost revealed about 24% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was to the tune of 35%. The cost incurred towards hiring labour was 29%. These models revealed mean REY of 34.15 tonnes besides soil health improvement to the tune of 12.9 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 1.01 with mean SVI of 0.7.

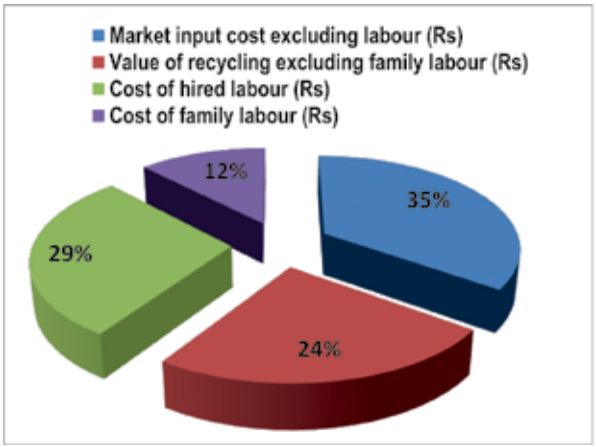


Fig 17. Different fraction of total cost in IFS models of WPH

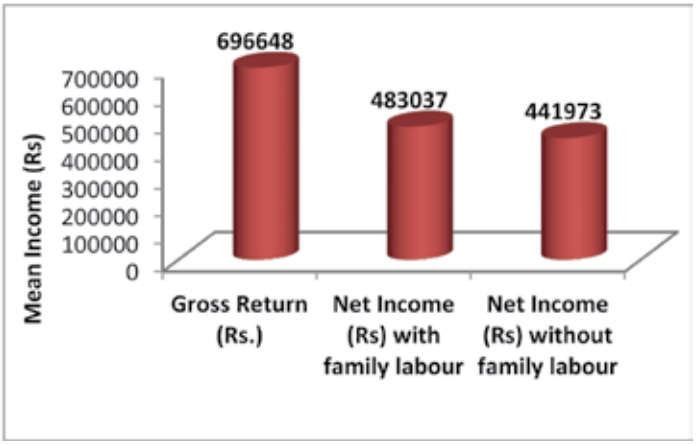


Fig 18. Economics of IFS models of WPH

10. SOUTHERN PLATEAU AND HILLS (SPH)

Six AICRP-IFS centers namely, TNAU, Coimbatore (Tamil Nadu), ARS, Kathalgere (Karnataka), ANGRAU, Rajendra Nagar, Hyderabad (A.P.), ARS, Sirriguppa (Karnataka) and PJTSAU, Hyderabad (Telangana) are located in different NARP zones of Southern Plateau and Hill ACZ of the country. A new sub centre is also being established at Maruteru, A.P. The results of study during 2022-23 at these centres along with components of IFS is presented in Table 7.1.10 which revealed mean gross income of Rs. 521080 while the mean net return excluding family labour cost was found to be Rs.395586. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 305123. Details of IFS model cost components presented in Table 7.1.10 indicated mean total cost for the IFS models to be Rs. 342785 while it varied from Rs 78384 at Kathalgere model(0.5 ha) to Rs 735106 at Coimbatore for 1.0 ha IFS model.

Table 7.1.10 Details of IFS model along with total cost per model in SPH

Location	IFS model	Area (ha)	Total cost (Rs)
Coimbatore	Cropping systems (0.85 ha) + Horticulture (0.10 ha) + Dairy (2 cow+ 2 calf) + Goat (Salem black 10+1) + Poultry (Aseel- 3 batches of 50 birds) + Vermicompost unit + Compost yard + Kitchen garden & Border planting	1.0	735106
Kathalgere	Cropping systems (0.53 ha) + Horticulture and plantation crops (0.30 ha)+ Dairy (HF-2+ 1 calf)+ Sheep (7+1) + Fishery(0.02) + Apiary (3 boxes)+ Mushroom+Vermicompost + Azolla+ Boundary plantation	1.0	209371
Siruguppa	Cropping systems (0.74 ha) + Dairy (HF-3+ 3 calves)+ Horticulture (0.17 ha) + Goatery (27+3)+ Vermicompost Boundary Plantations + Kitchen Gardening	1.0	377228
Rajendranagar	Cropping systems (0.7 ha) + Dairy (Gir-2 nos)+ Horticulture with Pastureintercrop (0.2 ha) + Nellore Sheep (20+1)+ Poultry(Rajashri-200 birds)+ Compost + Boundary Plantations	1.0	281675
Maruteru_sub	Cropping systems(0.28 ha) + Dairy (2 Desi cows) + Fishery (0.12 ha) + Poultry (15 units) + Horticulture (0.165 ha)+ Compost /others	0.5	78384
Rudrur_sub	Cropping systems (0.70 ha)+Dairy (Murrah 1 + 2 Calves) +Horticulture (0.24 ha)+Poultry (110 birds)+vermiomposting	1.0	374950
Mean		0.92	342785

Aerial view of IFS model site with its components at Coimbatore, Tamil Nadu

Aerial view of IFS model site with its components at Kathalgere, Karnataka

Aerial view of IFS model site with its components at Maruteru, Andhra Pradesh

The models could generate mean employment generation of 422 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -7094.3 CO_2 equivalent. Further, study of different fractions of cost revealed about 34% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was to the tune of 20%. The cost incurred towards hiring labour was 17%. These models revealed mean REY of 25.32 tonnes besides soil health improvement to the tune of 22.5 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.85 with mean SVI of 0.7.

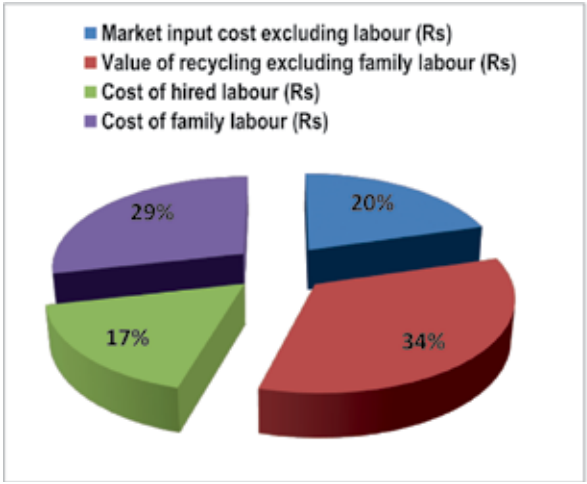


Fig 19. Different fraction of total cost in IFS models of SPF

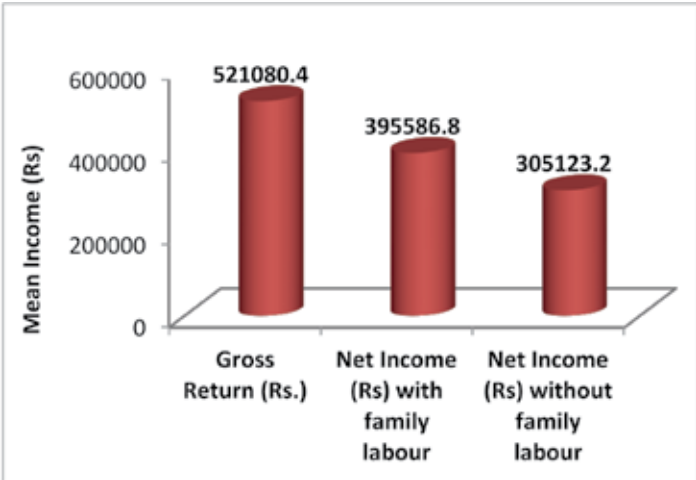


Fig 20. Economics of IFS models of SPH

11. EAST COAST PLAIN & HILLS (ECPH)

Two climate smart IFS models namely one at Bhubaneswar (Odisha) and another at Thanjavur (Tamil Nadu) represented the east coast plains and hills region. The IFS model at AICRP-IFS center at Bhubaneshwar (Odisha) representing East Coast Plain & Hill region is developed for small farming household with 1.20 ha area under irrigated ecosystem. The present system consists of cropping system, horticultural system, dairy, poultry, fishery, boundary plantation, kitchen garden and apiary. The IFS model at Thanjavur consisted of crops, dairy, poultry, horticulture and other supplementary enterprises in 0.8 ha. The results obtained from these IFS models during the reporting period of 2022-23 revealed that mean gross income of Rs. 678670 while the mean net return excluding family labour cost was found to be Rs.481095. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 387545. Details of IFS model components and cost is presented in Table 7.1.11 which indicated mean total cost for the IFS models was Rs. 363898 while it varied from Rs 338688 at Thanjavur for 0.8 ha model to Rs 389108 at Bhubaneswar for 1.20 ha IFS models.

Table 7.1.11 Details of IFS model along with total cost per model in ECPH

Location	IFS model	Area (ha)	Total cost (Rs)
Bhubaneswar	Cropping systems (0.32 ha) + Dairy + Horticulture (0.31 ha) +Fishery (0.46 ha)+ Poultry	1.20	389108
Thanjavur	Crops + Dairy + Poultry +Horticulture + Fishery + Vermicompost + Boundary Plantations	0.80	338688
Mean		1.0	363898

Components of IFS model at Bhubaneswar, Odisha

The models could generate mean employment generation of 403 mandays through different modules while the IFS models were found to be carbon negative in terms of GHG emission at -4098.8 CO2 equivalent. Further, study of different fractions of cost revealed about 20% share of recycled inputs in total cost of the IFS which could be further enhanced whereas cost of outside purchase was to the tune of 48% of the cost. The cost incurred towards hired labour was 6%. These models revealed mean REY of 33.27 tonnes besides soil health improvement to the tune of 23 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.85 with mean SVI of 0.8.

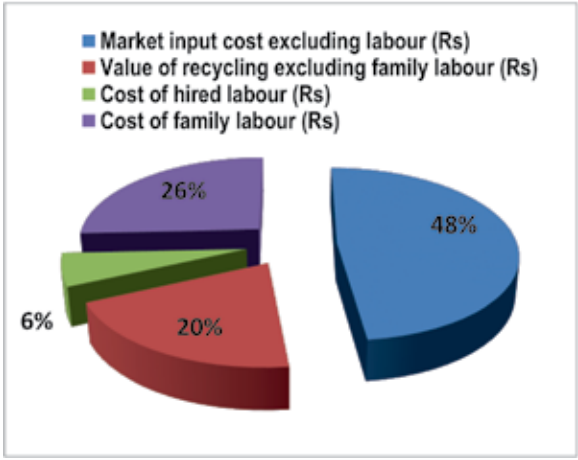


Fig 21. Different fraction of total cost in IFS models of ECPH

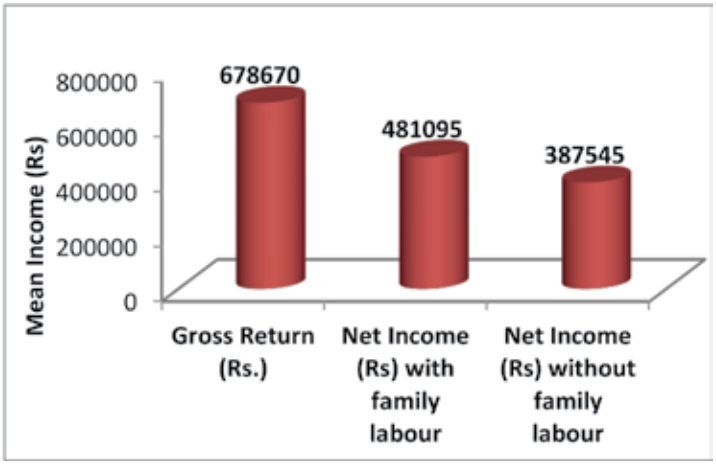


Fig 22. Economics of IFS model of ECPH

12. WEST COAST PLAINS & HILLS (WCPH)

In this Agro Climatic Region three AICRP-IFS centers in the states of Goa (ICAR- Central Coastal Agricultural Research Institute, Goa), Maharashtra (Karjat) and Kerala (Karamana) represented the climate smart IFS Models for respective states. The results of study during 2022-23 at these centres revealed mean gross income to be Rs. 402759 while the mean net return excluding family labour cost was found to be Rs.201888. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 156827. Details of IFS model cost components presented in Table 7.1.12 indicated mean total cost for the IFS models to be Rs. 314223.

Table 7.1.12 Details of IFS model along with total cost per model in WCPH

Location	IFS model	Area (ha)	Total cost (Rs)
Goa	Rice based lowland: Cropping systems (0.40 ha) + Rice cum fish – Moong (0.07 ha)+ Dairy (1 Croos bred + 1 Calf) + Goat (7 nos) + Kitchen Gardening	0.50	206900
	Plantation crop based: (Casheu+ Pineapple- 0.25 ha)+ (Coconut+ Pineapple+Tapioca+Elephnat foot yam- 0.23 ha) + (Arecanut+Banana+ Turmeric- 0.22 ha)+ Goat + Compost + Catch pit with duckery	0.80	177290
Karjat	Cropping systems (0.50 ha) + Horticulture (Fruit crops + Nursery) (0.40 ha)+ Livestock (Dairy- 3 cows + Goat (10+2)+ Poultry (3 batches of 150 birds) + Vermicompost + Boundary Plantations + Kitchen garden	1.0	728579
Karmana	Homestead based- Cropping systems including vegetables and plantation (0.1455 ha)+ Dairy (Crossbred 1+ 1 calf) + Poultry (60 nos) + Fishery (0.002 ha) +Biogas+ Vermicomposting+ Azolla	0.2	234221
	Coconut based- Cropping systems including vegetables (0.147 ha)+ Dairy (Crossbred 1+ 1 calf) + Fishery (0.002 ha) +Apiary (1 box)+Boundary plantation+ Azolla	0.2	265905
	Rice based-- Cropping systems including vegetables (0.166 ha)+ Dairy (Crossbred 1+ 1 calf) + Fishery (0.002 ha) + Ducks (80 birds)	0.2	324426
	Banana based- Cropping systems including tubers,vegetables and fodder (0.1825 ha)+ Dairy (Crossbred 1+ 1 calf) + Fishery (0.002 ha) (500 GIFT Tilapia) + Vermicomposting	0.2	262239
Mean			314422

Components of lowland IFS model at Goa

Components of coconut based IFS model at Karamana

Components of rice based IFS model (0.2 ha) at Karamana

The models could generate mean employment generation of 272 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -18363 CO_2 equivalent. Further, study of different fractions of cost revealed about 22% share of recycled inputs in total cost of the IFS which could be further improved whereas cost of outside purchase was 48% of the model cost. The cost incurred towards hired labour was 16%. These models revealed mean REY of 19.74 tonnes besides soil health improvement to the tune of 55.9 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 0.2 with mean SVI of 0.70.

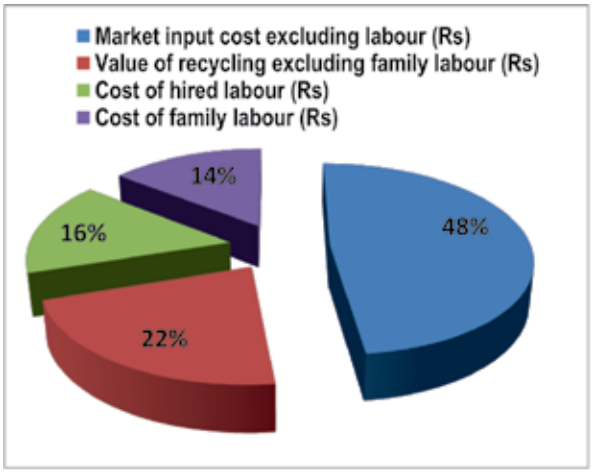


Fig 23. Different fraction of total cost in IFS models of WCPH

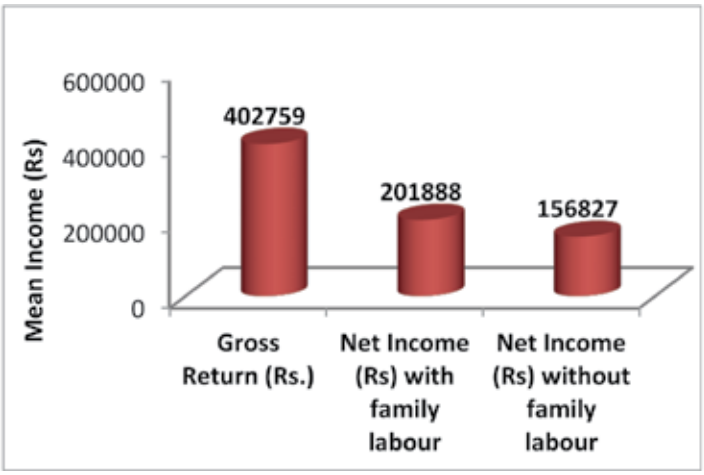


Fig 24. Economics of IFS models of WCPH

13. GUJARAT PLAINS AND HILLS (GPH)

This agroclimatic region was represented by climate smart IFS model established at Junagadh where a climate smart IFS model with crops, horticulture, dairy, fishery and supplementary component like boundary plantation in 1.0 ha area. Another IFS model having 1.0 ha area was established in SK Nagar, Gujarat. The results obtained during reporting period of 2022-23 from these models revealed the mean gross return to be Rs. 439522 while the net return excluding family labour cost was found to be Rs.259472. Details of IFS model cost components presented in Table 7.1.13 indicated total cost for the IFS models to be Rs. 234981 for 1.0 ha IFS model.

Aerial view of IFS model with its components at SK Nagar, Gujarat.

Table 7.1.13 Details of IFS model along with total cost of model in GPH

Location	IFS model	Area (ha)	Total cost (Rs)
Junagadh	Cropping systems (0.50 ha) +Multi storied horticulture (0.0.34 ha) +Dairy (2 Buffalo Mehsani breed)+ Fish pond (0.02 ha)+ Boundary plantations + NADEP Compost	1.0	246639
SK Nagar	Cropping systems (0.70 ha) +Multi storied horticulture (0.25 ha) +Dairy (2 Buffalo Mehsani breed)+ Farm pond (0.015 ha)+ Boundary plantations + Vermicomost	1.0	223323
Mean		1.0	234981

Aerial view of IFS model with its components at Junagarh, Gujarat.

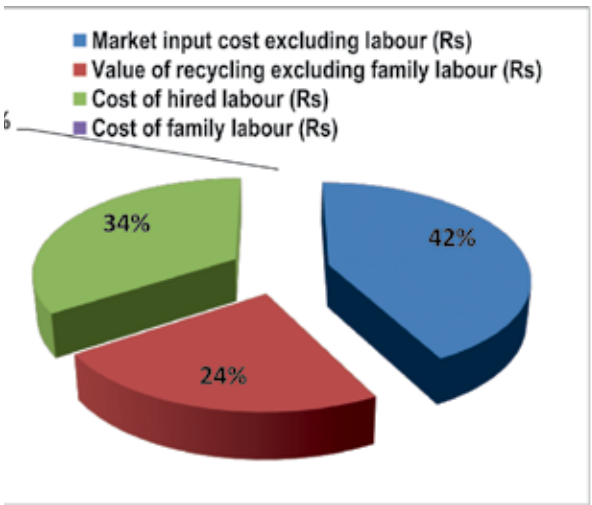


Fig 25. Different fraction of total cost in IFS models of GPH

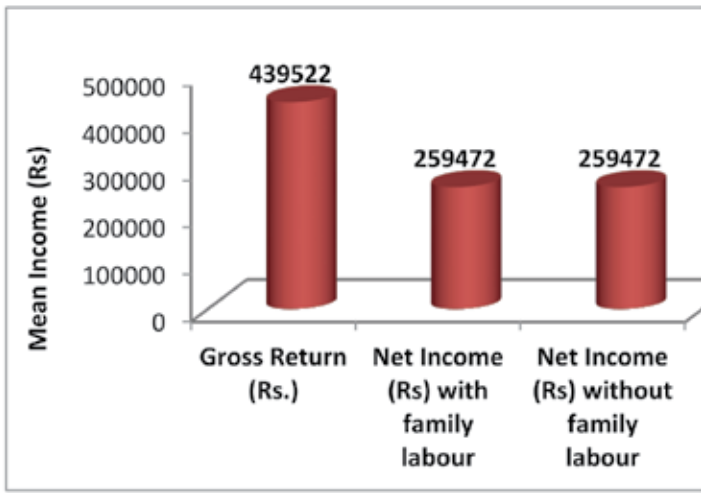


Fig 26. Economics of IFS models of GPH

The models could generate employment generation of 226 mandays through different modules. Further, study of different fractions of cost revealed about 24% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was 42% of the model cost. The cost incurred towards hired labour was 34%. These models revealed mean REY of 21.55 tonnes besides soil health improvement to the tune of 43.4 % in terms of organic carbon improvement.

14. ISLAND

The Andaman and Nicobar group of Islands lie in the Bay of Bengal 1200 km east of main land India between 6-140 N latitude and 92-940 E longitude. The holding size ranged in between 0.39ha (marginal farmer) to 1.38 (small farmer) with an average of 7 members in a family. The results obtained during reporting period of 2022-23 from horticulture + fishery+ Poultry+ Goatery for upland areas started in 2021 revealed the gross return to be Rs. 302050 while the net return excluding family labour was found to be Rs.189530. Details of IFS model cost components presented in Table 7.1.14 indicated total cost for the IFS models to be Rs. 119020 for 1.0 ha IFS model.

Table 7.1.14 Details of IFS model along with total cost of model in Island ecosystem

Location	IFS model	Area (ha)	Total cost (Rs)
Port Blair	Cropping systems: Coconut with intercrops (0.9 ha)+ Horticulture (Banana) + Poultry (3 batches of 50 birds) + Goat (15+1) + Fishery (0.06 ha) + Vermicomposting	1.0	119020
Mean		1.0	119020

The model could generate mean employment generation of 192 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -5686 CO_2 equivalent. Further, study of different fractions of cost revealed about 5% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was 35% of the model cost. The cost incurred towards labour was 60% which needs further reduction. These model revealed mean REY of 14.81 tonnes besides soil health improvement to the tune of 43.4 % in terms of organic carbon improvement as compared to benchmark with net returns per rupee invested being 1.5.

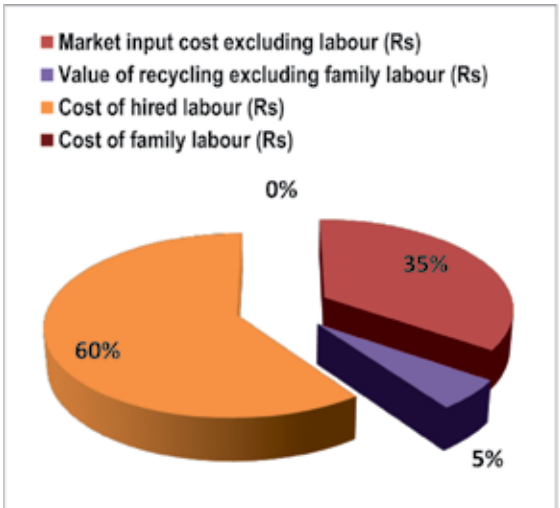


Fig 27. Different fraction of total cost

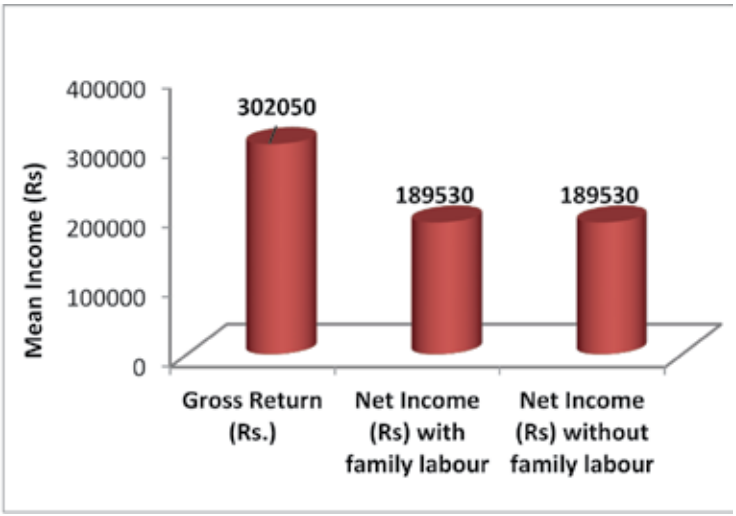


Fig 28. Economics of IFS model at Pot Blair (A & N)

View of different components of IFS model at Port Blair, AN

The study of climate smart IFS across agroclimatic zones during 2022-23 depicted that;-

- Production from IFS models varied between 11.36 t in LGP (0.66 ha) to 36.79 t in TRansgangetic Palins.
- Employment generation from IFSmodels varied between 192 in Island ecosystem (1.0 ha Model at Port Blair) to 656 days in UGP (2 IFS models of 1.0 ha).
- Purchase of animal feed from market as share of market input excluding labour (23.2 % in LGP to 93 % in Islands)

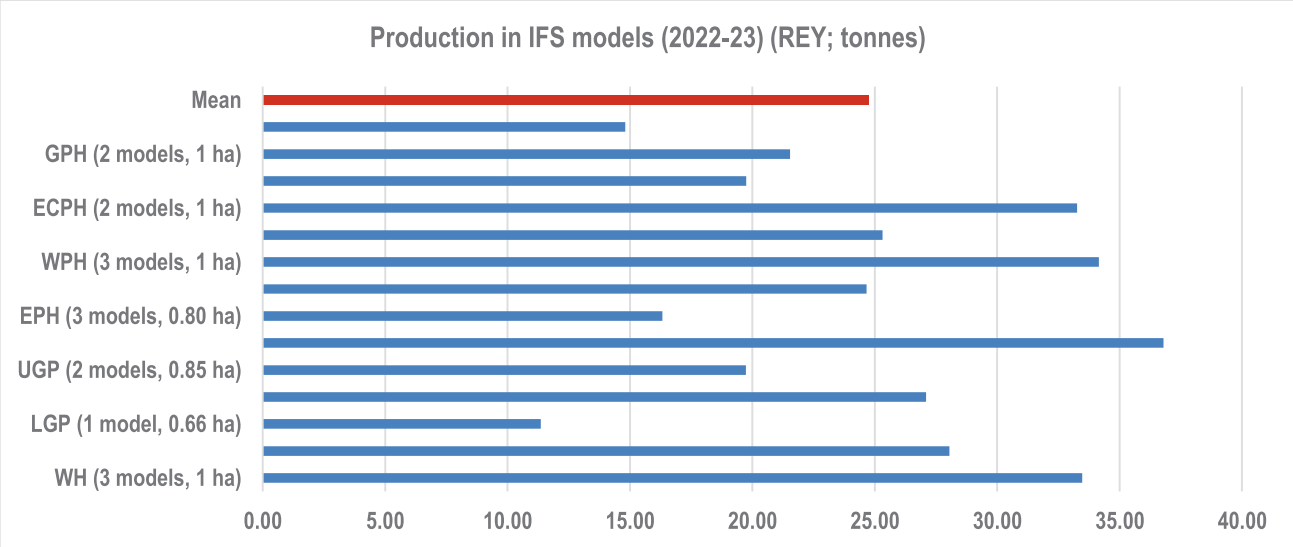


Fig. 29 System production (REY:tonnes) from IFS models of different ACZ.

- Net return per rupee invested varied from 0.20 in WCPH to 3.62 in HER.
- SVI varied between 0.4 to 0.8
- Improvement in soil OC over initial status in range of 6.2 % (EPH) to 55.9 % (WCPH)

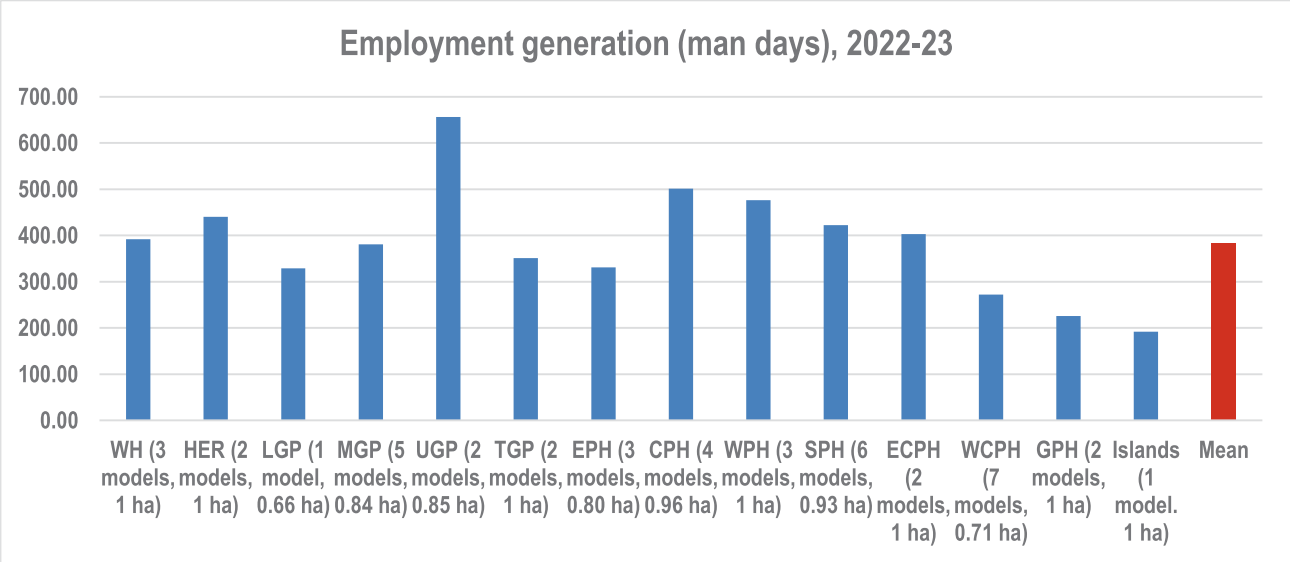


Fig. 30 Employment generation (mandays) from IFS models of different ACZ.

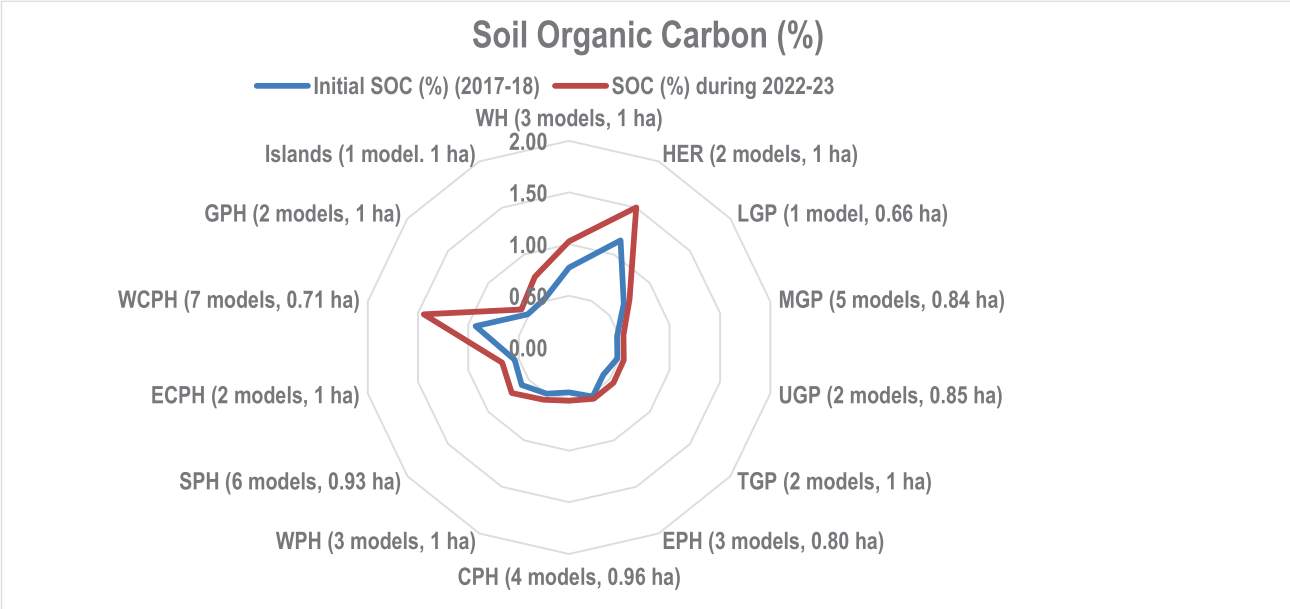


Fig. 31 Initial SOC and SOC during 2022-23

Details of Project being executed under AICRP-IFS at National Level

Project tittle	Duration	Principal Investigator	CO-PI`s	Source of Fund	Budget
Project Coordinator- Dr N. Ravisankar					
AICRP on Integrated Farming Systems (On-station)-National	2020-2026	A.K. Prusty	R.P. Mishra M. Shamim Debashis Dutta N. Ravisankar Raghuveer Singh M.A. Ansari	NRM Division, ICAR	3316.49 lakh (2022-23)
AICRP on Integrated Farming Systems (On Farm Research)-National	2020-2026	Raghuveer Singh	N. Ravisankar M.A. Ansari Raghavendra K.J. M. Shamim	NRM Division, ICAR	
Identification of cropping Systems module for different farming systems (Expt. 1a)	2020-2026	M. Shamim	-	NRM Division, ICAR	

7.2 CROPPING SYSTEM MANAGEMENT

Title of the Experiment: Identification of cropping systems module for different farming systems

Objectives

- To evaluate the cropping systems in ecological, nutritional, feed and economic perspective
- To identify the cropping system module for specific farming systems
- To assess the resource dynamics of identified cropping system module

Year of start: 2017-18

During reporting period i.e., 2021-22, several cropping systems encompassing 4 crop modules for meeting the various purposes of farming systems such as family nutrition, soil health improvement, livestock nutrition as well as income enhancement with check were evaluated across 13 Agroclimatic regions of the country. The locations and the respective agroclimatic regions are described in Table 1 and treatment details are given in Table 2.

