



वार्षिक प्रतिवेदन ANNUAL REPORT 2018 - 19



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

ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut. 250 110 (UP), India



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 nos.) on-station sub (11 nos.) on-station voluntary (6 no's) and on-farm research (32 nos.) 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

ALL INDIA CO - ORDINATED RESEARCH PROJECT ON
INTEGRATED FARMING SYSTEMS

Annual Report 2018-19



ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut – 250 110, India



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Compiled and Edited by:

Dr N. Ravisankar Programme Facilitator (Coordination Unit) & PI(OFR)
 Dr Prem Singh, Programme Facilitator (Cropping Systems & Resource Mgt.)
 Dr R.P. Mishra, Programme Facilitator (Organic Agriculture Systems)
 Dr A.K. Prusty, Sr. Scientist (Coordination Unit)
 Dr Mohammad Shamim, Senior Scientist (Coordination Unit)
 Mr Raghuveer Singh, Scientist (Coordination Unit)
 Dr. Amit Kumar, Scientist(Cropping Systems &Resource Mgt.)
 Mr Dhananjay Tripathi, Chief Tech. Officer (Coordination Unit)
 Dr Brij Mohan Garg, Chief Tech. Officer (Coordination Unit)

Administrative/Typing Assistance: Mrs Jailata Sharma

Data Processing at

Dr Anil Kumar, Principal Scientist & PI, AICRP-IFS

IASRI, New Delhi by:

Dr (Mrs) Cini Varghese, Principal Scientist, OFR, AICRP-IFS

Dr Arpan Bhowmick, Scientist

Dr Sukanta Dash, Scientist

Dr Sushil Kumar Sarkar, Scientist Mr Gyan Singh, Chief Tech. Officer

Mr Naresh Kumar, Asstt. Chief Tech. Officer Mr Devender Kumar, Asstt. Chief Tech. Officer

Published by:

Dr A.S. Panwar, Director

ICAR-Indian Institute of Farming Systems Research,
 Modipuram, Meerut-250 110, India

Important Notes:

- 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 2017-18 (period ending June 2018), under 'on-station' and 'on-farm' research programmes of AICRP on Integrated Farming Systems. The other details are relevant to 31st March 2019.
- 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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Contact- +91 9051391291, 3, Gokul Baral Street, 1st Floor, Kolkata - 700 012

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(Dr. A.S.Panwar)

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सारांश

अखिल भारतीय समन्वित एकीकृत कृषि प्रणाली अनुसंधान परियोजना 25 मुख्य केन्द्रों 11 उपकेन्द्रों 32 फार्म प्रक्षेत्र अनुसंधान एवं 6 भारतीय कृषि अनुसंधान परिषद संस्थानों के तत्वाधान में देश के 25 राज्यों 1 केन्द्र शासित प्रदेश में संचालित होती है, तथा सभी 15 कृषि जलवायु क्षेत्रों को सम्मिलित करती है। आन स्टेशन एवं आन फार्म पर 2018-19 में किये गये अनुसंधान कार्यक्रम की प्रमुख उपलब्धियाँ निम्न है।

सतत् संसाधन प्रबंधन, जलवायु के अनुकूल एकीकृत कृषि प्रणाली माडल।

वर्ष 2018-19 के दौरान 15 कृषि जलवायु के क्षेत्र में जलवायु के अनुकूल एकीकृत कृषि प्रणाली माडल के अध्ययन में निम्नलिखित तथ्य प्राप्त हुए।

- (1) जलवायु अनुकूल एकीकृत सतत् संसाधन प्रबंधन माडल में संसाधन जो कि बाजार में कय करके कृषि प्रणाली को विकसित करने में लगे है, मध्य केन्द्रीय पठार एवं पहाणियों में 17 प्रतिशत जबकि 49 प्रतिशत गुजरात के मैदान एवं पहाडियों में बाजार में कृषि संसाधन कय करना पडा।
- (2) पश्चिमी हिमालय क्षेत्र में कृषि मजदूर सम्पूर्ण लागत का 19 प्रतिशत, जबकि मध्य केन्द्रीय पठार एवं पहाडियों में 67 प्रतिशत, लागत कृषि मजदूर पर खर्च हुआ। एकीकृत कृषि प्रणाली माडल को विकसित करने में परिवारिक श्रम का उपयोग करने पर अतिरिक्त बचत पूर्वी तटीय मैदान में 0.32 लाख एवं पश्चिमी तटीय मैदान एवं घाट में 10 लाख तक प्राप्त हुआ।
- (3) पश्चिमी शुष्क प्रदेश में पुनः चक्रण 13 प्रतिशत, जबकि 45 प्रतिशत पश्चिमी हिमालय क्षेत्र एवं गंगा के मध्य मैदानी क्षेत्रों में उपयोग हुआ। पोषक तत्वों का पुनः चक्रण पूर्वी हिमालय क्षेत्र में अधिक, जबकि गंगा के मध्य मैदानी क्षेत्र में कम प्राप्त हुआ।

विभिन्न कृषि प्रणालियों के लिए फसल प्रणाली मॉड्यूल की पहचान

पाँच परिवार के सदस्य और दो देशी गाय वाले एक हे. कृषि प्रणाली माडल के तहत अनुशांशित क्षेत्र आवंटन: विभिन्न परिस्थितियों तंत्रों में परिवार के पोषण, पशुधन पोषण एवं आय सृजन आदि जैसे कृषि प्रणाली के विभिन्न उद्देश्यों को पूरा करने के लिए अनुमानित क्षेत्र पर कार्य किया गया। सभी पारिस्थितिकी तंत्रों के लिए

दो देशी गायों (औसत शरीर का वजन लगभग 250 किलोग्राम) के साथ डेयरी इकाई के लिए 0.05 हे. का क्षेत्र लिया गया है। शुष्क पारिस्थितिकी तंत्र के लिए लगभग 0.26, 0.11 और 0.32 हे. क्षेत्र परिवार के पोषण, पशुधन पोषण और आय सृजन की वस्तुओं को पूरा करने के लिए लिया जा सकता है। इसी तरह, अर्ध शुष्क पारिस्थितिकी तंत्र में, परिवार के पोषण, पशुधन पोषण और आय सृजन के उद्देश्य को पूरा करने के लिए क्रमशः एक हे. कृषि प्रणाली माडल में लगभग 0.25, 0.12 और 0.37 हे. भूमि क्षेत्र लिया जा सकता है। उप-आर्द्र पारिस्थितिकी तंत्र के लिए लगभग 0.15, 0.12 और 0.54 हे. क्षेत्र परिवार के पोषण, पशुधन पोषण एवं आय सृजन हेतु पर्याप्त होगा। तटीय पारिस्थितिकी तंत्र के लिए परिवार के पोषण, पशुधन पोषण एवं आय सृजन के उद्देश्य को पूरा करने के लिए, कृषि प्रणाली माडल में 0.18, 0.14 और 0.45 हे. भूमि आवंटित की जा सकती है।

➤ फार्म प्रक्षेत्र अनुसंधान

प्रयोग-1: फार्म प्रक्षेत्र पर पोषण तत्वों के प्रति फसल प्रतिक्रिया

विभिन्न एन. ए. आर. पी. क्षेत्रों में प्रचलित फसल प्रणाली में दिए गये पोषक तत्वों की प्रतिक्रिया के परिणाम का सारांश इस प्रकार है।

- विभिन्न एन. ए. आर. पी. क्षेत्रों एवं फसल प्रणालियों में सिफारिश की गई पोषक तत्वों की तुलना में किसानों द्वारा अपनाई गई विधि में कम उपज प्राप्त हुई।
- फार्म प्रक्षेत्र पर विभिन्न फसलों/फसल प्रणाली में सिफारिश की गई नाइट्रोजन, फास्फोरस, पोटैश एवं सूक्ष्म तत्वों की मात्रा की तुलना में किसानों द्वारा कम मात्रा में पोषक तत्वों के उपयोग में लेने के कारण धान-धान, धान-गेहूँ, धान-सरसों, मक्का-गेहूँ और मक्का-चना फसल प्रणाली में क्रमशः 388, 1812, 1601, 2645 और 1459 किग्रा/हे. उपज में अंतर पाया गया।
- मृदा परीक्षण के आधार पर भूमि में सूक्ष्म पोषक तत्वों की मात्रा उपयोग में लेने के परिणाम स्वरूप धान-धान, धान-गेहूँ, धान-सरसों, मक्का-गेहूँ एवं मक्का-चना फसल प्रणाली में क्रमशः 123, 605, 351, 584 और 411 किग्रा/हे. अतिरिक्त अधिकतम उपज प्राप्त की गई।
- सभी एन. ए. आर. पी. क्षेत्रों एवं फसल प्रणाली में सिफारिश की गई पोषक तत्व नाइट्रोजन, फास्फोरस, पोटैश या नाइट्रोजन, फास्फोरस, पोटैश + सूक्ष्म पोषक

तत्वों की मात्रा देने में उपज की अधिक प्राप्त होती है एवं पोषक तत्वों के उपयोग की दक्षता भी अधिक होती है। पोषक तत्व विशेषतः नाइट्रोजन की मात्रा एवं संख्या के कम अनुप्रयोग के कारण फसलों की उपज में कमी के साथ-साथ पोषक तत्वों के उपयोग की दक्षता में भी कमी पाई गई।

- फार्म पर क्षेत्र के 3 केंद्र (वेल्लयानी, केरल) धान-धान (पटियाला, पंजाब) धान-गेहूँ (चिकबल्लापुरा, कर्नाटक) टमाटर-फ्रेंचबीन में किसान संस्तुत की गई पोषक तत्वों की तुलना में अधिक पोषक तत्व असंतुलित मात्रा में दे रहे हैं फलस्वरूप अधिक उपज प्राप्त हो रही है इन क्षेत्रों के किसानों को संतुलित मात्रा में पोषक तत्व फसल में देने हेतु प्रोत्साहित करने की जरूरत है।

प्रयोग 2: मौजूदा कृषि प्रणालियों का विविधीकरण

- विभिन्न जिलों, राज्यों में अध्ययनरत सभी कृषि प्रणाली की संख्या एक से पांच तक पाई गई, पांच कृषि प्रणाली माडल गोलपारा (आसाम), मेडक (तेलंगाना), चिकबल्लापुरा (कर्नाटक) एवं चार कृषि प्रणाली माडल नादिया (पश्चिम बंगाल), कांकेर (छत्तीसगढ़), हिंगोली सातारा नागपुर (महाराष्ट्र) एवं एक कृषि प्रणाली माडल सिर्फ 5 जिलों में क्रमशः विलासपुर (हिमाचल प्रदेश), जम्मू (जम्मू एवं कश्मीर), फतेहाबाद (हरियाणा), पटियाला (पंजाब) एवं आदिया (गुजरात) है।
- सीमांत परिवारों में सभी स्थान पर फसल+डेयरी मुख्य कृषि प्रणाली पाई गई और इस प्रणाली को अपनाने वाले परिवारों की संख्या के आधार पर 18 जिलों में प्रचलित (घरों का 38 प्रतिशत) प्रमुख प्रणाली है।
- दो घटक कृषि प्रणाली, फसल प्रणाली के साथ डेरी या रेशम उत्पादन या बकरी पालन या बतक या मुर्गीपालन और उद्यानिकी के साथ या तो मुर्गीपालन डेयरी के रूप में 51 प्रतिशत परिवारों द्वारा किया जाता है, जिनका औसत लाभ बेंचमार्क में 0.87 हे. मे रुपये 69,431 पाया गया। पहले वर्ष में फसल प्रणालियों एवं पशुधन के विविधीकरण में लाभ को 0.87 हेक्टेयर से बढ़ाकर रुपये 81,067 किया जा सकता है जो औसतन 16.7 प्रतिशत अधिक है।
- 34 प्रतिशत परिवारों द्वारा तीन कृषि प्रणाली अपनाए गए हैं जिनका औसत लाभ बेंचमार्क में 1.06 हे. में रुपये 91,068 पाया गया था। 13 प्रतिशत परिवारों द्वारा चार

घटक कृषि प्रणाली अपनाई गई थी। जिनका औसत लाभ बेंचमार्क में 0.97 हे. में रुपये 78,682 पाया गया था।

- 2 प्रतिशत परिवारों द्वारा 5 घटक कृषि प्रणाली अपनाई गई जिनका औसत लाभ बेंचमार्क में 0.75 हे. में रुपये 77,285 मिला था।
- सांख्यिकीय विप्लेषण के आधार पर प्रत्येक जिले के लिए सबसे अच्छा प्रदर्शन करने वाली कृषि प्रणाली की पहचान की गई। जिसमें सीमांत कृषि परिवारों की आजीविका के सुधार के लिए विभिन्न संभावित विविधीकरण को समावेष्ट किया गया है।

प्रयोग 3: फार्म प्रशिक्षण कृषि प्रणाली मॉड्यूल का मूल्यांकन

- फार्म क्षेत्र के विभिन्न जिलों में कृषि प्रणालियों की संख्या एक (जम्मू, फतेहाबाद, पटियाला एवं आदिया) में तीन (गोलपारा, कांकेर, कोयंबटूर, हिंगोली, नागपुर, मेडक, चिकबल्लापुरा एवं विजयनगरम) के बीच थी।
- सभी कृषि प्रणालियों में 1.28 हे. के औसत क्षेत्रफल वाले 15 जिले (कुल परिवारों का 40 प्रतिशत) में परिवारों की संख्या के आधार पर फसल + डेयरी प्रमुख कृषि प्रणाली पाई गई। विविधीकरण के कारण उत्पादन में 9.3 प्रतिशत की वृद्धि हुई जबकि विपणन योग्य परिवार में उपयोग में बाद 27 प्रतिशत की वृद्धि हुई।
- फसल + डेयरी, फसल + कुकुर पालन, फसल + रेशम उत्पादन, फसल + बकरी, फसल + बतख और बागवानी + मुर्गीपालन जैसी दो घटक प्रणाली का अध्ययन 53 प्रतिशत परिवारों द्वारा किया गया। जिनका औसत आकार 1.17 हे. था। उत्पादन और बाजार में विक्रय हेतु क्रमशः से 11.3 और 20 प्रतिशत की वृद्धि हुई।
- चार प्रकार की कृषि प्रणाली जैसे फसल + बकरी + सूअर पालन + मुर्गी पालन, फसल + डेयरी + बकरी पालन + मुर्गी पालन, फसल + बागवानी + बकरी + मुर्गी पालन, फसल + डेयरी + भेड़/बकरी + बागवानी, फसल + बागवानी + डेयरी + भेड़/ मुर्गी पालन, फसल + डेयरी + भेड़/बकरी + मुर्गी पालन, को 11 प्रतिशत परिवारों द्वारा किया गया था। जिनका औसत आकार 1.71 हे. था और उत्पादन में उपज के आधार पर 12.8 प्रतिशत और लाभ में 15.3 सुधार हुआ।

- 5 घटक प्रणाली में फसल + डेयरी + सूअर पालन + मुर्गी पालन + मत्स्य पालन, फसल + बागवानी + बकरी + मुर्गी पालन + मत्स्य पालन, फसल + डेयरी + बागवानी + बकरी + मुर्गी पालन और फसल + डेयरी + भेड़/बकरी + बागवानी + मुर्गी पालन को 7 प्रतिष्ठत परिवारों द्वारा किया जाता था। जबकि फसल के साथ 6 घटक प्रणाली डेयरी + सूअर पालन + मत्स्य पालन + मुर्गी पालन + सब्जियां केवल 1 प्रतिष्ठत परिवारों द्वारा की जाती थी।
- सामान्य तौर पर सभी स्थानों पर कृषि प्रणाली की समस्याओं को दूर करने पर एवं वैकल्पिक मॉडल देने पर फसल, पशुधन एवं प्रसंस्करण के उत्पादन में 1.14 प्रतिशत की वृद्धि हुई।

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 manure 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 responses of introduced high yielding and locally improved varieties to nitrogen and phosphorus applied alone in the combination and to potassium in the presence of nitrogen and phosphorus and irrigated 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 - Farm Research' remaining intact. However, within two decades of existence of PDCSR, the mandate of the Directorate 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:
 - i. To characterize existing farming systems to know the productivity, viability and constraints.
 - ii. To develop resource efficient, economically viable and sustainable integrated farming system modules and models for different farming situations.
 - iii. To undertake basic and strategic research on production technologies for improving agricultural resource use efficiencies in farming system mode.
 - iv. To develop and standardize package of production practices for emerging cropping/ farming concepts and evaluate their long-term sustainability.

- v. To act as repository of information on all aspects of farming systems by creating appropriate databases.
- vi. To develop on-farm agro-processing and value addition techniques to enhance farm income and quality of finished products.
- vii. To undertake on-farm production testing, verification and refinement of system -based farm production technologies.
- viii. 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 centres) are

engaged in farmers participatory research and are located in different agro climatic 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 (2017-18) is depicted in Map - 1 & 2, and details are given in table 3.

Map of AICRP CENTRE

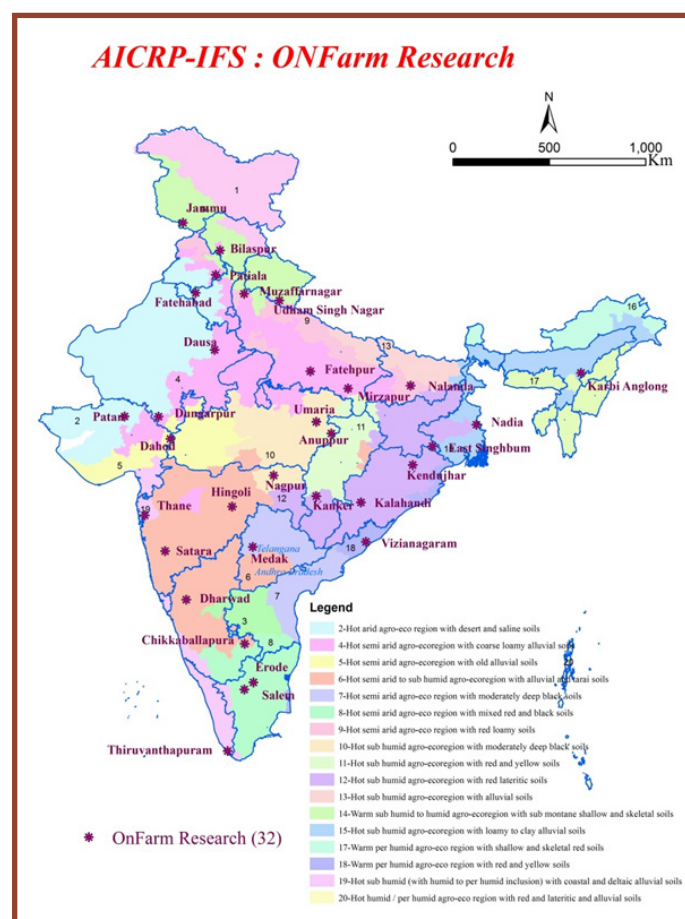
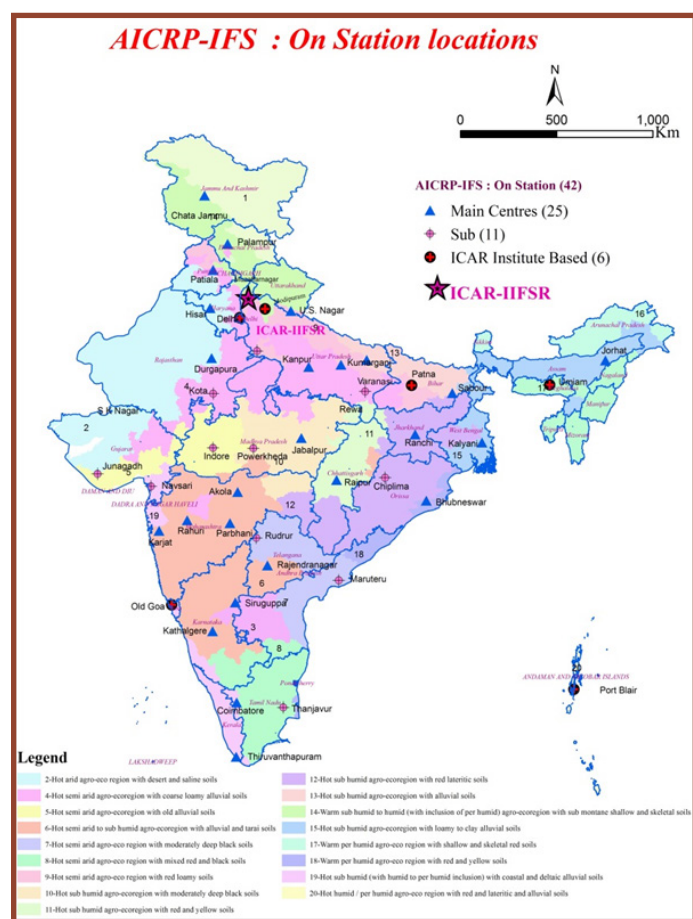


Table-3/1: Location of Different AICRP-IFS centres during the year under report (2017-18)

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)
16.		Dahod, Devgad	OFR Centre	Semi-Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	Middle Gujarat Zone (GJ-3)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
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. Thiruvananthapuram)	Main Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)
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)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
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. Ahmednagar)	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
46.	Meghalaya	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)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
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	Sothorn Zone (TN-5)
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)

S. No.	State	Centre/district	Status	Ecosystem	Agro-climatic Regions/ Sub-Region of Planning	NARP Zone
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 2017-18 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.

S.No.	Centre	Soil Type	Latitude	Longitude
1	Rajendranagar	Udic Ustochrepts, black soils	18° 59' N	78° 55' E
2	Maruteru	Chromusterts clayey, medium black soils	16° 38' N	81° 44' E
3	Rudrur	Chromusterts clayey, deep (90 cm depth), deep black soils	18° 30' N	77° 51' E
4	Jorhat	Fluoaquents/ Udicquents association, very deep (90 cm depth), alluvial sandy clay loam soils	26° 47' N	94° 12' E
5	Sabour	Eutrochrepts (Very deep), low and clay soils	25° 23' N	87° 07' E
6	Raipur	Ochraquas association, deep black soils	21° 16' N	81° 36' E
7	S K Nagar	Haplaquas, deep medium black soils	24° 90' N	72° 19' E
8	junagadh	Ustochrepts, deep medium black soils	21° 30' N	70° 30' E
9	Hisar	Vertic Ustochrepts deep medium black soils	20° 57' N	72° 54' E
10	Palampur	Ustochrepts, very deep silty alluvial soils	29° 08' 55" N	74° 41' 16" E
11	Navsari	Udic Haplustals, red soils	32° 06' N	76° 03' E
12	Chatha (Jammu)	Eutrochrepts very deep clay soils	32° 05' N	74° 04' E
13	Ranchi	Ultic Palustals very deep (90 cm) red soils	23° 79' N	85° 19' E
14	Kathalagere	Aficols, dark reddish brown sandy clay loam	13° 02' N	76° 15' E
15	Siruguppa	Type Chromusterts, very deep (90 cm) black soils	15° 38' N	76° 54' E
16	Karamana	Typic Tropofluvents, very deep (90 cm depth)	11° N	77° E
17	Jabalpur	Chromusterts, very deep (90 cm depth), medium to deep black	23° 10' N	79° 57' E
18	Indore	Vertisols, medium and deep black soil	22° 04' N	79° 57' E
19	Powarkheda	Deep black soil, clay to sandy loam	23° 25' N	73° 98' E
20	Rewa	Ustochrepts-Vertic Ustochrepts association, fine loamy soils	24° 41' N	81° 15' E
21	Akola	Medium deep black clayey soil	20° 42' N	77° 02' E
22	Karjat	Haplustults Udic-Fluvents, red soils	18° 33' N	75° 03' E
23	Parbhani	Chromusterts, deep (90 cm depths.), deep black soils	19° 08' N	76° 05' E
24	Rahuri	Chromusterts, fine clayey soils	19° 47' N	74° 18' E
25	Bhubaneswar	Haplustals very deep (90 cm depth), medium textured lateritic soils	20° 15' N	85° 52' E
26	Chiplima	Haplaquents, very deep (90 cm depth) clay, ill-drained soils	20° 21' N	80° 55' E
27	Ludhiana	Ustochrepts-Ustic Psammments Association, very deep (90 cm depth), alluvial sandy and sandy-loam soils	30° 56' N	75° 52' E
28	Durgapura (Jaipur)	Torrid-Psammments/ Torrid-Fluvents Association, sandy loam soils	26° 55' N	75° 49' E
29	Kota	Chromusterts-Paleusterts association, very deep (90 cm depth) clay loam soils	25° 26' N	75° 30' E

S.No.	Centre	Soil Type	Latitude	Longitude
30	Coimbatore	Udic Rhodustalts, fine loamy red sandy soils	11° 59' N	78° 55' E
31	Thanjavur	Typic Pellusterts, clayey very deep (90 cm depth)/ deep black soils of deltaic origin	10° 47' N	79° 10' E
32	Kanpur	Udic Ustochrepts, alluvial soils	26° 28' N	80° 21' E
33	Faizabad	Udic fluvents-Fluaquents Association, loqland clayey soils	26° 47' N	82° 12' E
34	Bichpuri	Ustochrepts, very deep (90 cm depth) alluvial soils	27° 02' N	77° 09' E
35	Varanasi	Aeric Chroquals very deep (90 cm depth) alluvial clayey soils	25° 18' N	83° 03' E
36	Pantnagar	Hapludolls, very deep (90 cm depth) alluvium coarse loam soils	29° 08' N	79° 05' E
37	Kalyani	Fluventic Eutrochrepts, very deep (90 cm depth) alluvial soils	23° 40' N	88° 52' E
38	ICAR-IIFSR, Modipuram	Ustochrept	29.4° N	77.46° E
39	ICAR-RC, Patna	Alluvial soil	25° 50' N	84° 45' E
40	ICAR-RC, Umiam	Slfisols, Entisols, Inceptisols	25° 59' N	85° 08' E
41	ICAR-RC, Goa	Lithic dystropepts karmali soils series	15° 13' N	75° 55' E
42	ICAR-RC, Port Blair	Costal alluvial soil	11° 38' N	92° 39' E

Weather condition at different farming system research centers during 2017-18

The weather conditions including important parameters such as rainfall and air temperature (maximum and minimum) prevailed during the reporting period (July 2017 to June 2018) at the various Integrated Farming Systems Research Centers of the AICRP on IFS were analyzed. The rainfall data was categorized in to 4 seasons such as winter season (January-February), pre-monsoon season (March-May), southwest monsoon (June-September) and post-monsoon (October-December) and depicted in fig.1. The contribution of the southwest monsoon rainfall was described in percentage of annual rainfall for each centre (fig.2). Centre-wise per cent departure of the annual rainfall was calculated. Air temperature data was collected at all the centres and analysed. Annual temperature range (lowest to highest) of maximum and minimum temperature are depicted in figures 3-4. Compiled results revealed that centers like Akola, Ayodhya, Bhubaneswar, Kalyani, Kota, Navsari, Rajendranagar, Sabour, SK Nagar and Thanjavur did not receive winter season rainfall during the reporting period. However, Akola, Junagadh, Kota, Navsari and Rewa were the centres that were remained deprived of rainfall in subsequent season (Pre-monsoon).

During the southwest monsoon season, Chiplima and Ludhiana were the centres that received the highest (1878.0 mm) and lowest (75.0 mm) rainfall while during post-monsoon season,

Ayodhya, Rewa and SK Nagar were found to be dry centres. In terms of annual rainfall, the highest rainfall (2674.0 mm) was received at Ranchi and lowest (154.0 mm) at Ludhiana centre. Kota was found to be hottest among the AICRP-IFS centre with maximum temperature of 44.7°C whereas the Ludhiana recorded the highest range (17.0-39.6°C) of 22.7°C variations in maximum temperature during reporting period. Jammu was found to be coldest centre with minimum temperature of 3.9 °C. During the reporting period, with the range of 5.6 to 30.0 °C minimum temperature, Ludhiana was found to be highly inconstant whereas Karmana registered the lowest range (23.0 to 26.0°C) of variations in minimum temperature. The center wise brief of the prevailing weather condition are described below.

Akola: During the reporting period, with (-)35.9% departure of annual rainfall, 517.3 mm rainfall was received at the centre. No rainy day was recorded during two consecutive seasons i.e. winter season and pre-monsoon season. Southwest monsoon contributed 88.0% to the total annual rainfall where

July month was found to be the wettest month at this centre with 185.3 mm rainfall.

Ayodhya: No rainfall was received during winter season and post-monsoon season at the centre. With contribution of 855.0 mm rainfall by southwest monsoon, centre recorded annual rainfall of 875.0 mm, which was 57.1% lower than the normal rainfall of the centre. July was found to be the wettest month with 397.0 mm rainfall during the reporting period. The monthly average maximum temperature ranged between 20.1°C to 38.3 °C while monthly average minimum temperature range was 5.8°C to 26.9 °C.

Bhubaneswar: Total rainfall received during the reporting period was 1751.0 mm which was 19.3% higher over the annual rainfall. Winter season did not receive any rain and pre-monsoon and post-monsoon season received almost equal amount of rainfall i.e. 250 and 296 respectively. Southwest monsoon contributed about 69.0% rain to the total amount of rain. With 442.6 mm of rainfall, August was found to be wettest month for the reporting period. The monthly average maximum temperature was found in the range of 27.8°C to 37.4°C while minimum temperature ranged between 5.8°C to 26.9°C.

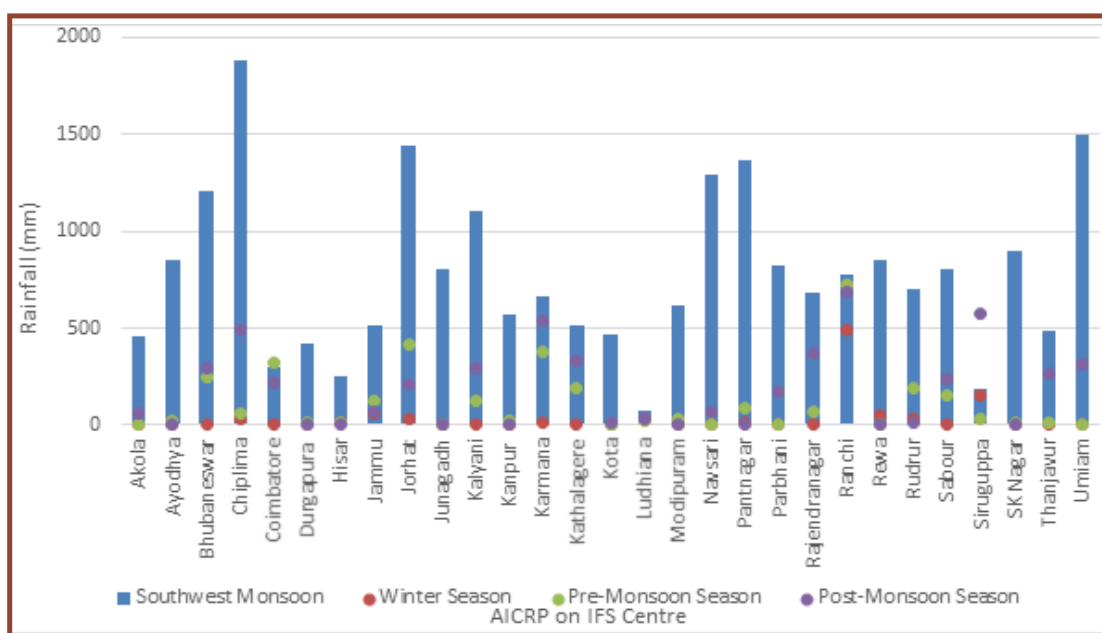


Fig. 1 Season-wise rainfall received at centres of AICRP on IFS during 2017-18

Chiplima: Centre received rainfall during all the seasons (winter season to post-monsoon season) however, the cumulative rain for the period of winter season to pre-monsoon season was 90.0 mm. Southwest monsoon contributed 76.0% to the total rain received during the reporting period. Total rain recorded at the centre was 2462.8 mm, which was 67.5% higher over the annual rainfall of the centre. The average monthly maximum and minimum temperature ranges were 28.5 to 40.9°C and 11.2 to 25.5°C respectively.