Table 1: Location of experiments conducted during 2021-22

Sl No.	Agro-Climatic Region	States	AICRP on IFS Centres
1	Western Himalayan region	Jammu	Jammu
		Himachal Pradesh	Palampur
		Uttarakhand (Hill region)	Pantnagar
2	Eastern Himalayan region	Assam	Jorhat
3	Lower Gangetic plain region	West Bengal (except the hilly areas)	Kalyani
4	Middle Gangetic Plain Region	Uttar Pradesh	Ayodhya
			Varanasi
		Bihar	Sabour
5	Upper Gangetic Plains Region	Uttar Pradesh (Central and western parts)	Kanpur
6	Trans-Ganga Plains Region	Punjab	Ludhiana
		Haryana	Hissar
7	Eastern Plateau and Hills	Jharkhand	Ranchi
		Chhattisgarh	Raipur
8	Central plateau and hill region	Madhya Pradesh	Jabalpur
			Indore
			Powarkheda
			Riwa
		Rajasthan	Durgapura
			Kota

9	Western plateau and hill region	Maharashtra	Akola
			Karjat
			Parbhani
			Rahuri
10	Southern Plateau and Hills	Telangana	Rajendranagar
			Rudrur
		Andhra Pradesh	Maruteru
		Tamil Nadu	Coimbatore
			Thanjavur
		Karnataka	Kathalgere
			Siruguppa
		Odisha	Chiplima
11	Eastern Coastal Plains and Hills	Orissa	Bhubaneshwar
12	Western Coastal Plains and Ghats	Kerala	Karmana
13	Gujarat plain and hill region	Gujarat	SK Nagar
			Junagarh
			Navsari

Table 1: Treatments details with crop modules undertaken during 2021-22

Treatment notation	Cropping system	Remarks
T_1	Pre-dominant cropping system of the region	Check
T_2	Pre-dominant cropping system of the region	
T_3	Ecological cropping system involving pulses/green manures and other crops for improving soil health	Soil health
T_4	Ecological cropping system involving pulses/green manures and other crops for improving soil health	
T_5	Cropping system involving cereals/pulses/oilseeds to meet the household nutritional security	Family nutrition
T_6	Cropping system involving cereals/pulses/oilseeds to meet the household nutritional security	
T_7	Cropping system for round the year green/dry fodder production	Livestock nutrition
T_8	Cropping system for round the year green/dry fodder production	
T_9	Cropping systems involving vegetables and other high value crops for income enhancement	Income enhancement
T_{10}	Cropping systems involving vegetables and other high value crops for income enhancement	

Agroclimatic-wise data of various cropping systems was collected and analyzed for inferring the best cropping systems for a particular agroclimatic regions which are described below.

Western Himalayan region: In Western Himalayan, total 29 cropping systems were evaluated with the objective to select the best cropping systems for different purposes such as soil health management (Rice-wheat-sesbania, Rice-mustard-greengram, Rice-vegetable pea-blackgram, Sesbania-early cabbage–french beans and Blackgram-wheat-vegetable cowpea + sesbania and Sesbania-vegetable pea-frenchbean), households food and nutritional requirements (Rice-pea-okra, Maize + soybean - chickpea + linseed, Rice - yellow sarson - grain cowpea, Rice-gobi sarson-mash, Maize-yellow sarson-blackgram and Maize + soybean-chickpea + linseed), livestock nutrition (Sorghum– berseem , Rice-oats-seed, Multicut sorghum-berseem + oat + mustard – Maize + cowpea, Hybrid napier/ Cowpea-hybrid napier/berseem-Hybrid napier/ cowpea, Hybrid sorghum + hybrid bajra-oats + sarson, Hybrid sorghum + hybrid bajra-ryegrass + berseem) and households income enhancement (Rice-brocolli-okra, Rice-potato-blackgram, Basmati rice-potato-maize, Maize-broccoli-okra, Babycorn-broccoli-frenchbean and okra-turnip-tomato) in Jammu, Himachal Pradesh and Uttarakhand. Based on diversification of cropping systems under studied agroclimatic region, crop sequence like Babycorn-broccoli-frenchbean recorded maximum rice equivalent yield (210.6 q/ha) at Palampur (Fig. 1). However, Rice-pea-okra and Multicut sorghum-berseem + oat + mustard – maize + cowpea was performed better in Jammu and Pantnagar respectively. Under household type 1 (HH1) having 1 acre of holding size, 5 number of family size and 2 number of dairy animals, cropping systems such as Rice - Yellow sarson - Grain cowpea should be taken in 2000 m^2, for household type 2 (HH2) having holding size of 2 acre land, family size of 5 numbers and dairy size of 2 numbers of dairy animal the same cropping system should be taken in 2000 m^2 however for household type 3 (HH3) having 3 acers of holding with family size of 7 numbers and dairy size of 4 dairy animal, the same cropping system should be taken in 3000 m^2 for providing food and nutritional security in terms of carbohydrate, fats and protein. To sustain the livestock fodder requirement trough out the year fodder crop module involving multicut sorghum – berseem + Oat – maize + cowpea should be taken in 1700 m^2, 1700 m^2 and 4000 m^2 for HH1, HH2 and HH3 respectively. Family income enhancement crop module such as Baby corn – broccoli – french bean found suitable under the studied agroclimatic region and land area of 347 m^2, 4394 m^2 and 5141 m^2 may be allotted under HH1, HH2 and HH3 respectively. In the western Himalayan region cropping system such as Sesbania- Early Cabbage – French bean registered 1.26% of soil organic carbon at the end of second year of experimentation which should be taken in plots of above modules on rotation basis to maintain the soil health particularly in terms of soil organic carbon and available nitrogen content.

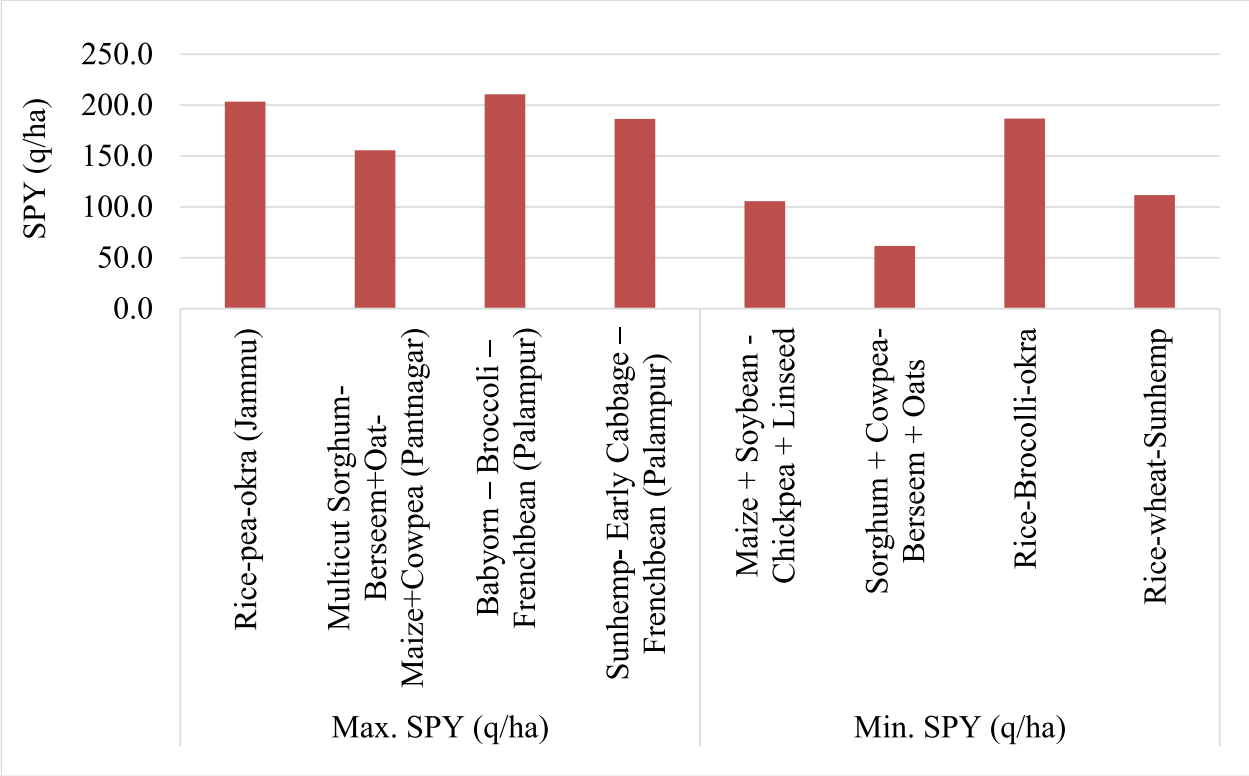


Fig. 1 Maximum and minimum system productivity from cropping systems module of Integrated farming systems in Western Himalayan regions during 2021-22

Eastern Himalayan region: Total 10 cropping system such as Rice - fallow - autumn rice, ice - toria – fallow, Pegionpea - pea - autumn rice, Soyabean - toria – blackgram, Rice - rajmash – cowpea, Rice - toria – blackgram, Tiosinte - oats – cowpea, Tiosinte - oats – ricebean, Ridge gourd- broccoli- teosinte, Bittergourd-tomato-frenchbean as predominant for the purposes of family nutrition, livestock fodder requirement, household income enhancement and soil health building were under taken at Jorhat for the study. Investigation highlighted that cropping systems involving vegetables and other high value crops for income enhancement were found to be better in terms of REY. The Ridge gourd–broccoli–lady's finger system gave the highest REY (336 q/ha) followed by Winter rice-rajmash-cow pea system (128 q/ha) among all the systems. Teosinte-oat-cowpea (fodder) system was found to be source of highest available NPK nutrients in the post-harvest soils, whereas lowest

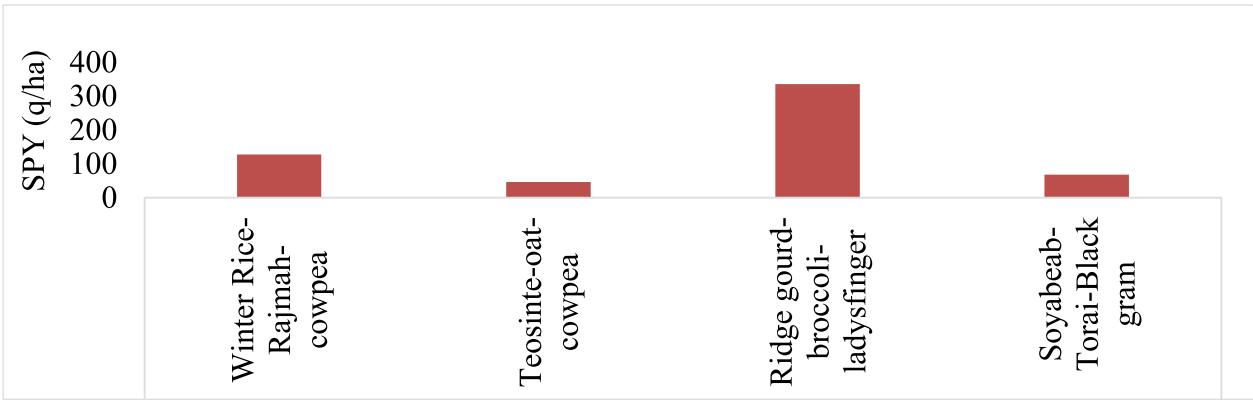


Fig. 2 Maximum and minimum system productivity from cropping systems module of Integrated farming systems in Eastern Himalayan regions during 2021-22

was recorded in case of winter rice- autumn rice sequence which is the most predominant cropping system of Assam and cropping systems like Ridge gourd- broccoli- teosinte registered the highest net return of Rs. 526900/ha. The spare area for this cropping system was only 47 m^2 and 94 m^2 under HH1and HH2 respectively and under HH3, area of 8141 m^2 may be allocated for enhancing the family income. However, Teosinte – oat – rice bean should be given area of 1287 m^2, 1287 m^2 and 5287 m^2, respectively. The soil organic carbon was registered highest (0.75%) under Soyabean– toria – blackgram cropping system hence, this system may be taken as soil health improvement crop modules on rotation basis.

Lower Gangetic Plain Region: Under this agroclimatic region 10 cropping systems such as Rice-rice, Rice-potao-jute, Sesbania + rice-grass pea-greengram, Sesbania + rice-french bean-cowpea, Rice (bio fortified)-mustard-greengram, Rice (bio fortified)-sunflower-blackgram, Rice-oat-fodder maize, Rice-Berseem-fodder cowpea, Pointed gourd + Cauliflower/ Onion and Elephant foot yam – brinjal + coriander leaf were evaluated in Nadia district of West Bengal for the purpose to select the suitable cropping systems for integration in the integrated farming system. The maximum system yield 553 q/ha was recorded from Elephant foot yam-brinjal + coriander cropping system whereas, maximum soil organic carbon (0.78 %) was recorded in the plot of Sesbania + rice-french bean - cowpea system. For fulfilling the requirement of food and nutrition of a household, Rice-mustard-greengram cropping system was capable enough which required to grow in 1512 m^2, 1512 m^2 and 2117 m^2 for HH1, HH2 and HH3 respectively. To provide the fodder and nutritional requirement of livestock in the studied region Rice-oat-fodder maize may be grown in 2488 m^2, 6488 m^2 and 9883 m^2 for HH1, HH2 and HH3 respectively whereas Sesbania + rice-french bean-cowpea may be taken as soil health building cropping system on rotational basis.

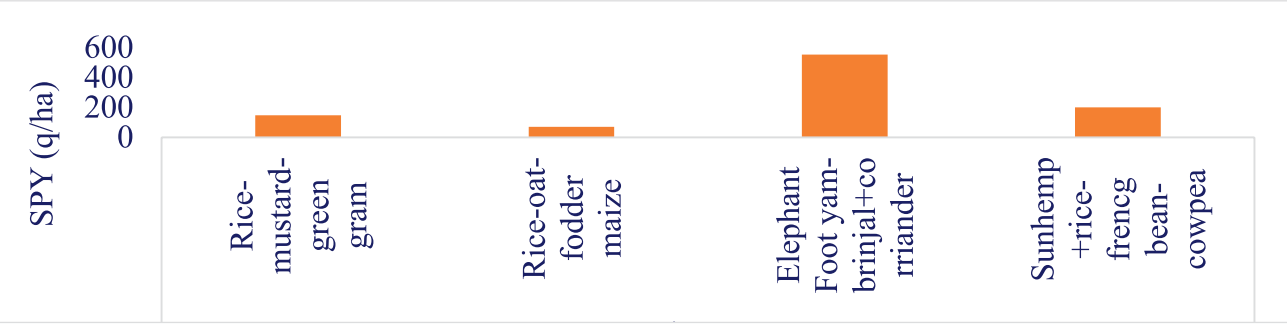
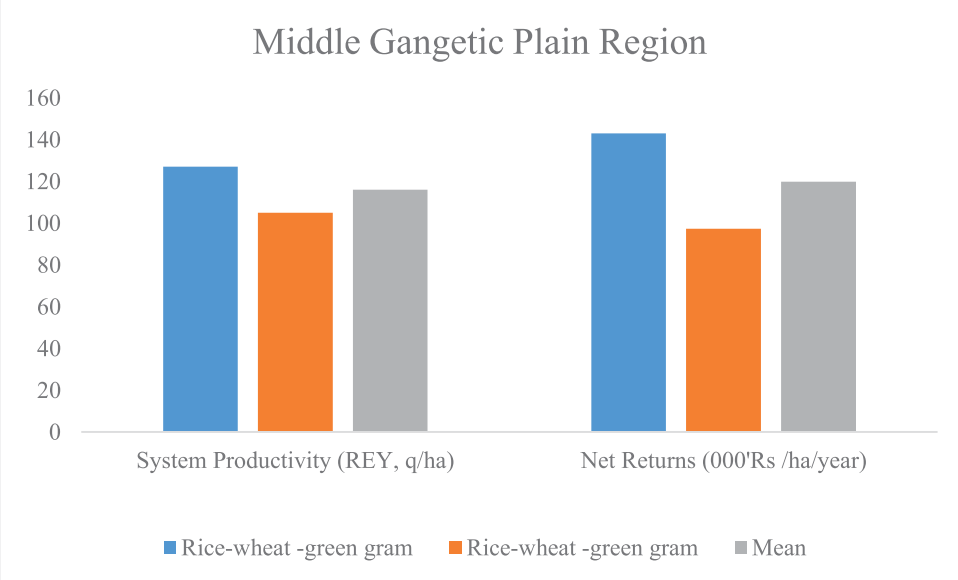


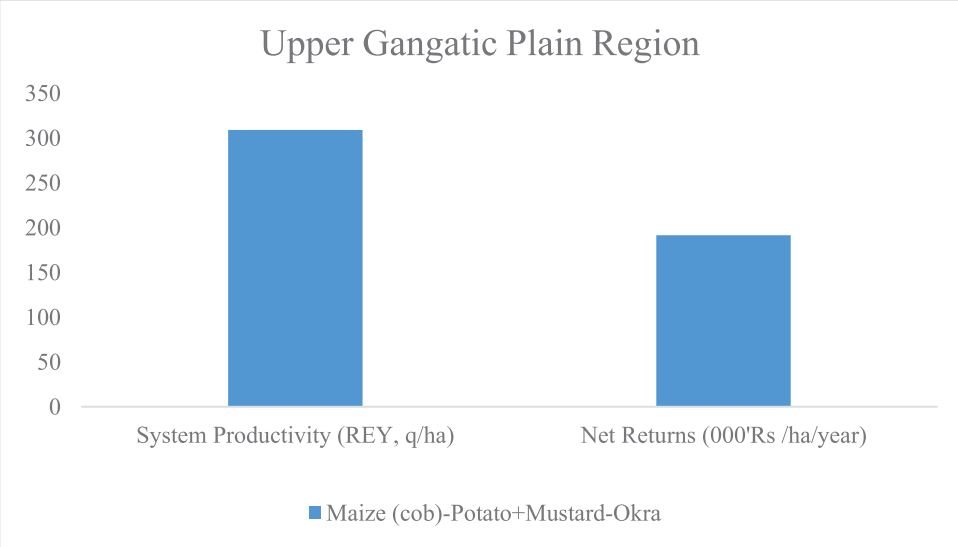
Fig. 3 Maximum and minimum system productivity from cropping systems module of Integrated farming systems in Eastern Himalayan regions during 2021-22

Middle Gangetic Plain Region: Total 10 cropping systems such as Rice-wheat -green gram, as check, Rice-french bean-greengram and Rice-vegetable pea-green gram for improving soil health, Rice-linseed-blackgram, Rice-oat-maize+cowpea,



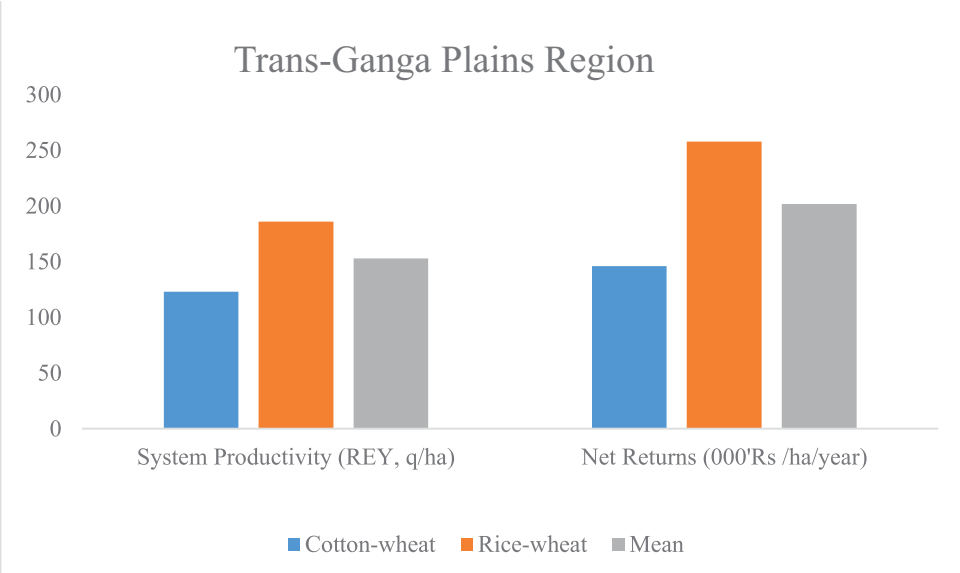
Rice-mustard-maize for maintaining household food and nutrition requirement, Rice-berseem-sorghum for providing fodder requirement of livestock component, Rice-cabbage-okra and Rice-cauliflower-okra for enhancing the family income were taken under Middle Gangatic plain region during the reporting period. The highest system productivity in the tune of 127 q/ha and net return in the tune of Rs.1,42,950 /ha was registered with Rice-Wheat-green gram cropping system (fig.). Cropping systems like Rice-Linseed-Black Gram were found to be most suitable for the middle gangatic plain region for providing family food and nutritional security. Therefore, this cropping system should be taken as an integral part of integrated farming system for the regions. The soil organic carbon was registered highest (0.52%) under Rice-vegetable pea-green gram cropping system therefore, this system may be taken as soil health improvement crop modules on rotation basis.

Upper Gangetic Plains Region: Under the reporting period, 5 cropping systems such as Hybrid Rice-wheat, Black gram-Bengal gram+ Mustard-Green gram, Hyb. Rice- veg. pea + mustard-black gram, Maize+ Cow pea (fodder)-berseem+ Gobhi sarson/Velvet grass-Sweet Sorghum (multi cut) and Maize (cob)-Potato+Mustard-Okra were evaluated in Upper Gangatic plain region. Maize (cob)-Potato + Mustard - Okra crop sequence excelled over all the cropping systems in respect of total system yield (309 q/ha) and Net monetary return (Rs 1,91,573.00 /ha). Cropping system Hyb. Rice- veg. pea + mustard-black gram was found to be most suitable for family food and nutrition, therefore, this cropping system should be taken in 2147 m^2, 2147 m^2, and 3006 m^2, under HH1, HH2 and HH3 respectively. While, Maize + Cowpea(fodder) - Barseem + Gobhisarso /Velvet grass - Sweet Sorghum (Multicut) cropping system should be given area of 1853 m^2, 5853 m^2 and 7247 m^2, respectively, for providing fodder requirement of dairy animals. For income enhancement of the household Maize (Cob) - Potato + Mustard-Okra can be taken in 1747 m^2 under HH3. The soil organic carbon was registered highest (0.49%) under Black gram-Bengal gram+ Mustard-Green gram cropping system hence, this system may be taken as soil health improvement crop modules on rotation basis.

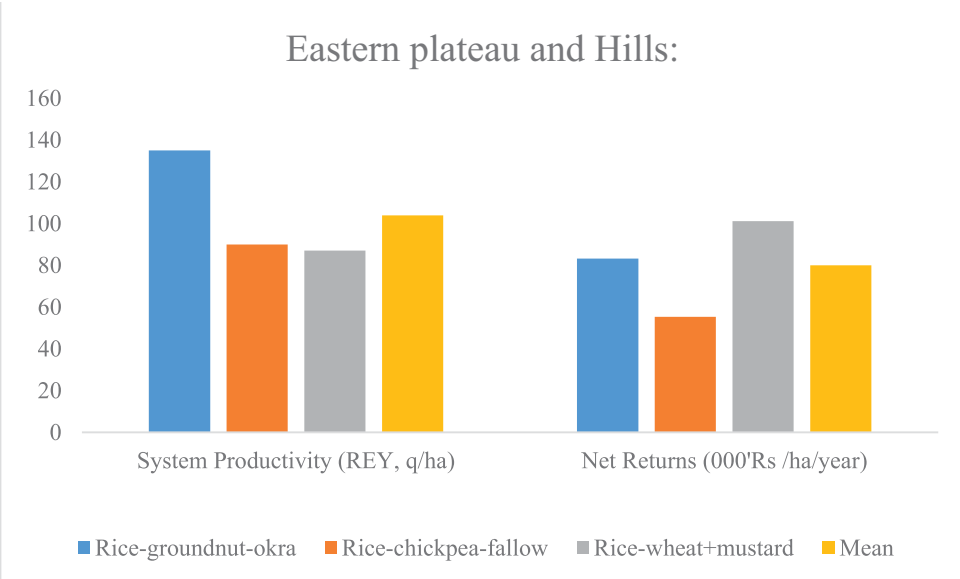


Trans-Ganga Plains Region: Ten cropping systems with diverse purposes such as family nutrition (Maize-Potato/Pea-Groundnut and Green Gram-Wheat+Mustard) livestock nutrition (Maize+Cowpea/Sorghum-Oat/Berseem-Saathi maize and Sorghum-Barseem), maintaining soil health (B. Rice-wheat-cowpea and Green-Gram-Mustard-Green Gram) and income enhancement for family (Maize/Baby corn-Potato-Onion/Okra and Cowpea-Potato-Cucurbits) were compared with predominant cropping systems like Rice/Maize-wheat and Cotton-wheat. For income enhancement with Rice-Wheat registered significantly higher rice equivalent yield 186 q/ha with net return Rs. 2,57,752 /ha. thus, indicating their suitability over the existing systems. Cropping systems like Maize-Potato/Pea-Groundnut was found to be most suitable for the Trans-Ganga plain region for providing family food and nutritional security. Therefore, this cropping system should be taken as integral part of integrated farming system for the regions. The area of 1800 m^2, 5000 m^2 and 7000 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Maize+Cowpea/Sorghum-Oat/Berseem-Saathi maize was found to be

suitable to provide the fodder and nutritional requirement of dairy animals and it should be taken in area of 1480 m^2, 1480 m^2 and 2960 m^2 under HH1, HH2 and HH3, respectively. The soil organic carbon was registered highest (0.36%) under B. Rice-wheat-cowpea cropping system therefore, this system may be taken as soil health improvement crop modules on rotation basis.

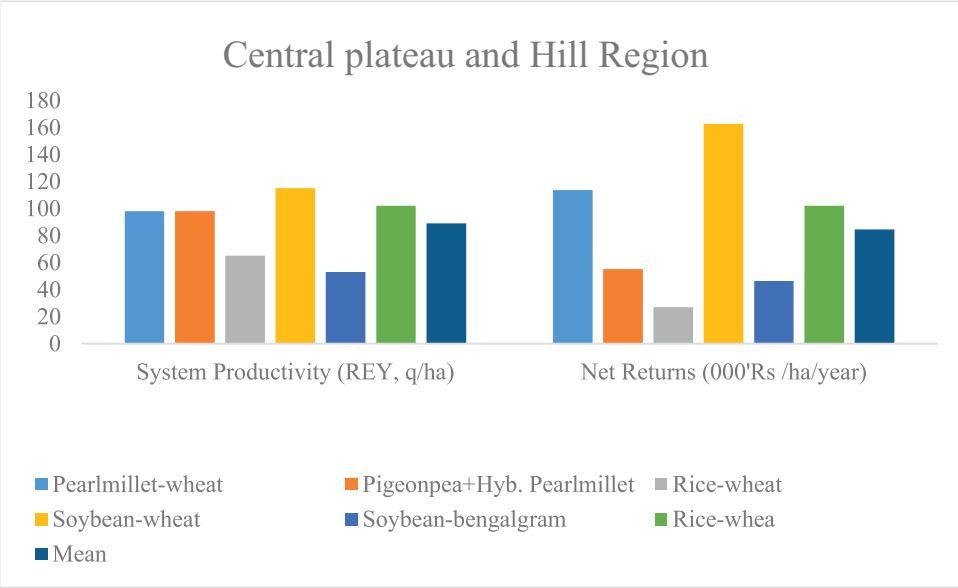


Eastern plateau and Hills: Under the reporting period, 15 cropping systems such as Rice-groundnut-okra, Rice-Chickpea-Fellow, Rice-Wheat+Mustard, Green manured rice-groundnut-cowpea, Rice-Gardon pea-Cowpea, Rice+Daincha-Lentil-Greengram, Rice -French bean-Groundnut, Rice-Groundnut-Greengram,Rice-Gram-Cowpea, Rice –Oat + Berseem-Cowpea, Rice-Fodder Maize-Fodder cowpea, Rice-Berseem-Sorghum, Rice – Sweet Corn – Tomato+ coriander, Rice-Sweet corn-Bitter gourd and Rice-Potato-Okra were evaluated in Eastern plateau and Hills. Rice-groundnut-okra crop sequence excelled over all the cropping systems in respect of total system yield (135 q/ha) and Rice-Wheat+Mustard cropping system recorded the highest annual net return Rs 1,01,187.00 /ha. Cropping systems like Rice -French bean-Groundnut was found to be most suitable for the Eastern plateau and Hills for providing family food and nutritional security. Therefore, this cropping system should be taken as integral part of integrated farming system for the regions. The area of 2200 m^2, 2200 m^2 and 3000 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Rice –Oat + Berseem-Cowpea was found to be suitable to provide the fodder and nutritional requirement of dairy animals and it should



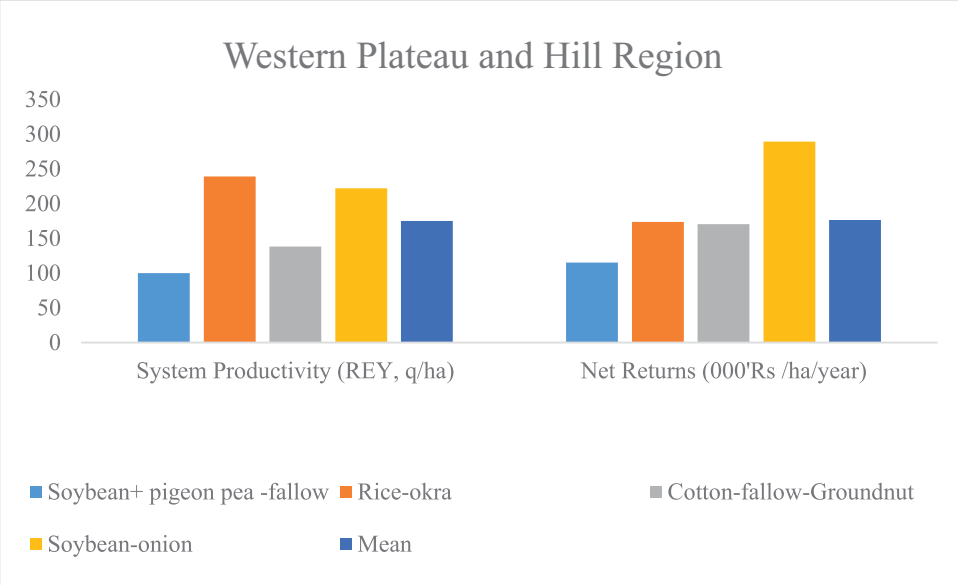
be taken in area of 1300 m^2, 1300 m^2 and 4550 m^2 under HH1, HH2 and HH3, respectively. The soil organic carbon was registered highest (0.70%) under Rice -French bean-Groundnut cropping system.

Central plateau and Hill Region: Twenty eight cropping systems with purposes like family nutrition (Rice-Potato-Maize, Groundnut-Wheat, Soyabean+Maize(4:2) Wheat+Mustard(2:2)-Moong, Groundnut-Wheat-Urdbean, Rice-Wheat-Greengram, Rice-Potato-Green gram), livestock nutrition (Sorghum+ cowpea (2:1)-Ryegrass+ Fodderbeet (FB/R)-Cowpea, Clusterbean-Dual barley, Arhar + Hyb. Bajra F (1:1)-Berseem-Sweet sorghum, Sorghum-Barseem, Maize (African tall)-Berseem-Sorghum, Rice-Barley-Bajra), maintaining soil health (Soybean + sweet corn (5:2)-lentil + linseed (5:2)-green gram (G+R), Clusterbean-Barley, Soyabean+Sesbania(1:1)-Wheat PI+Gram(2:4)-Moong, Soyabean-Chickpea-Greengram, Rice-Pea+Mustard-Green manure) and income enhancement for family (Okra+ Babycorn (FB/R)-Turnip + Beet root(FB/R)-Sponge gourd +Cluster bean (FB/R), Groundnut-Rabi onion, Maize-Veg. pea-Okra, Babycorn+Brinjal (1:1)- Onion-Okra, Maize cob-Potato-Okra, Rice-Garlic) were compared with predominant cropping systems. The results indicated that Soyabean-Wheat system was found most productive, and it has recorded the REY of 115.0 q/ha with net return Rs. 1,62,779 /ha whereas, maximum soil organic carbon (0.75%) was recorded in the plot of Green gram-Bengal gram-Green gram system. For fulfilling the requirement of food and nutrition of a household, Rice-Potato-Maize cropping system was capable enough which required to grow in 1500 m^2, 1500 m^2 and 2100 m^2 for HH1, HH2 and HH3 respectively. To provide the fodder and nutritional requirement of livestock in the studied region Sorghum+ cowpea (2:1)-Ryegrass+ Fodderbeet (FB/R)-Cowpea may be grown in 1600 m^2, 1600 m^2 and 3200 m^2 for HH1, HH2 and HH3 respectively, For enhancement of income of household Okra+ Babycorn (FB/R)-Turnip + Beet root(FB/R)-Sponge gourd +Cluster bean (FB/R) cropping system was capable enough which required to grow in 900 m^2, 4900 m^2 and 6700 m^2 for HH1, HH2 and HH3 respectively.



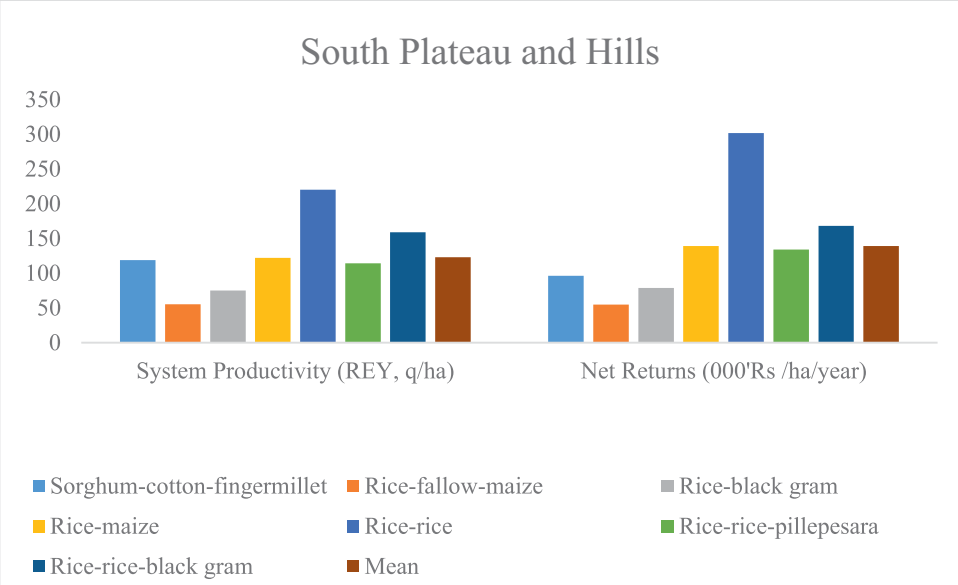
Western Plateau and Hill Region: Twenty two cropping systems having objectives like family nutrition requirement, cropping systems such as (Sorghum + Black gram (2:1)-Mustard Sorghum + Black gram (2:2)-Mustard Rice-Groundnut+Long yard bean, Sorghum-Chickpea-Seasamum, Pearlmillet-Chickpea), livestock nutrition (groundnut+sorghum-lucern-sweet corn, groundnut+maize-fennel-groundnut+sesame Maize + Greengram (2:2)- Cow pea, Rice-Oat, Sorghum-Cowpea-Pearlmillet, Cowpea-Rabi sorghum), maintaining soil health (Soybean+ sesbania (1:1)- Bengal gram, Soyabean+Sunhemp(1:1)-Chickpea, Rice-Cowpea, Soyabean-Chickpea, Soybean + Green manure crop-Sorghum+ Green gram) and income enhancement for family (Clusterbean + Sweetcorn (2:2)-Ajwain, Rice-Cucumber , Clusterbean-Carrot-Coriandar, Soyabean-Onion) were compared with predominant cropping systems like Rice-okra, Soyabean+Pigeonpea, Cotton-Groundnut, Soyabean-Onion. Among different cropping systems, Rice-Okra recorded highest REY of 239.0 q/ha

thus was found superior to other systems in terms of improvement in the productivity. Net return (Rs. 2,89,146 /ha) was recorded highest under Soyabean-Onion cropping system. Cropping systems like Sorghum + Black gram (2:1)-Mustard was found to be most suitable for the Western Plateau and Hill for providing family food and nutritional security. The area of 1500 m^2, 1500 m^2 and 2100 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Maize + Greengram (2:2)- Cow pea and Sorghum+Blackgram(2:2)-Mustard were found to be suitable to provide the fodder and nutritional requirement of dairy animals and it should be taken in area of 1000 m^2, 1000 m^2 and 2000 m^2 under HH1, HH2 and HH3, respectively. For enhancement of income of household cropping system Clusterbean + Sweetcorn (2:2)-Ajwain may be found suitable and it will take in area of 1500 m^2, 6500 m^2 and 2900 m^2 under HH1, HH2 and HH3, respectively. The soil organic carbon was registered highest (0.73%) under Rice -French bean-Groundnut cropping system therefore, this system may be taken as soil health improvement crop modules on rotation basis.

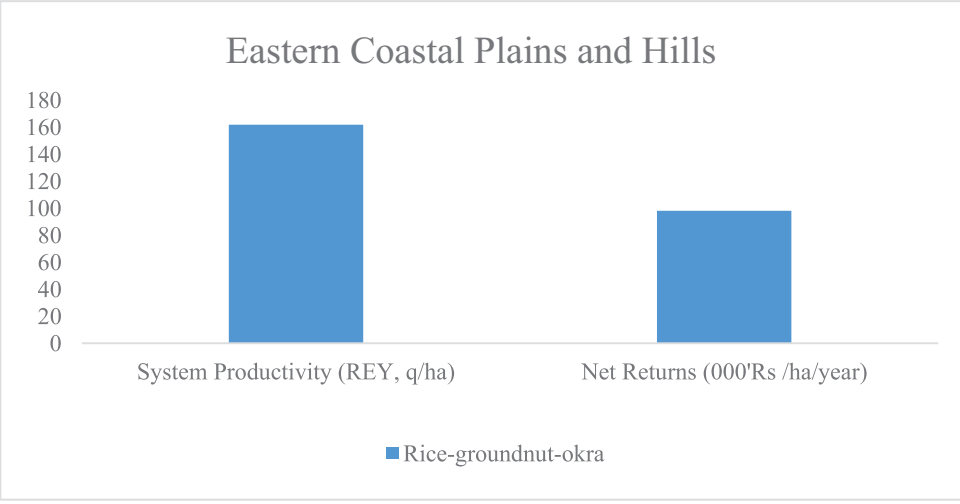


South Plateau and Hills: In this agroclimatic region 34 cropping systems have been evaluated at 7 centres such as Coimbatore, Kathalgere, Maruteru, Rajendranagar, Rudrur, Siruguppa and Thanjavur. The cropping systems tested as a check were Rice-rice, Sorghum-Cotton-Ragi, Paddy-Maize, Rice-Blackgram, Rice-Maize, Rice-Rice-Pillepesara, Rice-Rice-Blackgram. Under soil health crop modules Rice-Black gram-Sunhemp, Fodder maize-Fodder cowpea, Groundnut+Cowpea(4:1)-Sunhemp, Rice-Blackgram,Pigeonpea+ Greengram (1;6)-Sesame, Greengram-Cowpea-Dolchos, Dhaincha-Rice+Dhaincha-Blackgram cropping systems were evaluated. To identified the suitable crop modules for providing household food and nutritional security, cropping systems such as Maize+ Dolichos bean-Mustard-Cluster bean, Prosomillet-Cowpea-Sunflower, Groundnut+Cowpea-Fingermillet- Fellow-Finger millet/Maize+Castor-Sorghum-Fallow-Sorghum, Rice-Blackgram, Pigionpea+Maize(1:3)-Groundnut, Maize-Mustard-Blackgram, Blackgram – Rice – Groundnut were undertaken in the region. Total 6 cropping systems namely Bajra Napier grass + Desmanthus (perennial), Multicut hybrid Napier (CO-3), Rice-Fodder , Fodder Maize-Lucerne, Super Napier + fodder Cowpea, Fodder sorghum – Rice – Fodder cowpea were undertaken for evalution to secure the fodder requirement of the dairy animal round the year. Under family income enhancement crop modules, Okra-Marigold-Beetroot, Maize-Chillies-Radish, Tomato-Okra, Rice-Sweetcorn, Okra-Marigold-Beetrot, Bt. Cotton-Fallow-Sweetcorn, Sweetcorn-Marigold-Okra, Maize - Rice - Seeraga samba- Bhendi + blackgram (5:1) were taken for identifying most suitable croppin g systems for the region. The results indicated that Rice-rice system was found most productive, and it has recorded the REY of 220.0 q/ha with net return Rs. 3,01,580 /ha. For fulfilling the requirement of food and nutrition of a household, Maize+ Dolichos bean-Mustard-Cluster bean cropping system was capable enough which required to grow in 560 m^2, 560 m^2 and 784 m^2 for HH1, HH2 and HH3 respectively. To provide the fodder and nutritional requirement of livestock in the studied region Bajra Napier grass + Desmanthus (perennial) may be grown in 2720 m^2, 5440 m^2 and 4800 m^2 for HH1, HH2 and HH3 respectively. For enhancement of income of household

Okra-Marigold-Beetroot cropping system was capable enough which required to grow in 720 m^2, 2000 m^2 and 6416 m^2 for HH1, HH2 and HH3 respectively.

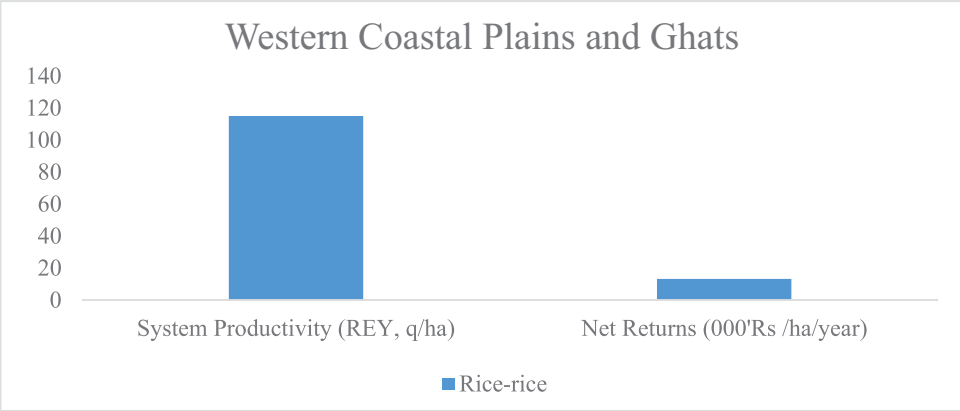


Eastern Coastal Plains and Hills: Under the reporting period, Rice-Groundnut-Cowpea, Rice-Groundnut-Green gram, Rice-Maize (fodder)-Cowpea (fodder) and Scented rice-Sweet corn-Bitter gourd were evaluated in Eastern Coastal Plains and Hills. Rice-groundnut-okra crop sequence excelled over all the cropping systems in respect of total system yield (162 q/ha) and annual net return Rs 98,301.00 /ha. Cropping systems like Rice-Groundnut-Green gram was found to be most suitable for the Eastern Coastal plateau and Hills for providing family food and nutritional security. Therefore, this cropping system should be taken as integral part of integrated farming system for the regions. The area of 2000 m^2, 2000 m^2 and 2800 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Rice-Maize (fodder)-Cowpea (fodder) was found to be suitable to provide the fodder and nutritional requirement of dairy animals and it should be taken in area of 1500 m^2, 1500 m^2 and 3000 m^2 under HH1, HH2 and HH3, respectively. For enhancement of income of household cropping system Scented rice-Sweet corn-Bitter gourd may be found suitable and it will take in area of 500 m^2, 4500 m^2 and 6200 m^2 under HH1, HH2 and HH3, respectively The soil organic carbon was registered highest (0.78%) under Rice-Groundnut-Cowpea cropping system.

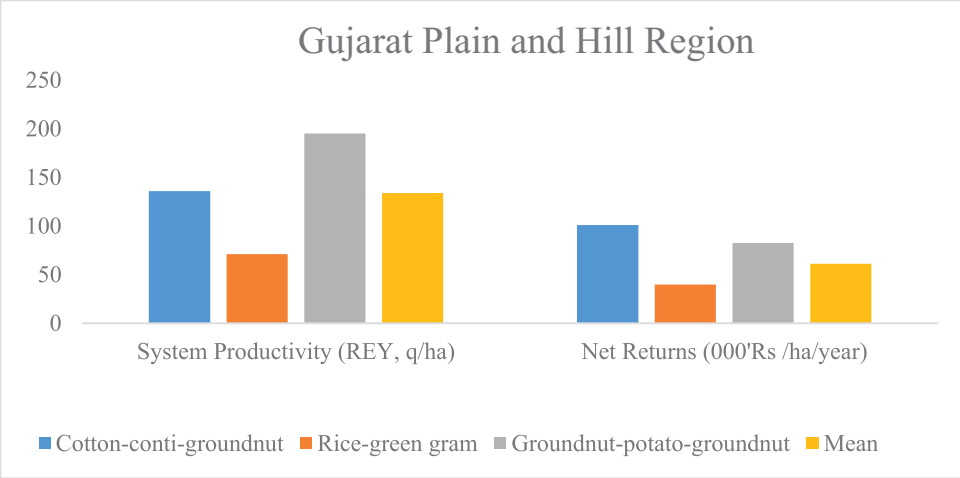


Western Coastal Plains and Ghats: Five cropping systems with diverse purposes such as family nutrition (Rice-Cassava-Amaranthus) livestock nutrition (Rice-Para grass-Fodder Cowpea), maintaining soil health (Rice-Sesbania- Bush

Cowpea) and income enhancement for family (Rice-Okra-Cucumber) were compared with predominant cropping system like Rice-Okra-Cucumber. For income enhancement with Rice-Rice registered significantly higher rice equivalent yield 115 q/ha with net return Rs. 13,139 /ha. thus, indicating their suitability over the existing systems. Cropping systems like Rice-Cassava-Amaranthus was found to be most suitable for the Western Coastal Plains and Ghats for providing family food and nutritional security. Therefore, this cropping system should be taken as integral part of integrated farming system for the regions. The area of 1000 m^2, 1200 m^2 and 1600 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Rice-Para grass-Fodder Cowpea was found to be suitable to provide the fodder and nutritional requirement of dairy animals and it should be taken in area of 1800 m^2, 4000 m^2 and 3600 m^2 under HH1, HH2 and HH3, respectively. . For enhancement of income of household cropping system Scented rice-Sweet corn-Bitter gourd may be found suitable and it will take in area of 1200 m^2, 2800 m^2 and 6800 m^2 under HH1, HH2 and HH3, respectively The soil organic carbon was registered highest (1.8%) under Rice-Okra-Cucumber cropping system.



Gujarat Plain and Hill Region: Total 15 cropping systems such as Groundnut-potato-groundnut, Cotton-Cotton-Groundnut, Rice-Greengram-Fellow, Veg. Cow pea-Amaranthus-Groundnut, Groundnut-Coriander-Sesame,Rice-Sunhemp-Greengram, Maize-Leafy coriander-Pearl millet, Groundnut-Coriander-Sesame, Rice-Indianbean-Sesamum, Marvel grass , Rice-Lucerne-Conti.., Fodder sorghum-Lucerne-conti.., Rice-fenugreek-Cluster bean, Groundnut-Onion-Sorghum and Veg. clusterbean-Leafy fenugreek-Sesamum have been examined. The results revealed that Groundnut-potato-groundnut (REY 195.0 q/ha) and net return (Rs. 1,00,954 /ha) was recorded under Cotton-conti-groundnut cropping system. Cropping systems like Maize-Leafy coriander-Pearl millet was found to be most suitable for the Gujarat Plain and Hill for providing family food and nutritional security. The area of 1400 m^2, 1350 m^2 and 4500 m^2 may be allotted for the above purpose for HH1, HH2 and HH3 respectively. Marvel grass-Conti.. were found to be suitable to provide the fodder and nutritional requirement of dairy animals and it should be taken in area of 800 m^2, 800 m^2 and 1600 m^2 under HH1, HH2 and HH3, respectively. For enhancement of income of household cropping system Rice-fenugreek-Cluster bean may be found suitable and it will take in area of 2200 m^2, 3700 m^2 and 5900 m^2 under HH1, HH2 and HH3, respectively. The soil organic carbon was registered highest (0.93%) under Marvel grass-Conti.. cropping system therefore, this system may be taken as soil health improvement crop modules on rotation basis.


Gujarat Plain and Hill Region
250
200
150
100
50
0
System Productivity (REY, q/ha)
Net Returns (000'Rs /ha/year)
Cotton-conti-groundnut
Rice-green gram
Groundnut-potato-groundnut
Mean

7.3 TECHNOLOGY TRANSFER AND REFINEMENT

7.3.1 ON-FARM RESEARCH

7.3.1.1 On-farm crop response to application of nutrient

Title of the experiment: On-farm crop response to application of major plant nutrients in predominant cropping system

Objective: To assess the response of major crops to application of N, P and K at recommended rates in predominat cropping systems in different agro-ecosystem under farmers field condition.

Year of start: 1999-2000, Treatments are modified in 2010-2011.

Treatments: There are five common treatments at various locations. They are ($N_0P_0k_0$), N, N+P, N+K and N+P+K and all the nutrients are applied as per the recommended rates of crops/cropping systems evaluated at particular location. Two treatments namely, N+P+K+ Supplement of deficient micronutrient based on soil test and farmer's practice were added during 2010-2011.

Locations:

Cropping system	OFR Centre (State)	No. of trials
Rice- Rice	Vellyani (Kerala)	24
Rice- Wheat	Udham singh nagar (Uttarakhand), East singh bhum (Jharkhand), Fatehpur (U.P.), Udham Singh Nagar (J.K.), Fethabad (Haryana) Umaria and Annupur (Madhy Pradesh)	168
Rice- Mustard	Nadia (W.B.)	24
Rice- Gram	Kanker (C.G.), Kendujhar (Orissa)	36
Rice- Maize	Vizianagaram (A.P.)	24
Rice- Sesamum	Bhawanisagar (Tamil Nadu)	24
Maize- Wheat	Dungarpur (Rajasthan), Bilashpur (H.P.)	48
Maize- Toria	Kendujhar (Orissa)	12
Pearlmillet- Mustard	Satara (Maharashtra)	24
F Sorghum- wheat	Patan (Gujarat)	24
Soybean- Wheat	Dharwad (Karnataka)	12
Soybean- Hybrid Maize	Dharwad (Karnataka)	12
Total		**432**

Results: The centre-wise details of varities, nutrients used, crop yield and crop response to NPK application in terms yield difference, and are presented in table 7.3.1. Brief descriptions of centre-wise result are given below.

Rice rice: A total 24 trial conducted at Vellyani centre Kerala. Application of micronutrient show very positive response. However, application of recommended dose of fertilizer recorded higher yield over the control 208% but it lower by -9% than farmers practices in *Kharif* Season as farmers already applying higher dose of fertilizers than RDF. Zinc application recorded good response and it helps in additional yield 5% over the RDF. Additional yield of 758 kg ha^{-1} is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient. Same trend like

Kharif observed in *Rabi* rice.

Rice-wheat: A total 168 trial conducted at 7 locations compromising of 7 NARP zones. Under these total 6 states covered which are Uttarakhand, Jharkhand, Madhya Pradesh, Uttar Pradesh, Jammu Kashmir and Haryana.

Increase in yield was recorded by the application of micronutrient (Zn) in both crop and highest percentage increase in yield over Recommended Fertilizer (NPK only) were rice it was 8.9% and in case of wheat 10.2% at Fethabad (Haryana) other centre also observed up to 9% increase in yield with the application of micronutrients. Similar trend was observed in case of recommended dose of fertilizer it recorded higher yield over the control at all the 7 locations within range of 68 to 186% in case of rice and 68 to 303% in case of wheat. Highest yield gap 3615 kg ha^{-1} in rice recorded Fatehpur of Uttar Pradesh and 3752 kg ha^{-1} in wheat were recorded at Fethabad of Haryana. Highest percentage increase in yield 186 in case of rice and 303% in case of wheat were recorded at East Singh Bhum Jharkhand. In rice-wheat system, across the NARP zones, it was found that mean yield gap of 1359 kg ha^{-1} exists between farmers and recommended nutrient practice. Additional yield of 507 kg ha^{-1} is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient.

Rice- gram: A total 36 trials were conducted in 2 NARP zones Chhattisgarh plain zone (Kanker) of Chhattisgarh and North Central Plateau of Kendujhar Orissa. At kanker it was found that significantly higher additional yield of 1064 kg ha^{-1} can be obtained from rice through application of 100:60:40 Kg NPK + 20 kg zinc ha^{-1}. In gram, the additional yield over farmer practice was found to be 416 kg ha^{-1} due to application of 20:50:20: Kg NPK ha^{-1}. Application of zinc as micronutrient in rice gave 3.3 per cent additional yield in rice and 5.9% in case of Gram than recommended NPK. At Kendujhar it was found that significantly higher additional yield of 109 kg ha^{-1} can be obtained from rice through application of 60:30:30 Kg NPK + 25 kg zinc ha^{-1}. Application of zinc as micronutrient in rice gave 3.6 per cent additional yield than recommended NPK. Same way at Orissa gram give 5.6% additional yield.

Rice-mustard: A total 24 trials were conducted in 1 NARP zones. New Alluvial Zone (Nadia) of West Bengal, application of 25 kg Zinc ha^{-1} recorded additional yield of 169 and 36 kg ha-1 in rice and mustard. It was observed that farmer's practices of nutrient management resulted in lower yield (328 and 125 kg ha-1) of rice and mustard compared to application of recommended quantity of NPK and NPK+ Mn.

Rice-maize: Total 24 trials were conducted in North Coastal Zone - Anakapalle of Andhra Pradesh. There were huge yield gap in recommended NPK application and farmer practices under both crop, In case of rice application of 80:60:50 Kg NPK ha^{-1} gave additional yield of 2363 kg ha^{-1} and 789 kg ha^{-1} over the control and farmer practice respectively which were 68 and 15% higher over the control and farmer practice respectively. In case of maize application of 200:80:80 Kg NPK ha^{-1} gave additional yield of 3031 kg ha^{-1} and 1475 kg ha^{-1} over the control and farmer practice respectively which were 111 and 30% higher over the control and farmer practice respectively.

Rice-sesame: A total 24 trials were conducted in 1 NARP zones. In Western Zone (Bhawanisagar) of Tamil Nadu, yield difference of system between farmers and recommended NPK practices were found to be 304 kg ha^{-1} and 31 kg ha^{-1} in rice and okra. Further with application of micronutrient gave additional yield of 675 kg ha^{-1} and 67 kg ha^{-1} in rice and okra.

Maize-wheat: A total 48 trials were conducted in 2 NARP zones. Sub-mountain and low hills sub-tropical zone (Bilaspur) of Himachal Pradesh, application of 25 kg Zinc ha^{-1} recorded additional yield of 240 and 251 kg ha^{-1} in maize and wheat. It was recorded that application of 90:45:30: Kg NPK + 25 kg zinc ha^{-1} in maize and 80:40:40: Kg NPK + 25 kg zinc ha^{-1} in wheat gave significantly higher yield than farmer practices and it was observed 55 and 62% higher than farmer practices in maize and wheat respectively. At Sub-Humid Southern Plain and Aravalli Hill Zone (Udaipur) of Rajasthan application of 25 kg ha^{-1} of zinc in addition to recommended NPK in maize and wheat gave additional yield of 260 and 269 kg ha^{-1} which was 9.3 and 7.6% higher than NPK alone. It was observed that farmer's practices of nutrient management resulted in lower yield (1290 and 1292 kg ha^{-1}) of maize and wheat compared to application of recommended quantity of NPK and NPK+ Mn.

Maize-Toria: A total 12 trials were conducted in 1 NARP zones. In (keonjhar) of Orissa, yield difference of system between

farmers and recommended NPK practices were found to be 1368 kg ha^{-1} and 347 kg ha^{-1} in maize and Chickpea. Additional yield of 242 kg ha^{-1} and 35 kg ha^{-1} can be achieved by adding micronutrient in the system.

Pearl millet-mustard: In case of pearl millet-mustard system at Semi Arid Eastern Plain Zone (Dausa) Rajasthan there is huge improvement in yield was recorded with the application of RDF over the farmer practice in pear millet (20%) and mustard (32%) further application of micronutrient enhance the yield up to (41%) and (42%) respectively. It indicated the importance of balance application of nutrients in the field. Arid system pearl millet-mustard recorded very positive response to RDF and micronutrient which show the importance of fertilizer application in arid region which normally taken least priority.

Soybean-maize: A total 12 trials were conducted in Northern Transitional Zone (Dharwad) of Karnataka, It was observed that farmer's practices of nutrient management resulted in lower yield (90 and 171 kg ha-1) of soybean and maize compared to application of recommended quantity of NPK. Application of zinc sulphate in addition to recommended NPK was resulted additional yield of 214 kg ha^{-1} in soybean and 314 kg ha^{-1} in maize.

Soybean-wheat: A total 12 trials were conducted in Northern Transitional Zone (Dharwad) of Karnataka, It was observed that there was huge yield gap between farmer's practices and recommended nutrient application and which gave (additional yield of 280 and 193 kg ha^{-1}) in soybean and wheat respectively as compared to farmer practices. Which were 16.0 and 14.8% higher yield than farmer practices in soybean wheat respectively.

Sorghum-wheat: In case of Sorghum-wheat system at North West Agro climatic Zone (Adiya) Gujarat a total 24 trials were conducted and like other arid or semi-arid climatic zones there is huge improvement in yield was recorded with the application of RDF over the farmer practice in Sorghum (17%) and wheat (22%) further application of micronutrient enhance the yield up to (26%) and (37%) respectively.

Summary of results on response of prevalent cropping system to applied nutrient in various NARP zones are:

- On-farm nutrient response trials (432 no's) conducted in various NARP zones indicated, across the locations and systems, nutrient application gap of 16, 25, 56 and 95% in N, P2O5, K2O and micro nutrient exists between farmers practice and recommended nutrient package. The same is also reflected in system yield of major cropping systems.
- Agronomic Efficiency (AE) of N can be enhanced to 34, 20, 19 and 47 kg (grain yield /kg of N) from 7, 9, 8, 18 (grain yield /kg of N) in rice-rice, rice-wheat, maize-wheat, and rice-chickpea systems respectively by application of recommended dose of N with P and K instead of N alone.
- Mean economic response of cropping systems to applied nutrients indicates, a return of Rs 6.7, 4.0 and 7.0 per rupee invested on N, P2O5 and K2O respectively.
- On-farm system yield gap between recommended dose of N P2O5 K2O and farmer's package was found to be 1359, 2086 and 1415 in rice- wheat, maize-wheat and rice-gram which can enhanced up to 1866, 2633 and 1804 kg ha^{-1} with application of micronutrients. If we consider all system together than yield gap between recommended dose of N P2O5 K2O and farmer's package was found 1454 kg ha^{-1}, which can enhanced up to 2325 kg ha^{-1} with application of micronutrients.
- At Vellyani (Kerala) in rice-rice farmer practices recorded higher yield than RDF because farmers are applying high dose of fertilizers but in imbalance manner. Farmers should encourage applying balance dose of fertilizers along with micronutrient.