Coimbatore: with no any rainy day during winter season, centre received 842.0 mm rainfall during

the reporting period, which was 36.5% lower than the normal rainfall. Here, pre-monsoon season and southwest monsoon contributed almost equal amount of rain whereas post-monsoon season received comparatively lower rain. Monthly average maximum and minimum temperature ranges for the reporting period were 29.5 to 35.5°C and 18.7 to 24.8°C respectively.

Durgapura: Centre did not observe any rainy day in the winter season however, a very meager amount of rainfall (5.0 mm) was recorded during post-monsoon season. With (-) 21.1% departure of annual rainfall, centre received 441.8 mm of rain. Here, southwest monsoon contributed 95.0% to the total

rains poured during the whole season. 24.5 to 42.0°C was the range of maximum temperature and 7.4 to 27.6°C was the range of minimum temperature for the reporting period.

Hisar: Cumulative rain during the winter season, pre-monsoon and post-monsoon season was only 30.0 mm while southwest monsoon contribute 248.0 mm rain to the total. Centre received 27.3% lower rainfall than the normal rainfall (381.9). As usual, summer was very hot, monthly maximum temperature (42.6°C) was reported highest during the June, and winter was severe during which average monthly minimum temperature dropped below 4.8°C in December.

Jammu: Centre received rain during all the four seasons with maximum contribution from southwest monsoon season (510.0 mm). Due to lower rainfall (-41.9%), centre received only 770.3 mm rain during the reporting period. The range of monthly average maximum temperature was 19.1°C to 38.3°C. December month was found to be coldest where night temperature was dropped to 3.9°C.

Jorhat: With the highest contribution from the southwest monsoon (1437.0 mm), center received rain during all other three seasons (653.0 mm). Received rainfall during the reporting period was 5.3% higher over the normal rainfall of the centre. The highest monthly mean maximum temperature was observed between 23.9 to 33.0°C while monthly mean minimum

temperature was recorded between 11.0 to 25.7°C.

Junagarh: Winter season, pre-monsoon and post-monsoon season did not received rainfall but lower than 3.0 mm. Total 808.0 mm rainfall was recorded at the centre, which was 8.5% lower than the normal rainfall of the centre. The highest monthly average maximum temperature (41.1°C) was observed during May whereas, lowest minimum temperature (13.3°C) was recorded during January.

Kalyani: No any rainy day was observed at the centre during winter season while pre-monsoon and post-monsoon seasons contributed 415.0 mm of rain to the total. Southwest monsoon season contributed 1107.00 mm of rain, which was 73.0% of the total rain received at the centre during the reporting period. The range of monthly average maximum temperature was 24.6 to 35.4°C. Lowest monthly average minimum temperature (8.8°C) was recorded during January.

Kanpur: Total contribution by winter season, pre-monsoon and post-monsoon season to the total rainfall received during the reporting period was 23.0 mm whereas southwest monsoon contributed 96.0%. There was (-) 20.6% departure of annual rainfall was calculated for the center with 591.1 mm rainfall. With 40.1°C monthly average maximum temperature, May was recorded as the warmest month while mercury dropped down to 6.5°C during nighttime of January.

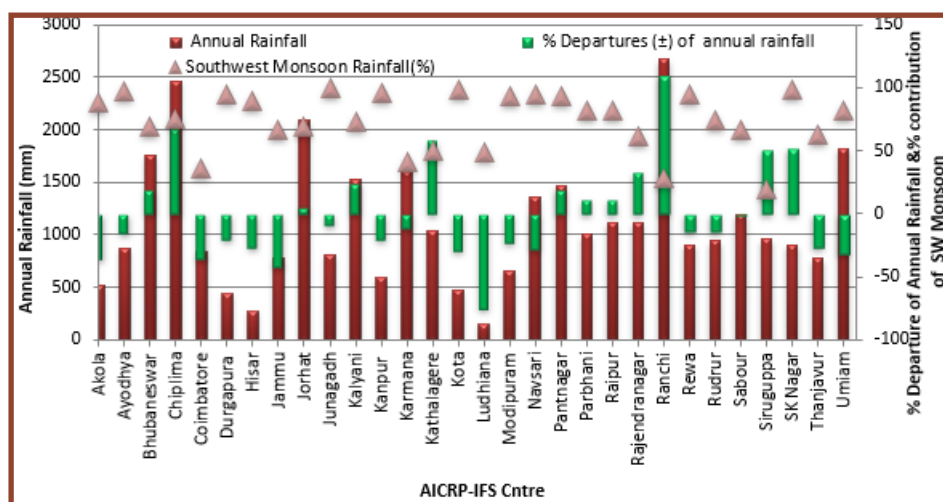


Fig. 2 Annual rainfall with percentage departure and contribution of southwest monsoon season at centres of AICRP on IFS during 2017-18

Karamana: During the reporting period, the total rainfall received was 1598.0 mm which was 11.8% lower than the normal rainfall received at the centre. Here, all the season received rain in between 17.0 mm (winter season) to 668.0 mm (Southwest monsoon season). With the rainfall amount of 304.0 mm, May month was recorded as the wettest month of the season whereas, January and March did not observe any rainy day. The range of monthly average maximum temperature was 30.0 to 33.0°C. Night temperature remained above 23.0°C during the reporting period.

Kathalagere: Total rainfall received during the reporting period was 1044.0 mm (58.9% higher over normal rain) where South-west monsoon contributed

50.0%. October month was recorded as the wettest month of the season where 315.5 mm rainfall was received. The range of monthly average maximum temperature was 31.0 to 40.0°C. Night temperature remained above 15.0 °C during the reporting period.

Kota: No rainfall was recorded during winter season and pre-monsoon season at the centre. Post-monsoon season received a very meager amount of rainfall i.e. 9.0 mm. Southwest monsoon season contributed 98.0% rain to the total rainfall received at the centre. Here, 29.2% lower rain than the normal rainfall was received during the reporting period. The highest average monthly maximum temperature (44.7°C) was recorded during May whereas lowest minimum temperature (7.3°C) was recorded during January.

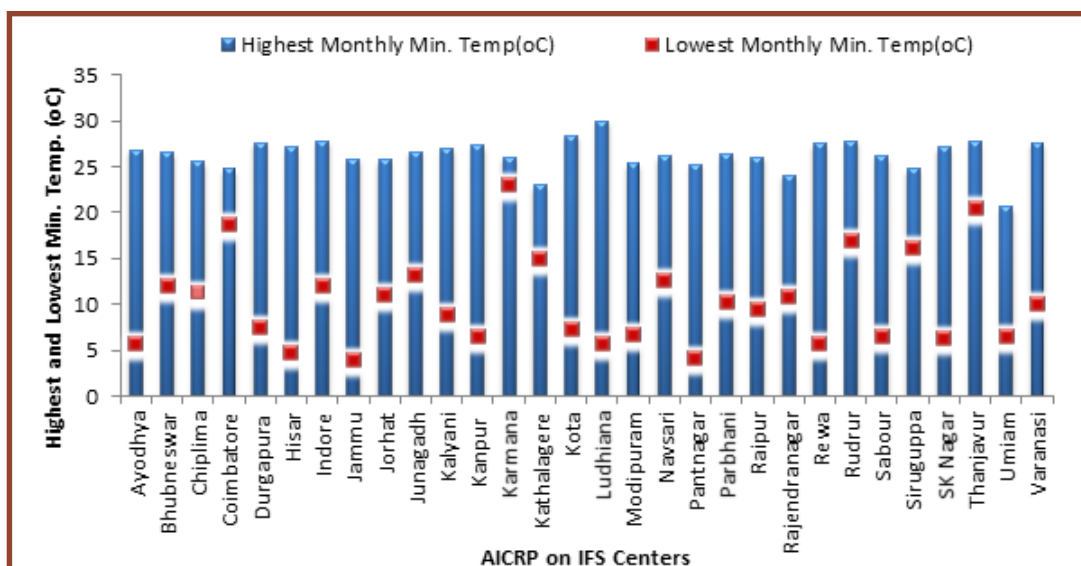


Fig. 3 Highest and lowest monthly average minimum (°C) temperature at centers of the AICRP on IFS during 2017-18

Ludhiana: The total annual rainfall received during the reporting period was 154.0 mm which 75.9% lower than the normal rainfall of the centre. Here, all the seasons received almost similar amount of rain except southwest monsoon season. The highest range of monthly mean maximum temperature (17.0 to 39.6°C) was observed at this centre and lowest minimum temperature (5.6°C) was recorded during January.

Modipuram: winter season, pre-monsoon and post-monsoon season received only 45.0 mm of rainfall

whereas southwest monsoon received which was 93.0% of the total rainfall. Here, 23.0 lower rains were received during the reporting period than the normal rainfall of the centre. The average monthly maximum and minimum temperature ranges were 20.0 to 38.5°C and 6.6 to 25.3 °C respectively.

Navsari: The reporting period received 1354.0 mm rainfall, which was 27.9% lower than the normal rainfall of the centre. Distribution of the rain during the reporting period was much skewed

and there were no rainy day during winter season and pre-monsoon season. Southwest monsoon contributed 95.0% rain to the total rainfall received at the centre. The average monthly maximum and minimum temperature recorded at the centre were 35.9°C and 12.5°C.

Pantnagar: Rain received during southwest monsoon was 1363.0 mm which was 93.0 % of the total rainfall received during the reporting period however rest three seasons contributed only 103.0 mm of rain where October, November and March did not observe any rainy day. During the season, 19.2% higher rain was poured at the centre. The highest monthly average maximum temperature (39.7°C) was recorded in the month of May however, average minimum temperature (4.2°C) was observed during the month of January.

Parbhani: Centre received total 180.0 mm rainfall during winter season (4.0 mm), pre-monsoon (6.0 mm) and post-monsoon season (170.0 mm) with 82.0% contribution to the total rainfall (1005.4 mm) from southwest monsoon season. In the reporting period 11.1%, higher rainfall was received over the normal rain. The highest monthly mean maximum temperature (42.3°C) was observed during May whereas; lowest minimum temperature (10.2°C) was recorded during January.

Rajendranagar: No any rainy day was observed during winter season at the centre where pre-monsoon (65.0 mm) and post-monsoon (370.0 mm) added 435.0 of rain to the total (1121.0 mm) rainfall. With 61.0% contribution to the total, southwest monsoon added 686.0 mm rain. During the reporting period, centre received 32.5% higher rain over the normal rainfall of the centre. The range of average monthly maximum temperature was 28.7 to 39.3°C whereas January has recorded as the coldest month with 10.9°C night temperature.

Ranchi: During the reporting period, the total rainfall received was 2674.0 mm. with 772.0 mm rainfall from south-west monsoon (29.0% to the total rain). Distribution of rainfall across the season was quite

good and the range of rainfall received during four seasons was 486.0 -729.0 mm.

Rewa: Center did not observe any rainy day during pre-monsoon and post-monsoon seasons whereas winter season received 50.0 mm of rainfall. Southwest monsoon contributed 94.0% of rain to the total rainfall (901.0 mm) recorded during the reporting period. In this period, (-) 14.1% departure of rainfall was calculated. The range of average monthly maximum temperature was 25.1 to 44.0°C whereas January was recorded as the coldest month with 5.7°C night temperature.

Rudrur: All the four seasons have received the rain between 17.0 mm to 701.0 mm. total rainfall received at centre was 943.9 mm with (-) 13.8% departure to normal rainfall. Southwest monsoon contributed 74.0% to the total rainfall. The ranges of monthly average maximum and minimum temperature were 29.6 to 38.6°C and 16.9 to 27.8°C respectively.

Sabour: The total annual rainfall received during the reporting period was 1189.4 mm which was almost equal to normal rainfall of the centre. There was no any rainy day was observed during winter season whereas, pre-monsoon and post-monsoon received 387.0 m of rain whereas southwest monsoon received 80.2 mm of rain which was 67.0% of the total rainfall received during the reporting period. The highest monthly mean maximum temperature (34.4°C) was observed in May whereas; lowest minimum temperature (6.4°C) was recorded during January.

Siruguppa: Rainfall received during all the four seasons was to the tune of 957.0 mm. With 187.0 mm of rainfall, southwest monsoon contributed only 20.0% rain to the total whereas post-monsoon season contributed 60.2%. The range of average monthly maximum temperature was 29.4 to 38.5°C whereas December was recorded as the coldest month with 16.2°C night temperature.

SK Nagar: During reporting period, winter season and post-monsoon season did not observe any rainy day however pre-monsoon season received 9.0 mm

of rainfall. Southwest monsoon contributed 99.0% to the total rainfall received at the centre. In this period, 52.4% higher rain was received over the normal rainfall of the centre. The ranges of average monthly maximum and minimum temperature recorded at the centre were 29.6°C to 43.9°C and 6.2°C to 27.1°C respectively.

Thanjavur: During the reporting period, winter season did not receive any rainy days at the centre where as southwest monsoon contributed 63.0% to the total rainfall. In this period about (-) 27.3% lower rain was received than the normal rainfall of the centre. Post-monsoon season also contributed

sizable amount of rainfall (266.0 mm). The highest monthly average maximum and minimum temperature recorded during the reporting period was 37.6°C and 27.7°C respectively during month of July.

Umiam: Total rainfall recorded during the reporting period was 1821.0 mm which was 32.1% lower to the normal rainfall of the centre. Here, southwest monsoon season contributed 82.0% rain to the total rainfall whereas, 17.4% was contributed by post-monsoon season. The ranges of average monthly maximum and minimum temperature were 18.8-29.6°C and 6.5-20.6°C.

5. STAFF POSITION

Out of 327 total staff sanctioned for different centres, 241 staff were actually in position as on 31st March 2019, suggesting that 26.3 percent total post were vacant. (Table 5.1 and Appendix-III)

Table -5: Staff position under AICRP-IFS (University -wise) as on 31.3.2019

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	CSKHPKV, 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
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, Bangalore	2	2	5	5
30	UAHS, Shimoga	3	3	1	1
31	TNAU, Coimbatore	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 (R.E.) for the year 2018-19 in the scheme of AICRP-IFS (ICAR Share Rs. In lakhs)

Sl. No.	Name of University/ Institute	Other than NEH & TSP										Total TSP	SCSP				Sub- Total SCSP	NEH								GRAND TOTAL	
		Grant-in-Aid 'General'			Grant-in -Aid 'Capital'					Sub-Total 'Other than NEH & TSP'	Research Expenses		Equipment	Livestock	Research Expenses	Operational Charges		Grant-in-Aid 'Capital'				Sub-Total 'NEH'					
		Domestic T.A.	Operational Charges	Research Expenses	Equipments	Works	Information Technology	Furniture & Fixture	Vehicle									Operational Charges	Domestic T.A.	Operational Charges	Research Expenses		Equipments	Works	Live stock	Furniture Fixtures	Information Technology
1	ANGRAU, Guntur	55.50	0.65	1.00	0.60	0.00	0.00	0.00	0.73	0.00	58.48	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.48
2	PJTSAU, Hyderabad	102.18	1.20	4.00	2.50	0.00	0.00	0.00	0.73	0.00	110.61	0.00	1.80	0.40	2.00	1.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115.81
3	HPKV, Palampur	101.50	1.00	4.00	3.00	0.00	0.00	0.00	0.23	0.00	109.73	0.00	1.00	0.00	1.53	1.00	3.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	113.26
4	GBPUA&T, Pantnagar	75.00	0.80	3.00	1.50	0.00	0.00	0.00	0.23	0.00	80.53	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.03
5	CSAU&T, Kanpur	75.00	1.00	4.00	2.50	0.00	0.00	0.00	0.23	0.00	82.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82.73
6	NDUA&T, Faizabad	80.00	1.00	3.50	2.00	0.00	0.00	0.00	0.23	0.00	86.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.73
7	BHU, Varanasi	30.66	0.60	3.25	1.50	0.00	0.00	0.00	0.00	0.00	36.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.01
8	BAU, Ranchi	57.00	0.60	1.00	0.25	0.00	0.00	0.00	0.23	0.00	59.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	59.08
9	BAU, Sabour	65.00	1.00	3.50	2.50	0.00	0.00	0.00	0.23	0.00	72.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72.23
10	BCKVV, Kalyani	76.00	1.00	3.75	0.50	0.00	0.00	0.00	0.23	0.00	81.48	2.25	1.98	0.00	2.00	2.00	5.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.71
11	AAU, Jorhat	66.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.00
12	PAU, Ludhiana	83.50	1.00	4.70	2.00	0.00	0.00	0.35	0.23	6.00	97.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.78
13	HAU, Hisar	73.00	1.00	4.00	2.50	0.00	0.00	0.00	0.23	0.00	80.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.73
14	SKNAU, Jobner	69.10	1.00	4.50	2.50	0.00	0.00	0.00	0.00	0.00	77.10	0.00	1.56	0.96	2.00	1.50	6.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.12
15	SDAU, S.K. Nagar	90.40	1.00	4.00	2.50	0.00	0.00	0.00	0.23	6.00	104.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.13
16	NAU, Navsari	8.75	0.15	0.25	0.25	0.00	0.00	0.00	0.50	0.00	9.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.90
17	JAU, Junagadh	8.75	0.15	0.25	0.25	0.00	0.00	0.00	0.00	0.00	9.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.40
18	AAU, Anand	10.00	0.18	0.25	0.00	0.00	0.00	0.00	0.23	0.00	10.66	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.66
19	JNKVV, Jabalpur	116.25	0.97	2.47	4.00	0.00	0.00	0.00	0.46	0.00	124.15	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.65
20	RVSKVV, Gwalior	38.16	0.38	1.00	1.00	0.00	0.00	0.00	0.00	0.00	40.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.54
21	IGKV, Raipur	90.50	1.00	4.00	2.50	0.00	0.00	0.00	0.23	0.00	98.23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	99.23
22	OUAT, Bhubaneswar	125.71	1.50	4.00	6.00	0.00	0.00	0.00	0.46	6.00	143.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	143.67

Sl. No.	Name of University/ Institute	Other than NEH & TSP										Total TSP	SCSP				Sub- Total SCSP	NEH									GRAND TOTAL	
		Grant-in-Aid 'Sal- aries'	Grant-in-Aid 'General'				Grant-in -Aid 'Capital'				Sub-Total 'Other than NEH & TSP'		Equipment	Livestock	Research Expenses	Grant-in-Aid 'General'				Equipment	Research Expenses	Operational Charges	Sub-Total 'NEH'					
			Domestic T.A.	Operational Charges	Research Expenses	Works	Information Technology	Furniture & Fixture	Vehicle	Domestic T.A.						Operational Charges		Research Expenses	Works					Live stock	Furniture	Information Technology		
23	PDKV, Akola	67.75	1.00	4.00	2.50	0.00	0.00	0.00	0.23	0.00	75.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75.48	
24	MAU, Parb- hani	53.75	0.75	4.00	1.50	0.00	0.00	0.00	0.23	0.00	60.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.23	
25	MPKV, Rahuri	77.75	1.00	4.00	3.26	0.00	0.00	0.00	0.23	0.00	86.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.24	
26	KKV, Dapoli	96.75	1.00	4.50	2.50	0.00	0.00	0.00	0.23	0.00	104.98	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.98	
27	UAS, Raichur	42.00	0.70	4.00	1.75	0.00	0.00	0.00	0.00	0.00	48.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.45	
28	UAS, Dharwad	42.00	0.70	1.00	1.50	0.00	0.00	0.00	0.23	0.00	45.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.43	
29	UAS, Bangalore	22.50	0.69	2.00	1.50	0.00	0.00	0.00	0.23	6.00	32.92	0.00	1.40	2.00	2.00	1.50	6.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.82	
30	UAHS, Shi- moga	35.00	0.70	3.70	1.75	0.00	0.00	0.00	0.00	0.00	41.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.15	
31	TNAU, Coim- batore	134.71	1.67	5.50	6.00	0.00	0.00	0.00	0.46	6.00	154.34	0.68	1.72	0.36	2.50	1.00	5.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	160.60	
32	SKUAST, Jammu	106.25	1.20	8.50	4.50	0.47	0.00	0.00	0.23	6.00	127.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	127.15	
33	KAU, Thrissur	96.25	1.00	4.50	2.50	0.00	0.00	0.00	0.23	0.00	104.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.48	
34	MPUAT, Udai- pur	23.33	0.57	0.25	0.50	0.00	0.00	0.00	0.23	0.00	24.88	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.38	
35	AU, Kota	14.00	0.35	1.75	0.50	0.00	0.00	0.00	0.00	0.00	16.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.60	
36	ICAR-IIFSR, Modipuram	0.00	1.09	6.00	12.48	2.00	0.00	0.00	0.00	0.00	21.57	11.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.70	
37	PC Unit,IIFSR, Modipuram	0.00	1.34	0.14	8.00	0.40	0.00	1.43	0.00	0.00	11.31	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.53	
38	ICAR Res. Comp., Patna	0.00	0.20	1.50	1.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	
39	ICAR Res. Comp., Umiam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.25	
40	ICAR -CCARI, Old Goa	0.00	0.30	4.00	1.50	0.00	0.00	0.00	0.00	0.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	
41	ICAR-CIARI- Port Blair	0.00	0.30	4.00	1.00	0.00	0.00	0.00	0.00	0.00	5.30	1.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.02	
42	ICAR-IASRI, New Delhi	0.00	0.70	3.75	0.50	0.00	0.00	0.00	0.00	0.00	4.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.95	
	Total	2310.00	32.44	127.51	95.09	2.87	0.00	1.78	8.17	36.00	2613.86	25.00	9.46	3.72	12.03	8.00	33.21	0.00	2.00	13.60	9.40	75.27	16.50	5.00	2.38	0.85	125.00	2797.07

7

RESEARCH RESULTS

7.1 INTEGRATED FARMING SYSTEMS

Title of the experiment: 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, which are as follows:

- To identify ecologically and economically viable

Year of starts: 2017-18

Location:

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), Faizabad (UP), Patna (Bihar), Sabour (Bihar)	5
Lower Gangetic Plains	Kalyani (WB)	1
Eastern Plateau and Hills	Raipur (Chhattisgarh) Ranchi (Jharkhand)	2
Central Plateau and Hills	Jabalpur (MP)	1
Western Plateau and Hills	Akola (MS), Parbhani (MS), Rahuri (Maharashtra)	3
Southern Plateau and Hills	Rajenderanagar (Telangana), Coimbatore (TN), Kathalgere (Karnataka), Sriguppa (Karnataka) Thanjavur (TN)	5
East Coast Plains and Hills	Bhubaneswar (Odisha)	1
West Coast Plains and Hills	Goa, Karjat (MS), Karamana (Kerala)	7
Western dry	Durgapura (Rajasthan), Kota (Rajasthan)	2
Gujarat Plains and Hills	S K Nagar (Gujarat)	1
Islands	Portblair (A&N)	2
Total		39

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

1. WESTERN HIMALAYAN REGION (WHR)

In this Agro Climatic Region two on-station Integrated Farming Systems (IFS) models (Palampur (Himachal Pradesh) and Pantnagar (Uttarakhand) with objectives of climate smart IFS initiated during 2017. The results obtained from these IFS models during the reporting period of 2018-19 revealed that mean gross income of Rs. 207102 while the mean net return

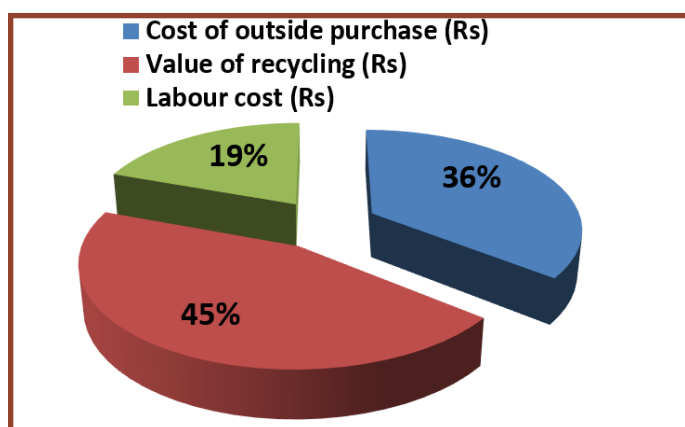
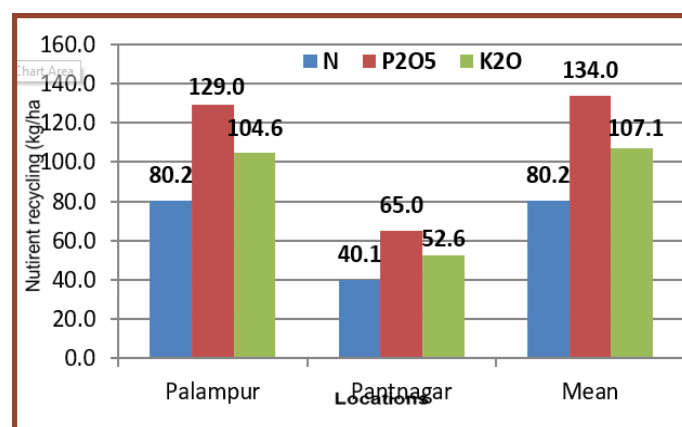
excluding family labour was found to be Rs.148218. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 116043. Details of IFS model components and cost is presented in Table 7.1.1. which indicated mean total cost for the IFS models was Rs. 205627 while it varied from Rs 168089 at Palampur to Rs 243165 at Pantnagar for 1.0 ha IFS models.

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

Location	IFS model	Area (ha)	Total cost (Rs)
Palampur	Crops + Dairy + Horticulture + Fodder + Vermi-compost + Boundary Plantations + Kitchen Gardening	1.0	1,68,089
Pantnagar	Crops + Dairy + Horticulture/Agroforestry + Fisheries	1.0	2,43,165
Mean		1.0	2,05,627

The models could generate mean employment generation of 404 mandays through different modules while the IFS models were also found to be carbon negative in terms of GHG emission at -1787 CO₂ equivalent. Further, study of different fractions of cost revealed about 45% share of recycled inputs in total cost of the IFS whereas cost of outside purchase

was to the tune of 36% of the cost (Fig 1). The cost incurred towards labour was 19%. The study of nutrient recycling in the IFS models revealed, an amount of 80.2 kg N, 129 kg P₂O₅ and 104.6 kg K₂O could be recycled in IFS model at Palampur while 40.2 kg N, 65 kg P₂O₅ and 52.6 kg K₂O was recycled in IFS model at Pantnagar (Fig 2).

**Fig 1.** Different fraction of total cost**Fig 2.** Nutrient recycling in 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. The results obtained from these IFS models during the reporting period of 2018-19 revealed that mean gross income of Rs. 645547 while the mean

net return excluding family labour was found to be Rs.531649. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 419022. 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. 2336232 while it varied from Rs 315557 at Umiam to Rs 356907 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 + Dairy + Horticulture + Fishery + Poultry + Duckery + Goatery + Apiary + Vermi-compost + Biogas + Liquid Manure + FYM production	1.0	3,56,907
Umiam	Crops + Livestock + Horticulture + Fishery	1.0	3,15,557
Mean		1.0	3,36,232

The models could generate mean employment generation of 414 mandays through different modules while the IFS models were also found to be carbon negative in terms of GHG emission at -3175 CO₂ 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 enhanced

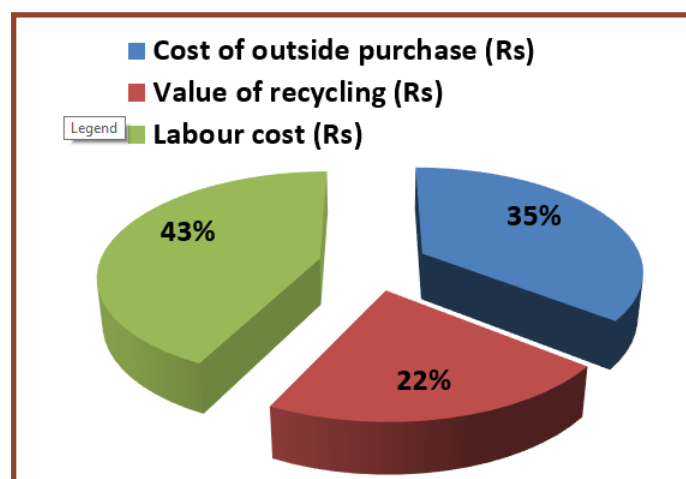


Fig 3. Different fraction of total cost

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 2018-19 revealed that mean gross income of Rs.

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	Crops+Dairy+Hort.+Vermicompost+Boundary Plantations + Mushroom+ Biogas	1.0	147000.0
Ludhiana	Crop + Dairy +Horticulture (fruits and vegetables)	1.0	294402
Mean		1.01	220701

The models could generate mean employment generation of 315 mandays through different modules while the IFS models were found to be carbon positive in terms of GHG emission at +6058 CO₂ equivalent which requires attention to make it

whereas cost of outside purchase was to the tune of 35% of the cost (Fig 3). The cost incurred towards labour was 43%. The study of nutrient recycling in the IFS models revealed, an amount of 359.4 kg N, 76 kg P₂O₅ and 217.7 kg K₂O could be recycled in IFS model at Jorhat while 140 kg N, 31 kg P₂O₅ and 85.5 kg K₂O was recycled in IFS model at Umiam (Fig 4).

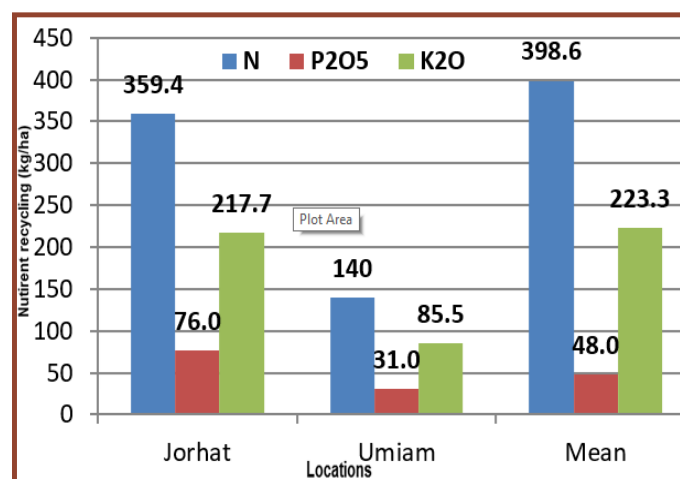


Fig 4. Nutrient recycling in IFS models of EHR

625441 while the mean net return excluding family labour was found to be Rs.528523. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 480748. 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. 220701 while it varied from Rs 147000 at Hisar to Rs 294402 at Ludhiana for 1.0 ha IFS models.

carbon neutral. Further, study of different fractions of cost revealed about 35% 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 44% of the cost (Fig 5). The cost incurred

towards labour was 21%. The study of nutrient recycling in the IFS models revealed, an amount of 99.0 kg N, 11 kg P₂O₅ and 16 kg K₂O could be

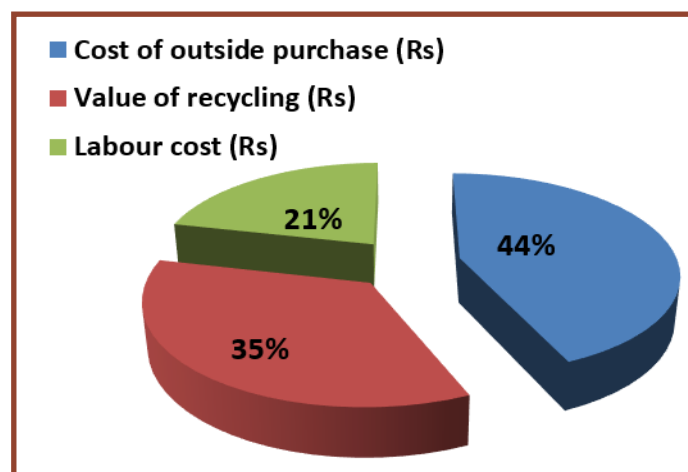


Fig 5. Different fraction of total cost

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 0.7 ha while the IFS model at Kanpur was having 1.0 ha area. The findings of IFS models from these centres during

recycled in IFS model at Hisar while 79 kg N, 39 kg P₂O₅ and 87 kg K₂O was recycled in IFS model at Ludhiana (Fig 6).