Table-1 : Yield potential of different cropping systems under researcher and farmer managed conditions - Year 2021-22
Report for Grain Yield - Year 2021-22

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Rice-rice																							
Kerala	Southern Zone - Vellayani/	Not Available	Uma/	4.6	2	446	35	148	**1576**	**2088**	**3180**	**3197**	**4843**	**5601**	**5324**	--	--	--	--	**3267**	**758**	**-481**	**277**
	Vellayani/		90- 45 -45 /																				
	24		ZnSO4(20)																				
			98-50-41																				
Kerala	Southern Zone - Vellayani/	Not Available	Uma/	--	--	--	--	-	**1486**	**2299**	**3238**	**3242**	**4782**	**5416**	**5295**	--	--	--	--	**3296**	**634**	**-513**	**122**
	Vellayani/		90- 45 -45 /																				
	24		0																				
			101-48-43																				
Rice- Wheat																							
Uttarakhand	Bhabar and Tarai Zone - Pantnagar/	Alluvial	**HKR 27**	6.3	0.7	275	18	170	3713	4550	5421	5100	6242	6479	5875	--	--	--	--	**2529**	**238**	**367**	**604**
	Udham singh nagar/		150- 60-40/																				
	24																						
			148-50-25																				
Uttarakhand	Bhabar and Tarai Zone - Pantnagar/	Alluvial	**HD 2967/**	6.3	0.7	275	18	170	3429	3813	4646	4450	5763	6138	5567	--	--	--	--	2333.3	375.0	195.8	570.8
	Udham singh nagar/		150- 60-40/																				
	24																						
			127-43-33																				
Uttar Pradesh	Central Plain Zone - Kanpur/	Not Available	**PHB - 71**	7.9	0.4	188	13	142	2872	4281	5488	5078	6486	6993	5400	--	--	--	--	3614.7	506.5	1086.8	1593.3
	Daleep Nagar (Kanpur Dehat)/		**150- 60 -40 /**																				
	24		**ZnSO4(25)**																				
			199- 64-0																				
Uttar Pradesh	Central Plain Zone - Kanpur/	Not Available	**HD 2967**	7.9	0.4	188	13	142	2221	3230	4165	3860	4787	5182	4035	--	--	--	--	2566.3	394.9	752.3	1147.1
	Daleep Nagar (Kanpur Dehat)/		**120- 60 -40 /**																				
	24		**ZnSO4(0)**																				
			143- 61-0																				

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Jharkhand	Central and North Eastern Plateau Zone	Not Available	Naveen	--	--	--	--	-	1243	2338	2715	2574	3563	3733	2607	--	--	--	--	2320	170	956	1126
	East Singhbhum		100- 50 -25 /																				
	24		ZnSO4(5)																				
			60- 30-0 (0)																				
Jharkhand	Central and North Eastern Plateau Zone	Not Available	K-9107	--	--	--	--	-	826	2084	2674	2567	3333	3505	2516	--	--	--	--	2506.7	172.5	817.1	989.6
	East Singhbhum																						
	24		ZnSO4(5)																				
			60- 30-0 (0)																				
Jammu & Kashmir	Subtropical low altitude	Not Available	B-370	7.2	3.0	229.0	14.6	122.2	1404	1895	2496	2220	2906	2982	2320	--	--	--	--	1503	75	587	662
	Samba		30- 20 -10 /																				
	24		ZnSO4(10)																				
			24- 14-0 (0)																				
Jammu & Kashmir	Subtropical low altitude	Not Available	WH1105	7.2	3.0	229.0	14.6	122.2	1473	1970	2564	2333	2988	3056	2389	--	--	--	--	1514.6	68.8	598.8	667.5
	Samba		100- 50 -25 /																				
	24		ZnSO4(0)																				
			56- 26-0 (0)																				
Haryana		Not Available	PB-1121						1983	4130	4446	4295	4712	5130	4461	--	--	--	--	2729	418	251	669
	Fatehabad		150- 60 -60 /																				
	24		ZnSO4(5)																				
			150-60-0 (0)																				
Haryana		Not Available	WH-2967						1281	3601	4771	4549	5034	5548	5158	--	--	--	--	3752.5	514.2	-124.2	390.0
	Fatehabad		150- 60 -30/																				
	24		ZnSO4(0)																				
			150-0-0 (0)																				
Madhy Pradesh	Central Highland, Hot Sub humid	Not Available	JRH-19						2315	3864	4400	4004	5267	5562	4195	--	--	--	--	2952	295	1072	1367
	Umaria		120- 60 -40 /																				
	24		ZnSO4(25)																				
			80-30-0																				

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Madhy Pradesh	Central Highland, Hot Sub humid	Not Available	JW3211						2131	3436	4321	3820	4603	4819	3845	--	--	--	--	2472.4	216.3	758.5	974.8
	Umaria		120- 60 -40/																				
	24		ZnSO4(25)																				
			80-30-0																				
Madhy Pradesh	Central Highland, Hot Sub humid	Not Available	MTU1010						2313	2594	2769	2800	4062	3967	2804	--	--	--	--	1749	-95	1258	1163
	Annupur		120- 60 -40 /																				
	24		ZnSO4(25)																				
			50-25-0																				
Madhy Pradesh	Central Highland, Hot Sub humid	Not Available	JW3211						2015	2708	3283	2977	3800	4073	2989	--	--	--	--	1784.4	272.9	810.8	1083.7
	Annupur		120- 60 -40/																				
	24		ZnSO4(25)																				
			60-25-0																				
Rice- Gram																							
Chhattis-garh	Chhattisgarh plain zone	Not Available	IGKVR-1	7.3	0.6	251.9	12.5	306.5	3391	4565	5331	5069	6247	6451	5388	-	-	-	-	2856	205	859	1064
	Kanker		100- 60-40/																				
	24		ZnSO4(20)																				
			60- 40-30																				
Chhattis-garh	Chhattisgarh plain zone	Not Available	JAKI-9218	7.3	0.6	251.9	12.5	306.5	1276	1580	1970	1782	2278	2413	1996	-	-	-	-	1002.1	134.9	281.7	416.5
	Kanker		20- 50-20/																				
	24																						
Odisha	Odisha	Not Available	Sahbhagi Dhan						2192	3248	3745	3645	4587	4754	4061	-	-	-	-	2395	166	526	692
	keonjhar		60-30-30/																				
	12		ZnSO4(25)																				
Odisha	Odisha	Not Available	NBeG 3						537	798	888	882	1282	1353	919	-	-	-	-	745.1	71.3	363.3	434.5
	keonjhar		20- 40-20/																				
	12																						

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Rice-Maize																							
Andhra Pradesh	North Coastal Zone - Anakapalle/	Red Sandy	MTU1001/	6.8	2.1	214	17	271	3437	4396	5128	4901	5800	6180	5391					**2363**	**380**	**409**	**789**
	Vizianagaram		80- 60-50/																				
	24		ZnSO4(25)																				
			70-44-37																				
Andhra Pradesh	North Coastal Zone - Anakapalle/	Red Sandy	NK 6607/	--	--	--	--	-	2739	3882	4800	4634	5770	6452	4976					3031.7	681.3	794.6	1475.8
	Vizianagaram		200 - 80-80/																				
	24		control																				
			172-71-54																				
Rice-Seasme																							
Tamil Nadu	Western Zone	Not Available		0	0	0	0	0	3555	3952	4208	4455	5163	5533	4859	33	23	45	3.47	**1608**	**370**	**304**	**675**
	Bhawanisagar		150- 50-50																				
	24		ZnSO4(25)																				
			115-50-23																				
Tamil Nadu	Western Zone	Not Available		--	--	--	--	-	463	499	530	580	676	712	645	5	4	8	3.65	**212**	**37**	**31**	**67**
	Bhawanisagar		35- 23-23																				
	24		ZnSO4(5)																				
			32-23-20																				
Rice-Mustard																							
West Bengal	New Alluvial Zone	Not Available	Ajit-IET-22083						3285	3914	4559	4410	5030	5199	4871	-	-	-	-	**1745**	**169**	**159**	**328**
	Nadia		80-40-40-25																				
	24																						
West Bengal	New Alluvial Zone	Not Available	Pusa bold						1142	1381	1574	1506	1715	1750	1625	-	-	-	-	**573**	**36**	**89**	**125**
	24		80-40-40-30																				
Maize-wheat																							
Rajasthan	Humid Southern Plain /	Clay	DHM-117/	6.8	0.6	303	19	214	785	1490	2508	2350	2808	3069	1779	0	0	0	0	**2023**	**260**	**1029**	**1290**
	Dungarpur/		90- 35 -30 /																				
	24		ZnSO4(25)																				
			70- 20 -0																				

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Rajasthan	Humid Southern Plain /	Clay	Raj-4079/	6.8	0.6	303	19	214	1281	2513	3104	2873	3515	3783	2492	0	0	0	0	**2233**	**269**	**1023**	**1292**
	Dungarpur/		120- 40-30 /																				
	24		control																				
			70- 15-0																				
Himachal Pradesh	Sub-mountain and low hills sub-tropical zone /	Submon-taneous	Hybrid; Kanchan/	0	0	0	0	0	1580	1989	2580	2249	2964	3204	2067	0	0	0	0	**1384**	**240**	**897**	**1136**
	Bilaspur (H.P.)/		90- 45 -30 /																				
	24		ZnSO4(25 Kg)																				
			76.7-0-0																				
Himachal Pradesh	Sub-mountain and low hills sub-tropical zone /	Submon-taneous	HPW-368/	--	--	--	--	-	1570	1989	2539	2314	2903	3154	1951	0	0	0	0	**1333**	**251**	**952**	**1203**
	Bilaspur (H.P.)/		80- 40-40/																				
	24		ZnSO4(25 Kg)																				
			72.6-5-2.5																				
Maize-Toria																							
Odisha	**Odisha**	Not Available	OMH 14-27						2069	3270	4130	3926	5153	5395	3784	-	-	-	-	**3084**	**243**	**1368**	**1611**
	keonjhar		120-60-60																				
	12		ZnSO4(25)																				
			59-46-23																				
Odisha	**Odisha**	Not Available	Anuradha						519	721	849	841	1037	1072	690	-	-	-	-	**518**	**35**	**347**	**382**
	keonjhar		30-15-15/																				
	12		ZnSO4(40)																				
			12-9.7-4																				
Soyabean-Maize																							
Karnatka	Northern Transitional Zone		DSb-21	0	0	0	0	0	1010	1181	1354	1583	1756	1970	1666	0	0	0	0	**746**	**214**	**90**	**304**
	Dharwad		40-80-25																				
	6		ZnSO4(12.5)																				
			9-23-0																				
Karnatka	Northern Transitional Zone		BRMH-1	--	--	--	--	-	4174	4332	4537	4782	4969	5282	4798	0	0	0	0	**795**	**314**	**171**	**484**
	Dharwad		150-62.5-62.5																				
	6																						

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status gap 1(kg/ha) gap 2(kg/ha)					Yield(kg/ha) gap 3(kg/ha) gap 4(kg/ha)											Yield	Yield	Yield	Yieldgap 3 (kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Control	N	NP	NK	NPK	NPK + M.Nut.	F. Pract.	SE(d)	SE(M)	CD -5%	CV	RF vs Control	RF + Mic.Nut. vs RF	RF vs FP	RF + Mic. Nut. vs FP
Soyabean-Wheat																							
Karnatka	Northern Transitional Zone		DSb-21	0	0	0	0	0	1500	1610	1807	1920	2030	2193	1750	0	0	0	0	**530**	**163**	**280**	**443**
	Dharwad		40-80-25																				
	7		ZnSO4(12.5)																				
			41-46-0																				
Karnatka	Northern Transitional Zone		JAKI-9218	--	--	--	--	-	1070	1193	1220	1357	1497	1663	1303	0	0	0	0	**427**	**167**	**193**	**360**
	Dharwad		25-50-0																				
	7																						
F Sorghum-wheat																							
Guajart	North-West AZ	Sandy loam		0	0	0	0	0	7147	8139	10770	9163	11631	12484	9905	0	0	0	0	**4484**	**853**	**1726**	**2579**
	Patan		100-50-25																				
	24		ZnSO4(20)																				
			101-33																				
Guajart	North-West AZ	Sandy loam		--	--	--	--	-	1844	2198	2954	2516	3320	3725	2726	0	0	0	0	**1476**	**405**	**594**	**999**
	Patan		120-60-30																				
	24		ZnSO4(15)																				
			110-39																				
Pearlmillet-mustard																							
Rajasthan	Semi Arid Eastern Plain Zone	Alluvial	Rasi-1827	7.4	0.5	222.4	22.4	226.6	988	997	1120	1124	1143	1344	947	0	0	0	0	**155**	**201**	**195**	**396**
	Dausa, Rajasthan/		90-30-30/																				
	24		ZnSO4(25)																				
			54-17																				
Rajasthan	Semi Arid Eastern Plain Zone	Alluvial	DRMRIJ-31 (Giriraj)	7.4	0.5	222.4	22.4	226.6	1345	1341	1401	1502	1636	1762	1240	0	0	0	0	**291**	**126**	**395**	**522**
	Dausa, Rajasthan/		60-40-30/																				
	24		ZnSO4(30)																				
			61-15-0																				

7.3.2 Diversification of existing farming systems

Title of the experiment: Diversification of existing farming systems under marginal household conditions

Objectives

- To enhance the productivity and profitability of marginal farmers households through IFS approach
- To improve the livelihood and nutritional security through diversification approach
- To estimate the impact of capacity building in diversification of crop + livestock system

Year of start: 2013-14 (Implemented in new districts from 2017-18)

The experiment in farming systems perspective entitled "Diversification of existing farming systems under marginal households" was initiated with the background that 63 % households in India are in marginal category with average land holding size of 0.38 ha. Due to their size of holding, marginal farm households do not have sufficient marketable surplus for getting the decent livelihood and are most vulnerable to climate related risks. The assumptions made are marginal households are having family members of 5 with crop + livestock as the dominant farming systems and if these system is diversified, sufficient marketable surplus can be generated for sustainable livelihood. First phase is completed in 2016-17 from 2017-18 onwards experiment conducted in new districts in this report impact study of second phase is covered.

Modules: The experiment was designed with innovative approach in which changes are made compulsorily in all components of farming systems by way of introducing new crops, livestock species and product or processing techniques in marginal households aiming to increase the marketable surplus and income of the family from a less land resource. The major strength of marginal household is having sufficient manpower (due to family size) for farm operations. After benchmarking, modules comprising of cropping system diversification (most efficient cropping systems was synthesized keeping in view of the farmers resources, perception, willingness, market and requirement other components in the system), livestock diversification [(Mineral mixture + deworming+ round the year fodder supply for existing components) + introduction of location specific low cost livestock components viz., BYP, duckery, piggery, goat etc)], product diversification (Preparation of mineral mixture/value addition of market surplus products/Kitchen /roof gardening) and capacity building (Training of farm households on farming systems including post- harvest and value addition and assessing its impact) were implemented in randomly selected 24 marginal farm households in each district. The general guidelines used for designing the modules are given below

Farming System	Notation	Module name	Details
Existing	M0	Bench mark	Recording of bench mark data on crop, livestock, other components and household as a whole
Improved	M1	Cropping system diversification	Most efficient cropping systems was introduced keeping in view of the farmers resources, perception, willingness, market and requirement of other components in the system besides improving the practices of existing systems
	M2	Livestock diversification	Mineral mixture + deworming+ round the year fodder production + introduction of location specific low cost livestock components viz., Backyard poultry, duckery, piggery & goat
	M3	Product diversification	Preparation of mineral mixture/value addition of market surplus products/kitchen /roof gardens
	M4	Capacity building	Training of farm households on farming systems especially on newly added practices & components and assessing its impact

Households: Twenty four marginal households were selected for experiment in all the locations. The average holding size of in the study locationsranged from 0.34 to 1.34 ha in various farming systems. Physical and technical inputs were provided

during 2018-19 to 2020-21 in different modules. During 2021-22, physical and technical inputs were not provided to assess the impact of the interventions and continuation of interventionsby farmers and its effect on net income. The impact study involved households with meanholding size of ha. At very few locations and farming systems, the size of holding of farming system was higher than 1 ha due to non-availabilityof marginal households.

Locations: During 2021-22, impact of physical and technical interventions made during 2018-19 to 2020-21 were measured in 21 districts covering 15 States in various farming systems. The details of district, State, farming systems, size of holding, number of households in each farming systemsin which impact assessment were made given in Table 7.4.2.

Data analysis methodology: Based on the benchmark data, farming systems practiced by the households were identified and grouped in to different farming system categories such as field crops+ dairy, field crops + dairy+ goat *etc* as givenin Table 7.4.2. Five parameters namely production(on equivalent basis of base pre-dominant crop), marketable surplus (calculated by deducting the

family consumption for food, feed, seed *etc* from the total production), cost (total cost of the systemincluding all components and diversification), returns (calculated by deducting the total costfrom gross returns of the system) and profit (calculated by deducting the cost of the system from the gross income obtained from marketablesurplus) were used for comparison of existing withimproved (diversified) system and also different farming systems during the intervention period of 2018-19 to 2020-21. Farming system with more than one household was subjected to ANOVA andpaired t-test analysis. Paired t-test has been carried out for comparing existing and diversifiedsystems with respect to production, marketable surplus, cost, return and profit. Similarly, one-wayANOVA has been carried out to identify the best farming system with respect to production, marketable surplus, cost, return and profit for the district.

The impact study was carried out with structuredproforma by collecting the data on interventions made during 2018-19 to 2020-21, continuation, partial continuation and rejection of interventionsduring 2021-22 and its impact on income during the impact year. Result of net income obtained during the impact year was compared withintervention period and increase in net incomeover benchmark was worked out with mean net income obtained during intervention and impact period (Table 7.4.2).

Results

Farming system wise net income obtained during intervention and post intervention period along with improvement over benchmark net income is given in Table 7.4.2. State and district wise summary of results is explained briefly below.

Andhra Pradesh

Vizianagaram : Crop+Livestock+Poultry farming system was found to be dominant in the district having mean area of 1.34 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 100183/year during 3 years of intervention period. During impact assessment year, net income of Rs 124,450 was recorded which 24 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + livestock farming system resulted in 1.64 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 64920 from 1.34 ha). Additional return of Rs 41,330 was obtained with the investment of Rs 9250 on critical inputs related to interventions. The return over cost of intervention was found to be 6.4. In the third year, the income could be doubled due to the diversification of existing farming systems in the marginal farm households.

Duplex back yard poultry rearing unit for rearing securely 15-20 Poultry Birds

Azolla unit for animal feeding

Assam

Goalpara : Among the 4 farming systems studied, Crop + Piggery+Poultry was found better in terms of improvement in net income over benchmark. The mean area of the 4 households where in the system was studied is found to be 0.76 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 74458/year during 3 years of intervention period. During impact assessment year, net income of Rs 78590 was recorded which 5.5% higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in Crop + Piggery+Poultry farming system resulted in 1.66 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 45,500 from 0.76 ha). Additional return of Rs 33,090 was obtained with the investment of Rs 5050 on critical inputs related to interventions. Among the four farming systems, Crop + Fishery + Piggery + Poultry yielded the highest net mean return of 88,970 per year, showcasing

a 1.64 times improvement in net income over the benchmark. This system was identified as the second-best option among the various systems evaluated.

Himachal Pradesh

Kangra : In the district Crop+dairy dominating all 24 farmers having this with average holding 0.55 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 66,331/ year during 3 years of intervention period. During impact assessment year, net income of Rs 39545 was recorded which is higher by 24%. This indicates that the farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 2.29 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 30,766 from 0.55 ha). Additional return of Rs 39,558 was obtained with the investment of Rs 3069 on critical inputs related to interventions. The return over cost of intervention was found to be 16.8. The net income could be nearly doubled from second year onwards.

Jammu and Kashmir

Jammu : In the district Crop+dairy dominating all 24 farmers having this with average holding 0.49 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 140717/ year during 3 years of intervention period. During impact assessment year, net income of Rs 132804 was recorded which is lower by 5%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.54 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 90,224 from 0.49 ha). Additional return of Rs 48,514 was obtained with the investment of Rs 12721 on critical inputs related to interventions. The return over cost of intervention was found to be 3.8. From second year onwards clear cut impact observed in net income and in post intervention year slight decrease in return was observed.

Diversification in existing component through mushroom and poultry

Jharkhand

East Singhbhum: In the district Crop+Goat+Poultry dominating all 24 farmers having this with average holding 0.75 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 93,392/ year during 3 years of intervention period. During impact assessment year, net income of Rs 95,170 was recorded which is higher by 2%. This indicates that the farmers have continued all the interventions during the post intervention impact assessment year. From first year itself high jump in net income is recorded as East Singhbhum is an interior area and it is untouched from the new technology in the agriculture sector developed after post green revolution period so small intervention shown good reflection

Low cost diversification options in field Crop+Goat+Poultry farming system resulted in 2.92 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 32,172 from 0.75 ha). Additional return of Rs 61,664 was obtained with the investment of Rs 32,172 on critical inputs related to interventions. The return over cost of intervention was found to be 6.95. The income could be almost tripled in the first year itself this show the importance of the IFS in those area which are far away from modern technology in agriculture.

Karnataka

Dharwad : In the Karnatka at Dharwad center both farming systems crop+dairy and crop+dairy+horticulture performed very well and through intervention they show almost three time return but if we go insight then crop+dairy+horticulture found more consistence than crop+dairy as it show continuous increase in net return The interventions made in different modules of crop, livestock, product diversification and capacity building of the (crop+dairy+horticulture) farming system resulted in mean net income of Rs 167642/year during 3 years of intervention period. During impact assessment year, net income of Rs 172704 was recorded which 3% higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. But in case of crop+dairy there is 10% lower net return recorded in impact year which show that farmers discontinue or partially adopted few intervention. Low cost diversification options in crop+dairy+horticulture farming system resulted in 3.0 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 56,214 from 0.66 ha). Additional return of Rs 1,12,694 was obtained with the investment of Rs 3204 on critical inputs related to interventions.

Chikkaballa pura At this centre total five farming system evaluated and in all possible combination it is found that Crop + dairy + poultry farming system is most remunerative The interventions made in different modules of crop, livestock and poultry product diversification and capacity building of the farming system resulted in mean net income of Rs 2,48,622/ year during 3 years of intervention period. During impact assessment year, net income of Rs 2,21,238 was recorded which is lower by 11%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + dairy + poultry farming system resulted in 1.81 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,33,82 from 0.83 ha). Additional return of Rs 1,08,411 was obtained with the investment of Rs 11,037 on critical inputs related to interventions. The return over cost of intervention was found to be 7.96. All the farming system show good performance except Crop + horticulture + dairy which only show 1.13 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income.

Kerala

Thiruvananthapuram: Three farming system Hort. + Poultry, Hort. + Dairy and Hort. + Crop + Dairy evaluated at the centre and it is recorded that all component horticulture, crop and dairy together performing well instead of taking only two. The interventions made in different modules of Hort. + Crop + Dairy product diversification and capacity building of the farming system resulted in mean net income of Rs 1,44,949/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,74,268 was recorded which is higher by 20%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Hort. + Crop + Dairy farming system resulted in 2.91 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 58,479 from 0.487 ha). Additional return of Rs 1,11,767 was obtained with the investment of Rs 10,935 on critical inputs related to interventions. The return over cost of intervention was found to be 10.58. All three farming system show good performance and show 2.39-2.91 time's improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income. It show that farming system model with scientific intervention on critical input is most remunerative in Kerala state as homestead farming system already exist in state, we just refine it in scientific manner.

Madhya Pradesh

Anuppur At this center Crop +Dairy +Goatry perform better than Crop +Dairy + Horti. But if we talk about net return than Crop +Dairy + Horti. is higher return. The interventions made in different modules of crop, dairy, goatry product diversification and capacity building of the farming system resulted in mean net income of Rs 112215/ year during 3 years of intervention period. During impact assessment year, net income of Rs 123890 was recorded which is higher by 10%.

This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy +Goatry farming system resulted in 1.91 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 60350 from 0.85 ha). Additional return of Rs 54,784 was obtained with the investment of Rs 9335 on critical inputs related to interventions. The return over cost of intervention was found to be 6.8.

Umaria Same pattern as Annupur this centre also observed good performance under Crop +Dairy +Goatry system. The interventions made in different modules of crop, livestock and goatry product diversification and capacity building of the farming system resulted in mean net income of Rs 1,55,919/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,67,020 was recorded which is higher by 7%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy +Goatry farming system resulted in 1.98 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 80,000 from 1 ha). Additional return of Rs 78,695 was obtained with the investment of Rs 13,240 on critical inputs related to interventions. The return over cost of intervention was found to be 6.57. Crop+dairy system also performed well and show double return as the Crop +Dairy +Goatry system.

Maharashtra

Nagpur: Total four farming system evaluated at this centre, out of this Crop+ Horticulture+ Bullock pair performance is recorded better than the other farming system here bullock pair taken as component as keeping in view the existing practices by farmers to use them for agriculture purpose. The interventions made in different modules of crop, livestock and bullock product diversification and capacity building of the farming system resulted in mean net income of Rs 1,61,210/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,27,194 was recorded which is lower by 21%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop+ Horticulture+ Bullock farming system resulted in 2.5 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 61,000 from 0.83 ha). Additional return of Rs 91,706 was obtained with the investment of Rs 2530 on critical inputs related to interventions. All four farming system show 20-30% drop in net income in impact year which show farmers discontinued or partially adopted some of the intervention, sometime unavailability of inputs is major cause for discontinue of the intervention it is easy and affordable to purchase inputs on mass level.

Satara: Total four farming system evaluated at this centre, out of this Crop + Dairy+ Poultry performance is recorded better than the other farming system. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,49,632/ year during 3 years of intervention period. During impact assessment year, net income of Rs 2,61,466 was recorded which is higher by 74%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in Crop + Dairy+ Poultry farming system resulted in 3.02 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 58,833 from 0.83 ha). Additional return of Rs 1,18,758 was obtained with the investment of Rs 10,740 on critical inputs related to interventions. All four farming system shown more than double in net income from second year onwards.

Thane: Two major cropping system prevailing in the district crop+dairy and crop+poultry both system show slight improvement with range of 1.34-1.39 in net return, impact study in 2021-22 not carried out as programme shifted to MVCD mode.

Odisha

Kalahandi: Total three farming system evaluated at this centre, out of this Crops+ Dairy+ Goatary + Poultry performance is recorded better than the other farming system. The interventions made in different modules of crops, dairy, goatary and poultry product diversification and capacity building of the farming system resulted in mean net income of Rs 1,67,673/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,70,351 was recorded which is higher by 5%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crops+ Dairy+ Goatary + Poultry farming system resulted in 1.6 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 61,862 from 0.76 ha). Additional return of Rs 61,862 was obtained with the investment

of Rs 4,167 on critical inputs related to interventions. The return over cost of intervention was found to be 16.2.

Kendujhar: Total three farming system evaluated at this centre, out of this Crops+Horticulture+Poultry performance in terms of Increase in net income (2.35) over benchmark is better than the other farming system. Overall all three system perform better and show improvement from 1.88 to 2.35 times.

Rajasthan

Dungarpur: Total three farming system evaluated at this centre, Crop +Dairy+ Horticulture performance is recorded better than other system. The interventions made in different modules of crop, dairy and horticulture product diversification and capacity building of the farming system resulted in mean net income of Rs 67,606/ year during 3 years of intervention period. During impact assessment year, net income of Rs 76,338 was recorded which is higher by 13%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy+ Horticulture farming system resulted in 2.36 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 30,375 from 0.82 ha). Additional return of Rs 41,417 was obtained with the investment of Rs 5,443 on critical inputs related to interventions. The return over cost of intervention was found to be 8.44.

Telangana

Medak Total three farming system evaluated at this centre, in terms of net return Crop + dairy(2) + sheep(10) + vegetables found superior than other system. The interventions made in different modules of crop, dairy, sheep and vegetable product diversification and capacity building of the farming system resulted in mean net income of Rs 172,102/ year during 3 years of intervention period. During impact assessment year, net income of Rs 205,500 was recorded which is higher by 19%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + dairy + sheep + vegetables farming system resulted in 1.62 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,11,637 from 0.85 ha). Additional return of Rs 41,417 was obtained with the investment of Rs 5,443 on critical inputs related to interventions. The return over cost of intervention was found to be 8.44.

Uttarakhand

Udham Singh Nagar: Two system evaluated at the centre both the system shown slight improvement and 34-48 increase in net return is observed

Uttar Pradesh

Mirzapur: Only one system evaluated and it show good performance The interventions made in different modules of crop, dairy, sheep and vegetable product diversification and capacity building of the farming system resulted in mean net income of Rs 47,600/ year during 3 years of intervention period. During impact assessment year, net income of Rs 59,143 was recorded which is higher by 24%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + dairy farming system resulted in 1.75 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 34,266 from 0.5 ha). Additional return of Rs 25,139 was obtained with the investment of Rs 6,289 on critical inputs related to interventions. The return over cost of intervention was found to be 3.95.

Kanpur: Two system crop+dairy and crop+dairy+horticulture evaluated at the centre both the system show almost equal performance and the range of net return improvement is 1.73-1.75. Both the system show around 50 thousand increase in net return by just spending 15 thousand on the system.

West Bengal

Nadia: Total four farming system evaluated at the centre all four system perform better but if we compare with in farming system performance of crop+dairy+fisheries recorded little bit poor than other system, other system show increase in return 2.4 to 3 times but crop+dairy+fisheries only show 1.86 times. Which indicate that with in system some time synergic effect among different component.

Table 7.3.2. Comparison of net income during intervention (with physical and technical inputs) and post intervention (impact year, i.e without physical and technical inputs) period due to diversification of farming systems in marginal households with location specific module based low cost interventions in different districts.

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
1	Andhra Pradesh	Vizianaga-ram	Crop+Livestock+ Poultry	24	1.34	64920	9250	89570	100730	110250	124450	106250	1.64
2	Assam	Goalpara	Crop + Fishery + Piggery+Poultry	4	0.89	54250	7950	83430	87560	89620	95270	88970	1.64
			Crop + Piggery+ Poultry	4	0.76	45500	5050	71680	75645	76050	78590	75491	1.66
			Crop + Goatary+ Poultry	4	0.76	48750	5550	73458	77980	79170	82467	78269	1.61
			Crop + Dairy+ Piggery+Poultry	8	0.79	54250	6650	77564	79884	83950	85126	81631	1.50
3	Himachal pradesh	Bilaspur	Field Crops+ Dairy	24	0.55	30766	3069	56045	67363	75585	82303	70324	2.29
4	Jammu & Kashmir	Jammu	Crop+Dairy	24	0.49	90224	12721	107794	148897	165460	132804	110642	1.23
5	Jharkhand	East Singhbhum	Crop+Goat+ Poultry	24	0.75	32172	9062	92064	90431	97682	95170	93836	2.92
6	Karnataka	Dharwad	Crop+Dairy	11	0.79	66364	4161	178131	151193	234271	167400	182749	2.75
			Crop+Dairy +Horti	13	0.66	56214	3204	121427	133983	247516	172704	168908	3.00
7	Karnataka	Chikkaballa pura	Crop + dairy	4	0.88	81788	5729	118155	108156	138761	118260	120833	1.48
			Crop + horticulture + dairy	6	0.88	207986	4185	240038	219486	253641	225104	234567	1.13
			Crop + dairy + sheep	5	0.52	121477	3773	296885	148801	158804	146204	187673	1.54

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
			Crop + dairy + poultry	3	0.83	133382	11037	295738	215782	234346	221308	241793	1.81
			Crop + horticulture + dairy + sheep + poultry	6	0.76	185903	3204	317580	254955	257920	254140	271148	1.46
8	Kerala	Thiruvanan-thapuram	Hort. + Crop + Dairy	8	0.487	58479	10935	82036	184102	168709	174268	170246	2.91
			Hort. + Poultry	12	0.342	57508	9180	68514	167839	149462	152531	151341	2.63
			Hort. + Dairy	4	0.350	83047	12587	100547	223253	206549	195147	198442	2.39
9	Madhya Pradesh	Anuppur	Crop +Dairy + Horti.	2	0.92	91336	8337	120593	159193	177758	148290	151459	1.66
			Crop +Dairy +Goatry	4	0.85	60350	93350	87673	114190	134783	123890	115134	1.91
10	Madhya Pradesh	Umaria	Crop + Dairy	23	1.20	64730	14880	115410	142134	147471	142930	136986	2.12
			Crop+ Dairy+ Goatary	01	1.00	80000	13240	124188	170130	173440	167020	158695	1.98
11	Mahara-shtra	Nagpur	Crop+ Dairy+	7	0.89	79571	2880	135417	196287	209256	140649	170402	2.14
			Horticulture	5	0.88	86000	2493	107470	162959	178092	116282	141201	1.64
			Crop+ Horticulture+ Bullock pair	5	0.83	61000	2530	124733	173752	185147	127194	152706	2.50
			Crop +Dairy	7	0.77	70000	2705	111004	138833	155856	96500	125548	1.79
12	Mahara-shtra	Satara	Crop + Dairy + Goatery + Poultry	7	0.70	64714	10470	73452	151030	172356	222110	154737	2.39
			Crop + Dairy + Goatery	7	0.63	46285	10470	65142	124220	171025	253633	153505	3.32
			Crop + Dairy+ Poultry	6	0.83	58833	10470	64642	188729	195527	261466	177591	3.02

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
			Crop + Dairy	4	0.54	62500	10470	63460	135122	188195	203337	147528	2.36
13	Mahara-shtra	Thane	Crop + Dairy	12	0.53	52001	5612	63441	69859	75139	-	69480	1.34
			Crop + poultry	12	0.62	40328	7909	51620	56056	60980	-	56219	1.39
14	Odisha	Kalahandi	Crops+ Dairy	8	0.55	77550	4167	128150	112850	132325	136002	131941	1.70
			Crops+ Dairy+ Goatary	8	0.68	96126	4167	145421	146826	150646	152356	148812	1.55
			Crops+ Dairy+ Goatary + Poultry	8	0.76	103059	4167	158829	162609	167673	170571	164921	1.60
15	Odisha	Kendujhar	Crops+ Horticulture +Poultry+ Goatery	14	0.65	42811	3012	82135	87628	91881	96381	89506	2.09
			Crops+ Horticulture +Poultry	5	0.79	31400	3012	68553	73068	75745	77680	73762	2.35
			Crops +Horticulture+ Poultry+Goatery + Dairy	5	0.75	56769	3216	98750	104099	109589	113459	106474	1.88
16	Rajasthan	Dungarpur	Crop +Dairy	04	0.88	31000	5270	39104	47055	54108	58800	48525	1.57
			Crop +Dairy+ Horticulture	08	0.82	30375	5443	41523	58736	67606	76338	79058	2.60
			Crop +Dairy+ Poultry	12	0.80	28750	4632	39104	55,009	58503	64496	61795	2.15
17	Telangana	Medak	Crop + dairy (2)	5	0.89	59854	6019	85500	84500	86650	104500	90287	1.51
			Crop+dairy (2)+ sheep (10)	5	0.76	90822	9172	130800	129000	133022	157500	137580	1.51

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
			Crop + dairy (2)+ poultry(10)	5	0.95	66012	6730	93400	97000	97000	116400	100950	1.53
			Crop + dairy(2) + vegetables	5	0.8	62516	7745	115600	113000	97500	138600	116175	1.86
			Crop + dairy(2) + sheep(10) + vegetables	4	0.85	111637	15037	162250	169000	185057	205500	180451	1.62
18	Uttara-khand	Udham Singh Nagar	Crop +Dairy	14	0.41	52659	11164	54631	61612	95922	-	70721	1.34
			Crop +Dairy	10	0.40	59016	14248	68530	77822	97772	-	81374	1.38
19	Uttar Pradesh	Mirzapur	Crop +Dairy	16	0.50	34266	6289	39278	50718	52804	59143	59405	1.73
20	Uttar Pradesh	Kanpur	Crop + Dairy	12	0.8	64959	15864	102413	109477	115862	121443	112299	1.73
			Crop + Dairy + Horti.	12	0.6	69322	16530	113290	116650	122515	133347	121451	1.75
21	West Bengal	Nadia	C+D	6	0.62	27925	5510	58525	71337	93322	100052	80809	2.89
			C+D+F	4	0.51	41606	4524	56592	47336	109973	95379	77320	1.86
			C+D+H	10	0.52	52152	3772	106784	120978	90596	175600	123490	2.37
			C+P+F	4	0.50	20198	4465	47342	43000	55274	97670	60822	3.01

7.3.3 On-Farm evaluation of farming system modules

Title of the experiment: On-Farm evaluation of farming system modules for improving profitability and livelihood of small and marginal farmers

Objectives

- To address critical constraints of small and marginal farm holders for overall improvement of productivity
- To increase the profitability of small and marginal households and ensure livelihood

Year of start: 2011-12 (Implemented in new districts from 2017-18)

Modules: The experiment was designed with holistic approach where in improvement of productivity of existing components of the farming system was concentrated by appropriate interventions besides farmer opinion-based introduction of new components in optional module. Benchmarking of all components was done before making interventions in different modules. Four modules comprising of crop (low cost interventions in existing cropping systems based constraint analysis), Livestock (low cost interventions in existing livestock components based on constraint analysis), On farm processing & value addition (on farm agro processing and value addition of marketable surplus produces) and optional (Introduction of additional components based on households perception) were implemented in 2 farm households in each village comprising of 1 marginal and small household. The experiment was implemented in randomly selected 12 marginal farm households in each district. The general guidelines used for designing the modules are given below

Farming System	Notation	Module name	Details
Existing	M0	Bench mark	Recording of bench mark data on crop, livestock, other components and household as a whole
Improved	M1	Crop	Low cost interventions in existing cropping systems based constraint analysis
	M2	Livestock	Low cost interventions in existing livestock components based on constraint analysis
	M3	On farm processing & value addition	On farm agro processing and value addition for marketable surplus
	M4	Optional	Introduction of additional components based on households perception

Households: Twelve households consisting of 6 each in small and marginal categories was selected for experiment in all the locations. A total of 248 farm households were covered during the year. The average holding size of households in the study locations ranged from 0.4 to 3.32 ha for small households. At very few locations and farming systems, the size of holding of farming system was higher than 2 ha due to non-availability of small households for diversification.