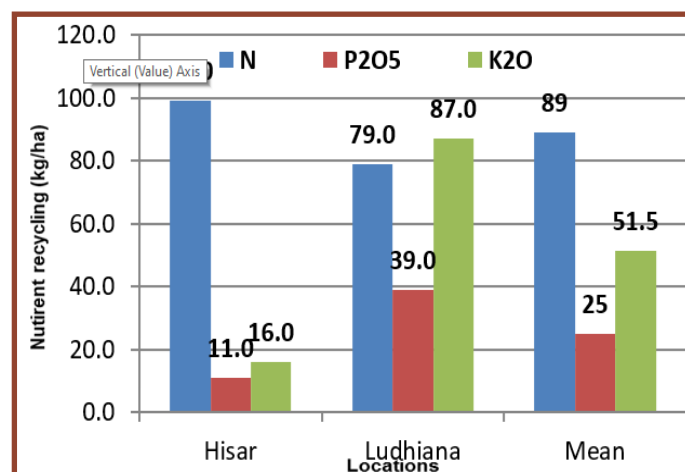


Fig 6. Nutrient recycling in IFS models of TGP

the reporting period of 2018-19 revealed that mean gross income of Rs. 353539 while the mean net return excluding family labour was found to be Rs.272851. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 183935. 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. 231213 while it varied from Rs 175964 at Modipuram for 0.7 ha model to Rs 286463 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	Crops + Dairy + Horticulture + Boundary Plantations	1.0	2,86,463
Modipuram	Crops + Horticulture + Dairy + fish + Boundary Plantations	0.7	1,75,964
Mean		0.86	2,31,213

The models could generate mean employment generation of 363 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -28013 CO₂ 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 enhanced whereas cost of outside purchase was to

the tune of 35% of the cost (Fig 7). The cost incurred towards labour was 43%. The study of nutrient recycling in the IFS models revealed, an amount of 34.0 kg N, 5.0 kg P₂O₅ and 5.0 kg K₂O could be recycled in IFS model at Kanpur requiring further attention to enhance farm recycling while 204 kg N, 136 kg P₂O₅ and 187 kg K₂O was recycled in IFS model at Modipuram (Fig 8).

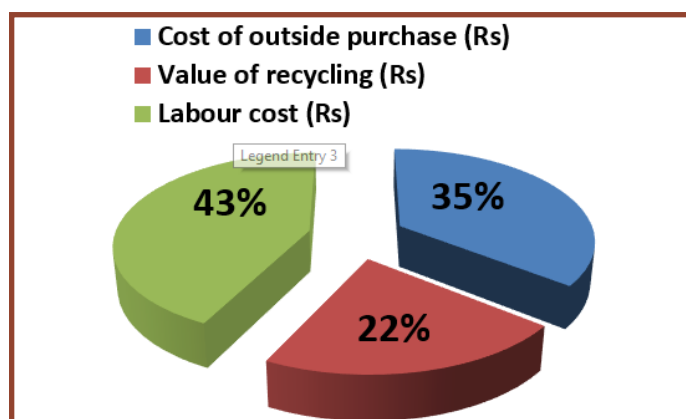


Fig 7. Different fraction of total cost

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 -Faizabad and two in Bihar i) ICAR Research Complex for eastern region, Patna., and BAU, Sabour-Bhagalpur (Bihar) are given responsibilities of developing climate smart IFS Models with revised objectives for respective states since 2017. Significance of IFS approach towards production, profitability and livelihood of small land holders in the regions as reflected from the results of

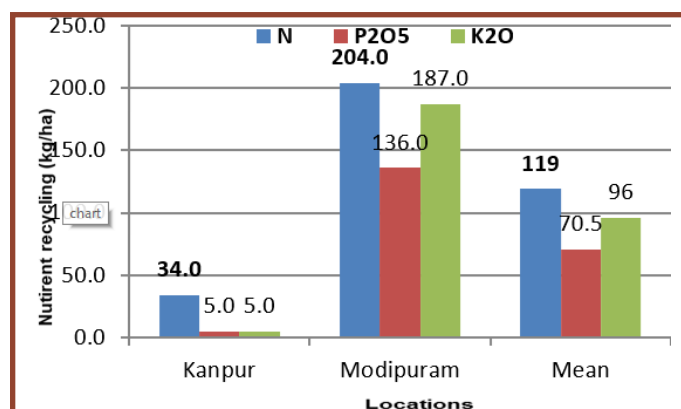


Fig 8. Nutrient recycling in IFS models of UGP

study during 2018-19 at 3 centres namely Faizabad (Ayodhya), Patna and Sabour along with components of IFS is presented in Table 7.1.5. revealed mean gross income of Rs. 388075 while the mean net return excluding family labour was found to be Rs.287543. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 192436. Details of IFS model cost components presented in Table 7.1.5 indicated mean total cost for the IFS models to be Rs. 206613 while it varied from Rs 125290 at Ayodhya (earlier Faizabad) model to Rs 384798 at Sabour for 1.0 ha IFS model.

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

Location	IFS model	Area (ha)	Total cost (Rs)
Faizabad	Crop + Dairy + Horticulture + Fishery + Vermi-compost	1.01	1,25,290
Patna	Main: Crop + Horticulture + Goatry + Poultry Allied: Mushroom /vermi-compost/B.P./ Agroforestry	1.0	1,58,182
Sabour	Crops + Dairy + Goatry + Duckery + Vermicompost + Boundary Plantations	1.0	3,84,798
Mean		1.0025	2,06,613

The models could generate mean employment generation of 397 mandays through different modules while the IFS models were found to be carbon emitte in terms of mean GHG emission at +1130.5 CO₂ equivalent which could be improved to make it carbon neutral or negative. Further, study of different fractions of cost revealed about 45% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was nil depicting self sufficiency of the model

in input generation (Fig 9). The cost incurred towards labour was 55% which could be further improved with small scale mechanization. The study of nutrient recycling in the IFS models revealed, an amount of 68.0 kg N, 24.0 kg P₂O₅ and 63.0 kg K₂O could be recycled in IFS model at Ayodhya and 50.35 kg N, 34.6 kg P₂O₅ and 37.0 kg K₂O was recycled in IFS model at Patna while 134.5 kg N, 51.8 kg P₂O₅ and 104.9 kg K₂O was recycled in IFS model at Sabour (Fig 10).

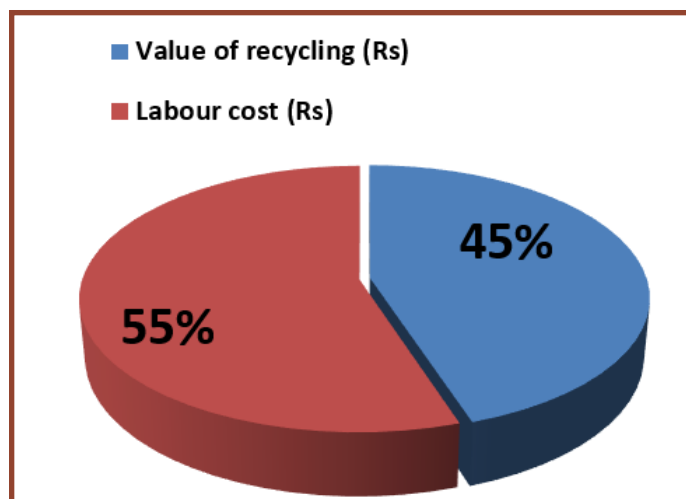


Fig 9. Different fraction of total cost

6. LOWER GANGETIC PLAINS REGION (LGP)

To demonstrate the benefits of diversified climate smart farming a climate smart IFS Model was initiated in 2017 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 synthesized for 0.66 ha land holding to support a family of small and marginal farmer having six family members. The model encompasses components like crop (0.42 ha), horticulture (0.11 ha), dairy, vermicomposting and biogas unit (0.03 ha) and fishery (0.09 ha). Low lying area measuring

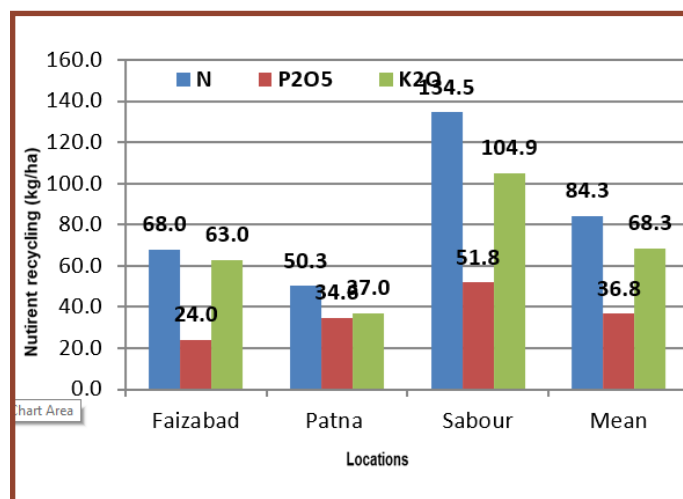


Fig 10. Nutrient recycling in IFS models of MGP

0.2 ha of the total crop area of 0.42 ha has been 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 2018-19 revealed gross income of only Rs. 10304 due to flooding while the net return were found to be negative. Details of IFS model cost components presented in Table 7.1.6 indicated total cost for the IFS models to be Rs. 122696.

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	Crops + Dairy + Horticulture + Vermi-compost + Biogas + fishery	0.7	1,22,696
Mean		0.7	1,22,696

The models could generate employment generation of 232 mandays through different modules while the IFS model was found to be carbon negative in terms of mean GHG emission at -4517 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 31% (Fig 11). The cost incurred towards labour was 38%. The study of nutrient recycling in the IFS model revealed, an amount of 75.0 kg N, 33.0 kg P₂O₅ and 63.0 kg K₂O could be recycled in IFS model at Kalayni (Fig 12).

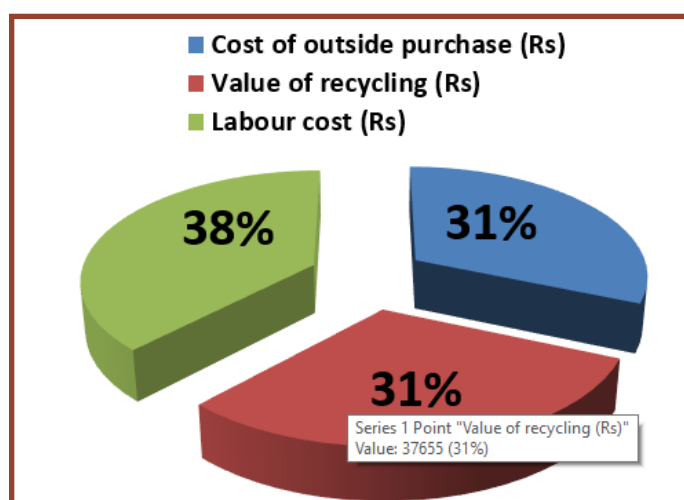


Fig 11. Different fraction of total cost

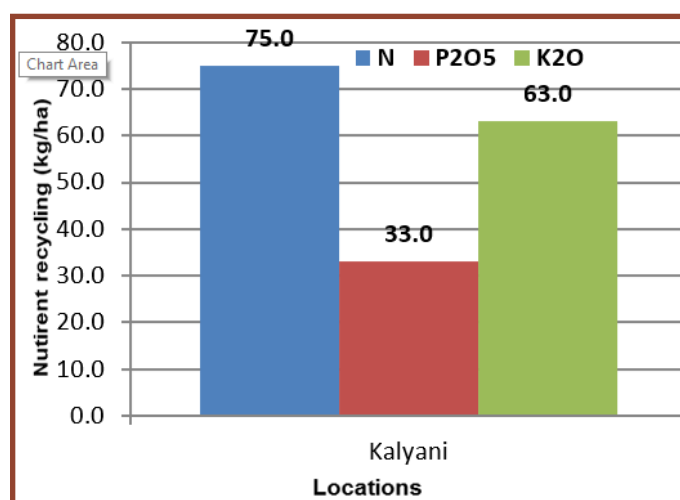


Fig 12. Nutrient recycling in IFS models of LGP

7. EASTERN PLATEAU AND HILLS (EPH)

IGKV, Raipur (Chhatisgarh) and BAU, Kanke Ranchi (Jharkhand), the two AICRP-IFS centers representing Eastern Plateau and Hills Region were evaluated for development of climate smart IFS models for livelihood improvement of small and marginal farmers of the region. The IFS model at both the locations were spread over 1.0 ha area. The findings of IFS models from these centres during the reporting period of 2018-19

revealed that mean gross income of Rs. 322043 while the mean net return excluding family labour was found to be Rs.255245. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 158990. Details of IFS model components and cost is presented in Table 7.1.7. which indicated mean total cost for the IFS models was Rs. 216106 while it varied from Rs 1177063 at Ranchi to Rs 255150 at Ranchi for 1.0 ha IFS models.

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	Crops + Dairy + Horticulture + poultry + fishery + Goatary + Mushroom + Vermicompost + Boundary Plantations + Kitchen Gardening	1.0	2,55,150
Ranchi	Crops + Dairy + Vermi-compost + Mushroom + Apiary + Fishery	1.0	1,77,063
Mean		1.0	2,16,106

The models could generate mean employment generation of 303 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -7713 CO₂ equivalent. Further, study of different fractions of cost revealed about 25% 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 31% of the cost (Fig 13). The cost incurred towards labour was 44%. The study of nutrient recycling in the IFS models revealed, an amount of 264.0 kg N, 64.0 kg P₂O₅ and 125.0 kg K₂O could be recycled in IFS model at Raipur while only 49.0 kg N, 29.3 kg P₂O₅ and 39.5 kg K₂O was recycled in IFS model at Ranchi (Fig 14).

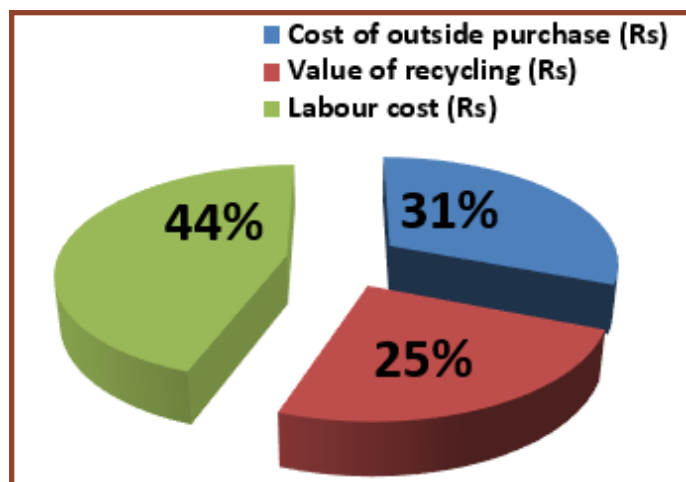


Fig 13. Different fraction of total cost

8. CENTRAL PLATEAU AND HILLS (CPH)

AICRP-IFS Centre Jabalpur (MP), falls under ACR 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

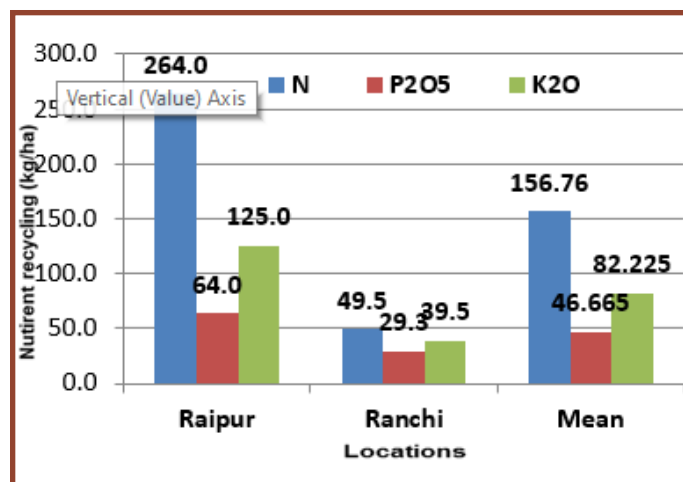


Fig 14. Nutrient recycling in IFS models of EPH

calf, fisheries component 0.06 ha (1800 m³), poultry component 300 birds, vermicompost 0.0039 ha and mandatory other enterprises like kitchen garden, boundary plantation etc. The results of study during 2018-19 revealed gross income of Rs. 427700 while the return excluding family labour was found to be Rs.394115. However, when family labour was accounted for in the cost, the net return was found to be Rs. 259775. Details of IFS model cost components presented in Table 7.1.8 indicated total cost for the IFS models to be Rs. 199388.

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	Crop + Dairy + Poultry + Fishery + Horticulture	1.0	1,99,388

The models could generate employment generation of 407 mandays through different modules while the IFS model was found to be carbon emissive in terms of mean GHG emission at +2846 CO₂ equivalent, which can be made carbon neutral with suitable management strategies. Further, study of different fractions of cost revealed about 16% share of recycled inputs in total cost of the IFS whereas

cost of outside purchase was 17% (Fig 15). The cost incurred towards labour was to the tune of 67% requiring special attention for reduction of labour hiring cost. The study of nutrient recycling in the IFS model revealed, an amount of 110.0 kg N, 55.0 kg P₂O₅ and 55.0 kg K₂O could be recycled in IFS model at Jabalpur (Fig 16).

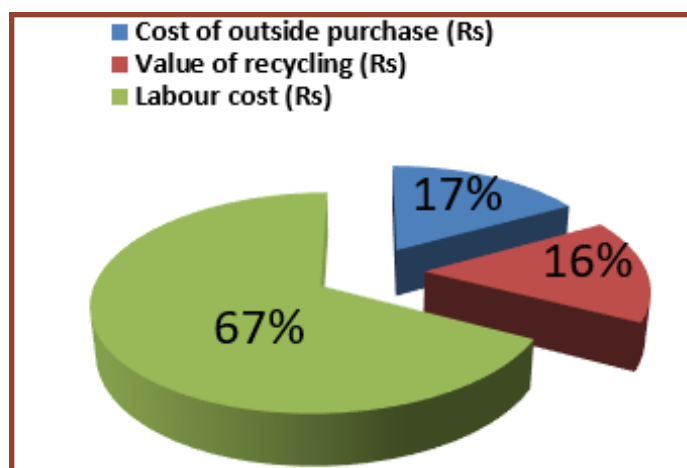


Fig 15. Different fraction of total cost

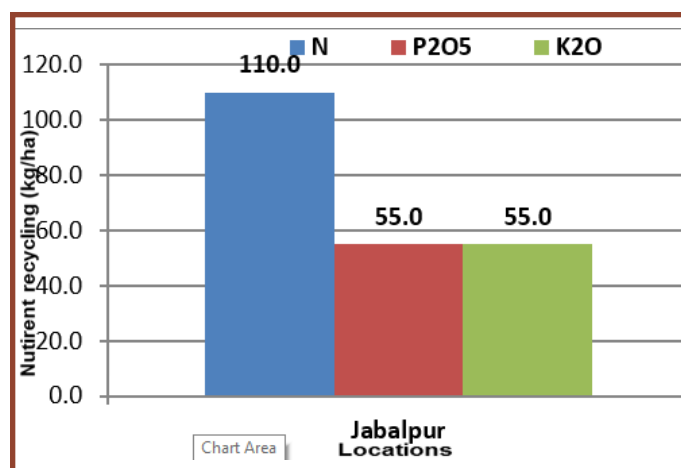


Fig 16. Nutrient recycling in IFS models of CPH

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 2018-19 at 3 centres along with components of IFS is presented in Table 7.1.9. which

revealed mean gross income of Rs. 681657 while the mean net return excluding family labour was found to be Rs.488647. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 345670. Details of IFS model cost components presented in Table 7.1.9 indicated mean total cost for the IFS models to be Rs. 411189 while it varied from Rs 264588 at Akola model to Rs 593575 at Rahuri for 1.0 ha IFS model.

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	Crops + Fruit & Vegetables + Goat+ Cow + Poultry+ Compost + Kitchen Garden + Apiary + Boundary plantations	1.0	2,64,588
Parbhani	Crops+Dairy+Horticulture+Vermicompost+Boundary Plantation	1.0	3,75,405
Rahuri	Crops + Dairy + Horticulture + Poultry + Goat + Vermicompost	1.0	5,93,575
Mean		1.0	4,11,189

The models could generate mean employment generation of 562 mandays through different modules while the IFS models were found to be carbon emissive in terms of mean GHG emission at +299.1 CO₂ equivalent. Further, study of different fractions of cost revealed about 18% share of recycled inputs in total cost of the IFS whereas cost of outside

purchase was to the tune of 47% (Fig 17). The cost incurred towards hiring labour was 35%. The study of nutrient recycling in the IFS models revealed, an amount of 130.0 kg N, 51.0 kg P₂O₅ and 42.0 kg K₂O could be recycled in IFS model at Parbhani and 67.0 kg N, 16.0 kg P₂O₅ and 63.0 kg K₂O was recycled in IFS model at Rahuri (Fig 18).

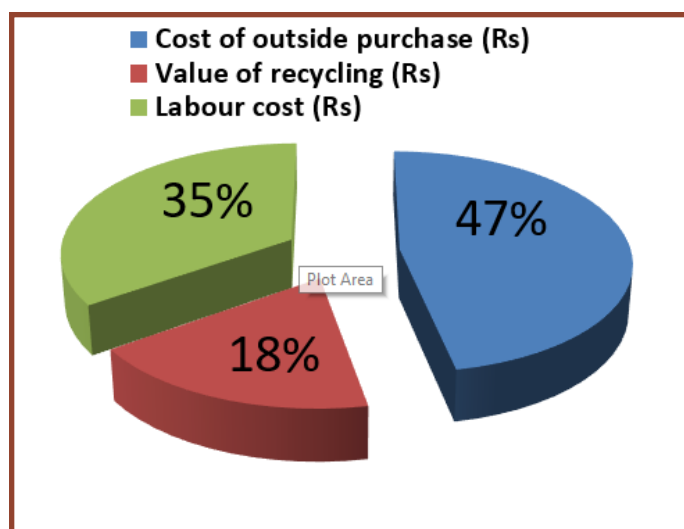


Fig 17. Different fraction of total cost

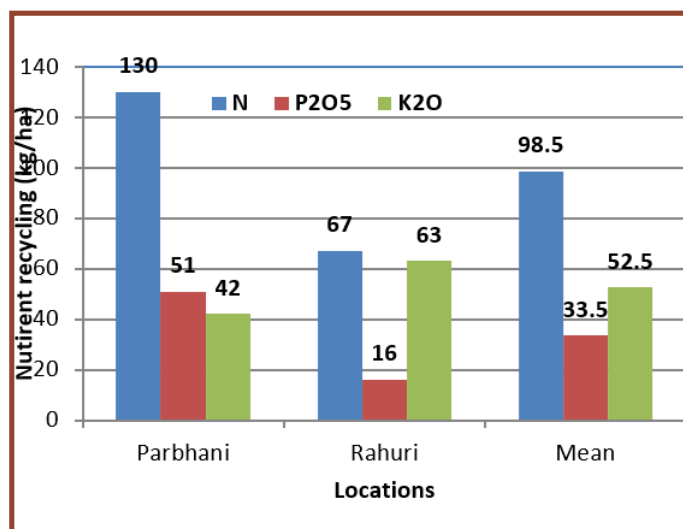


Fig 18. Nutrient recycling in IFS models of WPH

10. SOUTHERN PLATEAU AND HILLS (SPH)

Four AICRP-IFS centers namely, TNAU, Coimbatore (Tamilnadu), ARS, Kathalgere (Karnataka), ANGRAU, Rajendra Nagar, Hyderabad (A.P) and ARS, Sirriguppa (Karnataka) are located in different NARP zones of Southern Plateau and Hill Agro Climatic Zone of the country. The results of study during 2018-19 at 4 centres along with components of IFS is presented in Table 7.1.10 which revealed

mean gross income of Rs. 565689 while the mean net return excluding family labour was found to be Rs.484368. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 392119. Details of IFS model cost components presented in Table 7.1.10 indicated mean total cost for the IFS models to be Rs. 224791 while it varied from Rs 109191 at Kathalgere model to Rs 348796 at Rajendra Nagar 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	Crop + Horticulture + Dairy+ Goat Rearing + Poultry + Vermicompost unit + Compost yard + Kitchen garden & Border planting	1.0	2,63,160
Kathalgere	Crops + Horticulture +Plantation+ Dairy + Sheep + Vermicompos + Agroforestry + Boundary plantation	1.0	1,09,191
Siruguppa	Crops + Dairy + Horticulture + Goatary + Vermicompost +Azolla +Boundary Plantations + Kitchen Gardening	1.0	1,78,018
Rajendra Nagar	Crops + Dairy + Horticulture-Pasture + Compost + Boundary Plantations	1.0	3,48,796
Mean		1.0	2,24,791

The models could generate mean employment generation of 593 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -15329 CO₂ equivalent. Further, study of different

fractions of cost revealed about 37% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was to the tune of 30% (Fig 19). The cost incurred towards hiring labour was 33%. The study of nutrient recycling in the IFS models revealed, an

amount of 193.0 kg N, 103.0 kg P₂O₅ and 111.0 kg K₂O could be recycled in IFS model at Coimbatore while 100.0 kg N, 200.0 kg P₂O₅ and 100.0 kg K₂O

was recycled in IFS model at Kathalgere and 71.5 kg N, 39.5 kg P₂O₅ and 64.5 kg K₂O was recycled in IFS model at Siruguppa (Fig 20).

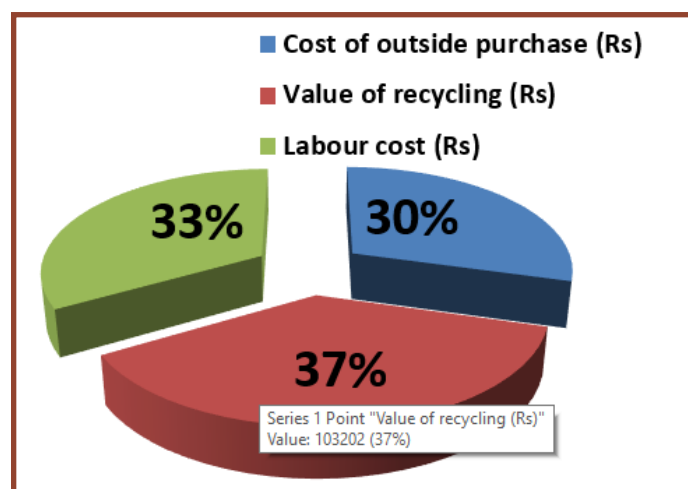


Fig 19. Different fraction of total cost

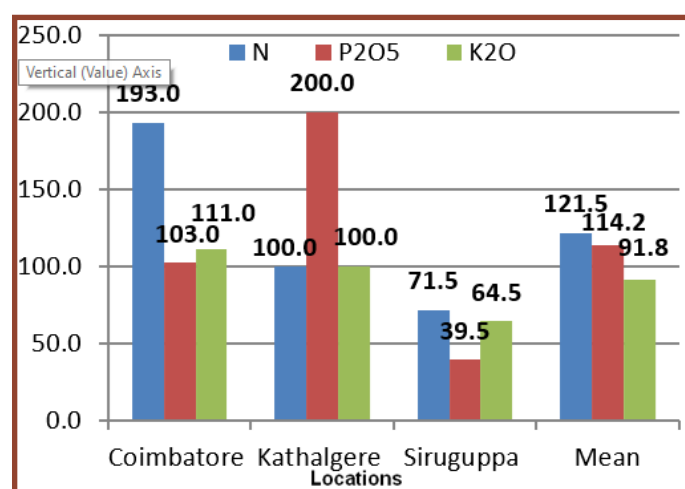


Fig 20. Nutrient recycling in IFS models of SPH

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 Bhubaneswar (Odisha) representing East Coast Plain & Hill region is developed for small farming household with 1.25 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 2018-19 revealed that mean gross income of Rs. 489247 while the mean net return excluding family labour was found to be Rs.342508. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 232521. 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. 320965 while it varied from Rs 300654 at Thanjavur for 0.8 ha model to Rs 341276 at Bhubaneswar for 1.25 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	Crops + Dairy + Horticulture +Fishery + Poultry	1.3	3,41,276
Thanjavur	Crops + Dairy + Poultry +Horticulture + Fishery + Vermicompost + Boundary Plantations	0.8	3,00,654
Mean		1.0	3,20,965

The models could generate mean employment generation of 449 mandays through different modules while the IFS models were found to be carbon negative in terms of GHG emission at -484.5 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 46% of the cost (Fig 21). The cost incurred towards labour was 34%. The study of nutrient recycling in

the IFS models at Thanjavur revealed, an amount of 101.6 kg N, 64.1 kg P₂O₅ and 85.7 kg K₂O could be recycled in IFS (Fig 22).

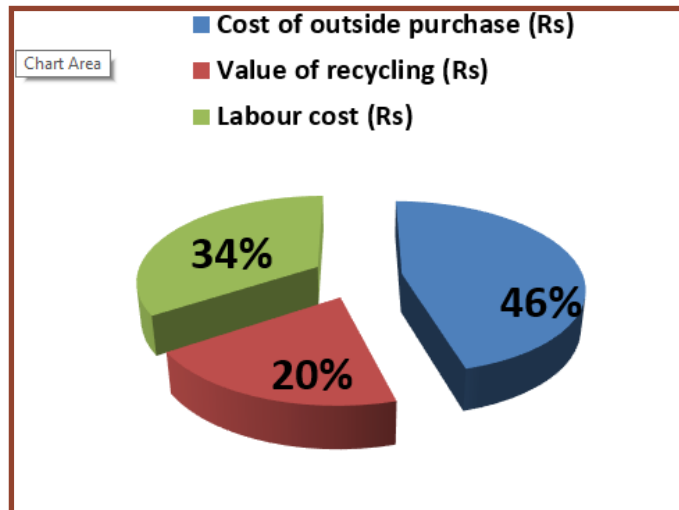


Fig 21. Different fraction of total cost

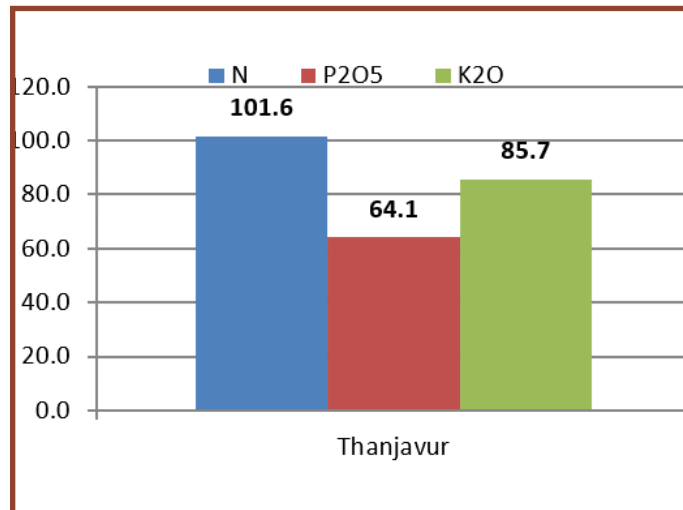


Fig 22. Nutrient recycling in IFS model of ECPH

12. WESTERN 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 (Karmana) represented the climate smart IFS Models for respective states. The results of study during 2018-19 at 3 centres revealed

mean gross income to be Rs. 396508 while the mean net return excluding family labour was found to be Rs. 264977. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 159948. Details of IFS model cost components presented in Table 7.1.12 indicated mean total cost for the IFS models to be Rs. 4,22,995 while it varied from Rs 1,91,157 at Goa for 0.5 ha model to Rs 6,54,833 at Karjat for 1.0 ha IFS model.

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	Crop- Dairy-Fishery-Poultry	0.5	1,91,157
Karjat	Crops + Horticulture (Fruit crops + Nursery) + Livestock (Dairy + Goatary + Poultry) + Vermicompost + Boundary Plantations + Kitchen garden	1.0	6,54,833
Karmana	Coconut, Fish, Fruit crops Fruits crop, Vegetables, Poultry, Cattle, Biogas etc	0.8 (4 X 0.2 each)	4,22,995
Mean		0.75	4,22,995

The models could generate mean employment generation of 369 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -5184.5 CO₂ equivalent. Further, study of different fractions of cost revealed about 18% share of recycled

inputs in total cost of the IFS which could be further improved whereas cost of outside purchase was 46% of the model cost (Fig 23). The cost incurred towards labour was 36%. The study of nutrient recycling in the IFS models revealed, an amount of 100.0 kg N, 19.0 kg P₂O₅ and 60.0 kg K₂O could be recycled in

IFS model at Goa and 50.0 kg N, 9.5 kg P₂O₅ and 30.0 kg K₂O was recycled in IFS model at Karjat while 25

kg N, 4.5 kg P₂O₅ and 15 kg K₂O was recycled in IFS model at Karmana (Fig 24).

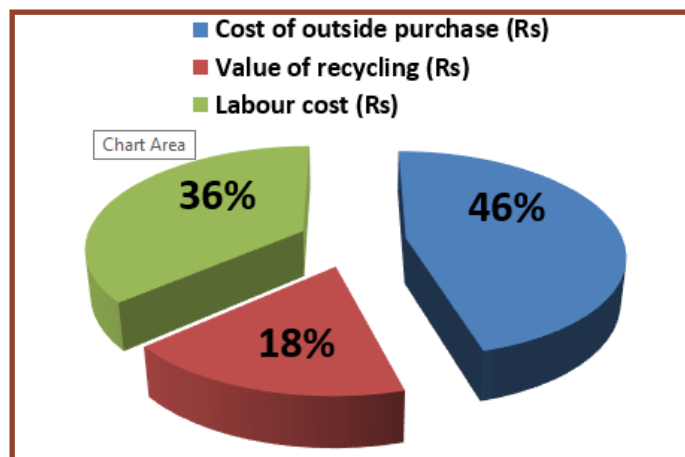


Fig 23. Different fraction of total cost

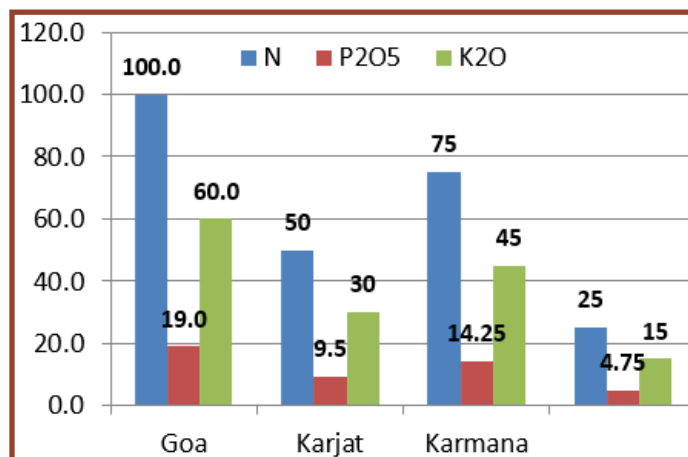


Fig 24. Nutrient recycling in IFS models of WCPH

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, diary, fishery and supplementary component like boundary plantation in 1.0 ha area. The results obtained during reporting period of 2018-19 revealed

the gross return to be Rs. 241730 while the net return excluding family labour was found to be Rs. 143191. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 88456 (Fig 25). Details of IFS model cost components presented in Table 7.1.13 indicated total cost for the IFS models to be Rs. 199324 for 1.0 ha IFS model.

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	Crops + Horticulture + Dairy + fish + Boundary Plantations	1.0	1,99,324

The models could generate employment generation of 308 mandays through different modules. Further, study of different fractions of cost revealed about 23%

share of recycled inputs in total cost of the IFS whereas cost of outside purchase was 49% of the model cost (Fig 26). The cost incurred towards labour was 28%.

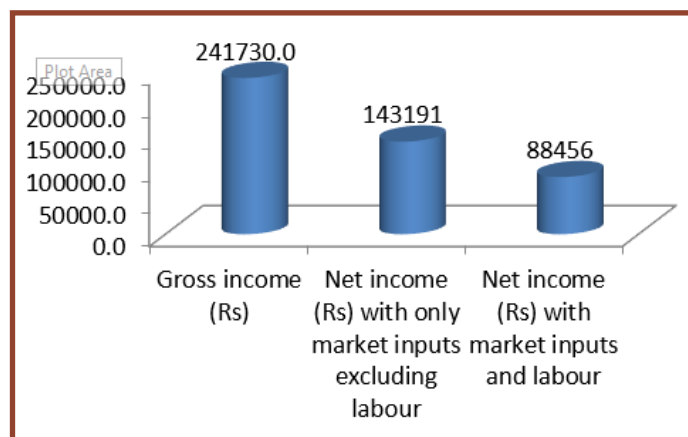


Fig 25. Economics of IFS model at Junagadh

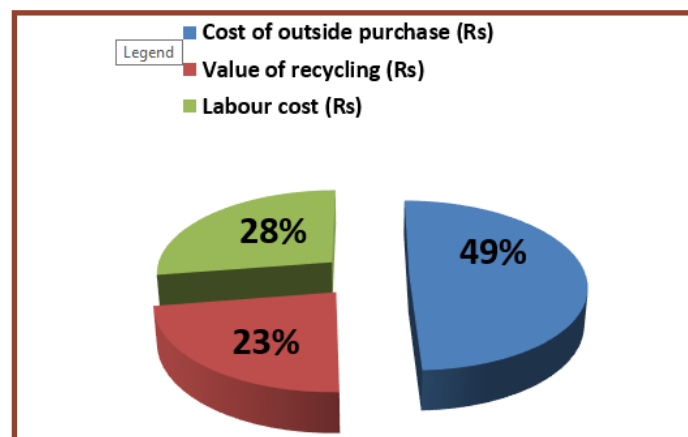


Fig 26. Different fraction of total cost

14. WESTERN DRY REGION (WDR)

Crop+ Dairy is the pre-dominated farming system of western dry region of Rajasthan with 90% farm families adopting the system. Average land holding of the region ranges in between 0.48 ha (marginal farmer) to 1.44 ha (small farmer) with a family size of 7 members. The climate smart IFS model at Durgapura represented the western dry region. The IFS model consisted of crops, dairy, horticulture,

goatary, poultry as well as other complementary and supplementary modules in 1.45 ha area. The results obtained during reporting period of 2018-19 revealed the gross return to be Rs. 930136 while the net return excluding family labour was found to be Rs.757304. However, when family labour was accounted for in the cost, the mean net return was found to be Rs. 419117. Details of IFS model cost components presented in Table 7.1.14 indicated total cost for the IFS models to be Rs. 558846 for 1.45 ha IFS model.

Table 7.1.14 Details of IFS model along with total cost of model in WDR

Location	IFS model	Area (ha)	Total cost (Rs)
Durgapura	Crops+ Dairy+ Horticulture + Goatry+ Poultry + Biocompost	1.45	5,58,846

The models could generate mean employment generation of 1351 mandays through different modules while the IFS models were found to be carbon negative in terms of mean GHG emission at -885 CO₂ equivalent. Further, study of different fractions of cost revealed about 13% share of recycled inputs in total cost of the IFS which could be further

improved whereas cost of outside purchase was 29% of the model cost (Fig 27). The cost incurred towards labour was 58% which needs further reduction through small scale farm mechanization. The study of nutrient recycling in the IFS models revealed, an amount of 158.0 kg N, 56.7 kg P₂O₅ and 105.6 kg K₂O could be recycled in IFS model Durgapura.(Fig 28).

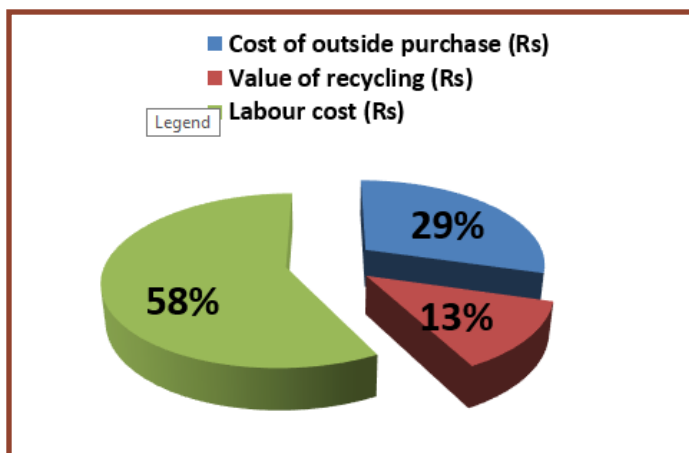


Fig 27. Different fraction of total cost

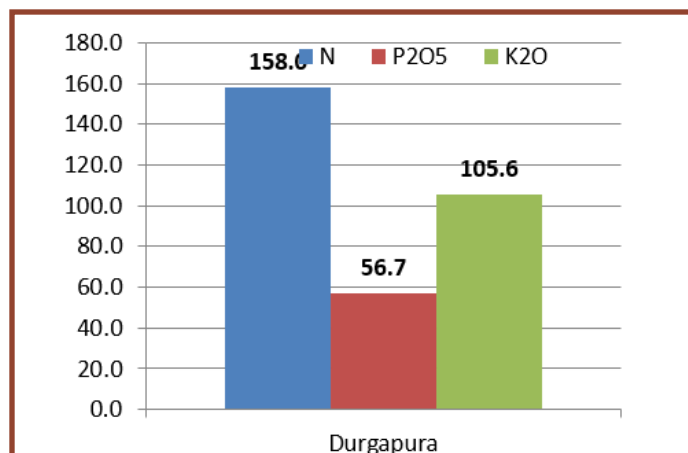


Fig 28. Nutrient recycling in IFS model of WDR

15. ISLAND

The Andaman and Nicobar group of Islands lie in the Bay of Bengal 1200 km east of main land India between 6-14° N latitude and 92-94° E longitude. Plantation crops + Pig (50 %) followed by Crop + Dairy animal cows + Fish (45 %) are two equally important and prevalent farming systems of the

region. Pigs are important animal of the region and symbol of social status too. The holding size ranged in between 0.39ha (marginal farmer) to 1.38 (small farmer) with an average of 7 members in a family. A climate smart IFS model involving crops, dairy and fisheries was developed in an area of 0.75ha for lowland or valley areas of Andamans. The results obtained during reporting period of 2018-

19 revealed the gross return to be Rs. 355492 while the net return excluding family labour was found to be Rs.300842. However, when family labour was accounted for in the cost, the mean net return was

found to be Rs. 300457 (Fig 29). Details of IFS model cost components presented in Table 7.1.15 indicated total cost for the IFS models to be Rs. 239375 for 0.75 ha IFS model.

Table 7.1.15 Details of IFS model along with total cost of model in Island ecosystem

Location	IFS model	Area (ha)	Total cost (Rs)
Port Blair	Crops + Dairy	0.75	2,39,375

The models could generate mean employment generation of 385 mandays through different modules while the IFS models were found to be carbon emissive in terms of mean GHG emission at +1241 CO₂ equivalent. Further, study of different fractions of cost revealed about 29% share of recycled inputs in total cost of the IFS whereas cost of outside purchase was 23% of the model cost (Fig 30). The cost incurred towards labour was 48% which needs further reduction through small scale farm mechanization.

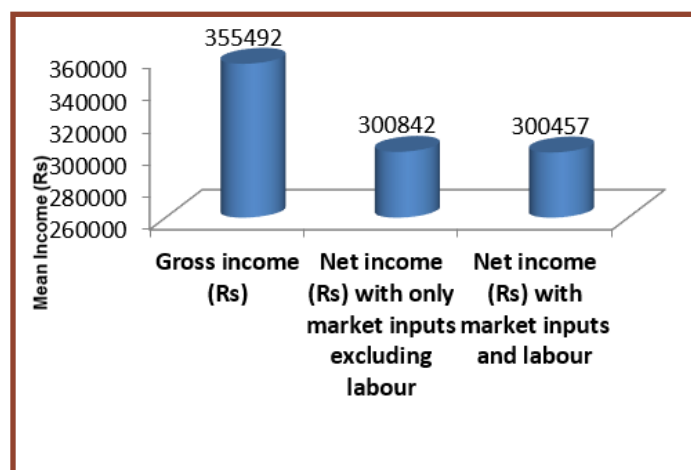


Fig 29. Economics of IFS model at Pot Blair (A & N)

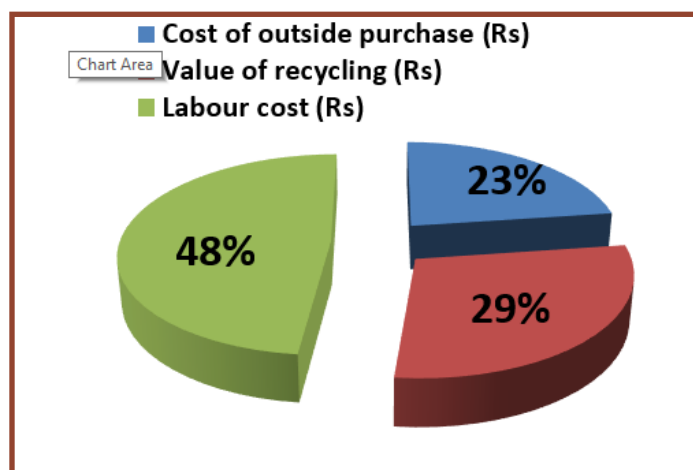


Fig 30. Different fraction of total cost

The study of climate smart IFS across 15 agroclimatic zones during 2018-19 depicted that:-

- Market inputs (17 % in CPH to 49 % in GPH)
- Labour (19 % in WHR to 67 % CPH)
- Recycling (13 % in WDR to 45 % in WHR & MGP)

- Nutrient recycling (higher in EHR while lower in MGP)
- Additional saving if only family labour is used in IFS: Rs 0.32 lakhs in ECPH to 10 lakhs in WCPH

Study of area allocation for different components across IFS models is presented in Fig 31 and Table 7.1.16.

Table 7.1.16 Mean area share of different components across IFS

Components	Number of models in which integrated	Mean area share (%)
Cropping Systems Soil health Family nutrition Income generation Livestock nutrition	36	67
Fruits/plantation crops/Spices	29	19
Livestock	28	3

Components	Number of models in which integrated	Mean area share (%)
Fishery	18	6
Other activities	31	6

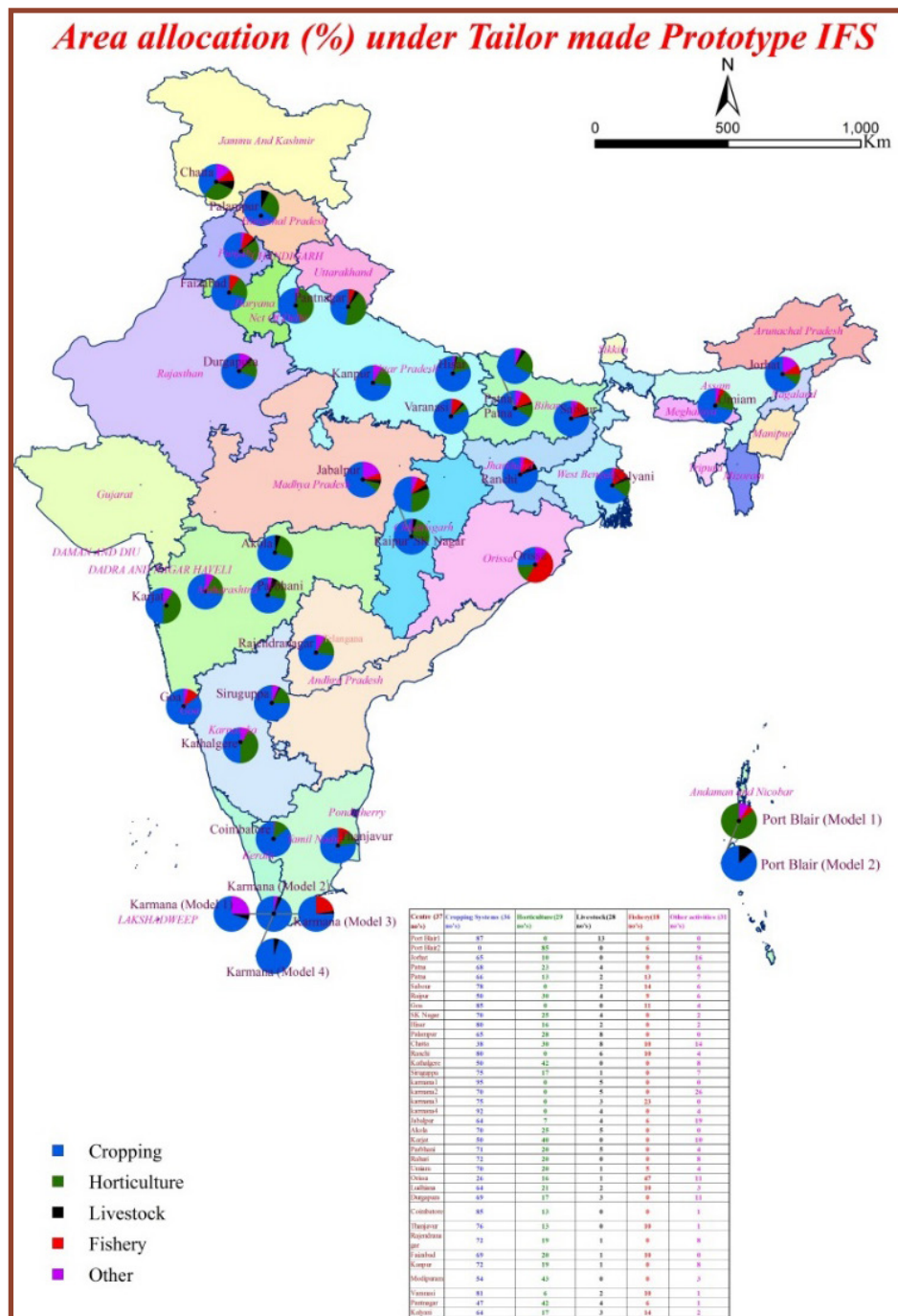


Fig 31. Area allocation under prototype models

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

Treatments

Ten different cropping systems were evaluated across 30 locations for meeting the various purposes of farming systems such as family nutrition, soil health improvement, livestock nutrition as well as income enhancement across different ecosystems (arid, semi-arid, sub-humid, humid and coastal) of the country. A brief description design and objective of cropping system and location wise findings and summarized results are presented below.

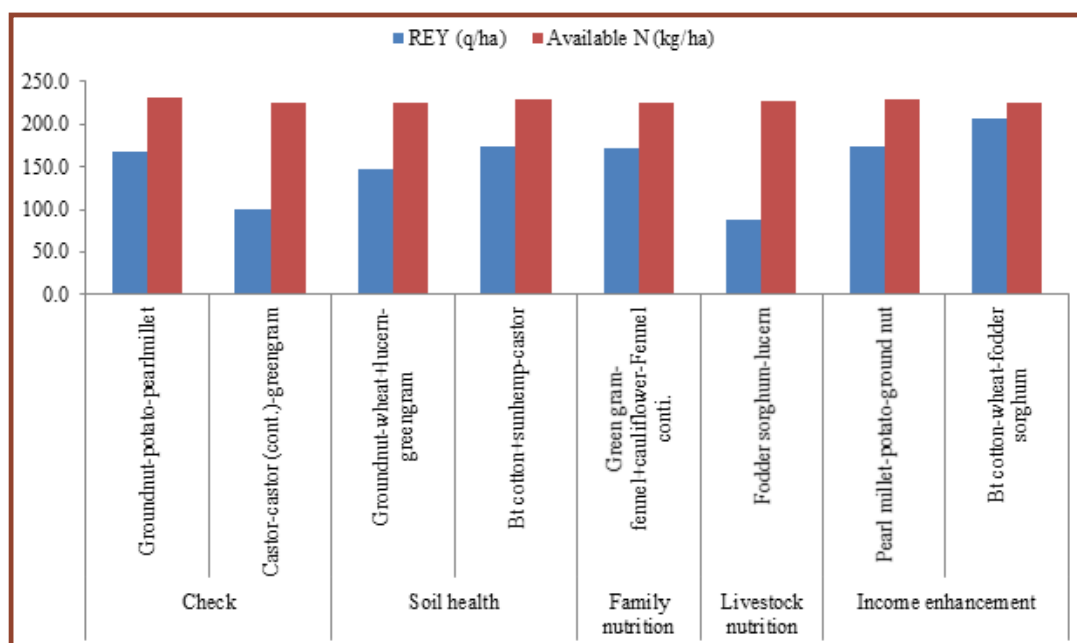
Treatment notation	Cropping system	Remarks
T ₁	Pre-dominant cropping system of the region	Check
T ₂	Pre-dominant cropping system of the region	
T ₃	Ecological cropping system involving pulses/green manures and other crops for improving soil health	Soil health
T ₄	Ecological cropping involving pulses/green 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	

Results

Arid ecosystem

S K Nagar (Gujarat): At S K Nagar, eight different cropping systems evaluated were groundnut-potato-pearlmillet, castor-castor (cont.)-greengram, groundnut-wheat+lucern-greengram, bt cotton + sunhemp-castor, green gram-fennel+cauliflower-fennel conti., fodder sorghum-lucern, pearl millet-potato-ground nut, and bt cotton-wheat-fodder sorghum. Amongst them highest REY of 207.5 q/ha was noticed under bt cotton-wheat-fodder sorghum system and this was followed by pearl millet-potato-ground nut system (REY 173.3 q/ha) Fig. Seeing their

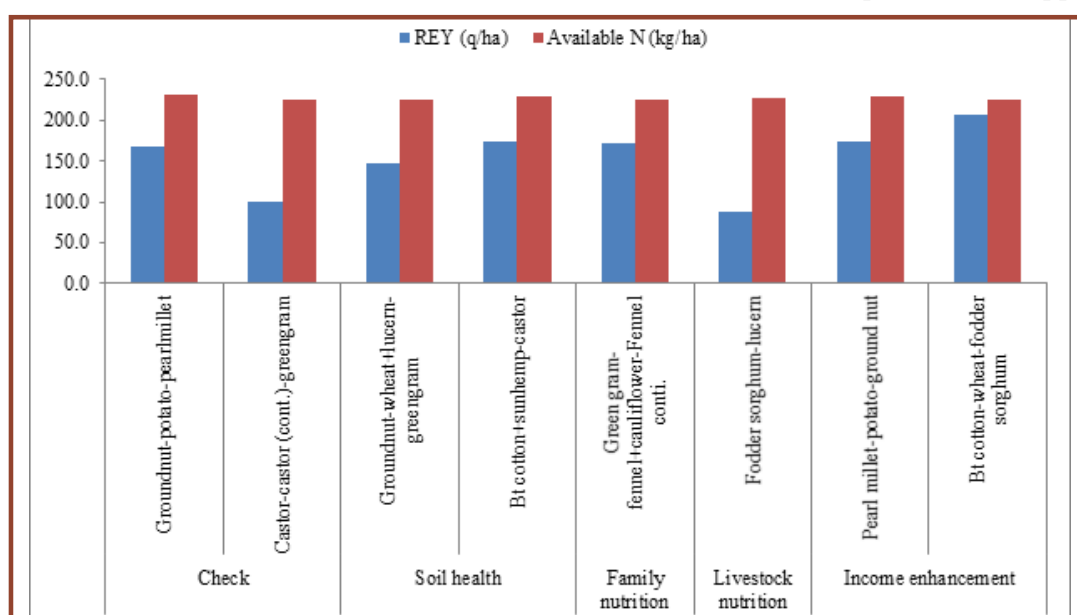
production potential, above systems can replace old low productive systems. Cultivation of green gram-fennel+cauliflower-Fennel (conti.) in around 0.26 ha land area can meet out nutritional requirement of a five member family. In order to improve the soil health, groundnut-wheat+lucern-greengram system can be taken up in rotation with other cropping system used for meeting the family nutritional requirement. Similarly, to meet green fodder need of two desi cows over one year time an area of 0.11 ha can be given to fodder sorghum-lucerne system. For location, bt cotton-wheat-fodder sorghum system recorded superior net returns (Rs. 302338/ha) as compared with other systems.



Semi-arid ecosystem

Kota (Rajasthan): At Kota, soybean-wheat, soybean-mustard-cowpea, soybean+red gram-oat-summer mungbean, direct seeded rice-wheat-summer mung bean, direct seeded rice-berseem, transplanted rice-wheat (ZT), urdbean+direct seeded rice-veg. pea+coriander, QPM maize-fennel, sweet corn-field pea-onion, sorghum-bitter gourd etc. ten systems were taken for the study. Investigation highlighted that urd bean+direct seeded rice-veg. pea+coriander (green leaf) system recorded the highest REY of

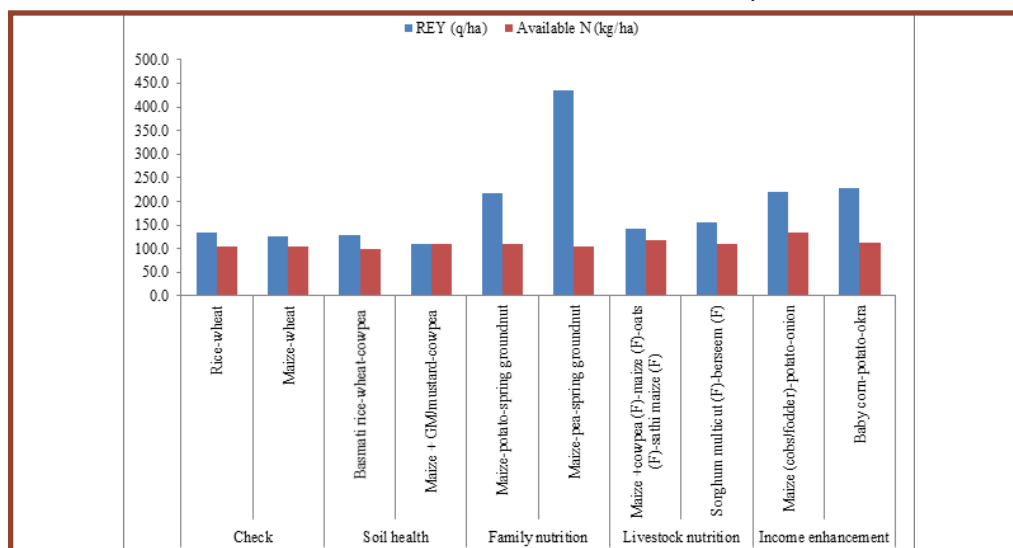
249.6 q/ha (Fig.) as compared to other cropping systems. The same system also recorded higher value of available soil N (462.6 kg/ha) at the end of two years of cropping system. For available N point of view, suitable cropping system among other tested systems was soybean+red gram-oat-summer mungbean which recorded available N status of 451.2 kg/ha (fig. 1). Thus the above systems can be used for soil quality maintenance in farming systems of the region. Among the different cropping systems highest net returns of Rs. 158195/ha was noticed with sweet corn-field pea-onion cropping system.



Ludhiana (Punjab): At Ludhiana, ten cropping systems with purposes like family nutrition (maize-potato-spring groundnut, maize-pea-spring groundnut), livestock nutrition (maize +cowpea (F)-maize (F)-oats (F)-sathi maize (F), sorghum multicut (F)-berseem (F), maintaining soil health (basmati rice-wheat-cowpea, maize + GM/mustard-cowpea) and income enhancement for family (maize (cobs/fodder)-potato-onion and baby corn-potato-okra) were compared with predominant cropping systems. The highest REY of 435.3 q/ha was noticed with maize-pea-spring groundnut at Ludhiana centre fig. Post two years of completion of cropping system, available soil N was higher (134 kg/ha) under maize (cobs/fodder)-potato-onion system followed by

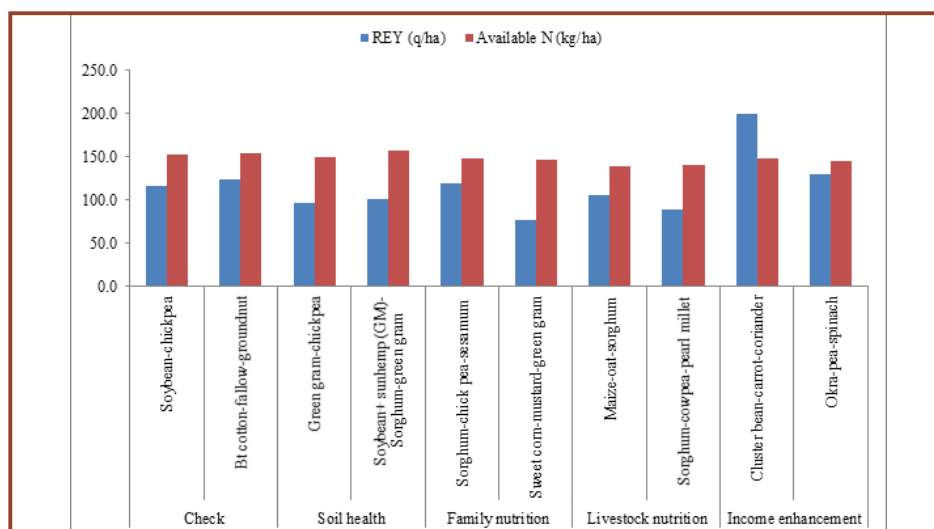
maize +cowpea (F)-maize (F)-oats (F)-sathi maize (F) (available N 118 kg/ha) (Fig. 1).

Similarly for meeting family nutrition of a five member family during the year maize-potato-spring groundnut system can be taken under 0.10 ha land area. Likewise, as per results allocation of 0.08 ha area to maize-maize +cowpea-sathi maize can meet green fodder need of two desi cows round the year. However, for multicut sorghum (F)-berseem (F) system, an area of 0.10 ha might prove sufficient to meet the green fodder requirement. Moreover, rest area can be allotted to Maize-pea-spring groundnut for improvement of overall farm income since this has recorded maximum net returns (Rs 501063/ha) over the other systems.



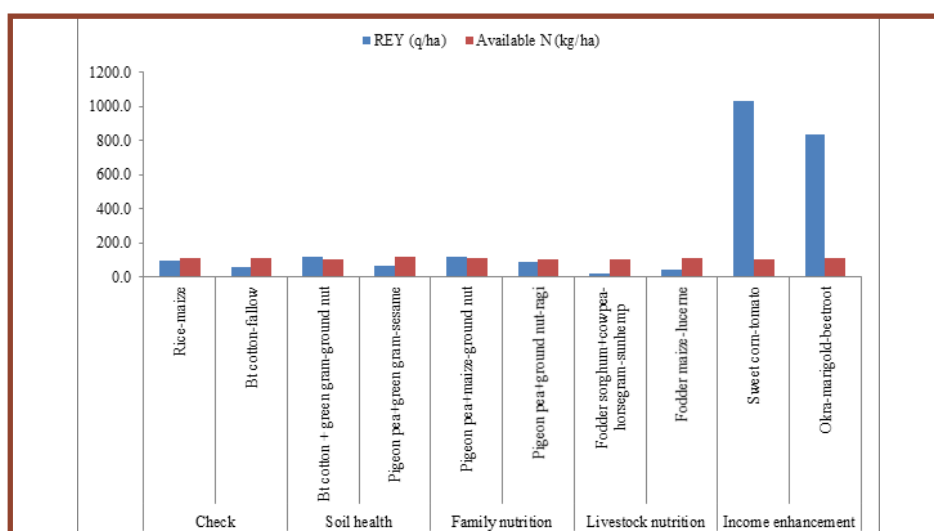
Parbhani (Maharashtra): At Parbhani, ten cropping systems with purposes like family nutrition (sorghum-chick pea-sesamum, sweet corn-mustard-green gram), livestock nutrition (maize-oat-sorghum, sorghum-cowpea-pearl millet), maintaining soil health (green gram-chickpea, soybean+ sunhemp (GM)-Sorghum-green gram) and income enhancement for family (cluster bean-carrot-coriander, okra-pea-spinach) were compared with predominant cropping systems. Among different cropping systems tested, the highest productivity in terms of REY was found in cluster bean-carrot-coriander (REY 199.8 q/ha) followed by Okra-pea-spinach (REY 129.3 q/ha) as depicted in Fig no. Therefore, these systems can be used in place of existing pre-dominant cropping system in the zone

for enhancing productivity. Soybean+sunhemp (GM)-sorghum-green gram system recorded higher value (157 kg/ha) of available N content thereby can be suggested as soil improver system for region Fig. In region a minimum of 0.40 ha land may be taken under sorghum-chick pea-sesamum system and around 0.22 ha area for sweet corn-mustard-green gram system can meet out the food grains and oilseed demand of a 5 member household throughout the year. For year round availability of green fodder to two desi cows an area of around 0.15 ha can be allotted to Maize-oat-sorghum system. Similarly for income improvement rest area can be allotted to cluster bean-carrot-coriander system as it has realized the highest net returns of Rs. 168245.0/ha as compared to other system tested in the region.