Locations: Locations: During 2021-22, impact of physical and technical interventions made during 2017-18 to 2020-21 were measured in 21 districts covering 15 States in various farming systems. Past three years data were used for assessing the net income during intervention period. The details of district, State, farming systems, size of holding, number of households in each farming systems in which impact assessment were made given in Table 7.4.3.

Data analysis methodology: Based on the benchmark data, farming systems practiced by the households were identified and grouped in to different farming system categories such as field crops+ dairy, field crops + dairy+ goat etc as given in Table 7.4.3. Four parameters namely production (on equivalent basis of base pre-dominant crop), marketable surplus (calculated by deducting the family consumption for food, feed, seed etc from the total production), cost (total cost of the

system including all components and diversification) and profit (calculated by deducting the cost of the system from the gross income obtained from marketable surplus) were used for comparison of existing with improved system and also different farming systems during the intervention period of 2018-19 to 2020-21. The impact study was carried out with structured proforma by collecting the data on interventions made during 2018-19 to 2020-21, continuation, partial continuation and rejection of interventions during 2021-22 and its impact on income during the impact year. Result of net income obtained during the impact year was compared with intervention period and increase in net income over benchmark was worked out with mean net income obtained during intervention and impact period.

Results

Farming system wise net income obtained during intervention and post intervention period along with improvement over benchmark net income is given in Table 7.4.3. State and district wise summary of results is explained briefly below.

Andhra Pradesh

Vizianagaram : Total three farming system evaluated, Crop+Livestock+Poultry farming system was found most remunerative. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 1,00,967/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,25,650 was recorded which 24 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field Crop+Livestock+Poultry farming system resulted in 1.72 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 62450 from 1.13 ha). Additional return of Rs 44,687 was obtained with the investment of Rs 9,150 on critical inputs related to interventions. The return over cost of intervention was found to be 4.9. In the third year, the income could be doubled due to the diversification of existing farming systems in the marginal farm households. Net return across the farming system ranging from 1.72-1.89.

Fig 1. On farm trial and refinement in technology at Vizianagaram

Assam

Goalpara : Among the 3 farming systems studied, Crop+Dairy+Piggery+Poultry was found better in terms of improvement in net income over benchmark. The mean area of the 4 households where in the system was studied is found to be 3.32 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,78,602 /year during 3 years of intervention period. During impact assessment year, net income of Rs 1,91,325 was recorded which 7.1% higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in Crop+Dairy+Piggery+Poultry farming system resulted in 1.2 times

improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,52,000 from 3.32 ha). Additional return of Rs 29,782 was obtained with the investment of Rs 7500 on critical inputs related to interventions. Among the three farming systems, Crop+Dairy+Piggery+Poultry+Fishery highest improvement in net income 1.49 times over the benchmark.

Himachal Pradesh

Kangra : Two farming system evaluated at the center and Field Crops +Dairy+ Goats was found remunerative than Field Crops +Dairy. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 63,016 / year during 3 years of intervention period. During impact assessment year, net income of Rs 75,489 was recorded which is higher by 20%. This indicates that the farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in Field Crops +Dairy+ Goats farming system resulted in 2.06 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 32,162 from 0.44 ha). Additional return of Rs 33,972 was obtained with the investment of Rs 2530 on critical inputs related to interventions. The return over cost of intervention was found to be 13.41. In both farming system net income could be nearly doubled from second year onwards.

Jammu and Kashmir

Jammu : Two farming system evaluated at the center and Crop +Dairy+ fisheries was found remunerative than Crop +Dairy. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,69,600/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,81,050 was recorded which is higher by 7%. This indicates that the farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.2 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,47,720 from 0.88 ha). Additional return of Rs 21,880 was obtained with the investment of Rs 22,953 on critical inputs related to interventions.

Jharkhand

East Singhbhum: In the district Crop+Goat+Poultry dominating all 12 farmers having this with average holding 1.24 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,03,397/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,01,144 was recorded which is lower by 9%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. From first year itself high jump in net income is recorded as East Singhbhum is an interior area and it is untouched from the new technology in the agriculture sector developed after post green revolution period so small intervention shown good reflection

Low cost diversification options in field Crop+Goat+Poultry farming system resulted in 2.28 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 44,400 from 1.24 ha). Additional return of Rs 56,744 was obtained with the investment of Rs 12,324 on critical inputs related to interventions. The return over cost of intervention was found to be 4.60. The income could be almost doubled in the first year itself this show the importance of the IFS in those area which are far away from modern technology in agriculture.

Karnataka

Dharwad : In the Karnatka at Dharwad center both farming systems crop+dairy and crop+dairy+horticulture performed very well and through intervention they show almost three time return but if we go insight then found crop+dairy more consistence than crop+dairy+horticulture as it show continuous increase in net return. The interventions made in different modules of crop, livestock, product diversification and capacity building of the (crop+dairy) farming system resulted in mean net income of Rs 2,02,254 /year during 3 years of intervention period. During impact assessment year, net income of Rs 2,49,261 was recorded which 23% higher over intervention period. This indicates that the interventions were effective and farmers have

continued the interventions during the post intervention impact assessment year. But in case of Crop+Dairy+Horti there is 10% lower net return recorded in impact year which show that farmers discontinue or partially adopted few intervention. Low cost diversification options in crop+dairy farming system resulted in 3.72 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 57,578 from 0.98 ha). Additional return of Rs 1,56,428 was obtained with the investment of Rs 2048 on critical inputs related to interventions. This indicated that scientific knowledge backup can create big difference it is not desired always to put big investment in farming system just we need to relocate and arrange things in systematic manner.

Chikkaballa pura: At this centre total three farming system evaluated and in all possible combination it is found that Crop + dairy + sheep + poultry farming system is most remunerative The interventions made in different modules of crop, livestock and poultry product diversification and capacity building of the farming system resulted in mean net income of Rs 3,19,893 / year during 3 years of intervention period. During impact assessment year, net income of Rs 285314 was recorded which is lower by 11%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + dairy + poultry farming system resulted in 2.34 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,33,068 from 0.63 ha). Additional return of Rs 1,78,180 was obtained with the investment of Rs 3,174 on critical inputs related to interventions. All the farming system show good performance except Crop + horticulture + dairy + sheep which only show 1.34 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income.

Kerala

Thiruvananthapuram: Two farming system Hort. + Poultry and Hort. + Crop + Dairy evaluated at the centre both performed very well but if go in detail Hort. + Poultry found more remunerative. The interventions made in different modules of Hort. + Crop product diversification and capacity building of the farming system resulted in mean net income of Rs 3,56,939/ year during 3 years of intervention period. During impact assessment year, net income of Rs 3,66,048 was recorded which is higher by 2.5%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Hort. + Crop + Dairy farming system resulted in 3.71 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 76668 from 0.94 ha). Additional return of Rs 293987 was obtained with the investment of Rs 10,450 on critical inputs related to interventions. The return over cost of intervention was found to be 28.13. Both system show good performance and show 2.93-3.71 time's improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income. It show that farming system model with scientific intervention on critical input is most remunerative in Kerala state as homestead farming system already exist in state, we just refine it in scientific manner.

Madhya Pradesh

Anuppur: Two farming system evaluated at the center and Crop +Dairy was found remunerative than Crop +Goarty+Poultry. The interventions made in different modules of crop, dairy, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,13,839/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,30,650 was recorded which is higher by 14.7%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy farming system resulted in 2.3 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 51,426 from 1.2 ha). Additional return of Rs 66,616 was obtained with the investment of Rs 9,690 on critical inputs related to interventions. The return over cost of intervention was found to be 6.87.

Umaria: Good performance under Crop +Dairy +Goatry system was recorded at this centre. The interventions made in different modules of crop, livestock and goatry product diversification and capacity building of the farming system resulted in mean net income of Rs 1,97,274/ year during 3 years of intervention period. During impact assessment year, net income

of Rs 2,39,300 was recorded which is higher by 21%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy +Goatry farming system resulted in 2.19 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 95,000 from 2 ha). Additional return of Rs 1,12,780 was obtained with the investment of Rs 24,000 on critical inputs related to interventions. The return over cost of intervention was found to be 4.70. Crop+dairy system also performed well and show double return as the Crop +Dairy +Goatry system.

Fig. 2 Training and different component establishment in OFR

Maharashtra

Nagpur: Total three farming system evaluated at this centre, out of this Crop+ Horticulture+ Dairy+ Bullock pair performance is recorded better than the other farming system here bullock pair taken as component as keeping in view the existing practices by farmers to use them for agriculture purpose. The interventions made in different modules of crop, livestock and bullock product diversification and capacity building of the farming system resulted in mean net income of Rs 1,47,900/ year during 3 years of intervention period. During impact assessment year, net income of Rs 126423 was recorded which is lower by 15%. This indicates that the farmers have discontinued or partially adopted some the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop+ Horticulture+ Bullock farming system resulted in 1.73 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 82,333 from 1.37 ha). Additional return of Rs 60,198 was obtained with the investment of Rs 8841 on critical inputs related to interventions. All four farming system show 20-30% drop in net income in impact year which show farmers discontinued or partially adopted some of the intervention, sometime unavailability of inputs is major cause for discontinue of the intervention it is easy and affordable to purchase inputs on mass level.

Satara: Total four farming system evaluated at this center, out of this Crop + Dairy+ Poultry performance is recorded better than the other farming system. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,94,425/ year during 3 years of intervention period. During impact assessment year, net income of Rs 3,01,929 was recorded which is higher by 55%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in Crop + Dairy+ Poultry farming system resulted in 2.5 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 88,050 from 1.1 ha). Additional return of Rs 1,33,251 was obtained with the investment of Rs 10,450 on critical inputs related to interventions. All four farming system shown more than double in net income from second year onwards.

Thane: Two major cropping system prevailing in the district crop+dairy and crop+poultry both system show slight improvement with range of 1.38-1.39 in net return, impact study in 2021-22 not carried out as programme shifted to MVCD mode.

Odisha

Kalahandi: Total four farming system evaluated at this centre, out of this Crops+ Dairy performance is recorded better than the other farming system. The interventions made in different modules of crops, dairy and poultry product diversification and capacity building of the farming system resulted in mean net income of Rs 2,50,958/ year during 3 years of intervention period. During impact assessment year, net income of Rs 2,53,761 was recorded which is higher by 2%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crops+ Dairy farming system resulted in 1.3 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,95,591 from 1.13 ha). Additional return of Rs 56,068 was obtained with the investment of Rs 3,710 on critical inputs related to interventions. The return over cost of intervention was found to be 15.11. Rest three farming system also performed very well and gave return from 1.5-2.0 times, but mean return is around 80,000 less than Crops+ Dairy.

Kendujhar: Total three farming system evaluated at this centre, out of this Crops+Horticulture+Poultry+Goatery+Fishery performance in terms of Increase in net income (1.72) over benchmark is better than the other farming system. Overall all three system perform better and show improvement from 1.61 to 1.72 times.

Rajasthan

Dungarpur: Two farming system evaluated at the center and Crop +Dairy+ Poultry was found remunerative than Field Crops +Dairy. The interventions made in different modules of crop, dairy and horticulture product diversification and capacity building of the farming system resulted in mean net income of Rs 43,068/ year during 3 years of intervention period. During impact assessment year, net income of Rs 49,817 was recorded which is higher by 16%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop +Dairy+ Horticulture farming system resulted in 2.04 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 23,833 from 0.93 ha). Additional return of Rs 24,682 was obtained with the investment of Rs 6,069 on critical inputs related to interventions. The return over cost of intervention was found to be 4.07.

Telangana

Medak Two farming system evaluated at the center and Crop + Dairy + Sheep was found remunerative than Crop + Dairy + Vegetables. The interventions made in different modules of crop, dairy, sheep and vegetable product diversification and capacity building of the farming system resulted in mean net income of Rs 1,53,933/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,65,500 was recorded which is higher by 7.5%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + Dairy + Sheep farming system resulted in 2.0 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,05,650 from 1.28 ha). Additional return of Rs 1,06,000 was obtained with the investment of Rs 24,633 on critical inputs related to interventions. The return over cost of intervention was found to be 4.30.

Uttarakhand

Udham Singh Nagar: Two system evaluated at the centre both the system shown slight improvement and 28-30% increase in net return is observed

Uttar Pradesh

Mirzapur: Only one system evaluated and it show good performance The interventions made in different modules of crop, dairy, sheep and vegetable product diversification and capacity building of the farming system resulted in mean net income of Rs 56,639 / year during 3 years of intervention period. During impact assessment year, net income of Rs 65,856 was recorded which is higher by 16%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + dairy farming system resulted in 1.53 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 38,591 from 0.77 ha). Additional return of Rs 20,352 was obtained with the investment of Rs 8,890 on critical inputs related to interventions. The return over cost of intervention was found to be 2.29.

Kanpur: Two system crop+dairy and crop+dairy+horticulture evaluated at the centre both the system show almost equal performance and the range of net return improvement is 1.72-1.76. Both the system show around 70 thousand increase in net return by just spending 9 thousand on the system.

West Bengal

Nadia: Two farming system evaluated at the center and Crop +Horticulture+ Dairy was found remunerative than Crop + Dairy+ Fisheries. The interventions made in different modules of crop, dairy, sheep and vegetable product diversification and capacity building of the farming system resulted in mean net income of Rs 1,80,214/ year during 3 years of intervention period. During impact assessment year, net income of Rs 2,27,526 was recorded which is higher by 26%. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in field Crop + Dairy + Sheep farming system resulted in 1.44 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,33,303 from 1.07 ha). Additional return of Rs 58,739 was obtained with the investment of Rs 4,123 on critical inputs related to interventions. The return over cost of intervention was found to be 14.2.

Table 7.3.3. Comparison of net income during the intervention (with physical and technical inputs) and post-intervention (impact year, i.e without physical and technical inputs) period due to address the critical constraint of existing farming system of small and marginal farmers.

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
1	Andhra Pradesh	Vizianagaram	Crops	6	0.93	43584	3900	72040	82270	85430	89670	82352	1.89
			Crops+ poultry	3	0.98	49440	5950	81750	90200	94280	107700	93462	1.89
			Crops+ poultry+ Dairy	3	1.13	62450	9150	91730	103570	107600	125650	107137	1.72
2	Assam	Goalpara	Crop+Dairy+ Piggery+ Poultry+Fishery	4	1.70	97500	5950	140575	145687	146400	148250	145228	1.49
			Crop+Piggery+ Goatary+Poultry	4	2.11	132000	5700	148652	149354	161900	164270	156044	1.18
			Crop+Dairy+ Piggery+Poultry	4	3.32	152000	7500	170578	175627	189600	191325	181782	1.20
3	Himachal pradesh	Bilaspur	Field Crops +Dairy	6	0.58	20524	2401	37044	46510	55725	70215	52373	2.55
			Field Crops +Dairy+ Goats	6	0.44	32162	2533	53904	63009	72134	75489	66134	2.06
4	Jammu & Kashmir	Jammu	Crop +Dairy	9	1.04	138389	19133	144780	147216	193074	166970	161690	1.17
			Crop +Dairy+ fisheries	3	0.88	147720	22593	154551	167880	186370	181050	169600	1.15
5	Jharkhand	East Singhbhum	Crop+Goat+Poultry	12	1.24	44400	12324	92501	110005	107684	94389	101144	2.28
6	Karnataka	Dharwad	Crop+Dairy	4	0.98	57578	2048	169557	113872	323333	249261	214006	3.72
			Crop+Dairy+ Horti	8	1.36	88279	1613	205851	238703	251151	209648	226338	2.56
7	Karnataka	Chikkaballa pura	Crop + horticulture + dairy	3	1.33	169903	8611	299966	277471	222091	218210	254434	1.50
			Crop + horticulture + dairy + sheep	3	1.43	201458	10833	313376	259950	260293	245543	269790	1.34
			Crop + dairy + sheep + poultry	6	0.63	133068	3173	290074	367693	301911	285314	311248	2.34
8	Kerala	Thiruvanan-thapuram	Hort. + Crop + Dairy	6	0.993	83103	11969	214485	406201	352439	323833	337348	326861 **2.93**
			Hort. + Poultry	6	0.945	76668	10450	177026	499223	394567	366048	370655	361504 **3.72**
9	Madhya Pradesh	Anuppur	Crop +Dairy	7	1.20	51426	9690	79101	128973	133443	130650	118042	2.30
			Crop +Goarty +Poultry	5	1.10	56410	10820	84958	108738	106824	103750	101068	1.79
10	Madhya Pradesh	Umaria	Crop + Dairy	11	1.36	69700	16600	112618	150291	161383	156530	145206	2.08
			Crop+ Dairy+ Goatary	01	2.00	95000	24000	138208	210505	243108	239300	207780	2.19
11	Maharashtra	Nagpur	Crop+ Bullock pair	3	0.93	95000	2921	100552	110657	119353	93442	106001	1.12
			Crop+ Dairy	3	1.33	88333	7199	110657	137170	142742	117194	126941	1.44
			Crop+ Horticulture+ Dairy+ Bullock pair	6	1.37	82333	8841	120283	154677	168740	126423	142531	1.73

Sr. No.	State	District (s)	Farming System	Number of farm households	Mean Area (ha)	Bench mark net income (Rs) (before refinement) 2017-18	Cost incurred on interventions (Rs)/year	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								First year* (2018-19)	Second year* (2019-20)	Third year* (2020-21)	Impact year** (2021-22)	Mean	
12	Maharashtra	Satara	Crop + Dairy + Goatery + Poultry	3	1.19	101191	10450	114962	165246	211509	237516	182308	1.80
			Crop + Dairy + Goatery,	3	0.84	65683	10450	92650	149093	240483	284166	191598	2.92
			Crop + Dairy + Poultry	3	1.10	88050	10450	91963	199038	292275	301929	221301	2.51
			Crop + Dairy	3	0.90	92686	10450	111723	171561	250530	277396	202802	2.19
13	Maharashtra	Thane	Crop +Dairy	6	0.40	52791	3484	67309	73589	78500	-	73133	1.39
			Crop + poultry	6	0.50	30593	2740	38150	41587	46639	-	42125	1.38
14	Odisha	Kalahandi	Crops+ Dairy	3	1.13	195591	3710	247651	251461	253761	253761	251659	1.29
			Crops+ Dairy + Goatery	3	0.86	110850	3710	165780	169420	170740	170740	169170	1.53
			Crops+ Dairy + Goatery + Poultry	3	1.26	67633	3710	124963	128493	128093	128493	127511	1.89
			Crops+ Dairy + Poultry + Fishery	3	1.86	109216	3710	160596	163246	167336	167336	164629	1.51
15	Odisha	Kendujhar	Crops+Horticulture+ Poultry+ Goatery	3	1.13	61799	3353	91459	98339	103349	105099	99562	1.61
			Crops+Horticulture+ Poultry + Goatery + Fishery	5	1.26	71380	4394	107038	116850	130770	135530	122547	1.72
			Crops+Horticulture+ Poultry+Goatery + Dairy	4	1.05	57166	3610	77947	90286	98296	102216	92186	1.61
16	Rajasthan	Dungarpur	Crop +Dairy	06	1.04	26,833	4730	35005	44084	45933	47884	42634	1.59
			Crop +Dairy+ Poultry	06	0.93	23,833	6069	35336	45119	48750	49817	48515	2.04
17	Telangana	Medak	Crop + Dairy	6	0.87	98318	18433	125500	124500	133500	145500	158800	1.62
			Crop + Dairy + Sheep	3	1.28	105650	24633	179400	156500	164500	185500	211650	2.00
			Crop + Dairy + Vegetables	3	1.05	139957	17700	155000	153000	153800	165500	173800	1.24
18	Uttarakhand	Udham Singh Nagar	Crop+Dairy	7	0.65	36724	8245	38788	41588	62774	-	47717	1.3
			Crop+Dairy+	5	0.76	51283	15308	53311	63018	80805	-	65711	1.28
19	Uttar Pradesh	Mirzapur	Crop+ Dairy	8	0.77	38591	8890	53089	55056	61773	65856	58943	1.53
20	Uttar Pradesh	Kanpur	Crop + Dairy	6	1.32	105925	7932	163759	180847	188517	196583	182427	1.72
			Crop + Dairy + Horti.	6	0.92	94229	8105	153754	159723	168659	180227	165591	1.76
21	West Bengal	Nadia	Crop + Dairy+ Fisheries	6	1.15	67920	4695	90766	108542	156086	205042	140109	2.06
			Crop +Horticulture+ Dairy	6	1.07	133303	4126	177442	182226	180975	227526	192042	1.44

7.3.4 Frontline Demonstration on Cropping Systems Involving Oilseeds

India holds a prominent position globally in oilseed production, ranking fourth, with oilseeds covering 20% of the global cultivation area and contributing to 10% of global production. Oilseed crops in India are cultivated over 25.3 million hectares, second only to food grains. Over the past 30 years, oilseed cultivation has shown significant growth in both area and production. However, compared to staple cereals like rice and wheat, the expansion and yield growth of oilseeds have been relatively limited, with substantial variation across different states. Farmers have consistently sought technological advancements and practices that enhance returns, often responding well to economic incentives. Major oilseed crops include groundnut, rapeseed, mustard, sunflower, safflower, soybean, sesame, and castor. While overall production and productivity in these crops have largely remained stagnant, select crops have seen moderate gains following the initiation of the Technology Mission on Oilseeds. The Indian Institute of Farming Systems Research (IIFSR), through its 32 on-farm centers nationwide, has implemented Frontline Demonstrations (FLDs) as part of a crop diversification strategy to boost farmers' income by introducing oilseed crops into existing systems. The results of FLDs conducted on farmers' fields by the On-Farm Research (OFR) units of AICRP-IFS during 2022-23 are presented in this report.

Objectives

- To demonstrate the production potential and monetary advantages of well identified cropping and inter cropping systems under real farm situation involving oilseed as one of the component crops in various agro ecosystems.

Technical Programme

The FLD's were conducted at 3 OFR units of All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) in two agro ecosystems *viz.,* Semi-Arid and Subhumid; covering three states. Crops/cropping systems in which FLDs were conducted are given in Table 1. In Semi-Arid 10 FLD conducted and Subhumid ecosystem, 20 FLD conducted on soybean and groundnut. Soybean planted in *kharif* season a Soybean-wheat system and groundnut planted in *rabi* season as rice-groundnut system. There were only two treatments taken for comparison, i.e. farmers' practice (FP) and improved practice (IP). These treatments were applied on a time-tested; well-recognized oilseed-based cropping systems of the location.

Table 1: List of centres of Front Line Demonstrations (FLD) on oilseed-based cropping systems (2022-23)

Agro Ecosystem	Name of Centre (State)	Crop/cropping system (s)	Number of demonstrations
1. Semi-Arid	Kota	Soybean	10
2. Sub-humid	Jabalpur	Soybean	10
3. Sub-humid	Chikkaballapura	Groundnut	10
Total			30

Table 2 Details of management practices adopted in farmers and improved practice

Agro Ecosystem	Name of Centre (State)	Intervention	Farmer practices	Improved practices
1. Semi-Arid	Kota	Varieties	Soybean variety (JS-95-60)	Soybean variety JS 20-34
		Seed rate	100	80
		Seed treatment	-	Fungiside, Rhizobium and PSB
2. Sub-humid	Jabalpur (Madhya Pradesh)	Varieties	-	JS-20-116
		Seed traetment	-	Fungiside, Rhizobium and PSB
3. Sub-humid	Chikkaballapura (Karnataka)	Varieties	Local	KCG 6

crop varieties along with management practices used by farmers and recommended improvements within various cropping systems (Table 2). At all three locations—Kota, Jabalpur, and Vizianagaram—farmers adopted the latest improved varieties, optimal seed rates, and balanced nutrient management practices. Generally, farmers tend to rely on local or older varieties, use higher-than-recommended seed rates, and apply imbalanced fertilizers, which often results in suboptimal yields. For oilseed crops, in particular, applying sulfur fertilizers is essential for oil synthesis in plants. Improved practices recommend using Single Super Phosphate (SSP) instead of Diammonium Phosphate (DAP) to meet the sulfur requirements more effectively.

Financial source

FLDs on oilseed based cropping systems were 100% financed by the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India through Directorate of Oilseeds Research, Hyderabad. During 2022-23, an amount of Rs 1,56,000/- has been released to the different centres as indicated in Table 3.

Table 3: Centre wise budget allocation for FLD (2022-23)

a) FLD on oilseed				
Agro Ecosystem	**Name of Centre (State)**	**Name of crop**	**Number of demonstrations conducted**	**Amount released (Rs)**
1. Semi-Arid	Kota (Rajasthan)	Soybean	10	30,000
2. Sub-humid	Jabalpur (MP)	Soybean	10	30,000
3. Sub-humid	Chikkaballapura (Karnataka)	Groundnut	10	48,000
Total			30	108000
b) Training of farmers “Crop diversification and remunerative cropping system involving oilseeds (Soybean/Groundnut/other)”.				
Semi-Arid	IIFSR, Modipuram, (UP)		1	24,000
	Kota (Rajasthan)		1	24,000
b) Total				48,000
Grand total				1,56,000

Salient findings

Out of 30 demonstrations on oilseed based cropping systems, 20 were on cropping system involving soybean at 2 centers and groundnut evaluated at 1 centre with total 10 FLD.

Yield

The mean yield of soybean under improved package was recorded 1695 kg ha^{-1} at Kota, Rajasthan (Table 4). The yield increase in soybean due to improved package was higher (14%) with improved variety (JS 20-34) and other agronomic practices. In the case of Jabalpur there is 42% increase in yield is recorded with (JS-20-116) and other improved practices. In Groundnut, 15% increase in yield was observed at Chikkaballapura (Karnataka) with improved variety of. Average yield of rabi groundnut was recorded 2140 kg ha^{-1} and with improved package 2410 kg ha^{-1}. Rabi groundnut in the south India area shows very encouraging results and farmers feel happy with an alternative crop after rice harvesting. Rabi groundnut can be potential crop in rice-fallow area.

Gross and Net returns

Gross returns were higher in improved packages for both soybean and groundnut due to an increase in yield. Higher gross

return was realized in groundnut (Rs 66795 ha^{-1}) followed by soybean (Rs 37216 ha^{-1}). In the case of per cent improvement 11 % increase was recorded in rabi groundnut followed by 14-42% in soybean. Across the locations, the improvement in net returns with the improved package in groundnut was recorded 47% and 15% in the case soybean (Table 5&6).

Table 4: Influence of farmers and improved practices on grain or pod yield (kg/ha) of various crops under FLD (2022-23)

Agro Ecosystem	Name of Centre (State)	Crop/cropping system (s)	Number of demonstrations	Yield farmer practices	Yield improved practices	per cent increase
1. Semi-Arid	Kota (Rajasthan)	Soybean	10	14.88	16.95	13.9
2. Sub-humid	Jabalpur (Madhya Pradesh)	Soybean	10	15.09	21.65	42.3
3. Sub-humid	Chikkaballapura (Karnataka)	Groundnut	10	21.4	24.1	12.2

Table 5: Influence of farmers and improved practices on gross returns (Rs/ha) of various crops under FLD (2022-23)

Agro Ecosystem	Name of Centre (State)	Crop/cropping system (s)	Number of demonstrations	gross returns farmer practices	gross returns improved practices	per cent increase
1. Semi-Arid	Kota (Rajasthan)	Soybean	10	-	-	13.8
2. Sub-humid	Jabalpur (Madhya Pradesh)	Soybean	10	26187	37216	42.12
3. Sub-humid	Chikkaballapura (Karnataka)	Groundnut	10	61738	66795	10.8

Table 6: Influence of farmers and improved practices on net returns (Rs/ha) of various crops under FLD (2022-23)

Agro Ecosystem	Name of Centre (State)	Crop/ cropping system (s)	Number of demonstrations	net returns farmer practices	net returns improved practices	per cent increase
1. Semi-Arid	Kota (Rajasthan)	Soybean	10	-	-	14.7
2. Sub-humid	Jabalpur (Madhya Pradesh)	Soybean	10	15716	10687	47.06
3. Sub-humid	Chikkaballapura (Karnataka)	Groundnut	10	44013	50595	15.0

Awareness through training

Total 2 training for farmers conducted during 2022-23 in which total 225 farmers (145 males and 35 female) participated

Table 7 Detail training of farmers

Name of Centre	Date	Participants		
		Male	Female	Total
IIFSR, Modipuram, Uttarpradesh	27-03-2023	120	30	150
Kota (Rajasthan)	27-09-2022	25	5	30
Total		145	35	180

Fig 1. Glimpse of FLD on oilseed in 2022-23

Constraints encountered in implementation of the programme

- Demonstration cost of Rs 3000-4800/ demonstration is too low to meet all the expenditures on improved package like seeds of improved varieties, fertilizers, other inputs and organizing field days. This needs to be enhanced to at least Rs 7500/ demonstration for meeting all the expenditures of inputs, training, labelling of demonstration plots etc.