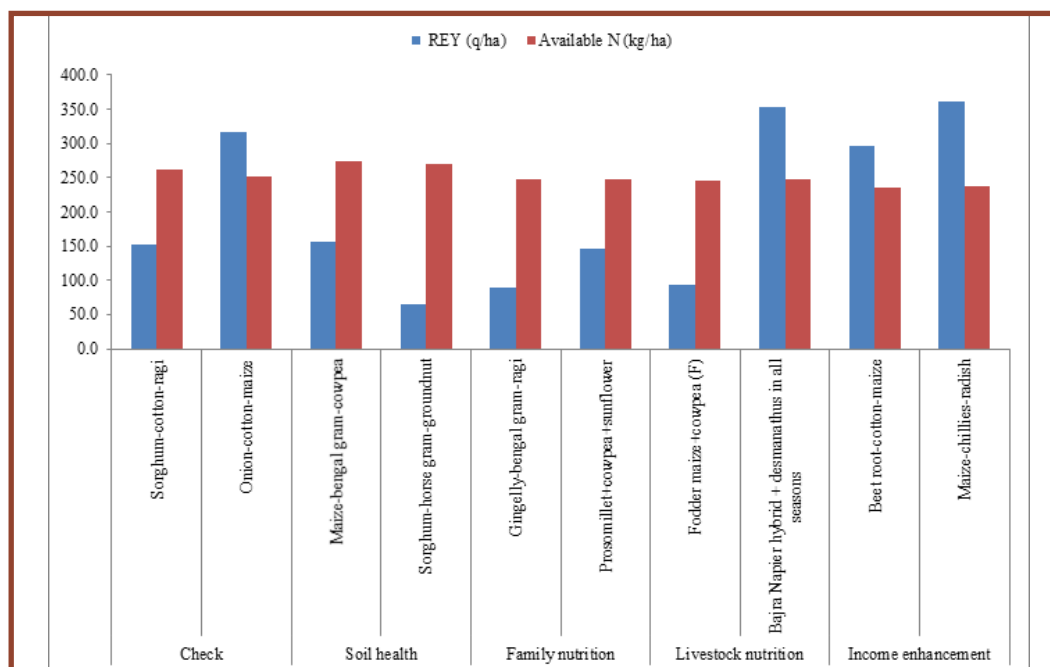
Rajendernagar (Telangana): Ten cropping systems with diverse purposes such as family nutrition (Pigeon pea+maize-ground nut, pigeon pea+ground nut-ragi), livestock nutrition (maize fodder sorghum+cowpea-horsegram-sunhemp, fodder maize-lucerne), maintaining soil health (Bt cotton + green gram-ground nut, pigeon pea+green gram-sesame) and income enhancement for family (Sweet corn-tomato, okra-marigold-beetroot) were compared with predominant cropping systems at Rajendernagar. Cropping system designed and evaluated for income enhancement with sweet corn-tomato and okra-marigold-beetroot registered significantly higher rice equivalent yield (1029 and 837.3 q/ha, respectively) thus indicating their suitability over the existing systems (Fig. 1). Among

different systems, pigeon pea + green gram-sesame recorded highest soil available N as compared to other systems thus this system could be best system for intermittent rotation with income enhancing systems to maintain soil health Fig. In region allocation to 0.24 ha area to pigeon pea+ground nut-ragi system can meet yearly cereals, pulses and oilseed demand of a five member family. Similarly, fodder maize-lucerne system should be followed in 0.15 ha area for meeting the green fodder need of two desi dairy cattle. The remaining area (after allocating the area for family and livestock nutrition) can be allocated to Okra-marigold-beetroot system for income generation as it has registered highest net income of Rs. 439018.7/ha.



Coimbatore (Tamil nadu): At Coimbatore, cropping systems with purposes such as family nutrition (gingelly- bengal gram-ragi, prosomillet + cowpea + sunflower), livestock nutrition (fodder maize + cowpea (F), bajra napier hybrid + desmanathus in all seasons), maintaining soil health (maize-bengal gram-cowpea, sorghum-horse gram-groundnut) and income enhancement for family (beet root-cotton-maize, maize-chillies-radish) were compared with predominant cropping systems. Among different cropping systems, maize-chillies-radish system recorded highest REY (362.03 q/ha) thus was found promising for productivity enhancement (Fig. 3). Post 2 years of completion of cropping system, available soil N was higher (300 kg/ha) under maize-bengal

gram-cowpea (Fig. 1). Thus this system can be used in rotation with other cropping systems for maintenance and improvement of soil health. For meeting yearly cereal, pulses and oil demand of a five member family, a minimum area of 0.31 ha can be allotted for Gingelly-bengal gram-ragi system. Likewise, an area of around 0.10 ha can be allotted to maize (F)+cowpea (F)-cummu (F)+cowpea (F)-cummu (F)+cowpea (F) to meet year around green fodder per livestock. Out of 1 ha area, remaining area (after allocating area for family and livestock nutrition) can be allocated to maize-chillies-radish system for income generation as this system have recorded highest net returns of Rs. 427236/ha.

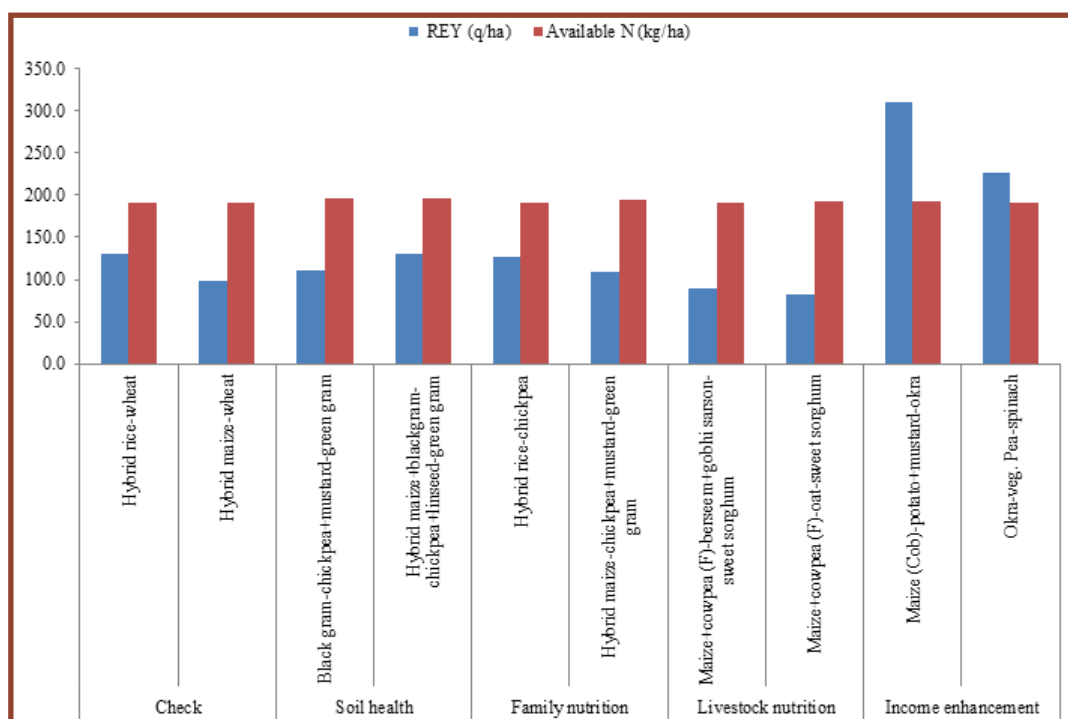


Kanpur (Uttar Pradesh): At Kanpur, ten cropping systems with purposes like family nutrition (hybrid rice-chickpea, hybrid maize-chickpea+mustard-green gram), livestock nutrition (maize+cowpea (F)-berseem+gobhisarson-sweet sorghum, maize+cowpea (F)-boat-sweet sorghum), maintaining soil health (black gram-chickpea+mustard-green gram, hybrid maize+blackgram-chickpea+linseed-green gram) and income enhancement for family (maize (Cob)-potato+mustard-okra, okra-veg. pea-spinach) were compared with predominant cropping systems. The results indicated that maize

(cob)-potato+mustard-okra system was found most productive and it has recorded the REY of 309.9 q/ha (Fig). The soil was also analyzed for available soil N, and it was found the Black gram-chickpea+mustard-green gram system showed the highest available soil N (196 kg/ha) as compared to other systems (Fig. 1). Hence said system can be used as soil builder system in the farming system and may be taken up in rotation with the other cropping systems. Similarly for meeting cereals, pulses and oil (through ground nut) demand of a five member family, a minimum area of 0.22 ha can be allotted for Hybrid maize-

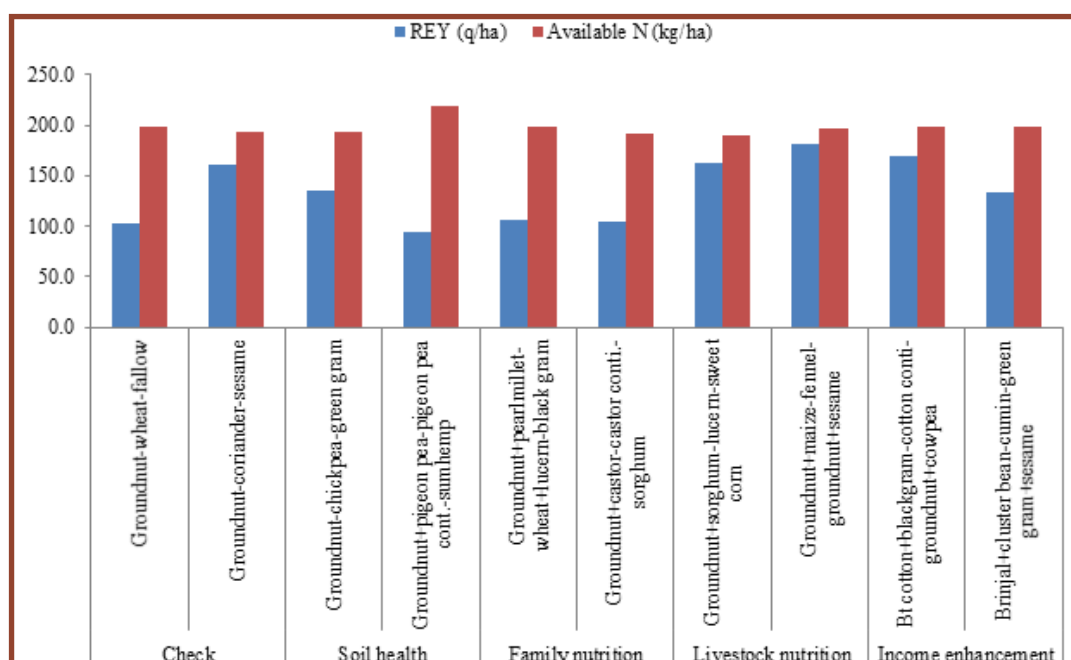
chickpea+mustard-green gram system. Similarly acreage of 0.10 ha can be utilized for green fodder production for meeting round the year green fodder requirement of two desi cows. Out of 1 ha area, remaining area (after allocating the area for

family and livestock nutrition) can be allocated to the income enhancing systems such as Maize (cob)-potato+mustard-okra and okra-veg. pea-spinach which have recorded net income of Rs. 623146.8/ha and Rs. 264563.8/ha, respectively.



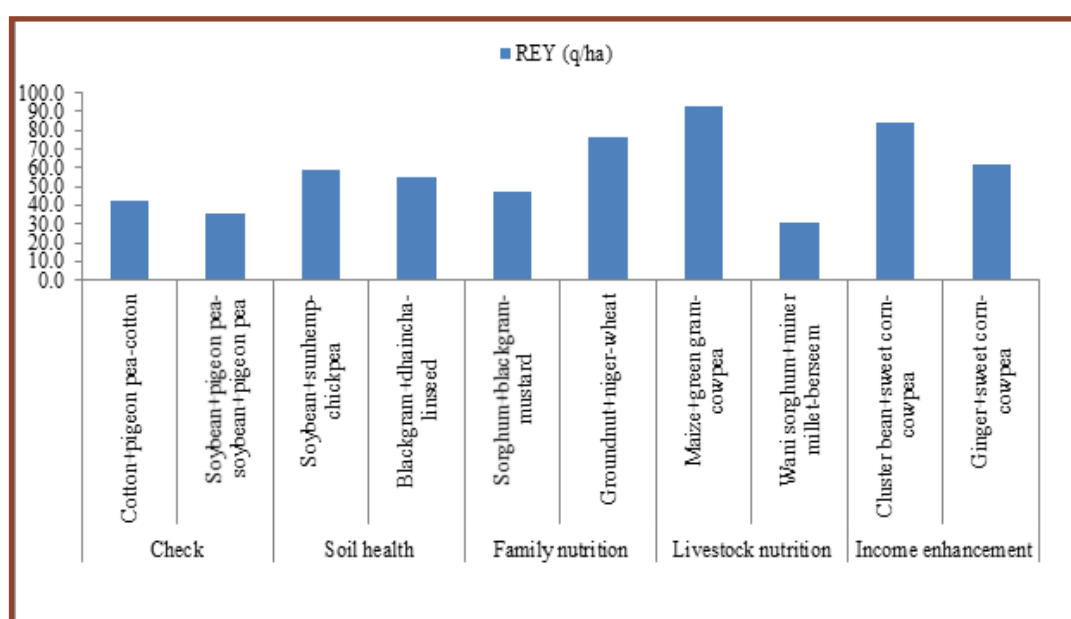
Junagadh (Gujrat): At Junagadh, ten cropping systems having objectives like family nutrition (groundnut+pearlmillet-wheat+lucern-black gram, groundnut + castor-castor conti.-sorghum), livestock nutrition (groundnut+sorghum-lucern-sweet corn, groundnut+maize-fennel-groundnut+sesame), maintaining soil health (groundnut-chickpea-green gram, groundnut+pigeon pea-pigeon pea cont.-sumhemp) and income enhancement for family (bt cotton+blackgram-cotton-conti-groundnut+cowpea, brinjal+cluster bean-cumin-green gram+sesame) were compared with predominant cropping systems. Among different cropping systems, groundnut+maize-fennel-groundnut+sesame recorded highest REY of 180.8

q/ha thus was found superior to other systems in terms of improvement in the productivity Fig. As far as area allocation is concerned, allocation of 0.40 ha area to groundnut+pearlmillet-wheat+lucern-black gram system for meeting the cereal, oilseed and pulses need of a 5 member farm family. After two years of cropping system, available soil N was higher (219 kg/ha) under groundnut+pigeon pea-pigeon pea cont.-sumhemp (Fig. 1). Hence said system can be used as soil builder system in the farming system and may be taken up in rotation with the other cropping systems. In terms of profitability analysis, the highest net returns of Rs. 212196/ha was noticed with Groundnut-coriander-sesame system, therefore this system can be used as an income generating system.



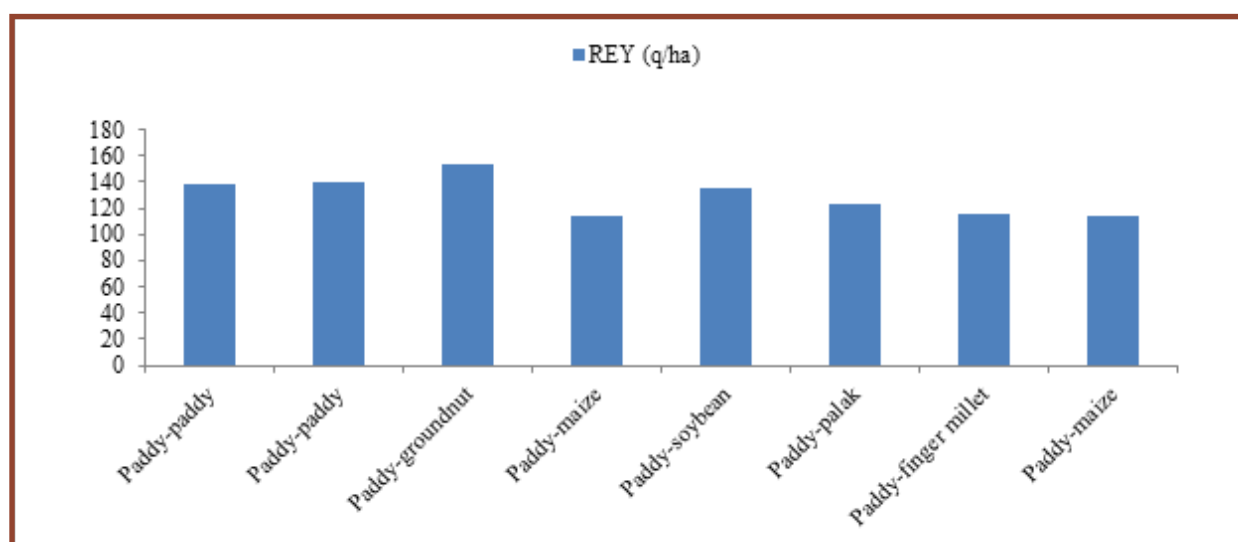
Akola (Maharashtra): At Akola, ten cropping systems with purposes, family nutrition (Rice sorghum + black gram-mustard, groundnut+niger-wheat), livestock nutrition (maize+green gram-cowpea, wani sorghum + miner millet-berseem), maintaining soil health (soybean+sunhemp-chickpea, black gram+dhaincha-linseed) and income enhancement for family (cluster bean+sweet corn-cowpea, ginger+sweet corn-cowpea)

were compared with predominant cropping systems. Out of the systems tested, maize+green gram-cowpea system has realized the highest REY of 92.4 q/ha was fig. The system can be adopted in place of lower yielding systems of the region. For meeting the yearly cereals, oil seed and pulse demand groundnut+niger-wheat system can be followed in 0.38 ha of land under a farming system model.



Kathalagera (Karnataka): Various paddy based cropping systems such as paddy-paddy, paddy-groundnut, paddy-maize, paddy-soybean, paddy-palak, paddy-finger millet, paddy-maize were tested at Kathalagera. Among different systems, highest productivity in terms of REY was found in Paddy-groundnut (REY 153.3 q/ha) as depicted in Fig no. The next best systems for productivity improvement perspective were paddy-paddy (139.9 q/ha) and paddy-soybean (104.4 q/ha). Therefore, these systems can be used in place of existing pre-dominant cropping system in the zone for enhancing the productivity.

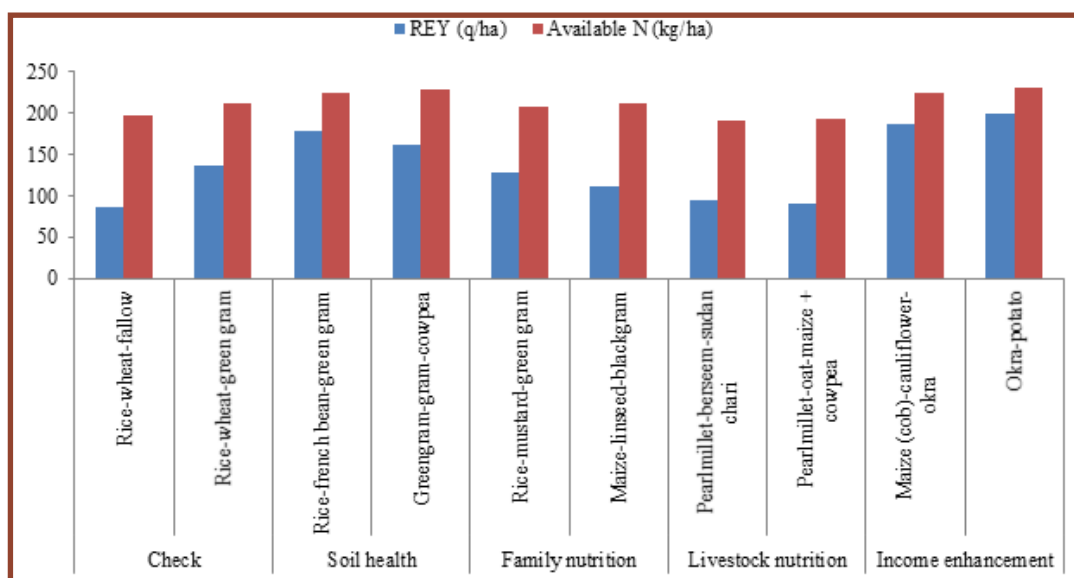
In the region paddy-groundnut system may be given around 0.08 to 0.10 ha of land area under a farming system in order to meet the yearly cereals and pulses demand of a five member family. Similarly, allocation of 0.07 to 0.10 ha area may be done if soybean crop is included in the cropping system. In order to maximize, farm income remaining area can be given to Paddy-groundnut and Paddy-soybean system as these have reported net returns of Rs. 157683.0/ha and Rs. 135798.0/ha, respectively.



Sub-humid ecosystem

Faizabad (Uttar Pradesh): In Faizabad centre also, ten cropping systems with different purposes such as family nutrition (rice-mustard-green gram, maize-linseed-blackgram), livestock nutrition (pearlmillet-berseem-sudan chari, pearlmillet-oat-maize + cowpea), maintaining soil health (rice-french bean-green gram, greengram-gram-cowpea) and income enhancement for family (maize (cob)-cauliflower-okra, okra-potato) were compared with predominant cropping systems. Among different cropping systems tested at Faizabad centre, the highest productivity in terms of REY was found with okra-potato system (REY 200.0 q/ha) followed by maize (cob)-cauliflower-

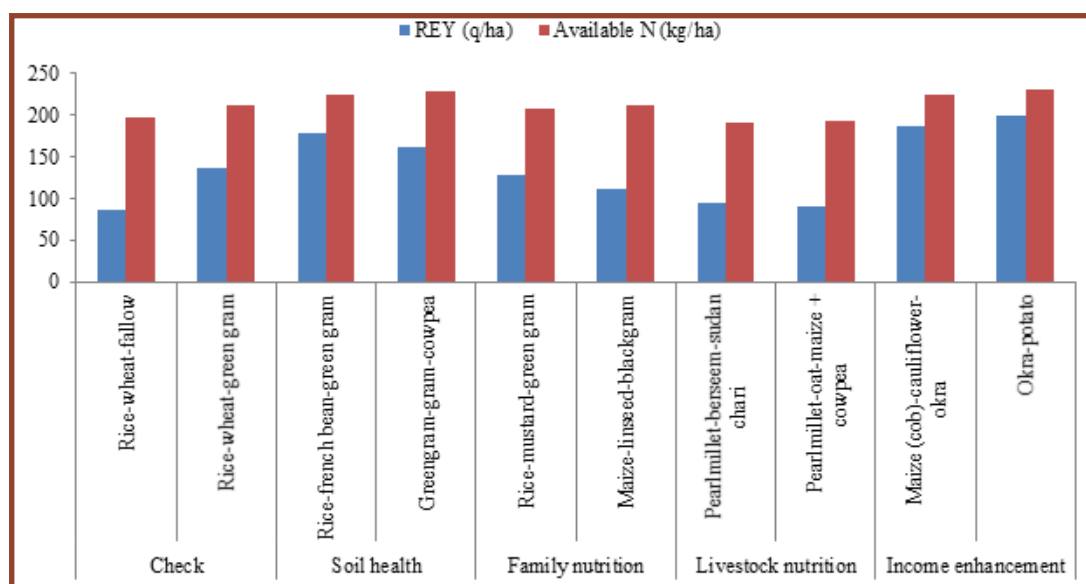
okra system (REY 187.9 q/ha) as depicted in Fig no. So, both the systems can be used as an alternative to existing pre-dominant cropping system in the zone for enhancing productivity. In the region, a minimum of 0.14 ha land area under rice-mustard-green gram system cultivation may meet out the yearly cereals and pulses demand of 5 member family. Similarly for green fodder production, an area of 0.10 ha can be allotted to pearlmillet-berseem-sudan chari system for round the year supply of green fodder for two desi cows. After fulfilling the acreage need for family and livestock nutrition, remaining area can be given to higher income generating systems such as Maize (cob)-cauliflower-okra (net returns Rs. 206079/ha).



Rewa (Madhya Pradesh): At Rewa, ten cropping systems with purposes, (family nutrition (Rice-potato-green gram, rice-pea + mustard-sunhemp), livestock nutrition (rice-berseem-berseem (seed), rice-barley-bajra), maintaining soil health (rice-gram+mustard-sunhemp, rice-pea-green gram) and income enhancement for family (Rice-garlic, rice-toria-onion) were compared with predominant cropping systems. At present centre, highest productive cropping system in term of REY was notice with rice-garlic system, which recorded REY of 218.6 q/ha (Fig. 1).

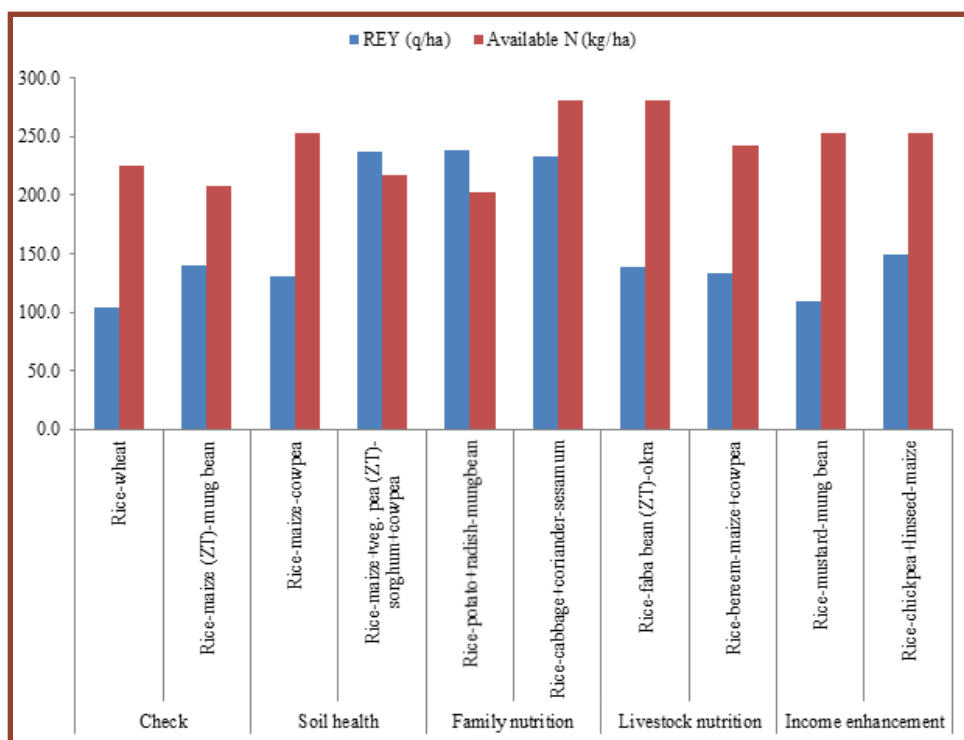
In the region allocation of 0.21 ha area to rice-potato-green gram system may fulfill the cereals

as well as pulses demand of five member family for a year. Likewise, allotment of around 0.12 ha area to rice-pea + mustard-sunhemp system is sufficient to fulfill cereal and oilseed demand of above said family. Overall around 0.21 ha must come under cereals, oilseeds and pulses cultivation to provide sufficient quantum of said crops. Similarly, to supply green fodder for two desi cows rice-berseem-berseem (seed) and rice-barley-bajra may be followed under 0.10 ha land area. After allocating area for family and livestock nutrition, rest area must be cultivated with income generating system such as rice-garlic (net income Rs. 219410/ha) and rice-gram+mustard-sunhemp (net income Rs. 202063/ha) cropping systems.



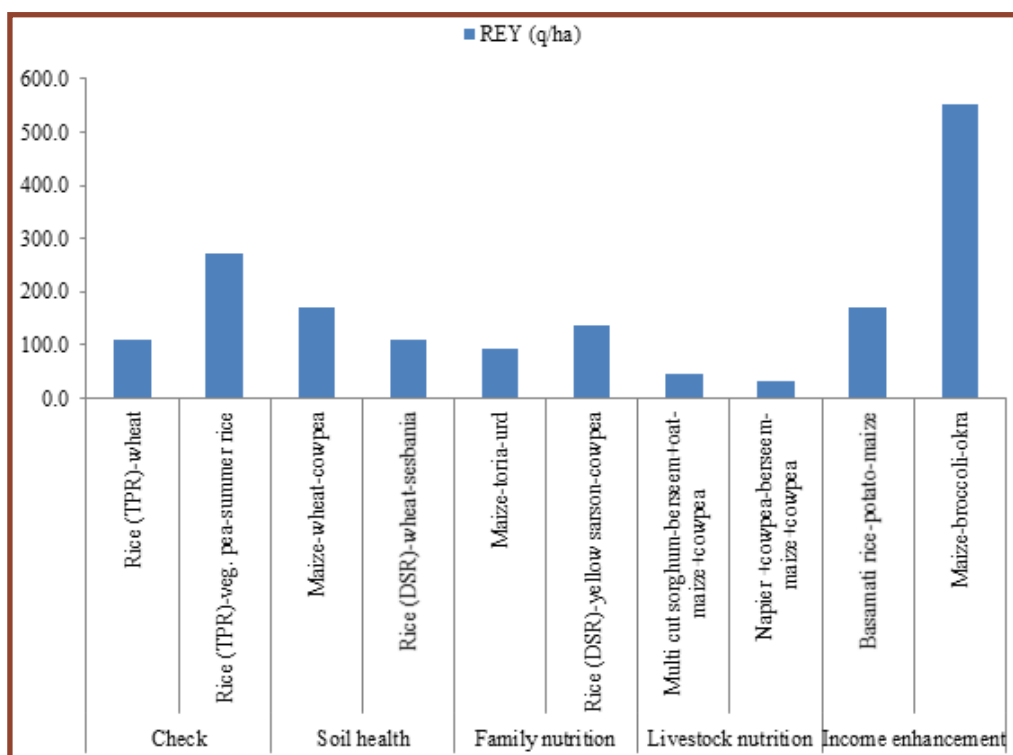
Sabour (Bihar): At Sabour, various cropping system such as rice-wheat, rice-maize (ZT)-mung bean, rice-maize-cowpea, rice-maize+veg. pea (ZT)-sorghum+cowpea, rice-potato+radish-mungbean, rice-cabbage+coriander-sesamum, rice-faba bean (ZT)-okra, rice-bereem-maize+cowpea, rice-mustard-mung bean, and rice-chickpea+linseed-maize have been examined. The findings revealed that rice-potato+radish-mungbean (REY 238.5 q/ha) closely followed by rice-maize+veg. pea (ZT)-sorghum+cowpea (REY 237.7 q/ha) were found most productive amongst all the evaluated system Fig. Thus these systems can be used for productivity enhancement in the region. In region

allocation of 0.11 ha area to rice-potato+radish-mungbean system can fulfill the cereals as well pulses requirement of five member family. Similarly for oilseed and cereals, rice-cabbage+coriander-sesamum system can be cultivated in around 0.17 ha area. Among different treatments used for soil health improvement rice-maize-cowpea was found suitable and reported higher soil available N (253 kg/ha). For meeting the fodder requirement of two desi cows an area of 0.14 ha can be taken under rice-bereem-maize+cowpea system. At Sabour rice-cabbage+coriander-sesamum system recorded highest net returns (Rs. 261312.1/ha) as compared with other systems.