8. GENERAL/MISCELLANEOUS

8. 1 LIST OF PUBLICATION (2022-23 ANNUAL REPORT)

8.1.1 Research Papers in NAAS rated Journals (Published during 2022-23)

S. N	State	Name of centre	Research paper/Review paper						
			Authors	Year	Title of paper	Journal name	Volume, pages	NAAS rating (as per 2023 score)	Number of citations
3	Andhra Pradesh	Maruteru	MMV Srinivasa Rao, D. Nagarjuna, K. Tejeswara Rao, M. Srinivas, T.S.S.K. Patro and N. Ravisankar	2022	Balanced Fertilization in Rice-Maize Cropping System to Enhance Productivity, Economics and Soil Fertility Status in North Coastal Zone, Andhra Pradesh	*International Journal of Plant & Soil Science*	34 (20): 202.208	5.07	-
			Srinivasa Rao MMV., Nagarjuna. D., Tejeswara Rao K., Srinivas M., Patro TSSK and Ravisankar N	2022	Balanced Fertilization in Rice-Maize Cropping System to Enhance Productivity and Soil Fertility Status in North Coastal Zone, AP	*Ecology, Environment & Conservation*	Issue pp.2022, S474-S479	5.41	
5	Chattisgarh	Raipur	Tiwari, Pallavi and Kumar, Sunil	2022	Effect of different organic nutrient management practices on yield and yield attributes of sweet corn (*Zea mays* L. var. Saccharata).	*International Journal of Advanced Chemistry Research*	4(2):307-310	5.31	
			Paikra,M.K., Gupta, P., Agrawal, S and Patel, A	2022	Effect of integrated nutrient management practices on the growth, flower yield and economics of African marigold cv. Pusa Narangi Gainda	*The Pharma Innovation Journal*	11(9): 1773-1777	5.23	

S. N	State	Name of centre	Research paper/Review paper						
			Chandrakar, Jaya, Gupta, P. and Agrawal, S	2022	Effect of Ghanjeevamrit on growth and flower yield attributes of China aster (*Callistephus chinensis* L. Nees) under organic production system	*The Pharma Innovation Journal*	11(9): 294-296	5.23	
			Sumit, Banjara, G.P., Kumar, Sunil, Mahilang, Amit, Sahu, Mahanand and Porte, Pallavi	2022	Yield and economics of chickpea (Cicer arietinum L.) as influenced by different chickpea based intercropping system in Chhattisgarh plains	*The Pharma Innovation Journal*	11(10): 849-853	5.23	
			Harshika Tiwari, DK Chandrakar, Sunil Kumar, Nitish Tiwari, Aditya Swarnkar, Ankita Dewangan and Keval Kumar Sahu	2023	Economics of lentil production under delayed planting condition in vertisol of Chhattisgarh plains.	*The Pharma Innovation Journal*	12(8): 2697-2699	5.23	
			Harshika Tiwari, DK Chandrakar, Sunil Kumar, Nitish Tiwari, Aditya Swarnkar, Ankita Dewangan and Keval Kumar Sahu	2023	Study the interaction between dates of planting and genotypes on growth, yield attributes and yield of lentil	*The Pharma Innovation Journal*	12(9): 694-699	5.23	
			Ankita, Dr. Sunil Kumar, Dr. MC Bhambri, Dr. SS Porte, Dr. RR Saxena, Dr. SK Jha, Aditya Swarnkar and Harshika Tiwari	2023	Evaluation of chickpea (Cicer arietinum L.) cultivars under organic production system.	*The Pharma Innovation Journal*	12(9): 603-607	5.23	
6	Gujarat	S K Nagar	L.J.Desai, K.M.Patel, P.K.Patel and V.K.Patel	2022	Productivity, profitability and soil sustainability of small holding farming system through suitable ceopping systems	*Indian journal of Agronomy*	67(3)	312-315	5.55

S. N	State	Name of centre	Research paper/Review paper						
			SR Rabari, LJ Desai and KN Prajapati	2022	Effect of cutting and nutrient management on yield and quality of summer fodder sorghum under north Gujarat condition	*The Pharma Innovation Journal*	11(4)	834-836	5.23
			Sunil D Chaudhari, LJ Desai and HN Chaudhary	2022	Feasibility of leafy coriander and leafy fenugreek as intercrop in cumin (Cuminum cyminum L.)	*The Pharma Innovation Journal*	11(6)	1515-1519	5.23
		Junagadh	Arpita Meena, RM Solanki, PM Parmar and Sonali Chaudhari	2022	Effect of spacing and nitrogen fertilization on growth, yield and economics of fodder maize (*Zea mays* L.)	*The Pharma Innovation Journal*	11(4): 1732-1735	5.23	
			Yamuna P, Solanki RM and Malam KV	2022	Response of fenugreek (*Trigonella foenum-graecum* L.) to varying fertilizer levels and bio-fertilizer inoculations under South Saurashtra conditions	*The Pharma Innovation Journal*	11(5): 2401-2407	5.23	
			BK Dharaiya, RM Solanki, DA Jadav, NN Damor and KV Malam	2022	Effect of drip irrigation schedules and fertigation levels on growth parameters and yields of sweet corn	*The Pharma Innovation Journal*	11(2): 2408-2412	5.23	
			Wahidullah, Solanki RM and Malam KV	2022	Response of sweet corn (*Zea mays var. saccharata* L.) to split application of nitrogen and harvesting schedule under South Saurashtra condition	*The Pharma Innovation Journal*	11(5): 2174-2180		
12	Karnataka	Kathalagere	CHETHAN, G.S, HUGAR, A. Y., SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M	2023	Influence of bio stimulants on growth and productivity of Foxtail Millet (*Setaria italica)* Genotypes.	*Environment conservation Journal*	*ISSN 0972-3099*	5.66	

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			CHETHAN, G.S, HUGAR, A. Y., SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M...	2022	Growth rate and Productivity of Foxtail Millet Genotype as influenced by Bio –stimulants	*The Pharma Innovation Journal*	*11(**11**):* 607-613	**5.23**	
			KRISHNA AILI, SARVAJNA, B. SALIMATH, RAVIKUMAR, D., HUGAR, A.Y. AND SHARANAPPA JANGANDI	2023.	Characterization of salt affected soils of Vanivilassagar command area, hiriyurtaluk, Chitra Durga dist.	*The Pharma Innovation Journal.*	12 (**1**): 2938-2943	5.66	
			PRASHANT, HUGAR, A.Y. MAVARKAR, N.S., SARVAJNA B. SALIMATH AND M.S. NANDISH. (2022). NAAS rating 5.23	2022	Influence of foliar nutrition of humic acid on growth and growth indices of Foxtail millet (*Setaria italica* L.).	*The Pharma Innovation Journal.*	11(1):423-427	5.23	
			RUDRAGOUDA, F. CHANNAGOUDA, A.Y. HUGAR, VIJAY, S. DANARADDI AND CHANDRU PATIL.2022.	2022	An integrated farming system: Approach to doubling the farmer's income and better recycling of farm resources.	*The Pharma Innovation Journal.*	11 (**10**): 2083-2087	5.66	
			VIDYA V.S, RUDRAGOUDA F.C, NAVEEN N.E, SARVAJNA B. SALIMATH AND ONKARAPPA S.	2022	Effect of various levels of chickpea magic on growth and yield of chickpea (*Cicerarietinum* L.).	*The Pharma Innovation Journal*	11(10): 1879-1882	5.23	
			CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B.	2022	Studies on effect of Organic and inorganic fertilizers in gherkin (*Cucumis anguria* L.) Production	*The Pharma Innovation Journal*	11(8): 1530-1533.	5.23	

S. N	State	Name of centre	Research paper/Review paper						
			CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B	2022	Evaluation of chilli (*Capsicum annum* L.) F1 hybrid cultivars on biomass and fruit yield attributes under southern zone of Karnataka.	*International Journal of Horticulture and food science*	4(2): 1530-1533	5.3	
		Siruguppa	Sunitha N H, ManjunathaBhanuvally and C M Kalibavi	2022-23	Popularization of white finger millet through frontline demonstrations in Vijayanagar district of Karnataka, India: A case study.	*The Pharma Innovation Journal,* 12	(3):2072-2074	>4	
			Basavaraj, P. M. PrabhulingTevari and B. Y. Sidram	2022	An Economic Analysis of the Cost Structure and Constraints of Maize Cultivation in Hyderabad-Karnataka Region	*Asian Journal of Agricultural Extension, Economics & Sociology:.*	40(6): 1-7	4.84	
			Laxuman. H. Avinalappa, Sidramappa, P.H. Kuchanur, K. Shiva Kumar, G. Ashok Kumar	2022	Seed Yield Stability Assessment of Chickpea Genotypes Through AMMI and Bi Plot Analysis	Legume Research-An International Journal,	Page 1-6.	6.23	
13	Kerala	Karamana	Sajeena, A., Mathew, D., John, J., Dhanya, M. K., Sushitha, K., and Nahan, R. P.	2022	First report of fruit rot of jackfruit caused by Athelia rolfsii in India	*J. Plant Pathol.*	https://doi.org/10.1007/s42161-022-01145-8	8.64	
			Adarsh, S. and John, J.	2022	Performance of different pulse crops in summer rice fallow of northern Kerala	*Crop Res.*	57(1&2): 8-14	4.41	

S. N	State	Name of centre	Research paper/Review paper						
			Innazent, A., Jacob, D., Bindhu, J.S., Joseph, B., Anith, K.N., Ravisankar, N., Prusty, A.K., Praramesh, V. and Panwar, A.S.	2022	Farm Typology of smallholders integrated farming systems in Southern Coastal Plains of Kerala, India	*Sci. Rep*	10.1038/ S41598-021-04148-0	11	
			Ravisankar, N., Ansari, M.A., Shamin, 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., Bal, S.K.		Sustainable livelihood security of small farmers improved through a resilient farming system in the semiarid region of India.	*Land Degradation . Develop.*	https://doi.org/10.1002/ldr.4358	10.38	
			Joy, J. M. M., John, J., Sudha, B., Meera, A. V., and Pillai, S.	2022	Productive and profitable rice-based cropping systems for coastal plains of Kerala	*J. Indian Soc. Coastal Agric. Res.*	40(1): 31-37	5.17	
			Sowmya, K., Bindhu, J.S. and Pillai, P. S. 2022.	2022	Agro-ecological Sustainability with Pulses under System of Crop Intensification: A Review.	*Agri. Rev..*	DOI: 10.18805/ ag.R-2521.	4.63	
			Begum, S., Pillai, S. P., John, J., and Sajeena, A.	2022	Rooting traits of rice genotypes as influenced by different water regimes and biofertilizer.	*The Pharma Innovation J.*	11(9): 2249-2254	5.23	
			Leno, N., Ajayan, A. S., Thampatti, M. K. C., Sudharmaidevi, C. R., Aparna, B., Gladis, R., Sajitharani, T., Joseph, B., Meera, A. V., and Nagula, S.	2022	Humification evaluation and carbon recalcitrance of a rapid thermochemical digestate fertiliser from degradable solid waste for climate change mitigation in the tropics.	*Sci. The Total Environ*	849: 157752. ISSN 0048-9697. https://doi.org/ 10.1016/j.scitotenv.2022.157752.	16.75	

S. N	State	Name of centre	Research paper/Review paper						
			Raj, A. B. and John, J.	2022	Fertilizer Responsiveness of Rice (Oryza sativa L.) Crop to Different Levels of NPK Fertilizers	*Environ. Ecolo.*	40 (4A) : 2290—2295	5.25	
			Amrutha, E. A., Manju, R. V., Viji, M. M., Stephen, R., John, J., Alex, S., and Meera, A. V.	2022.	The influence of biofertilizer s on growth and yield of rice (Oryza sativa L.).	*Biological Forum*	14(4a): 23-28	5.11	
			Sowmya, K., Bindhu, J.S., Pillai, P.S., Jacob, D. and Gladis, R.	2023	Productivity and Profitability of Green-gram [Vigna radiata (L.) Wilczek] Under System of Crop Intensification.	*Agri. Sci. Digest.*	doi: 10.18805/ag.D-5703.	5.13	
			Raj, A. B., John, J., Pillai, S. P., Meera, A. V., Manju, R. V., and Sudha, B.	2023.	Alternative cropping systems to mitigate carbon dioxide emission in rice fields under different nutrient levels.	*Intl. J. Environ. Climate Change.*	13(9): 540-546.	8.64	
			Sushmitha, T. Sajeena, A., Mathew, D., Joy, M., Radhakrishnan, N. V., John, J., and Anuradha, T.	2023	First report of bacterial wilt of yardlong bean (*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdc.) caused by *Kosakonia oryzae* in India.	*J. Plant Path.*	https://doi.org./10.1007/s42161-023-01476-0	4.69	
			Jacob, J. S., Salini, S., and Shanas, S..	2023	Coptosoma variegatum (Herrich-Schäeffer, 1838) (Hemiptera, Plataspidae) infesting mango in Kerala and Karnataka with redescription of the species.	*Entomon.*	48(1): 89-94. https://doi.org/10.33307/entomon.v48i1.848	4.69	
17	Odisha	Bhubaneswar	T R Mohanty, R K Paikray, A K Patra, S K Swain, K C Sahoo, P K Samant	2023	On-farm evaluation of balanced fertilization in rice-groundnut cropping system for productivity, nutrient use efficiency and profitability.	*Legume Research-An International Journal*	46(1): 75-79	6.67	

S. N	State	Name of centre	Research paper/Review paper						
		Chiplima							
18	Punjab	Ludhiana	CHETHAN, G.S, HUGAR, A.**Y.,** SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M	2023	Influence of bio stimulants on growth and productivity of Foxtail Millet (*Setaria italica)* Genotypes.	*Environment conservation Journal*	*ISSN 0972-3099*	5.66	
			CHETHAN, G.S, HUGAR, A. Y., SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M...	2022	Growth rate and Productivity of Foxtail Millet Genotype as influenced by Bio –stimulants	*The Pharma Innovation Journal*	*11(**11**):* 607-613	**5.23**	
			KRISHNA AILI, SARVAJNA, B. SALIMATH, RAVIKUMAR, D., HUGAR, A.Y. AND SHARANAPPA JANGANDI	2023.	Characterization of salt affected soils of Vanivilassagar command area, hiriyurtaluk, Chitra Durga dist.	*The Pharma Innovation Journal.*	12 (**1**): 2938-2943	5.66	
			PRASHANT, HUGAR, A.Y. MAVARKAR, N.S., SARVAJNA B. SALIMATH AND M.S. NANDISH. (2022). NAAS rating 5.23	2022	Influence of foliar nutrition of humic acid on growth and growth indices of Foxtail millet (*Setaria italica* L.).	*The Pharma Innovation Journal.*	11(1):423-427	5.23	
			RUDRAGOUDA, F. CHANNAGOUDA, A.Y. HUGAR, VIJAY, S. DANARADDI AND CHANDRU PATIL.2022.	2022	An integrated farming system: Approach to doubling the farmer's income and better recycling of farm resources.	*The Pharma Innovation Journal.*	11 (10): 2083-2087	5.66	
			VIDYA V.S, RUDRAGOUDA F.C, NAVEEN N.E, SARVAJNA B. SALIMATH AND ONKARAPPA S.	2022	Effect of various levels of chickpea magic on growth and yield of chickpea (*Cicerarietinum* L.).	*The Pharma Innovation Journal*	11(10): 1879-1882	**5.23**	

S. N	State	Name of centre	Research paper/Review paper						
			CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B.	2022	Studies on effect of Organic and inorganic fertilizers in gherkin (*Cucumis anguria* L.) Production	*The Pharma Innovation Journal*	11(8): 1530-1533.	**5.23**	
			CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B	2022	Evaluation of chilli (*Capsicum annum* L.) F1 hybrid cultivars on biomass and fruit yield attributes under southern zone of Karnataka.	*International Journal of Horticulture and food science*	4(2): 1530-1533	5.3	
19	Rajasthan	Durgapur, Jaipur	Sangeetha, S.P and Anandavalli, M	2023	Effect of Enriched Vermicompost and Organic Foliar Spray on Growth and Yield of Prosomillet (*Panicum miliaceum* L.)	*Biological Forum – An International Journal*	15(7): 172-176	5.11	
		Kota	CHETHAN, G.S, HUGAR, A. Y., SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M	2023	Influence of bio stimulants on growth and productivity of Foxtail Millet (*Setaria italica)* Genotypes.	*Environment conservation Journal*	*ISSN 0972-3099*	5.66	
			CHETHAN, G.S, HUGAR, A. Y., SARVAJNA, B. SALIMATH, GIRIJESH, G. K. AND DUSHYANTHA KUMAR, B. M...	2022	Growth rate and Productivity of Foxtail Millet Genotype as influenced by Bio –stimulants	*The Pharma Innovation Journal*	*11(**11**):* 607-613	5.23	
			KRISHNA AILI, SARVAJNA, B. SALIMATH, RAVIKUMAR, D., HUGAR, A.Y. AND SHARANAPPA JANGANDI	2023.	Characterization of salt affected soils of Vanivilassagar command area, hiriyurtaluk, Chitra Durga dist.	*The Pharma Innovation Journal.*	12 (**1**): 2938-2943	5.66	

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			PRASHANT, HUGAR, A.Y. MAVARKAR, N.S., SARVAJNA B. SALIMATH AND M.S. NANDISH. (2022). NAAS rating 5.23	2022	Influence of foliar nutrition of humic acid on growth and growth indices of Foxtail millet (*Setaria italica* L.).	*The Pharma Innovation Journal.*	11(1):423-427	5.23	
			RUDRAGOUDA, F. CHANNAGOUDA, A.Y. HUGAR, VIJAY, S. DANARADDI AND CHANDRU PATIL.2022.	2022	An integrated farming system: Approach to doubling the farmer's income and better recycling of farm resources.	*The Pharma Innovation Journal.*	11 (**10**): 2083-2087	5.66	
			VIDYA V.S, RUDRAGOUDA F.C, NAVEEN N.E, SARVAJNA B. SALIMATH AND ONKARAPPA S.	2022	Effect of various levels of chickpea magic on growth and yield of chickpea (*Cicerarietinum* L.).	*The Pharma Innovation Journal*	11(10): 1879-1882	5.23	
20	Telangana	Rajendera-nagar	CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B.	2022	Studies on effect of Organic and inorganic fertilizers in gherkin (*Cucumis anguria* L.) Production	*The Pharma Innovation Journal*	11(8): 1530-1533.	5.23	
		Rudrur	CHANDRU PATIL, NAGARAJA KUSAGUR AND MANJUNATHA B	2022	Evaluation of chilli (*Capsicum annum* L.) F1 hybrid cultivars on biomass and fruit yield attributes under southern zone of Karnataka.	*International Journal of Horticulture and food science*	4(2): 1530-1533	5.3	
21	Tamil Nadu	Coimbatore	Pavithra, G., Velayutham, A., Shanmugam, P. M., Boominathan, P. and Bharathi,C.	2023	Effect of Non-Chemical Weed Management Practices on Weed Dynamics and Yield in Blackgram (Vigna mungo)	International Journal of Plant & Soil Science	35(18): 1666 -1673	5.07	

S. N	State	Name of centre	Research paper/Review paper						
			Selvamani, S., Senthil, A., Ravichandran, V., Djanaguiraman, M., Anitha, K., Shanmugam, P. M. and Manikanda Boopathi, N.	2023	Mitigation of Salinity Stress by Application of Plant Growth Promoting Substances in Rice	International Journal of Environment and Climate Change	13(10): 2175-2185	5.13	
			Iswarya, S., Shanmugam, P.M., Somasundaram, E., Chitdeshwari, T. and Suganthy, M.	2023	*In silico* and *in vitro* Assessment of Indigenous Organic Practices on Germination and Seedling Metrics of Compact Cotton using GerminaR R Software Package	Indian Journal of Agricultural Research	Online first (10.18805/IJARe. A-6102)	5.20	
			Sangeetha, S.P and Anandavalli, M	2023	Effect of Enriched Vermicompost and Organic Foliar Spray on Growth and Yield of Prosomillet (*Panicum miliaceum* L.)	*Biological Forum – An International Journal*	15(7): 172-176	5.11	
22	Uttar Pradesh	Kanpur	Satyaveer Singh, M. Z. Siddiqui and Naushad Khan, R.A.Yadav, D.D. Yadav, Sanjeev Kumar & Sudheer Pal	2022	Effect of Land Configuration and weed management practices on yield and yield attributes of hybrid maize (*Zea mays* L.) during *Kharif season*	*The Pharma Innovation Journal*	11(4): 2132-2138	5.23	
			Pramod Kumar, Naushad Khan, M. Z Siddiqui, R. A Yadav and Kairovin Lakra	2022	Effect of crop establishment methods and weed management practices on weed dynamics, growth and yield of hybrid rice (*Oryza sativa L.*) in central plain zone of Uttar Pradesh	*The Pharma Innovation Journal*	19(3): 676-678	5.23	

S. N	State	Name of centre	Research paper/Review paper						
			Pramod Kumar, Naushad Khan, M. Z Siddiqui, R. A Yadav and S. P. Kushwaha	2022	Effect of different crop establishment methods and weed management practices on the performance of growth and yield hybrid rice (*Oryza sativa L.)* in central plain zone of Uttar Pradesh	*The Pharma Innovation Journal*	10(2): 577-580	5.23	
		Varanasi	Kumari, P., Sharma, P. K., Kumari, R., Sharma, B., &Singh, U. P.	2023	Kinetics of rice straw decomposition under different tillage and crop establishment practices in Indo-gangetic plain	*Journal of the Indian Society of Soil Science*	71	5.39	
			Bhangare Rupali, V., Prakash, P., &Singh, U. P	2023	Growth and physiological parameters of rice (Oryza sativa L.) as influenced by conservation agriculture-based crop establishment methods and nutrient management in RW cropping system	*The Pharma Innovation Journal*	12	5.23	
			Aakash, Thakur, N.S., Singh, M.K., Bhayal, L., Meena, K., Choudhary, S.K., Kumawat, N., **Singh,U.P.,** Singh,R.K., Singh, S.K., Sanodiya, P., Kumar,A., Singh, A.K.	2022	Sustainability in Rainfed Maize (*Zea mays* L.) Production Using Choice of Corn Variety and Nitrogen Scheduling.	*Sustainability*	14	9.89	

8.1.2.Paper presentated in seminor/ symposia

	Manukonda Srinivas, L. Rajashekar Reddy, KM Dakshina Murthy, B. Anusha, M. Ramabhadra Raju and G. Jogi Naidu	2023	Productivity of rice-rice cropping system influenced by puddling practices and planting techniques	2nd Indian Rice Congress. An International Event on Transforming Rice Research: Recent Scientific Developments and Global Food Crisis held at ICAR-NRRI, Cuttack. Extended Summaries	Pp: 238-240		

	Manukonda Srinivas, L. Rajashekar Reddy, N. Ravisankar, B. Anusha, MRB Raju, KM Dakshina Murthy and M Bharatha Lakshmi	2023	Non-chemical weed management practices in Rice-Sweet corn cropping system suitable for Coastal Agro-Ecosystem	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023	Pp:32		
	L. Rajashekar Reddy, Manukonda Srinivas, B. Anusha, MRB Raju, KMD Murthy and M Bharatha Lakshmi	2023	Green House Gases Emission studies from Wet Land IFS Model under Godavari Delta Region of Andhra Pradesh	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023	Pp: 123		
	G. Surya Teja, B. Prasanna Lakshmi, Manukonda Srinivas, K.M. Dakshina Murthy, BNVVD Narayana Raju and Ch. Sreenivas	2023	Impact of different crop establishment methods of rice under North, east and South Indian Conditions	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023	Pp: 25		
	B. Prasanna Lakshmi, G. Surya Teja, Manukonda Srinivas, K.M. Dakshina Murthy, and Ch. Sreenivas	2023	Review on usage of Nano Fertilizers for Smart Agriculture	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023	Pp: 122		
	Ch. Sreenivas, D. Srinivas, K.M. Dakshina Murthy, M. Srinivas and M. Bharatha Lakshmi	2023	An evaluation of Nutrient ratios for sea water intrusion of Kolleru Lake and Upputeru Estuary, Andhra Pradesh, India	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023	Pp: 147		

	MRB Raju, V. Bhuvaneswari, J. Krishna Prasadji, K. Vijay Krishna Kumar, S. Krishnam Raju, Y. Satish, Manukonda Srinivas, T. Srinivas, G. Jogi Naidu and M. Bharatha Lakshmi	2023	Integration of Poultry Manure Application with prophylactic foliar spray of Tebuconazole for effective management of stem rot in rice	13th National Symposium of Indian Society of Coastal Agricultural Research (ISCAR) - Fostering Resilient Coastal Agro-Ecosystems held at Regional Agricultural Research Station, ANGRAU, Tirupati from 22-25, February, 2023			
	Manukonda Srinivas, D. Mounika, B. Anusha, K.M.D. Murthy and G. Jogi Naidu	2022	Efficacy and response of liquid bio-fertilizers in rice	International Conference on System of Crop Intensification for Climate – Smart Livelihood and Nutritional Security held at IIRR, Hyderabad from 12-14 Dec, 2022			

8.1.3 Technology Bulletins/ Pamphlets/ Popular Articles

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
3	Andhra Pradesh	Maruteru	Manukonda Srinivas, T. Srinivas, K. M. Dakshina Murthy, B. Anusha and G. Jogi Naidu	2022	Andhra Pradesh ku anuvaina vari vangadalu	Annadata – Agricultural Magazine	June, 2022 Pp: 65-66
6	Gujarat	S K Nagar	L.J.Desai, K.M.Patel, P.K.Patel, K.N.Patel , V.K.Patel and K.G.Modi	2022	Sankalit Kheti Paddhati in vervacular language	2:21:23	1-8
			Purvi Kalal and Lalji Desai	2022	Health benefits of linseed	Volume:03 Issue:12	53-55
			Deepak Kumar, Santosh K, Arya, Deepti Srivvastava, Md. Shamim, L.J.Desai and Manjusha Tyagi	2022	Impact of major Rice Bacterial Dieases on Agriculture and Food security in the bookof " Bacterial Dieasesof Rice and their Management	ISBN: 978-1-191-4(hbk)	1-28
			M. B. Khadadiya, L. J. Desai and U. J. Pate	2022	SENSOR BASED IRRIGATION MANAGEMENT IN AGRICULTURE n the book "Recent Innovative Approaches in Agricultural Science"	Volume I ISBN: 978-93-91768-74-4	92 – 102
			L.J.Desai and V.K.Patel	2023	Water Productivity Enhancement in Scarcity Zones: Approaches and Applications	ISBN No.: 978-93-5786-682-8	152-155

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
		Junagadh	R.M. Solaki, P.J. Gohil and V.V. Rupareliya	2022	Integrated Farming System	Krushijivan	9 (54)
			V.V. Rupareliya, P.J. Gohil and R.M. Solanki	2022	Use of crop residue in Integrated Farming System	Krushijivan	9 (54)
			V.V. Rupareliya, K.V. Malam and R.M. Solanki	2022	Farming Systems for South Saurashtra Agro Climatic Zone	AkiNik Publications	20: 65-90
		Siruguppa	Sunitha N H, Kalibavi C M, Shrihari Hanamanthappa	17-19 October, 2022	An impact assessment of frontline demonstrations on yield and economics of little millet and foxtail millet under rainfed conditions	3rd National conference on Natural farming, organic farming and chemical farming in Indian Agriculture present scenario and way forward	
			Sunitha N H,Kalibavi C M,BhanuvallyManjunathaand Shrihari Hanamanthappa	17-19 October, 2022	Frontline demonstrations on kitchen gardening: An impact assessment	3rd National conference on Natural farming, organic farming and chemical farming in Indian Agriculture present scenario and way forward	
			Sunitha N H,Kalibavi C M,BhanuvallyManjunathaand Shrihari Hanamanthappa	17-19 October, 2022	Impact of frontline demonstrations on white finger millet in Vijayanagr district of Karnatka	3rd National conference on Natural farming, organic farming and chemical farming in Indian Agriculture present scenario and way forward	
			Sunita and C. M. Kalibavi	2022-23	Successful Story of millet growers Padavidhara Yuvakana Yashogathe	Krishipete-49(01)/ 48 (7):22-23	
13	Kerala	Karamana	Sajeena, A., John, J., Meera, A. V., Shanas, S., Bindhu, J. S., Krishnakumar, G., and Hiroshkumar, K. S.	2023	Products of IFSRS	IFSRS, KAU	4
			Sajeena, A., John, J., Sudha, B., Meera, A. V., Shanas, S., Krishnakumar, G., and Hiroshkumar, K. S.	2023	Agriculture progress through IFS-based on success stories of 16 farmers practicing IFS of 8 panchayats of Vamanapuram block	IFSRS, KAU	30
			Bindhu, J. S., John, J.,Jacob, D., Meera, A.V., Sajeena, A., Shanas, S.	2023	Food security and Profitability through Horticulture+ Poultry IFS Model	IFSRS, KAU	4

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
		Karjat	Dr. N. V. Mhaskar	2023	Konkan bhagatil Nagli lagwad tantradnyan	RCF Sheti Patrika	1, 19-20
			Dr. N. V. Mhaskar	2023	Rala – Ek Vaividhyapurn bharad dhanya	RCF Sheti Patrika	1, 11-12
		Rahuri					
18	Punjab	Ludhiana	Neeraj Rani and Walia S S	2023	How to prepare vermicompost	*Progressive Farming*	59(5): 7
			Walia S S and Neeraj Rani	2023	PAU Integrated Farming system model for income enhancement.	*Progressive Farming*	59(4): 24
			Neeraj Rani and Walia S S	2023	Gandoya khad kive tyar Karaye (Punjabi)	Kheti Sandesh Ank	293
			Walia S S and Neeraj Rani	2023	Adopt PAU Integrated Farming system model for income enhancement.	*Changi Kheti*	59(4): 20
			Pandove G, Aulakh C S and Walia S S	2023	Biofertilizers: An important component of organic farming.	*Progressive Farming*	59(3): 24
			Walia S S, Aulakh C S and Kaur T	2022	Conserve natural resources and sow maize based cropping systems.	*Changi Kheti*	58 (05): 8
			Walia S S, Neeraj Rani and Kaur T	2022	Integrated nutrient management for higher productivity.	*Progressive Farming*	58(06): 16
			Walia S S, Singh S and Kaur T	2022	Sow maize for more profit.	*Vikas Jagriti*	3(9) May issue: 38-39.
			Gulab Pandove, Sidhu A S and Walia S S	2022	Biofertilizers for rabi crops	*Progressive Farming*	58 (10): 21
			Singh Subash and Walia S S	2022	Pest management in basmati and non-basmati rice under organic farming system.	*Punjab Advance*	(July 2022): 22-23
			Singh, S. and Walia, S.S	2022	*Jaivik kheti karde ho tann bhendi de keerean di rokthaam iss tarah karo.*	*Vikas Jagriti*	6 (9): 24-25
			Singh, S. and Walia, S.S	2022	*Jaivik kheti parnali adheen jhone ate basmati te keet prabandh.*	*Vikas Jagriti.*	7 (9): 24-25
			Walia S S, Saini K S and Kaur T	2023	Spring groundnut based crop diversification options.	Punjab Advance	10 (9) : 44-47
			Singh S and Walia S S	2023	Pest management on basmati and non-basmati rice under organic farming system.	Punjab Advance	7 (9) : 24-25

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
			Singh S and Walia S S	2023	Pest management for basmati and non-basmati rice under organic farming system.	Kheti Sandesh	No, 308 dated 26/07/2023. pp 5
			Sohan Singh Walia and Vajinder Pal Kalra	2023	*Amdan Vdaun Lai Sanyukat Kheti Pranali*	*Changi Kheti*	pp28 April 2023
			Vajinder Pal Kalra, Sohan Singh Walia and Kuldeep Singh	2023	*Shayak dhandean vich mohri kisan*- Dara Singh.		issue 287 dated 1.03.2023
19	Rajasthan	Durgapura, Jaipur					
		Kota	Anuj Kumar, J.P. Tetarwal, Baldev Ram and Ram Kishan Singh Choudhary	2022	Weed management under organic crop production.	*The Agriculture Magazine*	Vol. 2, Issue-1, Page No. 179-182
			Anuj Kumar, J.P. Tetarwal and Anju Bijarnia	2023	Celebrating Millets – As Nutri cereals for food, Nutrition & health	*Agri Articles (e-magazine for agricultural articles)*	Vol. 3, Issue-1, Page No.424-427
			Anuj Kumar and J.P. Tetarwal	2023	Nano Urea is a low cost and high yield product for future food needs	*The Agriculture magazine*	Vol. 2, Issue 5 Page-209-211
			Anuj Kumar, J.P. Tetarwal and Anju Bijarniya	2023	Chamomile: A Herbal Medicine of the Bright Future	*The Agriculture Magazine*	Vol (2), Issue-7, PP. 308-311
			J.P. Tetarwal, Rakesh Kumar Yadav, Baldev Ram, Mahendra Singh, B.L. Dhaka and Pratap Singh	2023	Livelihood security through integrated farming system: A novel approach for farmers under Haroti region (Success Story)	*Indian Farming (ICAR)*	Vol. 73 (04): 6-8.

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
8.1.4. List of books/Pampalets							
	Tamil Naidu	Coimbatore	Shanmugam, P.M., S.P.Sangeetha, P.C. Prabu, S. Panneerselvam and S.V.Varshini.	2023	Fifty years of cropping and farming systems research in Tamil Nadu (1973-2023) 978-81-960545-6-4	Thannambikai publications, Coimbatore	
			Pamphlets				
			P.M. Shanmugam S.P. Sangeetha P.C. Prabu S.V. Varshini	2023	Integrated farming system for farmers livelihood security	Dept. of Agronomy, TNAU, Coimbatore	
			P.M. Shanmugam S.P. Sangeetha K.Sivasubramanian S.V. Varshini	2023	Integrated farming system for small and marginal farmers	Dept. of Agronomy, TNAU, Coimbatore	
			Dr.S.K. Natarajan S.Manickam S.Panneerselvam P.M.Shanmugam S.P. Sangeetha M.Velmurugan T. Rajendran	2023	Soil sample collection	TCRS, TNAU, Coimbatore	
			S.K. Natarajan S.Manickam S.Panneerselvam P.M.Shanmugam M.Velmurugan S.P.Sangeetha T. Rajendran	2022	Areca nut in integrated farming system (Tamil)	TCRS, TNAU, Coimbatore	
			Booklets				
			P.M. Shanmugam S.P. Sangeetha P.C. Prabu S.Panneerselvam S.V. Varshini	2023	Integrated farming system for irrigated upland of western zone of Tamil Nadu	Department of Agronomy, TNAU Coimbatore	

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
			N.Satheeshkumar T. Selvakumar P.M.Shanmugam P.C.Prabu S.P. Sangeetha S.V. Varshini	2023	Integrated farming systems suitable for small and marginal farmers of Erode district	AICRP - IFS, OFR Centre, Maize Research Station Vagarai	
			S.K. Natarajan T. Rajendran P.M.Shanmugam S.Manickam S.Panneerselvam S.V. Varshini	2023	Integrated farming system for north western zone of Tamil Nadu	AICRP - IFS, OFR Centre, Tapioca and Castor Research Station, Yethapur	
			T. Parthipan S.Porpavai A.Ramanathan P.M. Shanmugam P.C. Prabu S.P. Sangeetha N.Ravishankar	2023	Integrated farming system for Cauvery delta region (Tamil)	AICRP - IFS, Sub centre, ARS, Kattuthottam	
			S.K. Natarajan V.Geethalakshmi S.Manickam P.M.Shanmugam S.Panneerselvam S.P. Sangeetha	2023	Integrated agricultural waste management through accelerated vermicompost production	AICRP - IFS, OFR Centre, Tapioca and Castor Research Station, Yethapur	
			S.K. Natarajan V.Geethalakshmi S.Manickam P.M.Shanmugam S.Panneerselvam S.P. Sangeetha	2023	Farm waste management through accelerated vermicompost production (Tamil)	AICRP - IFS, OFR Centre, Tapioca and Castor Research Station, Yethapur	
			Book Chapter				
			Shanmugam, P.M., S.V.Varshini and S.P.Sangeetha	2022	Integrated farming system for saline and alkaline soils In: Innovative technologies for saline and alkaline soil management 978-93-95422-10-9	Shanlax Publications	

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
			Shanmugam, P.M., S.P.Sangeetha and S.V.Varshini	2023	Paddy based Integrated Farming System. In: Paddy varieties and production technologies 978-93-91845-81-0	ARS, Bhavanisagar	
			Iswarya, S., Shanmugam, P.M., Arun Balaji, G. and Sangeetha, S. P.	2023	Buckwheat. In: Millets - A Look into Nutritious Food for Food Security in South Asia. 978-93-56512-36-8	Jaya Publishing House, Delhi	
			Arivukkumar, N., Lalruatfeli, P. C. Mohammed Saud and Shanmugam, P. M.	2023	Modern Concepts on Climate Resilient Crop Production. Impact of climate change on agriculture and food production. Vol. I. 978-93-95967-06-8	JPS Scientific Publications, Tamil Nadu	
			P.M.Shanmugam, S.V.Varshini, S.P.Sangeetha and P.C.Prabu	2023	Convergence of developmental schemes at ground level for large scale implementation of IFS: Case study from Tamil Nadu. In: Training -Manual on Agroecology and Integrated Farming Systems,	National Bank Staff College (NBSC), Lucknow In Collaboration with ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut- 250110, UP during 10-12 April 2023	
			P.C.Prabu P.M.Shanmugam S.P.Sangeetha S.V.Varshini A.Renukadevi P.Panneerselvam	2023	Climate resilient Integrated farming system	National Conference “AGMET 2023” Advances in Agro meteorological interventions for climate resilient agriculture organised by ACRC, TNAU, Coimbatore 15-17.02.2023	
			Sangeetha SP, PM Shanmugam, PC Prabu, SV Varshini, P Parasuraman, T Parthiban	2023	Effect of Millet based Cropping systems on profitability and economics ISBN : 978-81-95444-57-1nternational Millets Conference And Futuristic Food Expo, 2023 IMCFFE 2023	International Millets Conference And Futuristic Food Expo, 2023 IMCFFE. organised by Tamil Nadu Agricultural University Coimbatore and Indian Society of Plant Breeders 24 to 26.05.2023	

S. N	State	Name of centre	Authors	Year	Title of paper/pamphlet/ bulletin	Publisher name	Volume, pages
			Sangeetha SP, Pakhale Smruti Dilip, S Maragatham, E Somasundaram, K Vanitha	2023	Effect of nutria cereals Intercropping in castor on weed control efficiency. ISBN : 978-81-95444-57-1	International Millets Conference And Futuristic Food Expo, 2023 IMCFFE. organised by Tamil Nadu Agricultural University Coimbatore and Indian Society of Plant Breeders 24 to 26.05.2023	
			S.V. Varshini and C. Jayanthi	2023	Crop Establishment and Micro Irrigation Technologies - A Innovation for Improving Productivity in Bajra Napier Hybrid Grass [CO (BN) 5]	School of Post Graduate Studies Tamil Nadu Agricultural University Coimbatore. August 22 & 23, 2023	
		Thanjavour					
22	Uttar Pradesh **X**	Kanpur					
		Varanasi					
		Ayodhya	Robin Kumar, Neeraj Kumar and A.K. Singh	2023	Integrated farming system: - Increasing livelihood and doubling farming system	Eco-Farming E- magazine for agriculture and allied science	Volume 3 (01) 77-80, e-ISSN: 2583-0791.
		Ayodhya on farm					
		Modipuram					
23	Uttarakhand	Pantnagar					
24	West Bengal	Kalyani					

8. 3 VII (XXXV of project) Biennial Workshop of AICRP on Integrated Farming Systems (18-21 January 2023)

The Biennial Workshop of ICAR-AICRP on Integrated Farming Systems was organized during 18-21 January 2023 at Mahatma Phule Krishi Vidyapeeth (Agriculture University), Rahuri (Maharashtra) in which review of on-going research programmes of on-station and on-farm centres including Tribal Sub Plan (STC), Scheduled Caste Sub Plan (SCSP), Model Value Chain Development (MVCD), administrative and financial issues were undertaken besides discussion on new programmes. All the Chief Agronomist, Agronomist of AICRP-IFS from on-station and on-farm centres participated besides scientists from ICAR-IIFSR. The Biennial Workshop of ICAR-AICRP on Integrated Farming Systems started with ICAR song followed by university song. Dr A.S. Panwar, Director, ICAR-IIFSR, welcoming the Chairman, Co-Chairman, Chief Guest, Guest of Honour, Special invitee and all the participants, highlighted the initiatives taken under the scheme for developing technologies for IFS. He briefly informed about research activities being carried out by the institute and the importance of farming systems research for enhancing the sustainability and income of the farmers. Honorable Vice Chancellor Dr P. G. Patil, MPKV, Rahuri inaugurated the group meeting as Chairmen while Dr S. Bhaskar, Assistant Director General (Agronomy, Agroforestry and Climate Change), NRM division, ICAR was chief guest. Dr S.D. Gorantiwar, Directorate of Research, MPKV also graced the occasion as special invitee and Dr (Prof.) A.V. Solanke, Head, Dept. of Agronomy, MPKV, while welcoming the participants, highlighted the research activities undertaken by the university. Dr Gorantiwar in his address highlighted the achievements of MPKV, Rahuri in education, research and extension. Dr S. Bhaskar, ADG (AAFCC) in his address highlighted the importance of farming systems research in addressing the many challenges faced in today's as well as tomorrow's agriculture. Dr P.G. Patil, Vice Chancellor released the publications brought out by different centres and addressed the participants. In his address, he highlighted that integrated farming system not only can help to improve the life of farmers, it will also help consumers to get fewer synthetic produces as recycling, reducing and reusing are the concepts behind it. He emphasized that banks and other relevant agencies should be approached for scaling of the IFS models. Dr U.S. Surve, Chief Agronomist proposed the Vote of Thanks. Salient recommendations emerged from the workshop are given below.

1. National level mapping of potential cropping system based on the six-year study on identification of cropping systems for soil health, human & livestock nutrition and income enhancement needs to be made.

2. Estimation of GHG emission from IFS models should be elevated from IPCC Tier-2 to Tier-3 by including Life cycle-based analysis at identified centres.

3. Whole farm modelling tool and integrative sustainability assessment parameters should be evaluated on pilot basis at identified on-station and on-farm centres. Capacity building of identified centres needs to be undertaken in collaboration with National and International institutions.

4. Scaling of IFS models and its impact analysis should be expanded to Odisha and Jammu & Kashmir.

5. Online data submission and analysis system should be developed for on-station IFS experiments in collaboration with ICAR-IASRI, New Delhi. Online data submission and analysis system developed for cropping systems and On-Farm Farming Systems Research experiments should be made operational by training the Scientists.

VII (XXXV) Biennial workshop of AICRP on Integrated Farming Systems held during 18-21 January 2023

9. APPENDIX

APPENDIX I

WEATHER PARAMETERS (MONTHELY AVERAGES RAINFALL) AT DIFFERENT FARMING SYSTEM CENTERS DURING 2021-22

Centre	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Akola	249.7	357.93	148.4	212.6	72	1.4	42.6	1	0	0	0.0	0.0
Bhubneswar	352.0	265.5	285.1	579.4	77.2	82.6	72.6	29.1	41.1	0.0	0.0	185.9
Chiplima	File not openned											
Coimbatore	15	30.5	38.5	33.5	190.6	271.9	54.5	16.6	0	9.2	41.2	16.5
Durgapura												
Faizabad	214.6	114.8	172	352.8	42	2	15	34.6	0	0	0	40.4
Goa												
Hisar	10.9	167.2	66.7	428.2	5.5	0.4	1.2	64	5.8	0	1.5	31.6
Indore	250.9	204.7	219.3	377.6	66.8	0	17.3	31.7	0.0	0.0	0.0	0.0
Jabalpur	169	242.6	84.2	156.6	67	1.8	23.8	16.1	11.6	0	0.2	17.2
Jammu	61.2	488.4	186.6	173.4	107.2	0	0.8	191	45.4	1	4.6	44.6
Jorhat	321.8	243.7	166.5	300.1	235.8	240.2	50.6	41.0	40.5	41.5	142.0	138.7
Junagadh	9.60	53.10	81.00	260.70	42.60	843.30	77.60	0.00	0.00	0.20	0.00	0.00
Kalyani	168.1	164.5	156.3	92.5	58.8	0.0	0.0	0.0	0.0	21.4	26.4	134.9
Kanpur	96.5	349.3	186	190.9	144.8	1.2	8.6	41.1	13	0	0	0.2
Karjat	792.5	1644.3	365	834.8	207.6	69.8	74.2	21	0	0.8	0	0
Karmana	138.2	125.5	184.1	105.9	311.9	92.0	82.3	18.5	10.7	13.7	78.7	136.9
Kathalagere	63.20	259.80	89.60	43.60	272.70	93.30	24.10	0	0	0	73.70	236.20
Kota	91.6	489.2	434.6	114.0	68.0	0.0	0.0	24.0	0.0	15.2	0.0	8.0
Ludhiana	84.8	271.2	107.6	101.8	37.6	0.0	0.0	113.4	43.5	0.8	0.0	25.6
Modipuram												
Maruteru	67.0	382.1	241.4	281.5	176.2	207.1	1.4	23.6	0.0	0.0	7.2	124.1
Navsari	384.0	423.0	170.0	493.0	18.0	11.0	66.0	0.0	0.0	0.0	0.0	0.0
Palampur	187	575.6	339	382.6	88.6	0	23.4	216.8	67.8	9.4	14.8	120.3
Parbhani												
Patna	431.8	185.3	232.8	150.6	41.4	0.0	10.6	28.6	34.8	0.0	0.0	34.6

Centre	Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Pantnagar	4.4	239.8	299.7	30	427.5	0.0	5	98.9	50.4	0	2.6	45.5
Portblair												
Powarkheda	303.9	209.7	208.5	263.9	43.8	0	0	8.2	0	0	0	0.2
Rahuri												
Raipur												
Rajendranagar	55.8	305.8	106.2	255.2	100.8	18.2	0.0	4.6	0.0	3.2	6.2	3.6
Ranchi	374.0	686.3	282.0	446.2	85.8	24.2	22.6	40.6	37.0	0.0	0.0	36.5
Rewa	201.6	192.1	395.6	160	13.4	-	25.4	40.6	-	-	-	17.8
Rudrur	179.3	515.7	226.2	411.7	38.3	11.3	1	45.9	0	0	0.00	6.50
Sabour	298.6	331.2	104.7	119.4	210.0	0.0	15.6	7.7	32.4	0.0	2.0	68.6
Siruguppa	79.5	163.0	62.3	43.5	67.9	137.0	0.0	0.0	0.0	0.0	5.5	57.0
Thanjavur	69.1	77.8	215.5	85.6	281.0	538.0	4.5	80.9	42.0	30.0	57.8	36.1
SK Nagar												
Umiam	226.2	352.8	400.6	353.8	230.9	0	52.6	44	29.2	10.8	109.6	499.2
Varanasi	671.3	555	256.1	312.9	120.7	0	8.6	55.6	5	0	0.00	5.80

APPENDIX II

Maximum and minimum temperature(°C) (June 2021 to May 2022)

	June		July		August		September		October		November		December		January		February		March		April		May	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Akola	34.50	24.00	31.80	24.00	30.80	23.30	30.50	23.00	32.30	19.60	31.40	16.70	28	12.8	25.9	11.3	31.5	12.5			42.4	24.5	42.1	27.1
Bhubneswar	34.0	26.3	33.5	26.1	33.3	26.1	32.4	25.5	33.0	24.7	30.2	21.8	26.8	15.2	26.5	14.7	30.0	17.2	35.4	22.5	36.9	26.5	35.9	26.3
Chiplima	Not opening'																							
Coimbatore	32.4	23.7	31.2	23.6	31.6	22.9	31.7	23.3	30.6	23.2	28.4	22.4	28.9	20.9	30.2	20.7	32.1	21.1	34.5	21.7	34.6	24.6	42.7	23.9
Durgapura																								
Faizabad	33.0	26.2	34.7	27	32.7	26	32.4	25.5	32.2	21.9	28.2	13	24.6	9.3	18.4	8.4	23.1	10.4	31.8	15.1	38.6	20.4	37.2	25.1
Goa																								
Gwalior	34.80	24.17	30.11	24.19	27.47	22.95	28.72	22.73	30.85	18.90	28.40	12.57	23.40	10.81	25.23	10.13	25.68	9.55	34.76	16.39	40.30	22.33	41.08	27.08
Hisar	40.8	26.7	43.4	27.5	35.5	26.6	32.3	25.4	32.0	19.6	27.9	9.9	21.3	6.3	16.4	7.2	23.2	8.1	31.9	13.8	40.2	19.0	40.9	25.0
Indore																								
Jabalpur	33.9	24.3	32.3	25.1	30.2	24.4	31.12	23.9	31.8	19	28.4	11.8	24.7	8.9	22	8.4	26.6	9.5	34	14.8	40.5	19.7	40.1	24.6
Jammu	38.0	25.0	34.9	25.9	35.0	25.8	33.0	24.2	31.2	18.0	26.4	9.0	21.1	5.0	15.7	7.4	20.8	6.8	29.9	13.6	37.9	18.0	38.3	21.9
Jorhat	32.0	24.3	31.1	25.2	32.9	25.0	33.7	24.4	32.6	22.8	28.4	14.4	26.0	10.8	23.3	9.6	23.6	10.2	30.8	16.1	27.0	19.2	30.5	22.0
Junagadh	36.6	26.7	32.7	25.2	32.4	24.1	30.0	24.2	33.7	21.8	33.3	17.3	28.7	14.8	27.7	11.8	31.4	14.3	37.9	21.0	40.1	23.2	38.4	23.9
Kalyani	32.67	25.85	32.74	26.4	32.88	26.33	31.76	25.61	31.29	23.32	28.41	17.85	24.48	14.11	23.7	12.4	27.2	13.5	34.2	20.7	36.7	26.1	34.0	24.7
Kanpur	35.7	26.8	34.9	27.6	33.1	26.7	32.9	26.0	32.6	21.3	27.8	12.6	23.0	9.8	18.7	7.7	24.7	9.7	33.4	16.1	41.0	20.8	40.3	26.0
Karamana	32.2	21.5	31.9	23.0	30.0	24.0	30.3	24.3	30.0	23.9	29.4	23.5	30.4	23.1	30.7	23.3	30.9	24.0	31.9	24.9	32.0	24.8	30.9	25.1
Karjat	30.92	24.22	29.60	23.90	29.81	23.50	29.98	23.73	32.98	22.00	34.23	20.10	32.21	16.11	30.70	14.60	33.72	14.81	38.90	18.35	40.61	21.77	37.53	24.51
Kathalagere	30.40	22.80	28.30	22.20	28.30	21.90	29.10	21.50	29.90	21.30	29.70	18.70	29.70	16.40	30.1	15.8	32.6	17.5	35.2	20.3	36.2	22.5	34.4	22.7
Kota	41.15	29.46	34.51	26.05	32.86	24.93	34.14	24.92	34.06	19.86	31.52	13.75	26.40	10.24	22.30	9.17	30.75	13.98	33.20	21.50	38.30	27.00	39.10	26.80
Ludhiana	36.3	25.3	34.3	27.8	33.7	27.2	31.7	25.3	31.3	19.5	26.8	10.7	20.7	6.7	15.7	8.4	21.1	8.5	30.8	15.9	39.0	20.5	39.2	26.1

APPENDIX III

CENTRE-WISE STAFF POSITION

1.AAU JORHAT (ASSAM)	
Main Centre, Jorhat	
Chief Agronomist	Dr.Ajit Baishya
Jr. Agronomist	Mrs. J. R. Hazarika
Jr. Soil Scientist	Mr. Bhabesh Gogoi
Technical Asstt.	Mr. K. K. Bordoloi
On-Farm Centre,Goalpara	
Agronomist	Mr. Ajoy Sankar Bora
Jr.Economist	Mrs. M. Borah
Field assistant	Mr. R. Borah
Field assistant	Mr. D. Sarma
Field assistant	Mr. L. Khaund
Field assistant	Mr. A.K.Borthakur
Driver	Sri Suresh Boro
2.ANGRAU, Guntur (A.P.)	
Sub Centre,Maruteru	
Agronomist	Dr. M. Srinivas
Technical Asstt.	A. S. Saibaba Reddy
On-Farm Centre,Vizianagaram	
Agronomist	Dr.M.M.V.Srinivasa Rao
Field assistant	Mr.N.Murali Mohan Rao
Field assistant	Mr. B.V.A. Satyanarayana
Field assistant	Mr. A.V.Ramana
Field assistant	Mr. K.Gopi
Driver	Vacant
3.BAU, Sabour (BIHAR)	
Main Centre, Sabour	
Chief Agronomist	Dr. Sanjay Kumar
Jr. Soil Scientist	Sri Anupam Das
Jr. Agronomist	Dr. Sushant
Technical Asstt.	Vacant
On-Farm Centre,Nalanda	
Agronomist	Dr. D.K. Mahto
Jr. Economist	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant
4.IGKVV,RAIPUR (CHHATISSGARH)	
Main Centre,Raipur	
Chief Agronomist	Dr. M.C. Bhambri
Jr. Soil Scientist	Mr.S.S. Porte
Jr. Agronomist	Mr. Sunil Kumar
Technical Asstt.	Mr. B.K.Chandrakar
On-Farm Centre, Kanker	
Agronomist	Shri Anil Kumar Netam
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant
5. SDAU, S.K.NAGAR (GUJRAT)	
Main Centre, S K Nagar	
Chief Agronomist	Dr A.M Patel
Jr. Soil Scientist	Mr. P.K.Patel
Jr. Agronomist	Dr. K. M. Patel
Technical Assistant	Vacant
On-Farm Centre, Adiya, Patan	
Agronomist	Dr. L. J. Desai
Jr. Ag Economist	Dr. R.R.Patel
Field assistant	Mr.A.K Goswami
Field Assistant	Mr. M.N.Prajapati
Field Assistant	Mr. D.P. Parekh
Field Assistant	Mr. S.S.Patel
Driver	Vacant
6.JAU,JUNAGADH(GUJARAT)	
Sub Centre, Junagadh	
Agronomist	Dr. R. M. Solanki
Technical Asstt.	Shri K. K. Sarvaiya

7. NAU, Navsari (GUJRAT)	
Sub Centre, Navsari	
Agronomist	Dr. L.K. Arvadiya
Technical Asstt.	K.M. Patel
8. AAU, ANAND (GUJRAT)	
On-Farm Centre,Dahod, Devgadh	
Agronomist	Dr Girishbhai J Patel
Field assistant	Mr. D.J. Gohil
Field assistant	Mr.V.H. Rathva
Field assistant	Mr. P.G. Solanki
Field assistant	Mrs. R.S. Thakor
Driver	Mr. B.S.Patel
9.CCS HAU, HISAR (HARYANA)	
Main Centre, Hisar	
Chief Agronomist	Dr. Pawan Kumar
Jr.. Agronomist	Dr. Uma Devi
Sr. Soil Scientist	Vacant
Technical Asstt.	Vacant
OFR Centre, Fatehabad	
Agronomist	Vacant
Jr. Scientist(Ag. Econ.)	Dr. Gulab Singh
Field Assistant	Mr.Mahinder Singh
Field Assistant	Sh. Sadi Lal
Field Assistant	Sh. Hariom
Field Assistant	Mr.Sube Singh
Driver	Vacant
10.CSK HPKVV, PALAMPUR (H.P.)	
Main Centre, Palampur	
Chief Agronomist	Dr. S K Sharma
Jr. Soil Scientist	Dr. Sanjay K Sharma
Jr. Agronomist	Dr.Pawan Pathania
Technical Asstt.	Sh. Manohar Lal
On-Farm Centre, Bilaspur	
Agronomist	Dr.S.K.Sharma
Field assistant	Sh. Ramesh Chand
Field assistant	Sh. Gurmeet Singh
Field assistant	Mr.Saran Das
Field assistant	Mani Raj
Driver	Mr. Ashok Kumar

11.SKUAST, Jammu(J &K)	
Main Centre, Chatta,Jammu	
Chief Agronomist	Dr. N P Thakur
Jr. Soil Scientist	Dr.N. P.Thakur
Jr. Agronomist	Dr. Vijay Khajuria
Technical Asstt.	Vacant
OFR Centre ,Jammu	
Agronomist	Dr. A.K.Gupta
Field assistant	Kuldeep Sharma
Field assistant	Dheeraj Rajwal
Field assistant	Mr.A.W. Katoch
Field assistant	Vikas Koul
Driver	Mohd.Saleem
12.BAU, Ranchi (JHARKHAND)	
Main Centre,Ranchi	
Chief Agronomist	**Dr S Karmakar**
Jr. Soil Scientist	Mr. A. N. Puran
Jr. Agronomist	Mr.R.P.Manjhi
Technical Asstt.	Mr.Rakesh Mitra
On-Farm Centre,East Singhbhum	
Agronomist	Dr.Shambhu Saran Kumar
Field assistant	Rajesh Kujur
Field assistant	Parvej Alam
Field assistant	Anant Kumar Mandal
Field assistant	Tulsi Baitha
Driver	Vacant
13. UAHS, Shivamoga	
Main Centre, Kathalagera	
Chief Agronomist	Dr A.Y. Hugar
Jr. Soil Scientist	Dr. Rajashakhar L
Jr. Agronomist	Dr.H.G.Sannathimmappa
Technical Asstt.	Mr. VijayS.Dannaraddi
14. UAS, Banglore (KARNATAKA)	
On-Farm Centre, Chikkaballapura	
Agronomist	Dr.M.T.Sanjay
Jr.Scientist	Dr. Mahin Sharif/Dr.Anjan kumar M J
Field assistant	Mr.Sunil Kumar
Field assistant	Mr. Narayanaswamy
Field assistant	Mr. Basavaraja

Field assistant	Mr. ALN Gowda
Driver	Jagadeesh, M. K.

15. UAS, Raichur

Main Centre, Siruguppa

Chief Agronomist	Dr.Basavarajappa M.A
Jr. Soil Scientist	Dr.Ashok Kumar Gaddi
Jr. Economist	Dr.Prabhuling Tewari
Technical Asstt.	Mr.Erappa Yankannvar

16.UAS, Dharwad (KARNATAKA)

On-Farm Centre, Dharwad (KARNATAKA)

Agronomist	Dr. V.V. Angadi
Field assistant	Mr. V.D. Kalwad
Field assistant	Mr. R.S. Hiremath
Field assistant	Mr.V.D.Kalawad
Field assistant	Mr. V.G. Chickmath
Driver	Mr. U.S. Athanimath

17. KAU,THRISSUR (KERALA)

Main Centre, Karmana (Thiruvandrum)

Chief Agronomist	Dr.Jacob John
Jr. Soil Scientist	Dr.Meera.A.V.
Jr. Agronomist	Dr.Sudha. B
Technical Asstt.	Mr. Krishnakumar.G

On-Farm Centre, Thiruvananthapuram

Agronomist	Dr. D. Jacob
Jr. Ag. Economist	Dr. Bindhu J.S.
Field assistant	Sri. Manu M.
Field assistant	Sri Santhosh N.
Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant

18. JNKVV, Jabalpur (M.P.)

Main Centre, Jabalpur

Chief Agronomist	Dr. P B Sharma
Jr. Soil Scientist	Vacant
Jr. Agronomist	Dr. R.P.Sahu
Technical Asstt.	Dr. Abhijeet Dubey

Sub Centre, Rewa

Agronomist	Dr.B.M.Mourya
Tech.Assistant	Vacant

Sub Centre, Powerkheda

Agronomist	Dr. V.K. Singh
Tech.Assistant	Shri. Sudhir Dubey

On Farm Centre, Anuppur

Agronomist	Dr D.N. Shrivash
Field assistant	Mr.V.R.Ghorke
Field assistant	Shri Sunil kumar Malviya
Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant

On Farm Centre, Umaria

Agronomist	Dr. Namrata Jain
Field assistant	Shri M. S. Prajapati
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant

19. RMVRSUA&T GWALIAR, (M.P.)

Sub Centre, Indore

Agronomist	Dr. S.K. Choudhary
Technical Asstt.	Shri N.K. Sinha

20. MPKV, RAHURI (MAHARASHTRA)

Main Centre,Rahuri

Chief Agronomist	Dr U S Surve
Jr. Agronomist	Dr.N.S.Ugale
Jr.Soil Scientist	Dr. A. S. Takate
Field Assistant	Mr.B.K.Jadhay

On Farm Centre, Padegaon, Satara

Agronomist	Dr. Arun D. Tumbare
Jr.Economist	Dr Yashawant C Sali
Field Assistant	Shri R. K. Chaudhari
Field Assistant	Shri A. G. Nikrad
Field Assistant	Shri B. K. Pisal
Field Assistant	Vacant
Driver	Vacant

21.PDKV,AKOLA (MAHARASHTRA)

Main Centre, Akola

Chief Agronomist	Dr. B. V. Saoji
Jr. Agronomist	Mr.B.S. Morwal
Jr.Soil Scientist	Vacant

Technical Assistant	Mrs. P. N. Kalane
On-Farm Centre, Katol, Nagpur	
Agronomist	Dr.S.N.Potkile
Field Assistant	Mr.S.D.Kadam
Field Assistant	Mr. R. S. Ghorpade
Field Assistant	Miss Sharda G. Bunde
Field Assistant	Vacant
Driver	Vacant
22.MAU, Parbhani (MAHARASHTRA)	
Main Centre, Parbhani	
Chief Agronomist	Dr. A. S. Karle
Jr.Economist/Jr.Agronomist	Vacant
Jr.Soil Scientist	Dr. S. T. Shirale
Tech. Assistant	Shri. D. Y. Chavan
On Farm Centre, Hingoli	
Agronomist	Dr. D. C. Lokhande
Field Assistant	Shaikh Ilahi Shaikh Lal
Field Assistant	Mr.A.U.Dukre/Mr.A.U.Dukre
Field Assistant	N.V.Kadam
Field Assistant	Vacant
Driver	Vacant
23.DBSKKV, Dapoli (MAHARASHTRA)	
Main Centre, Karjat	
Chief Agronomist	Dr. S. B. Bhagat
Jr. Soil Scientist	Dr.D.G.Jondhale
Jr. Agronomist	Dr.N V Mhaskar
Technical Asstt.	Shri. D. J. Shet
On Farm Centre,Thane	
Agronomist	Dr Amol V Dahiphale
Field Assistant	Shri. S.V. Kamble
Field Assistant	Shri. V.S. Daphal
Field Assistant	Shri. V. N. Patil
Field Assistant	Shri. G. N. Totkar
Driver	Mr.Vaibhav R Salunke
24.OUAT,Bhubaneswar (ODISSA)	
Main Centre,Bhubaneswar	
Chief Agronomist	**Dr Alok Kumar Patra**
Jr. Agronomist	Dr.Alok Kumar Patra
Jr. Soil Scientist	Mr.B.B.Behera
Tech. Assistant	Mr.Dilip Kumar Rout
Sub Centre, Chiplima	
Agronomist	Dr. Sanjukta Mohapatra
Tech. Assistant	Vacant
On Farm Centre, Kendujhar	
Agronomist	Dr.T. R. Mohanty/ Dr. K.C. Sahoo
Jr.Economist	Vacant
Field Assistant	Mr.Kasinath Mallick
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Driver	Vacant
On Farm Centre, Kalahandi	
Agronomist	Dr.Bhabani Shankar Nayak
Field Assistant	Mr. Ananda Chandra Sahu
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Driver	Vacant
25.PAU, Ludhiana (PUNJOB)	
Main Centre, Ludhiana	
Chief Agronomist	Dr.Sohan Singh Walia
Agronomist	Dr.C.S.Aulakh
Jr.Soil Scientist	Dr (Mrs). Neeraj Rani
Tech. Assistant	Manpreet Singh
On Farm Centre, Patiala	
Agronomist	Dr Jashanjot Kaur
Field Assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Driver	Mr.Avtar Singh
26. AU, Kota (RAJASTHAN)	
Sub Centre, Kota	
Agronomist	Dr. J. P. Tetarwal
Tech. Assistant	Vacant
27. MPUAT, Udaipur (RAJASTHAN)	
On Farm Centre, Dungarpur	
Agronomist	Dr. L N Dashora
Jr.Economist	Dr.Hari Singh
Field Assistant	Mr.N.S.Jhala