Pantnagar (Uttarakhand): In Pantnagar, ten diverse cropping systems with purposes like family nutrition (maize-toria-urd, rice (DSR)-yellow sarson-cowpea), livestock nutrition (multi cut sorghum-berseem+oat-maize+cowpea, napier +cowpea-berseem-maize+cowpea), maintaining soil health (maize-wheat-cowpea, rice (DSR)-wheat-sesbania) and income enhancement for family (basmati rice-potato-maize, maize-broccoli-okra) and were

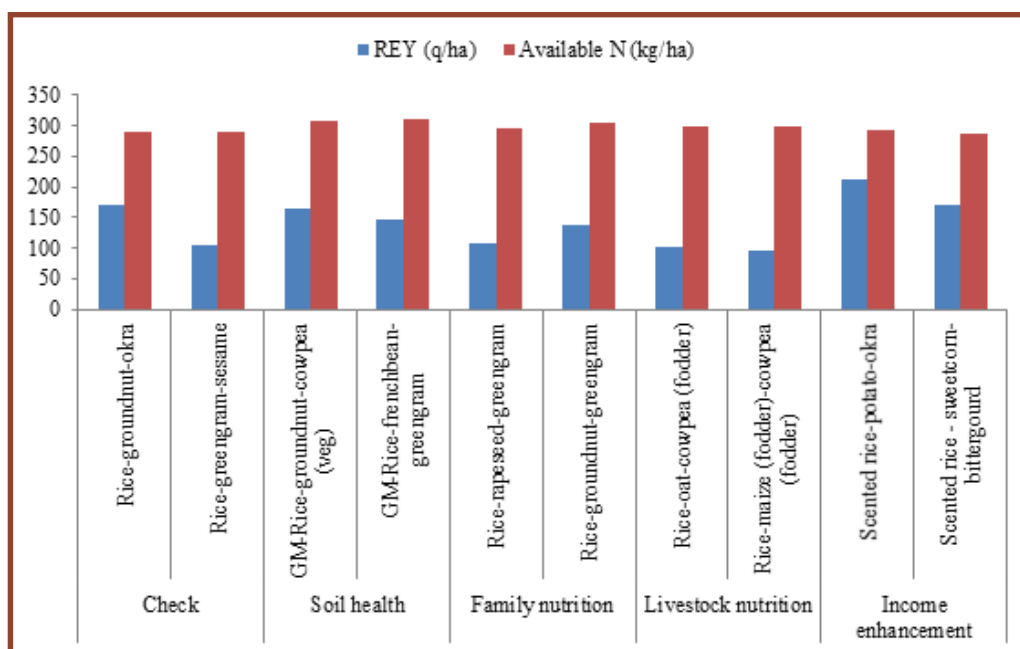
compared with predominant cropping systems. The highest REY of 553.3 q/ha was noticed with maize-broccoli-okra fig, therefore, this can be used as productivity enhance system. In this area, for meeting cereals (paddy), pulses (urd/cowpea) and oil demand of a five member family, a minimum area of 0.18 ha can be allotted to paddy based systems with inclusion of cowpea and urd as pulse crop as well as toria/yellow sarson as oil seed.



Chiplima (Odisha): Ten cropping systems with purposes, (family nutrition (rice-rapeseed-green gram, rice-groundnut-green gram), livestock nutrition (rice-oat (fodder)-cowpea (fodder), rice-maize (F)-cowpea (F), maintaining soil health (green manure-rice-groundnut-cowpea (veg.), green manure-rice-frenchbean-green gram) and income enhancement for family (scented rice-potato-okra, scented rice-sweet corn-bitter gourd) were compared with predominant cropping systems at Chiplima.. The results revealed that cropping system scented rice-potato-okra recorded highest REY of 210.9 q/ha thus was most productive one in terms of rice equivalent yield (Fig. 2). After two years of cropping system, available soil N was higher (308 kg/ha) under GM-Rice-frenchbean-green gram (Fig. 1). Hence said system may be used as soil builder system in the farming system and may be taken up in

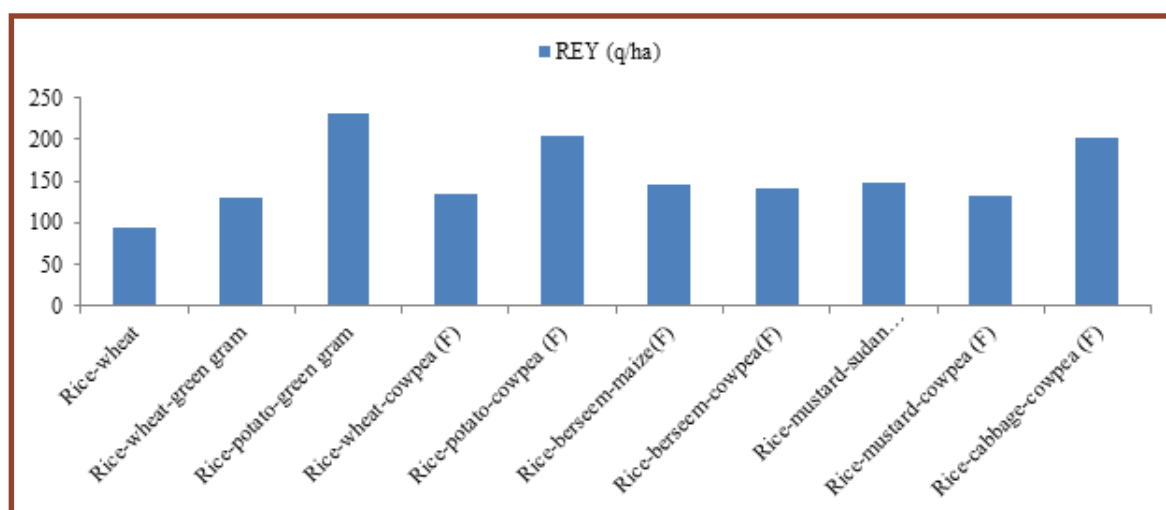
rotation with the other cropping systems. Similarly for meeting cereals (rice and scented rice), pulses (green gram) and oil (through ground nut) demand of a five member family, a minimum area of 0.21 ha can be allotted for Rice-groundnut-green gram cropping system. Minimal area of 0.16 ha can be utilized for green fodder production and may be given under rice-oat-cowpea (fodder) system.

using fodder crops as main system or through their integration into the main cropping system for meeting the round the year green fodder requirement of two desi cows. Out of 1 ha area, remaining area of 0.45 ha (after allocating area for family and livestock nutrition) can be allocated to scented rice-sweet corn-bitter gourd for income generation as this system have recorded highest net returns of Rs. 139909.0/ha.



Varanasi (Uttar Pradesh): Among ten different cropping systems (rice-wheat, rice-wheat-green gram, rice-potato-green gram, rice-wheat-cowpea (F), rice-potato-cowpea (F), rice-berseem-maize (F), rice-berseem-cowpea (F), rice-mustard-sudan grass (F), rice-mustard-cowpea (F) and rice-cabbage-cowpea (F)) tested at Varanasi. The highest productivity was found in rice-potato-green gram (REY 231.7 q/ha) system Fig no. Hence, it can be used in place of existing pre-dominant cropping system in the zone for enhancing productivity.

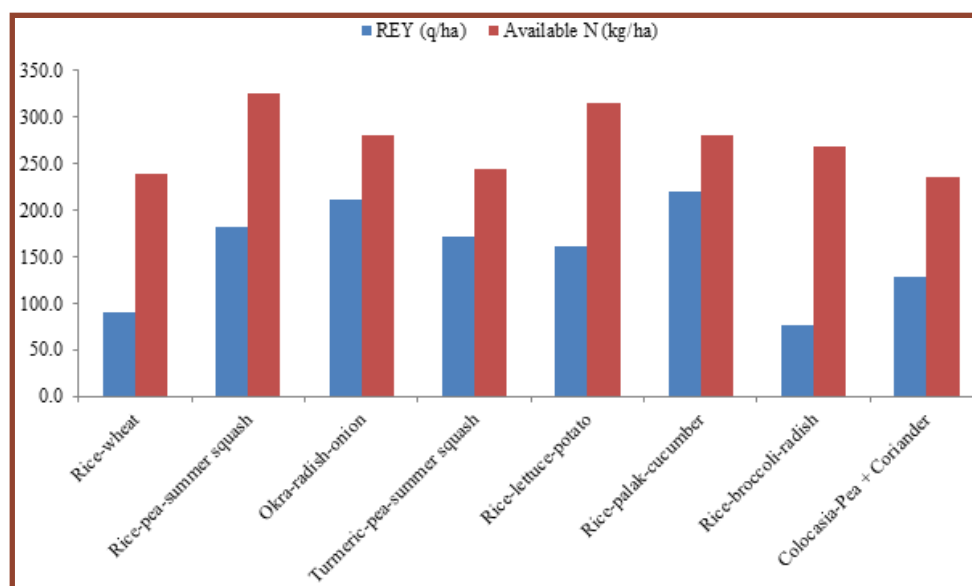
In region a minimum of 0.12 ha land area to Rice-potato-cowpea (F) system can meet year rice grain need of 5 member family. Likewise under rice-mustard-sudan grass (F), an area of 0.13 ha can be enough for meeting the oilseed and cereal demand of family and seasonal green fodder need of two desi cows. After completing area need for family and livestock nutrition, rest area can be given to higher income generating systems such as Rice-potato-green gram (net returns Rs.210209 /ha) and rice-cabbage-cowpea (F) (net returns Rs.196437/ha).



Humid ecosystem

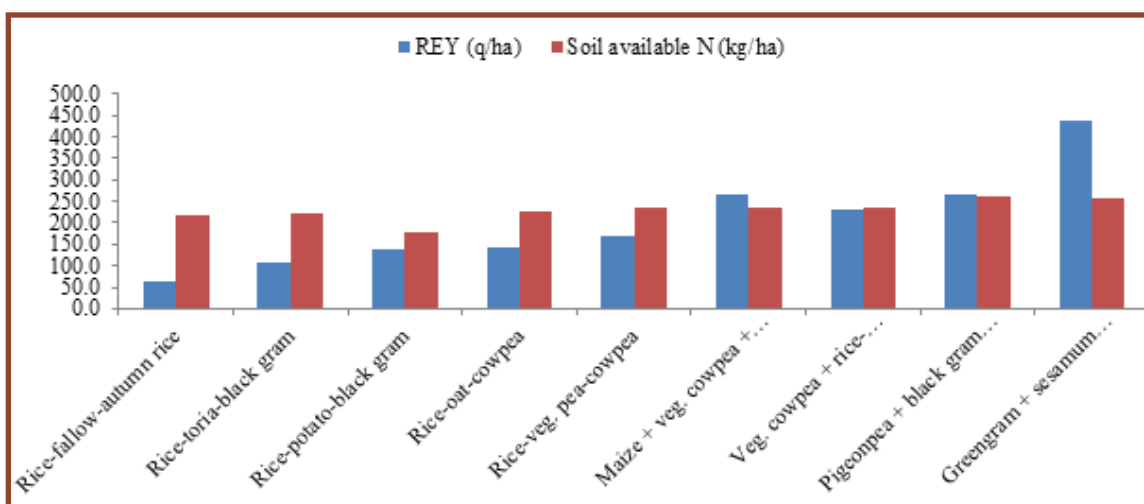
Palampur (Himachal Pradesh): Eight cropping systems viz., rice-wheat, rice-pea-summer squash, okra-radish-onion, turmeric-pea-summer squash, rice-lettuce-potato, rice-palak-cucumber, rice-broccoli-radish, colocasia-pea + coriander etc. were tested at Palampur. Out of different investigated systems, highest REY of 220.7 q/ha was noticed with rice-palak-cucumber followed by okra-radish-onion (REY 211.8 q/ha) fig. Therefore, this system

can be used as a replacement of existing systems. The system rice-pea-summer squash was found superior in term of soil available N content (326 kg/ha) hence its might improve the N status in the soil (Fig. 1). Likewise, in order to meet cereals (paddy) and pulses (pea) demand of a five member family, a minimum area of 0.14 ha can be allotted to paddy based systems with inclusion of pea as pulse crop. For income improvement of farm house hold the rest area can be given to income improving systems like rice-palak-cucumber (net returns Rs 218857.6/ha).



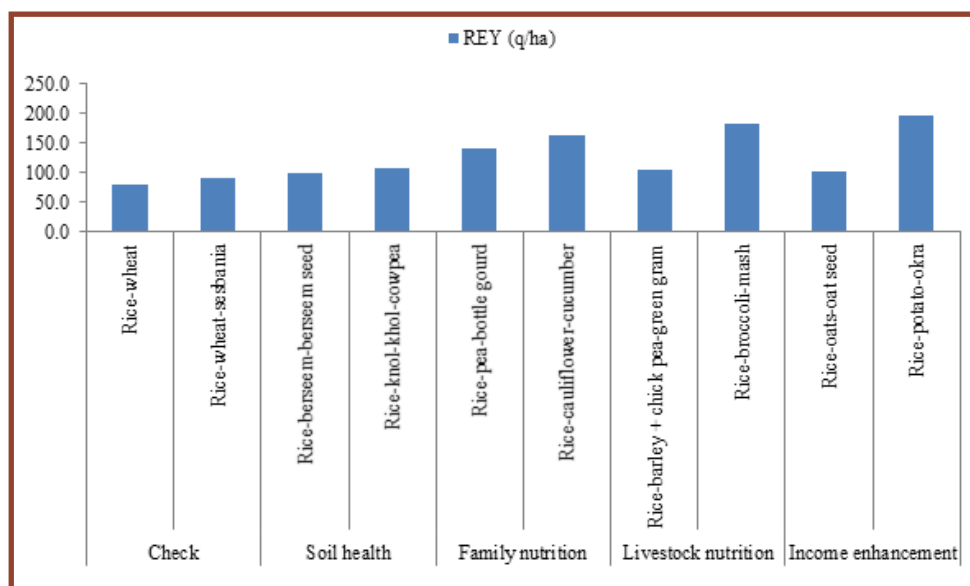
Jorhat (Assam): Nine different cropping systems such as rice-fallow-autumn rice, rice-toria-black gram, rice-potato-black gram, rice-oat-cowpea, rice-vegetable pea-cowpea, maize + vegetable cowpea (2:1) (BB) + dhaincha-cabbage + toria-black gram, veg. cowpea (3 row, BB)+ rice-cauliflower+toria-blackgram, pigeonpea + black gram (2:1, BB) + dhaincha-frenchbean +toria-cowpea, greengram + sesamum+rice-chilli + toria-cowpea were evaluated at Jorhat. The highest REY of 439.3q/ha was observed with green gram or/and sesamum+rice-chilli+toria-cowpea system over other systems (Fig. 1). After two years of completion of cropping system, available soil N was higher (260.8 kg/ha) under pigeonpea + black

gram (2:1, BB)+dhaincha-french bean+toria-cowpea system (Fig. 1). Therefore, above system can be used as soil quality enhancer system and may be taken up in rotation with other systems. For meeting food grain demand of five member family an area of 0.24 ha may be given under maize + vegetable cowpea (2:1) (BB) + dhaincha-cabbage+toria-black gram system. The remaining area should be given to green gram or/and sesamum+ rice-chilli+toria-cowpea and pigeonpea + BG (2:1, BB) +dhaincha- french bean+toria-cowpea systems which have recorded net return of Rs. 153115.3/ha and Rs. 109554.0, respectively.



Jammu (Jammu and Kashmir): At Jammu, out of different cropping systems (rice-wheat, rice-wheat-sesbania, rice-knol-khol-cowpea, rice-pea-bottle gourd, rice-cauliflower-cucumber, rice-barley + chick pea-green gram, rice-broccoli-mash, rice-oats-oat seed and rice-potato-okra), the highest productive (REY 196.0 q/ha) system was rice-potato-okra followed by rice-broccoli-mash (REY 182.7 q/ha) fig.

In this region for meeting the yearly cereals and pulses requirement an area of 0.23 ha can be allotted to rice-broccoli-mash cropping system. Likewise, an area of 0.06 ha can be taken for green fodder production in rice-berseem-berseem seed system for meeting seasonal fodder requirement of two desi cows. The rest of land area after allocation for family and livestock nutrition can be cultivated with income generating system such as rice-broccoli-mash (net income Rs. 115120/ha).



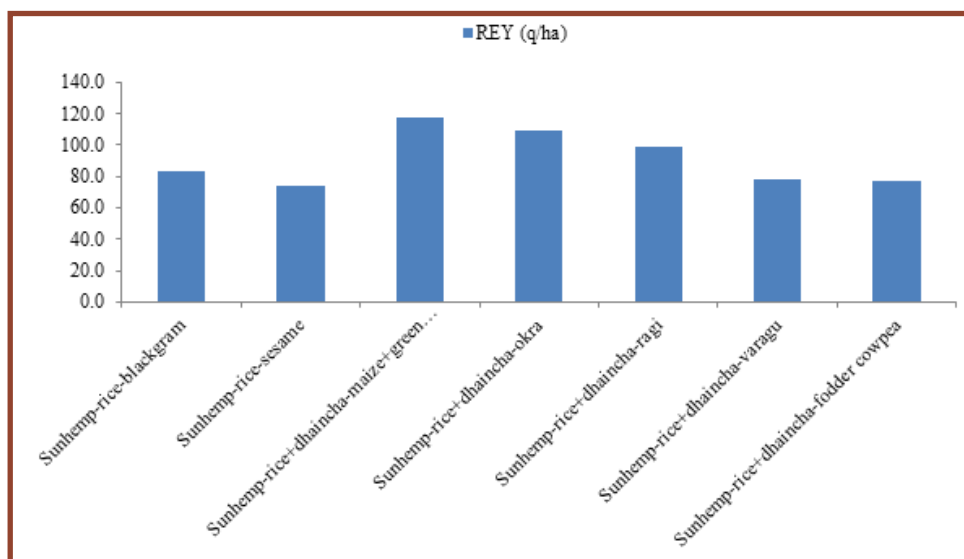
Coastal ecosystem

Thanjavour (Tamil Nadu): At Thanjavour, seven diverse cropping systems viz., sunhemp-rice-blackgram, sunhemp-rice-sesame, sunhemp-

rice+dhaincha-maize+green gram, sunhemp-rice+dhaincha-okra, sunhemp-rice+dhaincha-ragi, sunhemp-rice+dhaincha-varagu, and sunhemp-rice+dhaincha-fodder cowpea etc. have been taken

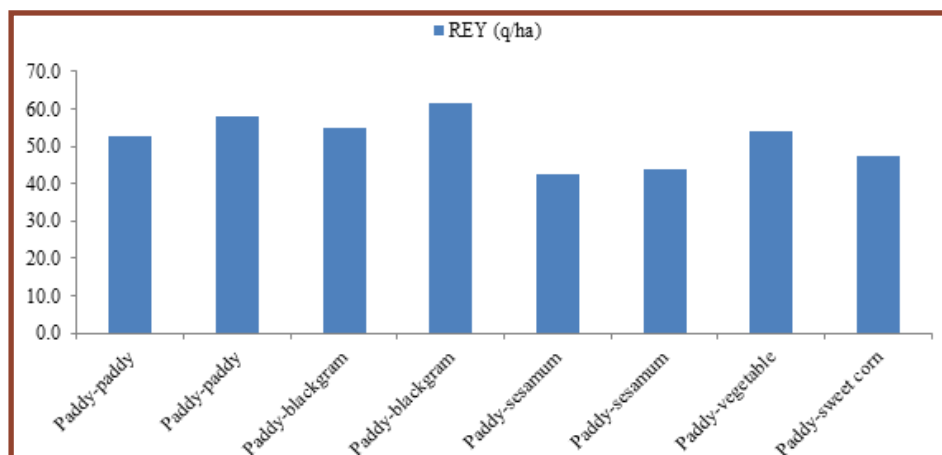
under study. Out of different systems, highest REY of 117.4 q/ha was observed with sunhemp-rice + dhaincha-maize + green gram system fig. Owing to its higher yield potential it can be suggested over existing system for yield enhancement in region. Sunhemp-rice-blackgram system should be followed in 0.24 ha area for providing sufficient cereal grains and pulses for a five member family throughout

the year. Likewise, for meeting the cereals and oil requirement of 5 person family allocation of around 0.15 ha area to sunhemp-rice-sesame system would be sufficient. For this location, sunhemp-rice+dhaincha-maize+green gram system provided the highest net returns of Rs 96925/ha as compared to other systems.



Maruteru (Andhra Pradesh): At Maruteru, among different cropping systems viz., paddy-paddy, paddy-blackgram, paddy-sesamum, paddy-sesamum, paddy-vegetable, and paddy-sweet corn, system Paddy-black gram recorded the highest REY of 61.7 q/ha (Fig. 1) which shows its suitability over other systems. This system can be used as a replacement of the existing paddy-paddy system

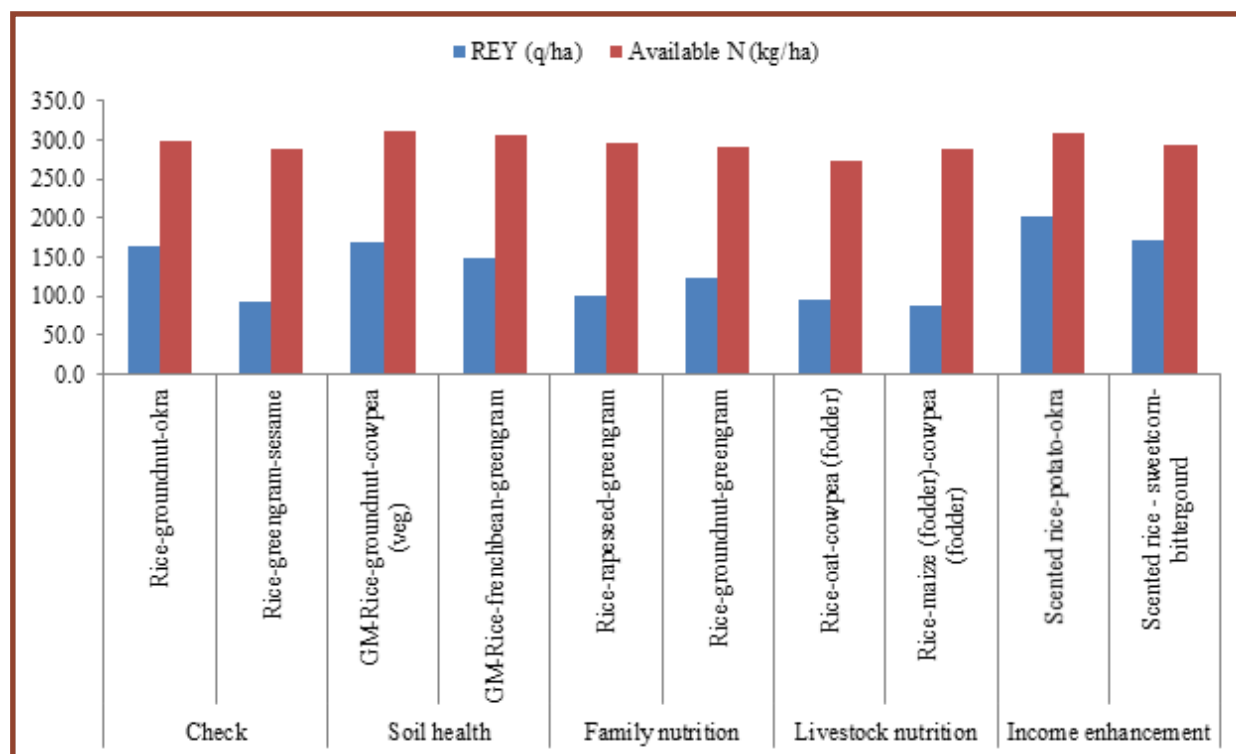
in the Maruteru region. In the region, for meeting cereals, and pulses demand of a five member family, a minimum area of 0.18 to 0.20 ha can be allotted to Paddy-black gram system. However, as per the data on sesamum yield, around 0.45 ha area can be given for meeting the yearly oil requirement of a five-member family of the region.



Bhubaneswar (Odisha): At Bhubaneswar, ten cropping systems with specific purposes, such as family nutrition (rice-rapeseed-green gram, rice-groundnut-green gram), livestock nutrition (rice-oat (fodder)-cowpea (fodder), rice-maize (F)-cowpea (F), maintaining soil health (green manure-rice-groundnut-cowpea (veg.), green manure-rice-frenchbean-green gram) and income enhancement for family (scented rice-potato-okra, scented rice-sweet corn-bitter gourd) and were compared with predominant cropping systems. Cropping system designed and evaluated for income enhancement with scented rice-potato-okra registered significantly higher rice equivalent yield (REY) of 203.2 q/ha thus indicating the suitability of this system for adding into existing pre-dominant cropping system in the zone for enhancing the income from the existing systems (Fig. 1). At the end of 2 years of study, available soil N was higher (300 kg/ha) under green manure-rice-

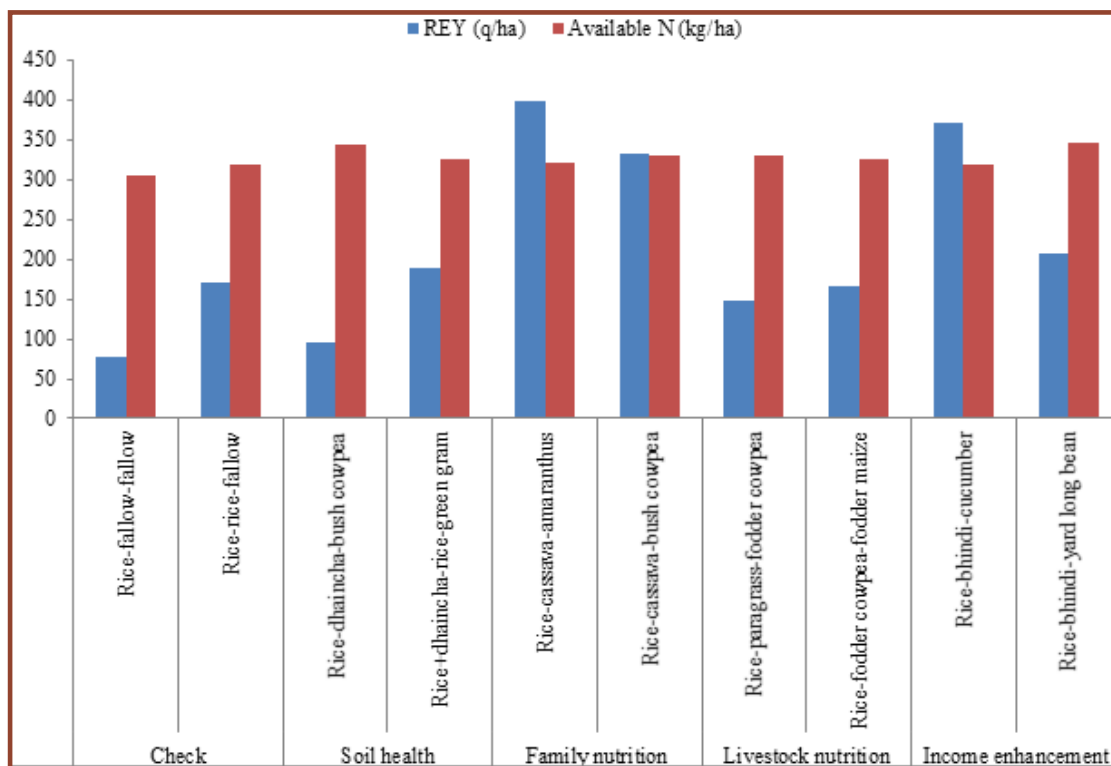
frenchbean-green gram (Fig. 1) indicating this system could be the best cropping system for intermittent rotation with income enhancement systems to maintain the soil health.

Rice-groundnut-green gram system recorded productivity of 124.5 q/ha and allocation of 0.24 ha to this system will ensure sufficient production of cereals (rice), pulses (green gram) and oil seeds (groundnut oil) required for 5 member family household for meeting the family nutrition. Similarly, results indicate that rice-oat (fodder)-cowpea (fodder) recorded higher yield and allocation of 0.15 ha to this system will ensure green fodder availability for two desi cows nutrition in the farming systems. Out of 1 ha area remaining area (after allocating the area for family and livestock nutrition) can be allocated to scented rice-sweet corn-bitter gourd for income generation (Net returns of Rs. 140570.3/ha).



Karamana (Kerala): Cropping systems like rice-dhaincha-bush cowpea and rice+dhaincha-rice-green gram as soil health improver, rice-cassava-amaranthus and rice-cassava-bush cowpea for family nutrition, rice-paragrass-fodder cowpea and rice-fodder cowpea-fodder maize as source of green fodder, and rice-bhindi-cucumber and rice-bhindi-yard long bean for improvement of farm income were evaluated at Karamana. Out of different systems tested, rice-cassava-amaranthus registered highest productivity as compared to the remaining cropping systems. The system recorded REY of 397.8 q/ha (Fig). As far as productivity is concerned, rice-bhindi-cucumber (REY 372.2 q/ha) and rice-cassava-bush cowpea (REY 333.3 q/ha) were found next best alternative as compared to the previous one. In this

experiment, available soil N status after completion of two years of study was found higher (347 kg/ha) under rice-bhindi-yard long bean system as against other systems (Fig. 1). So this system can be used as soil builder system in the farming system. Similarly for meeting round the year cereals (rice) demand for a 5 member family an area of 0.12 ha can be allotted to Rice-cassava-bush cowpea system. Likewise, an acreage of 0.15 ha can be utilized for green fodder production for meeting the round the year green fodder requirement of two desi cows. The rest of the area, after allocating the area for family and livestock nutrition, can be allocated to the income enhancing systems such as Rice-bhindi-cucumber (Net income Rs. 319146.6/ha).



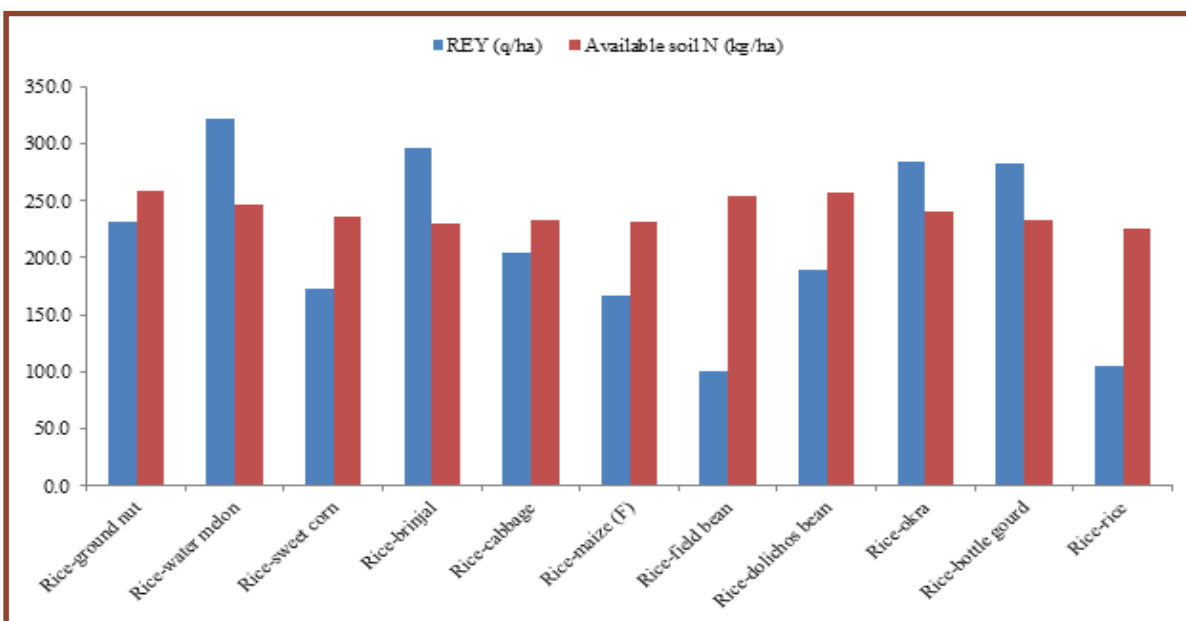
Karjat (Maharashtra): The cropping system rice-ground nut, rice-water melon, rice-sweet corn, rice-brinjal, rice-cabbage, rice-maize (F), rice-field bean, rice-dolichos bean, rice-okra, rice-bottle gourd and rice-rice were tested at Karjat. Out of examined systems, rice-water melon and rice-okra recorded highest REY (321.3 and 283.6 q/ha, respectively) as

compared to other cropping systems Fig. Therefore, these systems can be added or replaced with existing pre-dominant cropping system in the zone for enhancing productivity. At the end of 2 years of study, available soil N was higher (259.2 kg/ha) under rice-ground nut system (Fig. 1) indicating that this system could be the best cropping system for

intermittent rotation with income enhancement systems to maintain the soil health.

Rice-field bean system recorded productivity of 179.3 q/ha and allocation of around 0.18 ha area to this system can ensure sufficient production of cereals (rice) and pulses (field bean) for a 5 member family household. Similarly, allocation of 0.10 ha area to rice-groundnut system might prove sufficient

for meeting oilseed as well as cereal need of the 5 member family. For round the year green fodder supply for two desi cows an area of 0.17 ha area can be given. The rest area out of 1 ha, the remaining area (after allocating the area for family and livestock nutrition) can be allocated to Rice-water melon and Rice-bottle gourd systems for enhancement of net income.



Navsari (Gujrat): In Navsari, ten cropping systems with different objectives such as (family nutrition (paddy-green gram-pearl millet, paddy-sunhemp-green gram), livestock nutrition (paddy-lucerne (F)-lucerne continuous, paddy-sugar beet (F)-maize+copea (F), maintaining soil health (paddy-linseed-maize, paddy-Indian bean-sesamum) and income enhancement for family (paddy-cabbage-bottle gourd, paddy-fenugreek-cluster bean) were compared with predominant cropping systems. At centre, highest REY of 360.8 q/ha was noticed with paddy-cabbage-bottle gourd followed by paddy-fenugreek-cluster bean (REY 306.9 q/ha) fig. Therefore, this system can be used as a replacement

of the existing systems especially for increasing of the production per unit area of land. The cropping systems paddy-sunhemp-green gram recorded the highest available N content (224 kg/ha) over other systems after two years of study (Fig. 1).

Similarly for nutritional requirement of a five member family, paddy-Indian bean-sesamum system can give an area of 0.17 ha. Similarly for meeting nutrition requirement of two desi cows, an area of 0.12 ha can cultivated with Paddy-sugar beat (F)-maize+copea (F) system. Among cropping systems, highest net returns of Rs. 467333/ha has been found with Paddy-cabbage-bottle gourd so this can be used as a medium for enhancing farm income.

Summary

Recommended area allocation under 1 ha farming system model having 5 family members and 2 desi cows:

Across different ecosystems, approximate area to be taken for meeting different purposes of farming system such as family nutrition, livestock nutrition and income generation etc. have been worked out. For all ecosystems, an area of 0.05 ha has been taken for dairy unit with two desi cows (average body weight of around 250 kg). For arid ecosystem, approximately 0.26, 0.11 and 0.32 ha area, respectively can be

taken up for meeting family nutrition, livestock nutrition and income generation objects. Likewise, in semiarid ecosystem, around 0.25, 0.12 and 0.37 ha land area in a 1 ha farming system prototype model can be taken up for meeting the family nutrition, livestock nutrition and income generation objectives, respectively. For sub-humid ecosystem, around 0.15, 0.12 and 0.54 ha area allocation might prove sufficient for completion of said objectives. For the coastal ecosystem, 0.18, 0.14 and 0.45 ha land area should be given for meeting family nutrition, livestock nutrition and income generation purpose in a 1 ha prototype farming system model.

Location	Family nutrition		Livestock nutrition		Income enhancement		Soil health for rotation
	System	Area (ha)	System	Area (ha)	System	Area (ha)	System
Arid							
S K Nagar (Gujrat)	green gram-fennel+cauliflower-Fennel (conti.)	0.26	fodder sorghum-lucerne	0.11	bt cotton-wheat-fodder sorghum	0.32	Groundnut-wheat+lucerne-green gram
Mean		0.26		0.11		0.32	
Semi Arid							
Ludhiana (Punjab)	Maize-potato-spring groundnut	0.10	maize-cowpea + maize-sathi maize	0.08	Maize-pea-spring groundnut	0.67	maize-cowpea + maize-sathi maize
Parbhani (Maharashtra)	Sorghum-chickpea-sesamum	0.40	Maize-oat-sorghum	0.15	Cluster bean-carrot-coriander	0.20	Soybean + sunhemp (GM)-sorghum-green gram
Coimbatore (Tamil nadu)	Gingelly-bengal gram-ragi	0.31	Maize +cowpea-Cummu +cowpea -Cummu +cowpea	0.10	maize-chillies-radish	0.23	maize-bengal gram-cowpea
Rajendernagar (Telangana)	pigeon pea+groundnut-ragi	0.24	Fodder maize-lucerne	0.15	Okra-mari-gold-beetroot	0.32	pigeon pea + green gram-sesame
Kanpur (Uttar Pradesh)	Hybrid maize-chickpea+mustard-green gram	0.22	Maize+cowpea (F)-berseem+gobhi sarson-sweet sorghum	0.10	Maize (cob)-potato+mustard-okra	0.41	Black gram-chickpea+mustard-green gram
Mean		0.25		0.12			0.37
Sub-humid ecosystem							
Ayodhya (Uttar Pradesh)	rice-mustard-green gram	0.14	Pearlmillet-berseem-sudan chari	0.10	Maize (cob)-cauliflower-okra	0.57	Greengram-gram-cowpea

Location	Family nutrition		Livestock nutrition		Income enhancement		Soil health for rotation
	System	Area (ha)	System	Area (ha)	System	Area (ha)	System
Rewa (Madhya Pradesh)	Rice- pea+ mustard-sunhemp	0.12	Rice-barley-bajra	0.10	Rice-garlic	0.61	Rice-gram+mustard-sunhemp
Chiplima (Odisha)	Rice-groundnut-green gram	0.21	rice-oat-cowpea (fodder)	0.15	Scented rice-sweet corn - bitter gourd	0.38	GM-Rice-french-bean-green gram
Sabour (Bihar)	Rice-potato+radish-mungbean	0.11	Rice-ber-eem-maize+cow-pea	0.14	rice-cabbage+coriander-sesamum	0.59	Rice-maize-cow-pea
Mean		0.15		0.12		0.54	
Coastal ecosystem							
Bhubaneswar (Odisha)	Rice-groundnut-green gram	0.24	rice-oat (fodder)-cowpea (fodder)	0.16	scented rice-sweet corn-bitter gourd	0.31	Green manure-rice-french-bean-green gram
Karamana (Kerala)	Rice-cassava-bush cowpea	0.12	Rice-fodder cow-pea-fodder maize	0.15	Rice-bhindi-cucumber	0.56	Rice-dhaincha-bush cowpea
Navsari (Gujrat)	paddy-Indian bean-sesamum	0.17	Paddy-sugar beat (F)-maize+cowpea (F) system	0.12	Paddy-cabbage-bottle gourd	0.49	paddy-sunhemp-green gram
Mean		0.18		0.14		0.45	

7.3 : Organic Agriculture on weed management

Title of the experiment: Evaluation of weed management practices under organic production system

Objectives

- To evaluate the cultural and mechanical weed management practices under organic production system.
- To study the efficacy of non-conventional approaches of weed management using oil cakes under organic production system.
- To find out the economically viable and practically applicable alternative to hand weeding for organic weed management in different cropping systems.

Year of start: 2016-17

Treatments

T₁: Hand Weeding

T₂: One mechanical weeding + One hand weeding

T₃: Intercropping with pulses/green manure (location and crop specific intercropping)

T₄: Stale seed bed + reduced spacing (up to 25%) + mulching with previous crop residues + one hand weeding

T₅: Locally available weed mulch (water hyacinth/ lantana etc.) + one hand pulling

T₆: Incorporation of any one of castor/mahua/ mustard seed meal/neem cake/karanj/tumbha cake/ sal de oil cake 15 days before planting/sowing @ 5 t/ ha + one hand weeding

T₇: Soil solarization with 8-25 microns polythene mulch during summer + one HW (optional to centres)

T₈: ITK treatment on weed control practiced by farmers (like mulching with leaf of mango/ jackfruit etc.)

Jammu

At Jammu centre, in rice-potato-onion/french bean

system, the highest yield of rice (2.87 t ha⁻¹) and potato (12.14 t ha⁻¹) was recorded under the treatment T₃ and T₆ during kharif and rabi seasons, respectively. During summer season onion was replaced by french bean and the highest yield (3.51 t ha⁻¹) was also recorded under treatment T₆. However, as the yield performances of treatments over the years are concerned, the mean yield for rice, potato and french bean were highest under T₂, T₆ and T₂ during kharif, rabi and summer seasons with the yield level of 2.74 t ha⁻¹, 10.45 t ha⁻¹, and 1.18 t ha⁻¹, respectively.

Jorhat

At Jorhat, in rice-toria-rice system, highest grain yield of rice was recorded under T₃ at 3.60 t ha⁻¹. During rabi season highest yield of toria was recorded under T₃ at 0.87 t ha⁻¹. However, during summer season, highest grain yield of rice was recorded under T₄ at 2.70 t ha⁻¹. In kharif season, the yield of rice was also almost at par among T₁ and T₂, T₅ and T₆ while in rabi season the yield of toria was also recorded almost equal under T₁, T₂ and T₄ followed by T₅ and T₆. The yield of rice during summer season was also almost at par under all the treatments except T₄ which proved better compared to all the treatments under study.

Kalyani

At Kalyani, in paddy-potato-okra crop sequence, highest grain yield of paddy (1.96 t ha⁻¹) was recorded under T₁ while highest potato (15.01 t ha⁻¹) and okra (1.98 t ha⁻¹) yield was recorded under T₇. However, the yield performance of treatments over the years were also highest under T₁, T₇ and T₇ during kharif, rabi and summer seasons, respectively.

Rewa

At Rewa, in rice-wheat+mustard-fallow system the highest yield of rice (3.64 t ha⁻¹) was recorded under T₁ followed by 3.59 t ha⁻¹ under T₇. During rabi season the highest yield of wheat (7.45 t ha⁻¹) was recorded under T₆ followed by 5.25 t ha⁻¹ under T₁. However, the mean yield performances of treatments for rice (3.53 t ha⁻¹) and wheat (3.80 t ha⁻¹) were highest under T₇ during kharif and rabi seasons, respectively.

Kumarganj

In rice-potato-okra crop sequence at Kumarganj, the highest yield of all the three crops in the sequence was recorded highest at 3.39 t ha⁻¹, 18.08 t ha⁻¹ and 6.86 t ha⁻¹, respectively under the treatment T₄ followed by T₁ where the yields were recorded at 3.18 t ha⁻¹, 16.67 t ha⁻¹ and 6.41 t ha⁻¹ for rice, potato and okra, respectively.

Parbhani

At Parbhani, in soybean-chickpea-fallow system, highest yield of soybean (2.54 t ha⁻¹) and chickpea (2.77 t ha⁻¹) was recorded under the treatment T₄ and T₃ respectively followed by T₁ (2.37 t ha⁻¹) and T₄ (2.58 t ha⁻¹) for both the crops, respectively. However, the yield of soybean and chickpea was almost at par under the treatments T₆ and T₇.

Maruteru

At Maruteru, in rice-rice system the highest yield of 3.68 t ha⁻¹ and 3.59 t ha⁻¹ were recorded under T₃ during kharif and rabi seasons, respectively, followed by 3.61 t ha⁻¹ and 3.41 t ha⁻¹ under T₅ in both the crop seasons. The yield under T₁ and T₂, T₄ and T₆ was almost at par. Mean yield over the years were found highest under T₇ and T₁.

Rahuri

At Rahuri, in soybean-wheat crop sequence, the highest yield of soybean (2.92 t ha⁻¹) and wheat (3.97 t ha⁻¹) were recorded under T₇ followed by 2.63 t ha⁻¹ and 3.85 t ha⁻¹ under T₄ for both the crops, respectively during kharif and rabi seasons. Lowest yields for soybean and wheat were recorded under T₃ with 1.52 t ha⁻¹ and 2.74 t ha⁻¹, respectively.

Table: Effect of weed management practices on crop yields (kg/ha) under different organic production systems (2017-18).

Treatment	Crop season	Jammu	Jorhat	Kalyani	Rewa
		Rice-Potato-Onion / Frenchbean	Rice-Toria-Rice	Paddy-Potato-Okra	Rice-Wheat+Mustard*-Fallow
T ₁	Kharif	2699	2526	1962	3645
	Rabi	10414	660	13177	5248
	Summer	3152	2600	1777	-
T ₂	Kharif	2860	2515	1634	2900
	Rabi	11372	695	10035	4331
	Summer	3403	2550	1627	-
T ₃	Kharif	2876	3597	1766	3384
	Rabi	11653	875	5400	2082+1349*
	Summer	3424	2650	421	-
T ₄	Kharif	2215	2671	1725	3119
	Rabi	11770	663	9816	3998
	Summer	3331	2700	205	-
T ₅	Kharif	2691	2299	1710	3041
	Rabi	9847	558	9435	4248
	Summer	2800	2575	857	-
T ₆	Kharif	2827	2365	1641	3319
	Rabi	12143	548	10509	7447
	Summer	3510	2600	807	-

Treatment	Crop season	Jammu	Jorhat	Kalyani	Rewa
		Rice-Potato-Onion / Frenchbean	Rice-Toria-Rice	Paddy-Potato-Okra	Rice-Wheat+Mustard*-Fallow
T ₇	Kharif	2729	2009	1345	3592
	Rabi	10239	374	15011	4081
	Summer	3073	2425	1978	-
T ₈	Kharif	1818	0	1286	1835
	Rabi	4104	0	6945	0
	Summer	1097	0	1088	-

Continue.....

Treatment	Crop season	Kumarganj	Prabhani	Maruteru	Rahuri
		Rice-Potato-Okra	Soybean-Chickpea-Fallow	Rice-Rice	Soyabean-Wheat
T ₁	Kharif	3180	2370	3240	2222
	Rabi	16670	2390	3367	3663
	Summer	6410	-	-	-
T ₂	Kharif	3020	1970	3267	1935
	Rabi	16520	2270	3353	3484
	Summer	6225	-	-	-
T ₃	Kharif	2460	2200	3680	1521
	Rabi	14050	2771	3587	2740
	Summer	4240	-	-	-
T ₄	Kharif	3390	2541	3140	2629
	Rabi	18080	2580	3107	3853
	Summer	6860	-	-	-
T ₅	Kharif	2598	1360	3613	1738
	Rabi	14500	2110	3407	3108
	Summer	5460	-	-	-
T ₆	Kharif	2756	2150	3160	2299
	Rabi	14980	2475	3147	3648
	Summer	5885	-	-	-
T ₇	Kharif	2290	2180	3407	2919
	Rabi	13900	2480	2957	3972
	Summer	3780	-	-	-
T ₈	Kharif	0	1250	0	1719
	Rabi	0	1750	0	2847
	Summer	0	-	0	-

7.4 ON FARM RESEARCH

7.4.1 On-farm crop response to application of nutrients

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 predominant cropping systems in different agro-ecosystem under farmers field condition.

Year of start: 1999-2000, Treatments are modified in 2010-211.

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), Medak (Telangana)	48
Rice-wheat	Patiala (Punjab), Udham singh nagar (Uttarakhand), Annupur(M.P), East singh bhum (Jharkhand), Faizabad & Kanpur Dehat (U.P), Samba (J.K.), Fethabad (Haryana), Nalnda (Bihar)	212
Rice-Gram	Kanker (C.G.), keonjhar (Oridhsa)	36
Rice-mustard	Nadia (W. B.), Golpara (Assam)	
Rice-maize	Vizianagaram (A.P)	12
Rice-Horse Gram	Ratanagiri (M.H.)	10
Maize-Wheat	Udipur (Rajasthan), Bilashpur (H.P)	48
Maize-chick pea	Devgadh (Gujarat), keonjhar (Oridhsa)	36
Maize-maize	Yethapur (Tamil Nadu)	12
Maize-French bean	Chikkaballapura (K.A.)	12
Soybean-maize	Dharwad (K.A.)	12
Soybean-gram	Dharwad (K.A.)	12
Pearlmillet-mustard	Dausa (R. J.)	24
Pearl Millet-Wheat	Padegaon (M.H.)	24
Sorghum-wheat	Adiya (Gujarat)	24
Finger Millet- Tomato	Kolar (K.A.)	12
Groundnut--Finger Millet	Yethapur (Tamil Nadu)	12
Total		546

Results: The centre-wise details of varieties, 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 48 trial conducted at 2 locations comprising of two NARP zones and it covers Kerala and Telngana. Application of micronutrient show very positive response at Medak (Telgana) but on other at vellyani centre (Kerala) its show

negligible or even negative contribution over RDF. However, application of recommended dose of fertilizer recorded higher yield over the control at both centre range of 136% to 274% and highest yield gap 3854 & 3677 kg ha⁻¹ recorded at Southern Zone - Vellayani of Kerala in kharif & rabi season, with highest percentage increase 274 & 287% respectively. Zinc application recorded good response at Medak (Telana), it was found that mean yield gap of 412 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 867 kg ha⁻¹ is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient.

Rice-wheat: A total 212 trial conducted at 9 locations comprising of 8 NARP zones. Under this total eight states covered which are Punjab, Uttarakhand, Jharkhand, Madhya Pradesh, Uttar Pradesh, Jammu Kashmir, Haryana and Bihar.

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 recorded in rice at (Annupur) of MP which was 23.8% and in case of wheat 15.5% at (Fatehabad). Similar trend was observed in case of recommended dose of fertilizer it recorded higher yield over the control at all the 9 locations within range of 66 to 303% in case of rice and 86 to 349% in case of wheat. Highest yield gap 3207 kg ha⁻¹ in rice recorded at Central Plain Zone - (Kanpur) Uttar Pradesh and 3601 kg ha⁻¹ in wheat were recorded at (Fatehabad) of Haryana and highest percentage increase in yield 303 in case of rice and 349% in case of wheat were recorded at Ayodhya and Fatehabad centre respectively. There were huge yield gap recorded in recommended NPK application and farmer practices under both crop at Annupur of Madhya Pradesh, In case of rice application of 120:60:40 Kg NPK ha⁻¹ gave additional yield of 934 kg ha⁻¹ over farmer practice and in wheat application of 120:60:40 Kg NPK ha⁻¹ gave additional yield of (1321 kg ha⁻¹). Application of 25 kg ha⁻¹ of ZnSO₄ in both season gave additional yield 916 kg and 446 kg ha⁻¹ in

case or rice and wheat at Annupur. Total additional yield of 1850 and 1768 kg ha⁻¹ can be obtained from rice and wheat by application of RF along with micronutrient which were contribute 63.5 and 63% higher in yield over the farmers practice. At Central Plain Zone (Patiala) of Punjab it was observed that in this zone farmer already using high dose of NPK so there was lower yield recorded at recommended NPK (-667 and -127 kg ha⁻¹) but with application of micronutrient it was recorded higher yield of (44 and 43.8 kg ha⁻¹) over farmer practices, so farmer in this area by including micronutrient with RDF they can get higher instead of spending money on NPK only. Farmers should encourage for balance fertilizer application. It was observed that in Uttar Pradesh at Ayodha and Kanpur significantly higher yield recorded (1705 kg and 2215 kg ha⁻¹) over farmer practices with application of recommended dose of NPK and NPK+MN. In rice-wheat system, across the NARP zones, it was found that mean yield gap of 1142 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 665 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. In Chhattisgarh plain zone (Kanker) of Chhattisgarh, 24 trials were conducted and it was found that significantly higher additional yield of 1071 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 200 kg ha⁻¹ due to application of 20:50:20: Kg NPK ha⁻¹. Application of zinc as micronutrient in rice gave 21.5 per cent additional yield than recommended NPK. At keonjhar of Odisha 438 & 477 kg ha⁻¹ yield increase was recorded over farmer's practices with RDF which can be further increase to 690 & 518 kg ha⁻¹ by addition of micronutrient. In rice-green gram system, across the NARP zones, it was found that mean yield gap of 969 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 270 kg ha⁻¹ is possible through application of

required quantity of micronutrient to the system in addition to recommended level of NPK nutrient.

Rice- mustard: A total 48 trials were conducted in 2 NARP zones. In New Alluvial Zone (Mohanpur) of West Bengal, 24 trials were conducted and it was found that significantly higher additional yield of 236 kg ha⁻¹ can be obtained from rice through application of 80:40:40 Kg NPK + 20 kg zinc ha⁻¹. In mustard, the additional yield over farmer practice was found to be 92 kg ha⁻¹ due to application of 80:40:40: Kg NPK ha⁻¹. At Golpara of Assam 2082 & 225 kg ha⁻¹ yield increase was recorded over farmer's practices with RDF which can be further increase to 2504 & 335 kg ha⁻¹ by addition of micronutrient. In rice-mustard system, across the NARP zones, it was found that mean yield gap of 1250 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 351 kg ha⁻¹ is possible through application of required quantity of micronutrient to the system in addition to recommended level of NPK nutrient.

Rice-horse gram: A total of 24 trials were conducted in South Konkan Coastal Zone (Ratanagiri) of Maharashtra. Recommended NPK (100:50:50: Kg ha⁻¹) to rice recorded significantly higher grain yield (428 kg ha⁻¹) than farmer practices, and in case of horse gram higher yield of 164 kg ha⁻¹ recorded due to application of 25:50:50: Kg ha⁻¹ NPK which was 12.6 and 37.7% higher than farmer practices, respectively.

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 2896 kg ha⁻¹ and 702 kg ha⁻¹ over the control and farmer practice respectively which were 109 and 9% 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 4480 kg ha⁻¹ and 1140 kg ha⁻¹ over the control and farmer practice respectively which were 173 and 19.2% higher over the control and farmer practice respectively.

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 434 and 278 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 68.5 and 74.9% 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 211 and 245 kg ha⁻¹ which was 16.1 and 32.5% higher than NPK alone. It was observed that farmer's practices of nutrient management resulted in lower yield (2061 and 2645 kg ha⁻¹) of maize and wheat compared to application of recommended quantity of NPK and NPK+ Mn.

Maize-maize: A total 12 trials were conducted in 1 NARP zones. In North western Zone Yethapur (Yethapur) of Tamil Nadu, yield difference of system between farmers and recommended NPK practices were found to be 1194 kg ha⁻¹. Yield gap can be further enhancing to 1623 kg ha⁻¹ by addition of micronutrient.

Maize-chickpea: A total 36 trials were conducted in 2 NARP zones. In Middle Gujarat Zone (Devgadh Baria) of Gujarat, yield difference between farmers and recommended NPK practices were found to be 250 kg ha⁻¹ in Maize and 139 kg ha⁻¹ in gram. On other side at keonjhar (Odessa) yield difference between farmers and recommended NPK practices were found too high 1294 kg ha⁻¹ in Maize and 433 kg ha⁻¹ in gram. In keonjhar (Odessa) recommended NPK recorded 3124 kg ha⁻¹ in Maize and 631 kg ha⁻¹ in gram over control which was 157% high in both crops.

Maize-French bean: Total 12 trials were conducted in Eastern Dry Zone (Chikkaballapura) of Karnataka. There were huge yield gap in recommended NPK application and farmer practices under both crop, In case of maize application of 150:75:40 Kg NPK ha⁻¹

gave additional yield of 1875 kg ha⁻¹ and 167 kg ha⁻¹ over the control and farmer practice respectively which were 60.8 and 3.4% higher over the control and farmer practice respectively. In case of French bean application of 62.5:100:75 Kg NPK ha⁻¹ gave additional yield of 2283 kg ha⁻¹ and -2 kg ha⁻¹ over the control and farmer practice respectively which were 158.2 and -0.1% higher over the control and farmer practice respectively. Negative yield or per cent improvement recorded because farmers are applying high fertilizers (125:85:39) than RDF. Farmers applying almost double of nitrogen. It was recorded that use of Trichoderma help enhance the yield over farmer practices (12.6%). So it is better that farmers should encourage for balance use of fertilizers along with pest management strategies.

Soybean-maize: A total 12 trials were conducted in Northern Transition Zone (Dharwad) of Maharashtra, It was observed that farmer's practices of nutrient management resulted in lower yield (241 and 38 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 203 kg ha⁻¹ in soybean and 537 kg ha⁻¹ in maize.

Soybean-gram: A total 12 trials were conducted in Western Vidarbha Zone (Amravati) of Maharashtra, It was observed that there was huge yield gap between farmer's practices and recommended nutrient application and which gave (additional yield of 585 and 358 kg ha⁻¹) in soybean and bengal gram respectively as compared to farmer practices. Which were 36.8 and 34.9% higher yield than farmer practices in soybean bengal gram respectively.

Pearl millet-mustard: In case of pearl millet-mustard system at Semi Arid Eastern Plain Zone (Dausa) Rajasthan there is slight improvement in yield was recorded with the application of RDF over the farmer practice in pear millet (18%) but huge improvement in case of mustard (50%) further application of micronutrient enhance the yield up to (40%) and (57%) respectively.

Pearl millet-wheat: In case of pearl millet-wheat system at Scarcity Zone-Satara (Padegaon) Maharashtra there is significant improvement in yield was recorded with the application of RDF over the farmer practice in pear millet (24%) and wheat (26%) further application of micronutrient enhance the yield up to (34%) and (29%) respectively.

Sorghum-wheat: In case of Sorghum-wheat system at North West Agro climatic Zone (Adiya) Gujarat a total 23 trials were conducted and like other arid or semi-arid climatic zones there is slight improvement in yield was recorded with the application of RDF over the farmer practice in Sorghum (16%) and wheat (14%) further application of micronutrient enhance the yield up to (21%) and (22%) respectively.

Finger Millet- Tomato: In case of Finger Millet-Tomato system at Eastern Dry Zone (Chikkaballapura) Karnatka a total 12 trials were conducted slight improvement in yield was recorded with the application of RDF over the farmer practice in Finger Millet (5.4%) farmers are using high dose of fertilizers but not in balanced way that's why they recorded lower yield in case of tomato negative yield recorded (-6.5%) because farmer are using high amount of fertilizers (190:317:284) over the RDF (250:250:250). It was recorded that use of Trichoderma help enhance the yield over farmer practices (9.8%). So it is better that farmers should encourage for balance use of fertilizers along with pest management strategies.

Groundnut-Finger millet: In case of Groundnut-Finger Millet system at North western Zone Yethapur (Yethapur) Tamil Nadu a total 12 trials were conducted and like other arid or semi-arid climatic zones there is slight improvement in yield was recorded with the application of RDF over the farmer practice in Groundnut (11%) and Finger Millet (5%) further application of micronutrient enhance the yield up to (20%) and (20%) respectively.

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

- Across the various NARP zones and cropping systems, farmer's package resulted in lower yield compared to recommended package.
- On-farmsystemyieldgapbetweenrecommended dose of N P₂O₅ K₂O + micronutrient and farmer's package was found to be 388, 1812, 1601, 2645 and 1469 kg ha⁻¹ in rice- rice, rice- wheat, rice-mustard, maize-wheat and maize-chickpea systems respectively.
- Application of micronutrients based on soil test resulted in additional yield of 123, 665, 351, 584 and 411 kg ha⁻¹ in rice- rice, rice- wheat, rice-mustard, maize-wheat and maize-chickpea systems respectively.
- In all the NARP zones and systems, application of recommended N P₂O₅ K₂O alone or N P₂O₅ K₂O + micronutrient resulted in higher yield and use efficiency of nutrients. Suboptimal application in terms of number and quantity resulted in significantly lower yield and use efficiency of nutrients especially nitrogen.
- At few center like Vellayani (Kerala) rice-rice, Patiala (Punjab) rice-wheat, Chikkaballapura (Karnatka) in tomato and French bean 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.

Table-7.4.1 : Yield potential of different cropping systems under researcher and farmer managed conditions - Year 2017
Report for Grain Yield - Year 2017

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/	Initial Soil Status					Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield- gap 4(kg/ha)				
			Recom- mended Fertilizer Dose/ Micro. Dose/	pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.			
					(%)	(kg/ha)	(kg/ha)	(kg/ha)												vs	vs	vs	vs			
																				Con- trol	RF	FP	FP			
Rice-rice																										
Kerala	Southern Zone - Vellayani/	Not Avail- able	Uma/	4.6	2	446	35	148	1405	1812	3300	2889	5259	5189	5196	152	108	212	14.73	3854	-70	63	-7			
	90- 45 -45 /																									
	ZnSO4 (20)																									
	140- 60- 115																									
Kerala	Southern Zone - Vellayani/	Not Avail- able	Uma/	--	--	--	--	-	1278	1868	3212	2527	4955	4815	4899	120	85	167	12.38	3677	-140	56	-84			
	90- 45 -45 /																									
	0																									
	144- 70- 115																									

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)												Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield- gap 4(kg/ ha)							
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK +	F. Pract.	SE (d)	SE (M)	CD	CV											
																								(kg/ ha)	(kg/ ha)	(kg/ ha)				
																											Con- trol	RF	RF + Mic. Nut.	RF
				(%)	(kg/ ha)	(kg/ ha)	(kg/ ha)												vs	vs	vs	vs	Con- trol	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	
Telanga- na	Southern Zone - Vellayani/ Medak/ 24	Not Avail- able	MTU1010						2292	3338	3793	4335	5413	5807	5134										3121	394	279	673		
	120-60- 40- / ZnSO4(50)																													
Telanga- na	Southern Zone - Vellayani/ Medak/ 24	Not Avail- able	MTU1010	--	--	--	--	-	1658	2339	3435	3250	5209	5270	5076										3551	61	133	194		
	120-60- 40 / 50																													
Punjab	Central Plain Zone III/ Patia- la-PB/ 24	Not Avail- able	PR-126/ 120- 30 -30 / ZnSO4(25) 150-3.7-0	7.7	0.4	250	31	142	3175	3856	4473	4978	5258	5969	5925										2083	710	-667	44		
Punjab	Central Plain Zone III/ Patia- la-PB/ 24	Not Avail- able	PBW725 120- 30 -30 / MnSo4(5)	--	--	--	--	-	1590	1825	2654	2689	2951	3123	3079										1361.8	171.2	-127.4	43.8		

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)												Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield- gap 4(kg/ ha)			
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK +	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	
																				(%)	(kg/ ha)	(kg/ ha)	(kg/ ha)	vs	vs	vs
Uttara- khand	Bhabar and Tarai Zone - Pantna- gar/ Udham singh nagar/ 24	Allu- vial	150-60-0	6.3	0.7	275	18	170	3068	3692	5014	4520	5727	5888	4941						2659	161	786	947		
			HKR 27																							
			150- 60- 40/																							
Uttara- khand	Bhabar and Tarai Zone - Pantna- gar/ Udham singh nagar/ 24	Allu- vial	HD 2967/	6.3	0.7	275	18	170	2711	3461	4299	3961	5058	5280	4476						2346.7	221.9	581.6	803.5		
			150- 60- 40/																							
Uttar Pradesh	Eastern plain zone Ayo- dha-UP/ 20	Not Avail- able	NDRE- 3112-1						836.8	2239.4	3000.5	2556.5	3376.1	3595.2	2756.9	--	--	--	--	2539	219	619	838			
			150- 60 -60 /																							
			ZnSO4(25)																							
			129- 36-0 (9.1)																							

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)												Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Con- trol	N	NP	NK	NPK	NPK +	M. Nut.	F. Pract.	SE (d)	SE (M)	CD					CV																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
Uttar Pradesh	Eastern plain zone	Not Avail-able	PBW-17																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

State	NARP Zone/	Soil Type	Variety/	Initial Soil Status					Yield(kg/ha)												Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)
	Center/		Recom- mended	FP(Fert. Dose)	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	
	No. of Trials		Fertilizer Dose/	Micro. Dose/	(%)	(kg/ha)	(kg/ha)	(kg/ha)		+ M. Nut.								-5%		vs	vs	vs	vs	
Bihar		Not Avail- able	Super Moti	--	--	--	-	2067.4	3169.4	4086.1	3566.9	4547.7	4718.8	3894.2	--	--	--	--	--	2480	171	654	825	
	Nalnda		100- 40 -20 /																					
	24		ZnSO4(25)																					
			50- 23-0 (0)																					
Bihar		Not Avail- able	Lok-1	--	--	--	-	2241.2	3887.9	4895.8	4566.6	5212.7	5551.3	4859.9	--	--	--	--	2971.5	338.5	352.8	691.3		
	Nalnda		120- 60 -40 /																					
	24		ZnSO4(25)																					
			60- 23-0 (0)																					
Jharkhand	Central and North Eastern Plateau Zone	Not Avail- able	Naveen	--	--	--	-	1065	2000	2432	2140	2954	3274	2250	--	--	--	--	--	1889	320	705	1025	
	East Sing- hbhum		100- 50 -25 /																					
	24		ZnSO4(5)																					
			60- 30-0 (0)																					

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/	Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
			Recom- mended Fertilizer Dose/ Micro, Dose/	FP(Fert. Dose)	pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK +	M. Nut.	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/	Initial Soil Status				Yield(kg/ha)												Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield- gap 4(kg/ ha)				
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	Yield gap 3(kg/ ha)	Yield- gap 4(kg/ ha)		
																										(+)	M. Nut.
Harya- na	Fatehabad 24	Not Avail- able	PB-1121 150- 60 -60 / ZnSO4(5) 150-60-0 (0)						1922.9	4130.4	4409.6	4261.3	4671.7	5089.3	4358.1	--	--	--	2749	418	314	731					
Harya- na	Fatehabad 24	Not Avail- able	WH-2967 150- 60 -30/ ZnSO4(0) 150-0-0 (0)						1033.0	3350.8	4289.2	4077.1	4634.2	5352.9	4658.3	--	--	--	3601.2	718.8	-24.2	694.6					
Madhy Pradesh	Annupur 24	Not Avail- able	MTU1010 120- 60 -40 / ZnSO4(25)						2056.1	2315.8	3643.3	3296.4	3847.4	4763.0	2913.0	--	--	--	1791	916	934	1850					