Field Assistant	Mr.Ramji Lal
Field Assistant	Mr.Madan Lal
Field Assistant	Mr.A.S.Rathore
Driver	Sh. Neeraj Kumhar

28. SKNAU, Jobner, (RAJASTHAN)

Main Centre, Durgapura,Jaipur

Chief Agronomist	Dr. R. Sammauria
Jr. Agronomist	Dr. O.P.Meena
Jr. Soil Scientist	Dr Pratibha
Technical Asstt.	Shri Ram Lal Nehra

On-Farm Centre, Dausa

Agronomist	Dr. B. L. Meena
Field Assistant	Sri. Ramesh Gaotm
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Driver	Vacant

29.PJTSAU, Rajendernagar, Hyderabad

Main Centre, Rajendranagar

Chief Agronomist	Dr.M.Goverdhan
Jr. Agronomist	Dr.Ch.Pragathi Kumari
Jr. Soil Scientist	Sri G.Kiran Reddy
Technical Asstt.	C.Madhusudhan

Sub Centre, Rudrur

Agronomist	Smt.Firdoz Shahana
Technical Asstt.	M.Praveen

On-Farm Centre, Medak

Agronomist	Dr.Md Lateef Pasha
Jr.Economist	Dr. Md. Ali Baba
Field assistant	Md Munaweruddin
Field assistant	Sri. P.Yadagiri
Field assistant	S.Aziz Hasan
Field assistant	Vacant
Driver	Sri. Shaik Shabbir

30 . TNAU, Coimbatore (TAMILNADU)

Main Centre, Coimbatore

Chief Agronomist	Dr.K.R.Latha
Jr.Soil Scientist	Dr.A.Renukadevi
Jr. Agronomist	Dr. S.P.Sangeetha
Tech. Assistant	Mrs. P.Kasthuri

Sub Centre,Thanjavur

Agronomist	Dr.S. Porpavai
Tech. Assistant	S.Palanisamy

On farm ,OFR Centre Erode, Bhavanisagar

Agronomist	Dr.N.Satheeshkumar
Field Assistant	Th. R. Rajesh
Field Assistant	Ms. A. Kasthuri
Field Assistant	Th. M. Vijay
Field Assistant	Th. S.Sakthivel
Driver	Th.S.Sureshkumar

On farm, OFR Centre, Salem, Yethapur,

Agronomist	Dr.D.Raja/ Dr.D.Ravisankar
Jr. Ag economist	Vacant
Field Assistant	Mr.V.Sekar
Field Assistant	Mr.A.Ravichandran
Field Assistant	Mr.A.Murugan
Field Assistant	Mr.C.Muthulakshmi
Driver	Mr.P.Govindaraju

31 .CSAUA&T, Kanpur (UTTAR PRADESH)

Main Centre, Kanpur

Chief Agronomist	Dr. Karam Husain
Jr. Soil Scientist	Dr.U.S.Tiwari
Jr. Agronomist	Vacant
Technical Asstt.	Mr. U. S. Yadav

On Farm Centre, Fatehpur

Agronomist	Vacant
Field Assistant	Mr. Sudhir Pratap Singh
Field Assistant	Mr. Jagdish Chandra
Field Assistant	Mr. R.B.Yadav
Field Assistant	Vacant
Driver	Mr. Vijay Kumar

32.ANDUAT, Ayodhya (UTTAR PRADESH)

Main Centre, Ayodhya

Chief Agronomist	DR.A K Singh
Jr. Soil Scientist	Vacant
Jr. Agronomist	Vacant
Technical Asstt.	Mr. A. P. Singh

On Farm Centre, Ambedkar Nagar

Agronomist	Vacant
Field Assistant	Mr. A.N.Pandey

Field Assistant	Mr. Ashutosh Singh
Field Assistant	Mr. V.B.Singh
Field Assistant	Vacant
Driver	Vacant

33. OFR Centre, ICAR-IIFSR, Modipuram,Meerut, (UTTAR PRADESH)

Agronomist	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant

34. BHU, Varanasi (UP)

Sub Centre,Varanasi

Agronomist	Dr. U P Singh
Tech. Assistant	Vacant

35.GBPUAT, Pantnagar (UTTARAKHAND)

Main Centre, Pantnagar

Chief Agronomist	Dr.Rohitashav Singh
Jr.Soil Scientist	Dr.Ajeet Pratap Singh
Jr. Agronomist	Dr. Dinesh kumar Singh
Tech. Assistant	Mr.Y.S.Khokar

On- Farm Centre, Udham Singh Nagar

Agronomist	Dr.D K Singh I/C
Jr. Scientist (Economics)	Vacant
Field Assistant	M P Singh
Field Assistant	Mahendra Singh
Field Assistant	Ashok Kumar
Field Assistant	Vacant
Driver	R B Yadav

36. BCKV, Kalyani (WEST BENGAL)

Main Centre, Kalyani

Chief Agronomist	Dr. S. K. Mukhopadhyay
Jr. Soil Scientist	Dr. Sushanta Saha
Jr. Agronomist	Vacant
Technical Asstt.	Mr.Basudeb Datta

On-Farm Centre, Nadia

Agronomist	Dr.Manabendra Ray
Jr. Economist	Dr.Soumitra Chatterjee
Field assistant	Mr.A.K.Bhaumik
Field assistant	Mr.K.Maiti
Field assistant	Mr.N.Das
Driver	Vacant

APPENDIX IV

SOIL FERTILITY STATUS AND NUTRIENT UPTAKE 2022-23

Table A :Soil fertility status-Organic carbon (%) and available N,P and K (Kg/ha) after kharif/rabi/summer season in Exp No. 1(a)

Name of centre												
ANGRAU, Guntur	Kharif	OC%	1.12	1.14	1.14	1.14	1.14	1.13	1.13	1.13	1.12	1.12
		N	0.99	1.05	1.08	1.12	1.12	1.10	1.06	1.06	1.13	1.11
		P	0.44	0.50	0.48	0.45	0.48	0.47	0.46	0.47	0.49	0.49
		K	3.10	2.24	2.41	2.34	2.52	2.31	2.48	2.40	2.74	2.81
	Rabi	OC%	1.14	1.14	1.14	1.14	1.14	1.13	1.14	1.14	1.13	1.14
		N	2.28	2.89	3.46	2.50	3.41	2.91	0.34	0.21	0.21	7.33
		P	1.08	1.46	1.73	1.21	1.66	1.41	0.17	0.10	0.11	3.58
		K	6.66	8.32	10.09	7.19	9.72	8.37	0.95	0.60	0.63	21.38
PJTSAU, Hydera-bad	Kharif	OC%	0.4	0.39	0.43	0.43	0.44	0.43	0.44	0.44	0.4	0.4
		N	200	175	225	213	225	183	213	211.5	182.6	176.5
		P	30.1	28.9	38.6	40.6	42.6	36.9	36.5	40.3	30.5	29.3
		K	201.6	187	192.2	196.2	192.3	192.7	185.2	195.3	175.6	174.5
	Rabi	OC%	0.4	0.39	0.43	0.44	0.45	0.43	0.43	0.44	0.4	0.4
		N	183	175	212.3	225	225	187	200	212.3	181.5	175.3
		P	29.9	28.9	38.5	40.7	42	37.5	37.8	40.5	30.5	29.4
		K	203.3	187	191.2	195.5	191.2	193.2	192.5	196.3	177.4	175.6
	Summer	OC%	-	-	-	-	0.45	-	0.44	-	0.4	-
		N	-	-	-	-	221	-	216.7	-	183.7	-
		P	-	-	-	-	42.4	-	36.9	-	30.8	-
		K	-	-	-	-	193.7	-	186.6	-	178.5	-
BAU, Ranchi	After one cropping cycle	OC%	0.46	0.46	0.50	0.55	0.51	0.51	0.49	0.46	0.45	0.47
		N	213.2	203.6	234.7	241.1	236.5	231.6	228.6	221.8	222.4	220.5
		P	30.40	29.10	37.40	43.60	39.50	34.80	33.10	27.40	32.40	31.00
		K	133.1	137.0	167.9	186.2	175.7	162.6	155.9	129.4	130.8	150.9

Name of centre												
BAU, Sabour	Kharif	OC g/kg	4.86	4.89	4.85	4.95	4.86	4.94	4.88	4.86	4.97	4.86
		N	241.5	253.1	258.6	263.1	236.4	248.9	234.4	228.7	222.4	220.7
		P2O5	30.4	34.2	37	38.3	32	34.5	32.5	33.8	32.3	33.4
		K2O	186.5	189.4	197.4	185.1	174.1	192.4	184.7	177	179.6	176.9
	Rabi	OC g/kg	4.82	4.88	4.84	4.94	4.85	4.93	4.87	4.85	4.96	4.85
		N	239.7	252.6	258.1	262.5	236	248.4	234	228.2	221.9	220.3
		P2O5	30.1	34.1	36.9	38.2	31.9	34.4	32.4	33.7	32.2	33.3
		K2O	185.1	189	197	184.7	173.8	192	184.3	176.7	179.3	176.6
	Summer	OC g/kg	4.84	4.9	4.86	4.96	4.87	4.95	4.89	4.87	4.98	4.87
		N	240.9	253.9	259.5	263.9	237.2	249.7	235.2	229.4	223.1	221.5
		P2O5	30.3	34.3	37.1	38.4	32.1	34.6	32.6	33.9	32.4	33.5
		K2O	186.1	190	198.1	185.7	174.7	193	185.3	177.6	180.2	177.5
JAU, Junagadh	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	8.4	8.43	8.42	8.52	8.18	8.47	8.35	7.78	8.26	8.09
		N	234	232	240	243	240	236	238	240	236	238
		P	26.51	27.07	29.49	29.87	23.15	25.76	26.41	25.48	26.79	26.23
		K	252	240	251	246	223	222	214	229	245	228
SKUAST, Jammu	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	5.8	6.6	6.8	6.6	6.5	6.3	6.5	6.5	6.4	6.2
		N	220	238	245	225	232	230	235	232	220	215
		P	19.1	23.2	22.12	21.7	21.85	22.1	23.8	22.65	23.1	23.1
		K	122	130	135	128	126	132	131	128	122	118

Name of centre												
KAU, Thrissur	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	1.26	1.31	1.64	1.58	1.37	1.52	1.68	1.54	1.82	1.63
		N	311	307	339	351	322	327	296	287	318	317
		P	39.5	38.7	48.61	52.05	42.2	47.22	42.34	41.8	47.3	46.8
		K	153	154	172	181	169	165	151	158	161	164
	Kharif	OC%	1.05	1.06	1.1	1.09	1.07	1.08	0.99	1	1.02	1.01
		N	223.91	220.77	237.08	236.45	234.57	227.05	218.89	220.77	218.27	219.52
		P	11.2	11.4	11.91	11.71	11.61	11.51	10.59	10.69	10.69	10.89
		K	185.92	202.16	208.88	206.36	204.12	196	181.16	190.96	184.52	196.84
	Rabi	OC%	1.1	1.13	1.17	1.16	1.11	1.12	1.02	1.04	1.06	1.05
		N	228.93	231.44	245.86	244.61	242.73	237.71	224.54	226.42	220.15	222.66
		P	12.12	12.32	12.63	12.32	12.52	12.42	11.51	11.61	10.79	11.3
		K	197.4	195.16	192.36	191.52	186.88	190.68	189	186.76	209.44	207.48
IFS Sub center-Rewa	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	0.6	0.62	0.62	0.67	0.6	0.62	0.6	0.6	0.6	0.62
		N	281	288	285	283	315	310	281	235	225	238
		P	16.12	18.54	16.12	17.92	17.92	18.12	21.5	20.5	16.33	16.12
		K	237	262	213	202	202	251	236	226	217	292

Name of centre												
Ayodhya	Kharif	OC%	0.417	0.5	0.505	0.467	0.493	0.494	0.45	0.434	0.461	0.463
		N	213.5	230	233.2	235	224	229.4	219	215.75	223.12	233
		P	21	25.1	25	27.9	24.86	24.1	24.6	23.9	25.1	24
		K	270.1	269.1	271.6	270.2	270.8	267.3	251.9	252	269.9	265.7
	Rabi	OC%	0.418	0.501	0.503	0.465	0.491	0.493	0.448	0.43	0.458	0.461
		N	214.6	229	231.9	235.9	223.8	230.5	220.05	213	221.8	233.1
		P	21.9	25	25.87	27	24.1	24.18	23.96	22.1	24.6	23.75
		K	268.1	270.8	270.9	272	268.4	266.2	249.86	253.1	267	265
	Summer	OC%	0.419	0.502	0.504	0.466	0.492	0.493	0.449	0.432	0.46	0.462
		N	213.9	229.68	232.1	235.06	223.6	229.1	219.96	214.9	222.22	234.9
		P	21.87	25.12	25.36	27.66	24.96	24	24.5	23	24.96	24.98
		K	269.9	270.6	272.68	271.1	269.8	266.9	250.1	252.1	268.4	266.9
TNAU, Coimba-tore	Kharif	OC%	0.56	0.55	0.59	0.56	0.55	0.55	0.66	0.6	0.57	0.58
		N	244	274	231	257	244	225	322	330	296	233
		P	19.9	20.9	20	20.7	17.8	20.5	21.9	21.7	20.9	19.5
		K	627	644	666	619	662	643	680	667	628	659
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
RSVKVV, Gwalior	Kharif	OC%	0.38	0.42	0.64	0.50	0.42	0.40	0.46	0.48	0.44	0.38
		N	172	184	246	200	184	180	192	196	188	172
		P	10.40	9.20	10.40	8.80	10.40	10.00	10.40	8.80	10.4	8.2
		K	525	531	531	563	538	494	469	494	513	513
	Rabi	OC%	0.38	0.42	0.62	0.52	0.40	0.38	0.50	0.50	0.46	0.36
		N	172	184	241	207	180	172	200	200	192	165
		P	10.80	10.40	10.80	9.20	10.80	10.00	10.80	9.20	9.6	8.1
		K	500	485	520	535	430	445	460	530	520	500
	Summer	OC%	0.40	0.41	0.64	0.56	0.42	0.40	0.46	0.48	0.46	0.38
		N	180	185	246	221	184	180	192	196	192	172
		P	11.00	8.20	10.40	8.80	10.40	10.80	9.60	8.40	10	9.2
		K	495	500	500	545	425	460	445	490	495	485

Name of centre												
CSHAU, Hissar	Kharif, 2022	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi, 2023	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer, 2023	OC%	0.40	0.36	0.62	0.70	0.46	0.45	0.56	0.49	0.58	0.49
		N	125.50	127.00	135.00	148.00	130.50	129.50	142.00	135.00	131.33	128.67
		P	14.35	14.50	25.90	23.00	20.35	23.35	24.00	19.67	22.00	21.00
		K	311.50	302.50	333.33	284.00	313.50	295.00	327.50	258.00	324.33	338.67
AAU, Jorhat	Kharif	OC%	6.64	6.62	6.7	6.72	6.67	6.69	6.69	6.67	6.65	6.68
		N	221.5	222.8	231.5	235	234	230.5	229.5	232	227.8	233
		P	7.7	7.9	8.6	8.8	8.7	8.6	8.4	8.5	8.6	8.3
		K	83.5	85	90	91.8	90	87.8	87.3	85.8	87.5	90
	Rabi	OC%	6.61	6.66	6.5	6.8	6.2	6.72	6.68	6.08	6.24	6.34
		N	220	215	228	231	236	225	227	235	223	235
		P	7.02	6.98	8.4	8.2	8.45	8.23	7.98	8.2	8.4	8.23
		K	82	7.9	7.12	8.67	90	82	98	79	92	88
	Summer	OC%	6.08	6.12	6.71	6.45	6.56	6.51	6.78	6.77	6.12	6.34
		N	218	221	226	228	232	231	226	231	224	233
		P	7.5	7.01	8.12	8.34	8.6	8.11	8	7.82	8.02	7.98
		K	77	82	89	91	89	83	87	89	92	95
BCKV, Kalyani	Kharif	OC%	0.92	0.90	1.02	1.06	1.06	1.04	0.88	0.92	0.84	0.87
		N	232.20	210.80	262.20	258.70	238.40	234.10	222.40	214.80	210.80	224.70
		P	55.40	57.80	68.70	69.20	67.20	64.80	62.80	58.40	68.70	78.20
		K	170.20	160.10	195.40	192.70	178.20	165.80	168.40	168.20	174.20	200.80
	Rabi	OC%	0.84	0.82	0.88	0.89	0.90	0.88	0.82	0.78	0.76	0.78
		N	222.80	210.40	245.80	240.80	217.90	219.40	200.80	190.70	198.40	190.20
		P	48.20	46.80	55.80	52.10	50.80	49.70	45.20	42.80	60.80	70.00
		K	162.20	148.80	169.40	172.80	158.20	148.20	143.70	149.50	162.80	172.90
	Summer	OC%	0.85	0.89	0.97	0.98	1.03	1.01	0.86	0.88	0.81	0.83
		N	220.2	197.6	254.2	244.7	223.9	227.4	204.5	195.7	203.0	195.5
		P	49.4	47.1	60.7	57.7	52.3	54.2	50.0	45.8	64.7	71.0
		K	163.1	152.1	192.1	196.2	165.1	151.4	158.6	161.4	164.7	194.6

Name of centre												
CSAU&T, Kanpur	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	0.452	0.468	0.505	0.490	0.455	0.488	0.460	0.455	0.478	0.445
		N	203.40	210.60	227.25	220.50	204.75	219.60	207.00	204.75	215.10	200.25
		P	13.43	13.58	13.70	13.60	13.48	13.60	13.55	13.45	13.52	13.44
		K	201.20	206.50	224.80	218.10	200.40	214.25	204.40	199.60	210.80	197.20
KAU, Karmana, Thrissur	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K										
	Summer	OC%	1.26	1.31	1.64	1.58	1.37	1.52	1.68	1.54	1.82	1.63
		N	311	307	339	351	322	327	296	287	318	317
		P	39.5	38.7	48.61	52.05	42.2	47.22	42.34	41.8	47.3	46.8
		K	153	154	172	181	169	165	151	158	161	164
NAU, Navsari	End of summer	OC%	7.06	6.89	7.18	6.89	6.99	6.72	6.74	6.60	6.62	6.82
		N	268.67	267.60	268.67	270.73	267.60	263.43	267.63	271.77	274.93	265.50
		P	32.77	32.87	33.80	35.30	33.80	33.07	33.13	33.13	34.70	32.83
		K	247.13	247.87	255.37	255.00	249.77	249.77	251.23	264.70	266.93	251.60

Name of centre												
HPKVV, Palampur	Kharif	OC%	11.5	11.9	12.6	12.9	12.1	12.6	11.3	11.1	11	11.5
		N	360.4	373.2	421.1	417.1	404.5	366.7	399.7	400.2	385.4	385.9
		P	52.2	51.6	60.2	62.4	55.2	58.4	57.8	58.8	57.5	55.8
		K	156.9	160.8	143.5	147.5	160.7	139.2	178.8	152.5	175.8	196.4
	Rabi	OC%	11.9	12.2	13	13	12.8	12.9	12.4	12.1	11.8	11.7
		N	370.7	383.2	435.4	425.2	415.6	378.2	412.3	410.4	396.7	397.2
		P	207.5	54.2	60.8	64.2	58.4	60.5	58.6	60.5	59.8	57.4
		K	172.5	179.7	154.2	158.5	172.8	149.5	179.8	169.5	184.8	208.5
	Summer	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K		-	-	-	-	-	-	-	-	-
Rewa	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	0.6	0.62	0.62	0.67	0.6	0.62	0.6	0.6	0.6	0.62
		N	281	288	285	283	315	310	281	235	225	238
		P	16.12	18.54	16.12	17.92	17.92	18.12	21.5	20.5	16.33	16.12
		K	237	262	213	202	202	251	236	226	217	292
UAS, Raichur	Kharif	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K		-	-	-	-	-	-	-	-	-
	Rabi	OC%	-	-	-	-	-	-	-	-	-	-
		N	-	-	-	-	-	-	-	-	-	-
		P	-	-	-	-	-	-	-	-	-	-
		K	-	-	-	-	-	-	-	-	-	-
	Summer	OC%	5.8	6.3	7.1	7.1	6.8	6.8	5.9	6.3	6.7	6.9
		N	184	196	200	196	186	190	173	174	188	186
		P	9.9	13	14.1	16.1	14.9	14.3	15.2	15.4	15.0	12.5
		K	365	357	367	354	374	362	343	365	364	370

Name of centre												
BHU, Varanasi	Kharif	OC%	0.41	0.48	0.45	0.53	0.46	0.50	0.51	0.54	0.52	0.57
		N	186.8	186.7	185.0	186.9	196.7	205.9	198.7	211.3	227.9	227.7
		P	11.4	12.2	12.7	13.9	14.1	13.2	14.0	16.0	15.0	18.1
		K	183.6	174.5	180.8	178.0	171.4	186.0	192.0	188.1	196.2	199.7
	Rabi	OC%	0.38	0.42	0.40	0.47	0.41	0.44	0.45	0.48	0.46	0.51
		N	174.3	165.6	164.0	165.7	174.4	182.6	176.2	187.4	202.1	201.9
		P	10.7	11.4	11.9	12.9	13.1	12.3	13.0	14.9	14.0	16.9
		K	171.4	162.9	168.8	166.1	159.9	173.6	179.2	175.5	183.2	186.4
	Summer	OC%	0.39	0.43	0.41	0.48	0.42	0.45	0.46	0.49	0.47	0.52
		N	177.9	168.9	167.4	169.1	178.0	186.4	179.8	191.2	206.3	206.0
		P	10.9	11.6	12..1	13.2	13.4	12.6	13.3	15.2	14.3	17.2
		K	174.9	166.2	172.2	169.5	163.2	177.16	182.81	179.12	186.9	190.2

10. ANNEXURE

ANNEXURE-I

CURRENT ADDRESS OF CONTACT PERSON

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ANNEXURE II

Price (Rs./q) & Calorie per 100gm for (2022-23)

Crops	Price (Rs./q) 2021-22	Price (Rs./q) 2022-23	Cal./ 100 gm	Crops	Price (Rs./q) 2021-22	Price (Rs./q) 2022-23	Cal./ 100 gm
All Fodders**	200	210	16	Knolkhol**	490	550	43
All green manuring**	300	315	16	Ladyfinger**	1450	1650	35
Amaranthus grain**	5050	5500	49	Lentil /Masur*	5000	5500	343
Arhar/Pigeonpea/* Redgram	6000	6600	335	Linseed**	4450	4595	530
Baby Corn**	3000	3300	125	Maize(Grain)*	1720	1962	342
Barley*	1470	1635	336	Maize (green cobs)**	1.35/cob or 425/q	1.65/cob or 495/q	125
Beetroot**	500	550	25	Maize Sweet Corn**	1900	2035	342
Berseem (seed)**	10100	11000	344	Marigold**	2000	2200	4
Bitter Gourd**	1000	1100	25	Rapeseed& Mustard*	4200	4620	541
Blackgram/Urad*	6000	6600	347	Gobi sarson/Hayola**	2700	3000	541
Bottle gourd (Lauki)**	2000	2200	12	Niger Seed*	6550	7287	515
Brinjal**	1020	1210	24	Oat**	1450	1623	374
Broccoli**	2700	3000	45	Onion (big)**	1425	1650	50
Buck Wheat**	1000	1100	346	Pea*	6300	7040	315
Cabbage**	495	550	27	Pea (veg.)**	1950	2200	93
				Pearlmillet/Bajra**	2100	2350	361
Carrot**	1000	1100	48	Potato**	600	660	97
Cassava**	1620	1845	134	Pumpkin**	1525	1760	25
Castor**	4450	4950	440	Radish (White)**	500	550	17
Cauliflower**	500	550	66	Ragi/Fingermillet**	3250	3578	328
Chillies(green)**	2450	2750	29	Rice(coarse)*	1750	1950	346
Clusterbean **	3200	3520	35	Ricebean fodder**	200	235	16
Coleus**	2000	2300	86	Ridge /Round gourd**	3000	3300	17
Coriander(S)**	5500	6050	288	Safflower**	4950	5440	356
Coriander(L)**	400	450	49	Sesamum/Gingely/ Til**	7150	7830	563
Cotton(F-4/1180)*	5500	6080	332	Sorghum/Jowar*	2600	2970	349
Cotton (H-1380)*	5700	6380	332	Soyabean (b)*	-	3190	432
Cowpea/Lobia(S)**	2600	2950	323	Soyabean (y)*	3300	3740	432
Cowpea (Veg.)pod**	1500	1750	48	Sugar beet**	950	1073	48

Crops	Price (Rs./q) 2021-22	Price (Rs./q) 2022-23	Cal./ 100 gm	Crops	Price (Rs./q) 2021-22	Price (Rs./q) 2022-23	Cal./ 100 gm
Cucumber**	600	780	13	Sugarcane*	300	350	34
Cumin/SiyaZeera**	20000	22000	356	Summer Squash**	1450	1600	16
Fennel grain**	5000	5500	31	Sweet Potato**	1485	1650	120
Fennugreek (seed)**	5100	5610	333	Tomato (green)	735	825	23
Fennugreek leaves/ spinach**	1400	1625	49	Toria/Raya/*	4050	4510	541
Field bean**	2000	2200	48	Turmeric**	6950	7700	349
Fieldpeas/Veg. peas**	3000	3300	93	Wheat*	1810	2015	346
Frenchbeans**	2000	2200	26	White gingely**	7150	7810	563
Garlic**	5200	5720	145	Rajmash/Rajmah**	5560	6270	346
Ginger**	1950	2200	67	Sunflower seed *	5850	6400	620
Gram/Chickpea/ Bengalgram*	4550	5082	360	Rice Basmati*	1800	1950	346
Greengram/Moong*	7050	7755	334	Horse gram**	3500	3850	321
Groundnut*	5200	5850	567	Indian bean**	2400	2750	26

*** Minimum support price fixed by Government of India for 2022-23.**
****Farm gate price at OFR Centre.**

ANNEXURE III

S. No.	COMMON NAME	Botanical name	Hindi Name
1	Ajwain/Ajowan Caraway	Trachyspermum copticum	Ajwain
2	Ashwagandha/India Ginseng	Withania somnifera(L.) Dunal	Ashwagandha
3	Barley	Hordeum vulgare L.	Jau
4	Black caraway /Fennel flower	Nigella sativa Sumac	Kalongi
5	Black gram	Phaseolus mungo L.	Urd/Urd bean
6	Bottle gourd	Lagenaria siceraria (Mol.)/L.vulgaris L.	Lauki
7	Brinjal/Egg plant	Solanum melongena L.	Baigen
8	Broccoli	Brassica oleracea (L.)var.italica	Hari Phool Gobhi
9	Cabbage	Brassica oleracea (L.)var.capitata	Band gobhi/Patta gobhi
10	Castor	Ricinus communis L.	Arandi
11	Cauliflower	Brassica oleracea L.var botrytis	Phool Gobhi
12	Chickpea	Cicer arietinum L.	Chana
13	Chickpea /Bengal gram	Cicer arietinum L.	Chana
14	Chicory	Cichorium intybus L.	Kasni
15	Chilli	Capsicum annum L.	Mirch
16	Cluster bean	Cyamopsis tetragonoloba L.Taub .	Guar/Guar bean
17	Coriander	Coriandrum sativum L.	Dhania
18	Cotton	Gossypium hirstum L.	Kapaas
19	Cowpea	Vigna unguiculata (L)Walp.	Lobia
20	Cumin	Cuminum cyminum L.	Jeera
21	Egyptian clover	Trifolium alexandrinum L.	Berseem
22	Fenugreek	Trigonella foenum -graecum L.	Methi
23	Finger millet	Eleusine coracana (L.)Gaertn.	Ragi/Mandua
24	Garden Cress/ Water Cress	Lepidium sativum L.	Chandrasur
25	Garlic	Allivum sativum L.	Lahsun
26	Garlic	Allium sativum L.	Lehsum
27	Green gram	Phaseolus radiatus (L,) Wilczek	Moong/Moong bean
28	Groundnut	Arachis hypogea L.	Moongfali
29	Hyacinth bean/indian bean	Dolichis lablab L./D.purpureus/Lablab purpureus	Seim
30	Indian Mustard	Brassica juncea Coss.	Sarson /Raya

S. No.	COMMON NAME	Botanical name	Hindi Name
31	Indian rape	Brassica campestris L.var .Toria	Toria
32	Lady finger /Okra	Abelmoschus esculantus Moench .	Bhindi
33	Lentil	Lean culinaris Medikus	masoor
34	Linseed /Flax /Flax seed	Linum usitatissinum L.	Alsi
35	Maize /Com	Zea mays L.	Makka
36	Marigold	Calendula officinalis L.	Gainda
37	Mustard	Brassic campestris L.var .Yellow sarson/ Brown sarson	Sarson
38	Oat	Avena sativa L.	Jaee
39	Onion	Allium cepa L.	Pyaz
40	Pearl millet	Pennisetum americanum L.	Bajra
41	Pea /Vegetable Pea	Pisum sativum L.	Mastar
42	Pigeon pea	Cajanus cajan (L) Milsp	Arhar /Tauar
43	Potato	Solonum tuberosum	Aloo
44	Psyllium	Plantago ovata Forssk	Isabgol
45	Pumpkin	Cucurbita pepo Duch .	Kaddu
46	Radish	Raphanus sativus L.	Mooli
47	Rape/Oilseed rape	Brassica napus var.napus	Gobhi sarson
48	Red /Purple Amaranth	Amaranthus cruentus L.	Chauiai/Ramdana /Rajgira
49	Rice /Paddy	Oryza sativa L.	Dhan
50	Ridge groud /Sponge groud	Lufa acutangula /L.aegyptica/L. Cylindrica	Torai
51	Sesame	Sesamum indicum L.	Till
52	Sorghum	Sorghum bicolor (L.)Moench .	Jowar
53	Soybean	Glycine max L.(Merr.)	Soybean
54	Spinach	Spinacia oleracea L.	Palak
55	Suger beet	Beta vulgaris L.	Chukander
56	Sugarcane	Saccharum officinarum L.	Ganna
57	Sunflower	Helianthus annus L.	Surajmukhi
58	Sunhemp	Crotolaria juncea L.	Sanai
59	Sweet potato	Ipomoea batatas (L.)Lam.	Sakarkand
60	Tomato	Solanum lycopersicumL./Lycopersicon esculantum/L.lycopersicum	Tamatar
61	Turmeric	Curcuma longa L.	Haldi
62	Wheat	Triticum aestivum L.emend .Fiori $ Paol.	Gehun

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