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status						Yield(kg/ha)										Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield- gap 4(kg/ ha)
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.
					(%)	(kg/ ha)	(kg/ ha)	(kg/ ha)										-5%		vs	vs	FP	FP
Madhy Pradesh									1741.0	2713.1	3446.0	3185.3	4127.8	4574.4	2806.6	--	--	--	--	2386.8	446.5	1321.2	1767.8
Rice- Gram																							
Chhat-tisgarh	Chhattis- garh plain zone	Not Avail- able	IGKVR-1	7.3	0.6	2519	12.5	306.5	2495	3670	4224	4086	5257	5447	4376	-	-	-	-	2762	190	882	1071
	Kanker		100- 60- 40/																				
	24		ZnSO4(20)																				
			60- 40-30																				
Chhat-tisgarh	Chhattis- garh plain zone	Not Avail- able	JAKI-9218	7.3	0.6	2519	12.5	306.5	859	1004	1212	1105	1369	1426	1226	-	-	-	-	510	57	143	200
	Kanker		20- 50-20/																				
	24																						
Odisha	Odisha	Not Avail- able	Sahbhagi Dhan						1977	3082	3604	3702	4363	4615	3925	-	-	-	-	2385	253	438	690
	keonjhar		60-30-30/																				
	12		ZnSO4(25)																				

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro, Dose/				Initial Soil Status						Yield(kg/ha)												Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)	
			FP(Fert. Dose)	N	P	K	Con- trol	N	NP	NK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.							
																							pH	OC	(kg/ ha)	(kg/ ha)	(kg/ ha)	+	M. Nut.
Odisha	Odisha	Not Avail- able	NBeG 3			760	1035	852	1411	1452	934	-	-	-	-	864	41	477	518										
	keonjhar		20- 40-20/																										
	12																												
Rice-Mustard																													
West Bengal	New Allu- vial Zone - Mohan- pur/	Allu- vial	Pratik- shya/	0	0	0	0	0	3188	3666	4238	4032	4671	4807	4571	30	21	41	2.49	1483	136	100	236						
	80- 40- 40/																			0	0	0	0						
	ZnSO4(20)																			0	0	0	0						
	35 - 26.25- 65																			0	0	0	0						
West Bengal	New Allu- vial Zone - Mohan- pur/	Allu- vial	Pusa Bullet/	--	--	--	--	-	1097	1319	1515	1475	1643	1677	1551	7	5	10	1.67	546	34	92	126						
	80- 40- 40/																			0	0	0	0						
	Sulphar																			0	0	0	0						
	50- 35 -65																			0	0	0	0						
Assam	Assam	Not Avail- able	Ranjit	--	--	--	--	-	3377	3652	4136	4824	5401	5822	3319	-	-	-	-	2024	422	2082	2504						
	Golpara																												
	24																												

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status						Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)
				pH	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Con- trol	N	NP	NK	NPK	NPK + M. Nutt.	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nutt.	RF	RF + Mic. Nutt.
Assam	Assam	Not Avail- able	TS-67	--	--	--	--	-	720	776	807	834	940	1050	715	-	-	-	-	220	110	225	335
	Golapara		40-35-15/																				
	24																						
Rice-Maize																							
Andhra Pradesh	North Coast- al Zone - Anakapalle/	Red Sandy	MTU1001/	6.8	2.1	214	17	271	2652	3987	4472	4518	5548	5797	5095					2896	250	452	702
	Viziana- garam		80- 60-50/																				
	24		ZnSO4(25)																				
			75- 55-35																				
Andhra Pradesh	North Coast- al Zone - Anakapalle/	Red Sandy	NK 6607/	--	--	--	--	-	2590	4648	5570	5385	7070	7370	5930					4480	300	1140	1439
	Viziana- garam		200 - 80- 80/																				
	24		control																				
			144- 55-55																				
Rice-Horse Gram																							

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status					Yield(kg/ha)										Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)											
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK + M. Nut.	F. Pract.	SE (d)	SE (M)	CD					CV										
Mahar- ashtra	South Konkan Coastal Zone - Vengurla/ Ratanagiri 24	Not Avail- able	Ratnagiri - 4/ 100- 50- 50/ control 70- 12.5-0	0	0	0	0	0	2214	2845	3135	3109	3827	4486	3399	33	23	45	3.47	1613	659	428	1087										
Mahar- ashtra	South Konkan Coastal Zone - Vengurla/ Ratangiri 24	Not Avail- able	Ratnagiri - 4/ 25- 50-50/ control 0- 0-0	--	--	--	--	-	256	428	509	466	599	630	435	5	4	8	3.65	343	31	164	195										
Maize-wheat																																	
Rajast- han	Humid Southern Plain / Dungar- pur/ 24	Clay	DHM-117/ 90- 35 -30 / ZnSO4(25) 70- 20- 0	6.8	0.6	303	19	214	757	1707	2627	2336	3123	3334	1820	0	0	0	0	2366	211	1303	1514										

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)					
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Con- trol	N	NP	NK	NPK	NPK + M. Nut.	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF + Mic. Nut.	RF + Mic. Nut.			
Rajast- han	Humid Southern Plain / Dungar- pur/ 24	Clay	Raj-4079/ 120- 40- 30 / control 70- 15-0	6.8	0.6	303	19	214	1741	2282	2865	2600	3132	3377	2380	0	0	0	0	1391	245	752	997			
Him- achal Pradesh	Sub-moun- tain and low hills sub-tropi- calzone / Bilaspur (H.P.)/ 24	Sub- mon- tane- ous	Hybrid; Kanchan/ 90- 45 -30 / ZnSO4(25 Kg) 76.7-0-0	0	0	0	0	0	1597	2052	2312	2446	2826	3260	1935	0	0	0	0	1229	434	891	1325			
	Him- achal Pradesh		Sub-moun- tain and low hills sub-tropi- calzone / Bilaspur (H.P.)/ 24	Sub- mon- tane- ous	HPW- 368/ 80- 40- 40/ ZnSO4(25 Kg) 72.6-5-2.5	--	--	--	--	-	1631	2219	15103	2657	3116	3394	1941	0	0	0	0	1485	278	1175	1453	
			Sub-moun- tain and low hills sub-tropi- calzone / Bilaspur (H.P.)/ 24		Sub- mon- tane- ous	HPW- 368/ 80- 40- 40/ ZnSO4(25 Kg) 72.6-5-2.5	--	--	--	--	-	1631	2219	15103	2657	3116	3394	1941	0	0	0	0	1485	278	1175	1453
			Sub-moun- tain and low hills sub-tropi- calzone / Bilaspur (H.P.)/ 24			Sub- mon- tane- ous	HPW- 368/ 80- 40- 40/ ZnSO4(25 Kg) 72.6-5-2.5	--	--	--	--	-	1631	2219	15103	2657	3116	3394	1941	0	0	0	0	1485	278	1175
Maize-Maize																										

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)												Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)												
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK +	M. Nut.	F. Pract.	SE(d)	SE (M)	CD					CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	vs	vs	Con- trol	RF	FP	FP	
																																			(%)
Tamil Nadu	North western Zone Yethapur/ Yethapur TN/ 12	Black Soil (Shallo Black)	NK6240/ 250 - 75- 75/ ZnSO4(50) 220 - 50-50	8.1	0.4	219	17	453	2986	4003	5151	4597	5780	5974		5170	185	131	262	8.6	2794	194	610	804											
Tamil Nadu	North western Zone Yethapur/ Yethapur TN/ 12	Black Soil (Shallo Black)	NK6240/ 250 - 75- 75/ ZnSO4(50) 220 - 50-50	--	--	--	--	-	3328	3717	4553	4380	5550	5785		4966	226	160	320	10.98	2222	235	584	819											
Maize-Chick Pea																																			
Gujarat	Middle Gujarat Zone - Anand/ Devgadh Baria / 24	Sandy Loam	GM-6/ 100- 50- 50/ ZnSO4(20) 55- 22.5-0	6.9	0.8	198	20	244	897	1071	1370	1221	1569	1847		1319	0	0	0	0	672	278	250	528											

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro, Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)				
				pH	OC	N	P	K	Con- trol	N	NP	NPK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)
																		vs	vs	FP	FP				

Gujarat	Middle Gujarat Zone - Anand/	Sandy Loam	GJG-3/	--	--	--	--	-	749	852	985	917	1081	1188	942	0	0	0	0	332	107	139	246																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Devgadh Baria /	20 - 40-20 /																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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Odisha	Odisha	Not Avail- able	OMH 14-27	--	--	--	--	-	1991	3346	4067	3790	5115	5434	3821	-	-	-	-	3124	319	1294	1613																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Odisha	Odisha	Not Avail- able	Sushree	--	--	--	--	-	400	650	949	766	1031	1149	598	-	-	-	-	631	118	433	551																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)				
				pH	OC	N	P	K	Con- trol	N	NP	NPK	NPK +	M. Nut.	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.
AEZ 8.2/ Chikka- ballapura 12	Red Sandy	US 440/ 62.5-100- 75 Trichoder- ma	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
Soyabean-Maize																									
Karna- taka	Northern Transition Zone / UAS Dharwad/ 12	Deep Black soil	D.Sb-21/ 40-80-25/ Zinc(12.5) 32-23	0	0	0	0	0	1433	1555	1700	1886	2130	2333	1889	0	0	0	0	697	203	241	444		
Karna- taka	Northern Transition Zone / UAS Dharwad/ 12	Deep Black soil	NK6240 150-65- 25 Zinc sulphate (25) control 0-0-0	--	--	--	--	-	1748	2148	2385	2588	3029	3566	2991	0	0	0	0	1281	537	38	575		
Soyabean-Chick Pea																									

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/				Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ ha)	Yield gap 2(kg/ ha)	Yield gap 3(kg/ ha)	Yield gap 4(kg/ ha)																							
			FP(Fert. Dose)	pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK +	F. Pract.	SE(d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.																						
																										N	P	K	Con- trol	N	NP	NK	NPK	NPK +	F. Pract.	SE(d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.				
																																												(%)	(kg/ ha)	(kg/ ha)	(kg/ ha)
Karna- taka	Northern Transition Zone / UAS Dharwad/ 12	Me- dium Black Soil	D.Sb-21/	0	0	0	0	0	1066	1452	1697	1905	2176	2360	1591	0	0	0	0	1110	184	585	769																								
			0- 0-0/																																												
			control																																												
			09-23-0																																												
Karna- taka	Northern Transition Zone / UAS Dharwad/ 12	Me- dium Black Soil	JAKI 9218/	--	--	--	--	-	729	1029778	1064444	1234222	1382	1592.222	1024.222	0	0	0	0	653	210	358	568																								
			10- 25-0/																																												
			control																																												
			0- 0-0																																												
Pearlmillet-mustard																																															
Rajast- han	Semi Arid Eastern Plain Zone Dausa, Rajast- han/ 24	Allu- vial	SCBH-122	7.447	0459	222442	22.395	226.636	887	963	1085	1083	1080	1279	916	0	0	0	0	194	199	165	363																								
			90-30-25/																																												
			ZnSO4(25)																																												
			70- 10-0																																												

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP/Fert. Dose)	Initial Soil Status						Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.
				(%)	(kg/ha)	(kg/ha)	(kg/ha)	(kg/ha)										-5%		vs	vs	vs	vs
															M. Nut.					Con- trol	RF	FP	FP
Rajasthan	Semi Arid Eastern Plain Zone	Alluvial	NRCDR-2	7.447	0.459	222442	22395	226636	1245	1249	1336	1443	1603	1678	1072	0	0	0	0	358	75	531	607
	Dausa, Rajasthan/		60-40-30/																				
	24		ZnSO ₄ (25)																				
			130-40-0																				
Pearl Millet-Wheat																							
Maharashtra	Scarcity Zone-Satara/	Sandy Clay	Adishakti/	8.3	0.6	170	14	332	1982	2152	2267	2367	2479	2678	1993	0	0	0	0	497	199	486	685
	Padegaon/		50-25-25/																				
	24		NP-K+Zn(25)																				
			25-15-10																				
Maharashtra	Scarcity Zone-Satara/	Sandy Clay	NIAW-1994/	--	--	--	--	-	160284	172098	183681	190210	196799	202289	156686	0	0	0	0	36515	5490	40113	45603
	Padegaon/		120-60-40/																				
	24		NP-K+Zn(25)																				
			80-50-30																				
Sorghum-wheat																							

State	NARP Zone/ Center/ No. of Trials 	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose) 				Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)					
			pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK	F. Pract.	SE (d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.					
																									+	M. Nut.			
																											(kg/ha)	(kg/ha)	(kg/ha)
Gujarat	North West Agro climatic Zone/ Adiya/ 23	Allu- vial	GFS-5 /	7.7	0.3	118	25	303	8955	11435	11945	11770	12589	13118	10808	0	0	0	0	3634	529	1781	2310						
			100- 50- 25/																										
			ZnSO4(20)																										
			55- 20 -0																										
Gujarat	North West Agro climatic Zone/ Adiya/ 23	Allu- vial	GW-496/	--	--	--	--	-	1696	2815	3111	2886	3317	3545	2899	90	64	125	10.59	1621	228	418	646						
			120- 60- 30 /																										
			Znso4(15)																										
			80- 20 -0																										
Finger Millet- Tomato																													
Karna- taka	AEZ 8.2/ Chikka- ballapu- ra-KAR/ 12	Red Sandy	MR-1/	7.1	0.4	152	25	29	2271	3233	3983	3715	4667	5046	4426					2396	379	241	620						
			100- 50- 50/																										
			Zinc(10)																										
			97- 72 -26																										

State	NARP Zone/ Center/ No. of Trials	Soil Type	Variety/ Recom- mended Fertilizer Dose/ Micro. Dose/ FP(Fert. Dose)	Initial Soil Status				Yield(kg/ha)										Yield gap 1(kg/ha)	Yield gap 2(kg/ha)	Yield gap 3(kg/ha)	Yield gap 4(kg/ha)				
				pH	OC	N	P	K	Con- trol	N	NP	NK	NPK	NPK + M. Nut.	F. Pract.	SE(d)	SE (M)	CD	CV	RF	RF + Mic. Nut.	RF	RF + Mic. Nut.	RF	Mic. Nut.
Karna- taka	AEZ 8.2/	Red Sandy	US 440/	--	--	--	--	-	8328	14150	20411	21047	25986	30494	27778					17658	4508	-1792	2717		
	Chikka- ballapu- ra-KAR/		250 - 250 /																						
	12		Tricho- derma																						
			190- 317 -284																						
Groundnut--Finger Millet																									
Tamil Nadu	North western Zone Yethapur/	Clay Loam	VRI 2/	7.9	0.5	213	23	331	1009	1172	1408	1539	1882	2042	1698	21	15	30	326	873	160	184	344		
	Yethapur TN/		20 - 50- 75/																	0	0	0	0		
	12		Borax(10)																	0	0	0	0		
			22.5- 37.5 -52.6																	0	0	0	0		
Tamil Nadu	North western Zone Yeth- apur/	Clay Loam	GPU 28 /	--	--	--	--	-	1334	1615	2085	2038	2745	3097	2605	72	51	102	7.61	1411	352	140	492		
	Yethapur TN/		60- 30 -30 /																	0	0	0	0		
	12		ZnSO4 (12.5)																	0	0	0	0		
			55- 23- 26.26.6																	0	0	0	0		

7.4.2 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.

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 marginal households in the study locations ranged from 0.21 to 0.97 ha in various farming systems. During 2017-18, study involved 576 households with mean holding size of 0.97 ha. At very few locations and farming systems, the size of holding of farming system was higher than 1 ha due to non-availability of marginal households for diversification.

Locations: During 2017-18, 24 districts in 12 agro climatic regions covering 24 NARP zones have implemented the modules in various farming systems. The details of locations, farming systems, size of holding, number of households in each farming system and module wise interventions made are given in Table 7.2.1. Being a first year of benchmarking, eight districts namely Nalanda (Bihar), East Singhbhum (Jharkhand), Dharwad (Karnataka), Anuppur and Umari (Madhya Pradesh), Kalahandi (Odisha), Mirzapur (Uttar Pradesh) and US Nagar (Uttarakhand) have partially implemented the interventions and hence, the data is not included in this report.

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 7.2.1. 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 system including all components and diversification), returns (calculated by deducting the total cost from gross returns of the system) 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 (diversified) system and also different farming systems. Farming system with more than one household was subjected to ANOVA and paired t-test analysis. Paired t-test has been carried out for

comparing existing and diversified systems with respect to production, marketable surplus, cost, return and profit. Similarly, one-way ANOVA has been carried out to identify the best farming system with respect to production, marketable surplus, cost, return and profit for the district. Standard error of mean values is also presented in parenthesis in Table 7.2.2.

Results

The components of existing and diversified farming systems in marginal farm households are given in Table 7.2.1, while the production, marketable surplus and economics of different farming systems are given in 7.2.2. Location wise and summary of results is explained briefly below.

Western Himalaya

Bilaspur (Himachal Pradesh): Field crop + dairy system was practiced by all the 24 farm households having mean area of 0.55 ha. Diversification of crops in *kharif* and *rabi* along with introduction of kitchen garden resulted in improvement in production, and increase in profit. Among the parameters, significant difference was observed between existing and diversified system for production, cost and return. Diversified system resulted in improved production (5850 kg), marketable surplus (1568 kg), reduction in cost, return (Rs 68284) and profit (Rs 22631) from 0.55 ha.

Jammu (Jammu and Kashmir): Only one farming system viz; field crop + dairy was found in the district and practiced by 100 % households (24 numbers) having mean area of 0.47 ha. Diversification resulted in significantly higher production (3648 kg), marketable surplus (1554 kg), return (Rs 37611) and profit (Rs 37,760).

Eastern Himalaya

Goalpara (Assam): Five farming systems viz; field crops + poultry + fishery + piggery, field crop + goat + poultry, field crop + poultry + piggery, field crop + dairy + poultry + piggery and field crop + dairy + poultry were found among which field, crops

+ dairy + poultry + piggery was found dominant based on number of households (29 %) adopting the system. Diversification of cropping and livestock components resulted in significant improvement in profit from field crop + poultry + piggery and field crop + dairy + poultry + piggery farming systems. Among the systems, higher profit was obtained from field crops + poultry + fishery + piggery (Rs 1,20,656 from 0.89 ha).

Lower Gangetic Plains

Nadia (West Bengal): Four farming systems viz; field crop + dairy, field crop + dairy + fishery, field crop + dairy + horticulture and field crop + poultry + fishery were found among which field crops + dairy + horticulture system is practiced by 42 % households having mean area of 0.51 ha followed by field crops + dairy by 33 % households having mean area of 0.63 ha. Diversification resulted in significant improvement in profit from field crop + dairy (Rs 14,232 from 0.63 ha) and field crop + dairy + fishery (Rs 12,349 from 0.67 ha).

Upper Gangetic Plain

Fathepur (Uttar Pradesh): Two farming systems viz; field crops + dairy, field crops + dairy + horticulture were found, and both the farming systems were found dominant. Diversification of existing systems resulted in significantly higher profit in both the systems. Among the farming systems, significantly higher profit of Rs 55,313 from 0.65 ha was obtained in field crop + dairy + horticulture system.

Muzaffarnagar (Uttar Pradesh): Three farming systems viz; field crops + dairy, field crops + dairy + horticulture and field crop + dairy + poultry were found among which field crop + dairy was practiced by 79 % households with mean area of 1.40 ha. Diversification of existing systems resulted in significantly higher profit in all the systems. Among the farming systems, significantly higher profit of Rs 4,96,814 from 0.60 ha was obtained in field crop + dairy + poultry system.

Trans Gangetic Plains

Fathehabad (Haryana): Only one farming system viz; field crops + dairy was found in all the households having mean area of 0.67 ha. Diversification resulted in significant improvement in production, marketable surplus, and return. However, it could not result in better profit.

Patiala (Punjab): Only one farming system viz; field crops + dairy was observed in all the households having mean area of 1.66 ha. Diversification resulted in significant improvement in production on equivalent basis (18510 kg), marketable surplus (16021 kg), return (Rs 3,21,084) and profit (Rs 2,51,378) from 1.66 ha.

Eastern plateau and hills

Kanker (Chhattisgarh): Four farming systems namely field crops + dairy + fishery + piggery, field crop + goat + poultry, field crop + poultry and field crop + dairy + goat + piggery were found among which field crops + poultry system was practiced pre-dominantly by 45 % of households having mean area of 0.94 ha. In all the farming systems, significant improvement in production, marketable surplus and return was observed due to diversification. However, there is no influence on profit was observed which might be due to the fact that it is first year of intervention.

Keonjhar (Odisha): Three farming systems namely field crop + horticulture + poultry + goat, field crop + horticulture + poultry and field crop + dairy + horticulture + poultry + goat were found among which 58% households were having field crops + horticulture + poultry + goat with mean area 0.75 ha. Diversification resulted in higher production, marketable surplus, return and profit in all the farming systems. Among the systems, higher profit was observed in of field crops + dairy + horticulture + poultry + goat system after diversification (Rs 39,632 from 0.75 ha).

Central Plateau and hills

Dungarpur (Rajasthan): Three farming systems viz; , field crops + dairy + horticulture, field crops + dairy and field crops + dairy + poultry were found among which 50 % households were having the field crops + dairy + poultry system with mean area of 0.80 ha followed by 33% households having field crops + dairy + horticulture with mean area of 0.82 ha. Being a first year of intervention, diversification did not result in advantages in terms of production, marketable surplus, return and profit.

Western Plateau and hills

Hingoli (Maharashtra): Four farming systems namely field crops + sericulture, field crops + horticulture, field crops + goat and field crops + dairy were found among which 37.5 % households were having field crops + goat with mean area of 0.86 ha. Significantly higher production, marketable surplus and profit were recorded in field crops + horticulture and field crops + dairy farming systems after diversification. Among the farming systems, field crops + horticulture resulted in higher profit of Rs 1,22,170 from 0.82 ha after the interventions.

Satara (Maharashtra): Four farming systems namely field crop + dairy + goat, field crop + dairy + goat + poultry, field crop + dairy + poultry and field crop + dairy was found among which field crop + dairy + horticulture and field crop + bullock was practiced by 29 % households each. Diversification did not result in advantage over existing systems as it was the first year of interventions.

Nagpur (Maharashtra): Four farming systems viz; field crop + dairy + horticulture, field crop + horticulture + bullock, field crops + bullock and field crops + dairy were found among which 29% households were having field crops + dairy + horticulture system with mean area of 0.89 ha and field crops + bullock with mean area of 0.77 ha. Field crops + dairy + horticulture, field crops + horticulture + bullock and field crop + bullock systems recorded significantly higher production, marketable surplus,

profit and return due to diversification interventions. Among the farming system, field crops + horticulture + bullock system recorded profit of Rs 61,760 from 0.88 ha after diversification.

Southern Plateau and hills

Medak (Telangana): Five farming systems viz;, field crops + dairy + poultry, field crops + dairy + sheep/goat, field crop + dairy + sheep/goat + horticulture, field crop + dairy and field crop + dairy + horticulture were found and the spread of farming systems among study households was found to be equal (20 % each). Diversification in field crop +dairy + sheep/goat resulted in significantly higher production. Among the bench mark farming systems, field crops + dairy + sheep/goat recorded higher profit of Rs 2,21,695 from 2.36 ha.

Chikkaballapura (Karnataka): Five farming systems namely field crops + dairy + sheep/goat, field crops + dairy, field crops + dairy + poultry, field crops + dairy + horticulture + sheep/goat + poultry and field crops + dairy + horticulture were observed with mean area ranging from 0.52 to 0.84 ha. Diversification in field crop + dairy + horticulture resulted in higher production (11,160 kg), marketable surplus (11,070 kg), return (Rs 1,19,434) and profit (Rs 1,17,628) from 0.84 ha and performed better over other systems.

Salem (Tamil Nadu): Three farming systems namely field crops + dairy + goat + poultry, field crops + dairy + goat and field crop + dairy + poultry were found among which 50% households were having field crops + dairy + goat + poultry system with mean area of 0.86 ha. Significantly higher production, marketable surplus, return, and profit were recorded in field crop + dairy + goat + poultry and field crop + dairy + poultry farming system. Among the farming systems, field crop + dairy + goat + poultry recorded higher profit of Rs 87,571 from 0.86 ha after diversification.

Erode (Tamil Nadu): Two farming systems namely field crop + dairy + poultry and field crops + dairy + poultry + goat was found with mean area of 0.91 and

0.89 ha respectively and both the systems were found dominant. Diversification made in field crop + dairy + poultry resulted in significant improvement in profit (Rs 1,71,138 from 0.91 ha) due to diversification.

East coast plains and hills

Vizianagaram (Andhra Pradesh): Three farming systems namely field crop + dairy, field crop + poultry and field crop + dairy + poultry were found among which 50 % households were having field crops + poultry having mean area of 1.29 ha. Significant improvement in profit was observed in field crop + dairy (Rs 30,764) and field crop + dairy + poultry (Rs 38,331) was observed due to diversification.

West coast plains and ghats

Ratnagiri (Maharashtra): Two farming systems namely field crops + dairy and field crops + poultry with mean area of 0.21 and 0.23 ha. Interventions in both the systems resulted in improvement of production, marketable surplus, return and profit. Among the farming systems, field crop + poultry was found to be better in terms of profit (Rs 59,285 from 0.23 ha).

Thiruvananthapuram (Kerala): Three farming systems namely field crops + dairy + horticulture, horticulture + poultry and horticulture + dairy was found among which 50% households were having horticulture + poultry. Diversification resulted in significant improvement in production, marketable surplus, return and profit of field crop + dairy + horticulture and horticulture + dairy systems. Among the systems, horticulture + dairy farming system recorded higher profit of Rs 2,76,222 from 0.35 ha due to multistoried cropping.

Gujarat plains and hills

Adiya (Gujarat): Field crops + dairy farming systems were practiced by all the study households with mean area of 0.90 ha. Although improvement in production and marketable surplus was observed due to diversification, but it could not result in improvement in profit probably due to first year of intervention.

Dahod (Gujarat): Three farming systems viz, field crop + dairy + goat, field crop + dairy and field crop + dairy + goat + poultry were found among which field crop + dairy + goat was found in 58% of households having mean area of 0.93 ha respectively. Interventions made in field crops + dairy resulted in higher improvement in profit (Rs 59,114 from 0.88 ha) compared to other systems.

Western dry

Dausa (Rajasthan): Three farming systems viz, field crop + dairy, field crop + dairy + horticulture and field crop + dairy + goat was found as dominant farming systems in the district. Interventions made in field crop + dairy + goat gave higher profit of Rs 98,919 from 3.10 ha after meeting the household requirement. In all the systems, interventions contributed for significant improvement in production, marketable surplus and returns.

The results across the locations are summarized below

- The number of farming systems in different districts varied from 1 to 5. Presence of maximum of 5 farming systems was observed in Goalpara (Assam), Medak (Telangana) and Chikkaballapura (Karnataka) followed by 4 systems in Nadia (West Bengal), Kanker (Chhattisgarh), Hingoli, Satara and Nagpur (Maharashtra). Existence of single farming systems was observed in 5 districts namely Bilaspur (Himachal Pradesh), Jammu (Jammu & Kashmir), Fatehabad (Haryana), Patiala (Punjab) and Adiya (Gujarat).
- Field crops + dairy was found to be the common farming system at all locations in marginal households and it is the dominant system (38 % of households) practiced in 18 districts based on number of households practicing the system.
- Two component systems (Field crops with either of dairy or sericulture or goat or bullock or poultry and horticulture with either poultry

or dairy) is practiced by 51 % households whose mean profit was found to be Rs 69,431 from 0.87 ha in the benchmark. Due to the diversification interventions in cropping systems, livestock, and capacity building in the first year, profit could be enhanced to Rs 81,067 from 0.87 ha which is 16.7 % higher on an average.

- Three component systems are practiced by 34 % households whose mean profit was found to be Rs 91,068 from 1.06 ha in the benchmark. Four component systems are practiced by 13 %

households whose mean profit was found to be Rs 78,682 from 0.97 ha in the benchmark.

- Five component systems are practiced by 2 % households whose mean profit was found to be Rs 77,285 from 0.75 ha in the benchmark.
- Based on the statistical analysis, best performing farming system has been identified for each district which can be scaled along with all possible interventions and diversification approach for improving the livelihood of marginal farm households.

Table 7.4.2.1 Components of existing and diversified farming systems in marginal farm households at different locations

District (state/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fication eries if any)	Prod- uct ification	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion		
				Kharif	Rabi			Summer	Kharif			Rabi	Summer
Western Himalaya													
Bilaspur (Himachal Pradesh) / HP-1/ Sub-Montane and Low Hills Sub-Trop- ical Zone / Semi-arid to humid/ 73 rainy days/ 1230 mm rain	Field crops + dairy (1-2)	0.55	24	Maize/ sorghum	Wheat	-	Cow (1-2) + Buffalo (1-2)	-	Maize/sor- ghum	Wheat	Cow (1) + Buffalo (1-2)	Kitchen Garden	-
Jammu (J&K)/ JK-1/ Low altitude Sub-Trop- ical Zone/ Semi-arid to humid/ 1030 mm rain	Field crops + dairy (2-3)	0.47	24	Rice/sor- ghum	Wheat / Berseem	Black gram	Cow (1-2) + Buffalo (1)	-	Rice/mash	Wheat / veg. pea	Cow (1-2) + Buffalo (1)	Kitchen Garden-	scientific cultivation of rice & wheat
Udam singh Nagar (Ut- tarakhand)/ UK-1/Hill Zone / Semi-arid to humid /55 rainy days /1428 mm rain	Field crops + dairy	0.40	10	Rice	Wheat/ sugarcane	-	Cow (1-2)	-	Rice	Wheat/ sugarcane	Cow (1-2)	-	-
	Field crops	0.40	14	Rice	Wheat	-	-	-	Rice	Wheat	-	-	-

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model						
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fication if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion	Capacity building		
				Khharif	Rabi			Summer	Khharif				Rabi	Summer
				Eastern Himalaya										
Goalpara (As- sam) / Central Brahmaputra + Valley Zone / Per humid to humid /63 rainy days/ 1687 mm rain	Field crop + dairy (2) + pig (2) + poultry (9)	0.79	7	Rice/Are- canut	Banana/ Bamboo / Rabi Vegeta- bles	Cow (2)+ Pig (2) + Poultry (9)	-	Rice/ Are- canut	Toria/ Rabi Vegetables	Cow (2) + goat (2)+ Pig (2)+ Poul- try (8-9)	Arecunut fruit Scientific Cultivation of Winter Rice & Making of su- pari from raw Arecanut.			
	Field crop + dairy (2) + poultry (11-12)	0.81	5	Rice/Are- canut	Sesamum/ Rabi Vegeta- bles	Cow (2) + poul- try (11-12)		Rice/ Are- canut	Toria/ Rabi Vegetables	Cow (2) + poultry (11-12)	-do- - do-			
	Field crop + poultry + fishery + piggery	0.90	4	Rice/Are- canut	Banana/ Rabi Vegeta- bles	Cow (1) + pig (1)+poultry (9)+Fishery		Rice/ Are- canut	Banana/ Rabi Vege- tables	Cow (1) + pig (1)+poultry (7)+ fishery	- do-			
	Field crop + goat (2-3) + poultry (16)	0.73	4	Rice/Are- canut	Banana/ Rabi Vegeta- bles	Cow (2) + goat (2-3)+ poultry (16)		Rice/ Are- canut	Banana/ Rabi Vege- tables	Cow (2) + goat (2-3)+ poultry (16)	- do-			
	Field crop + piggery (1-2) + poultry (12)	0.53	4	Rice/Are- canut	Bamboo	Pig (1-2)+ Poul- try (12)		Rice/ Are- canut	Toria	Pig (1-2)+ Poultry (12)	- do-			
Lower Gangetic Plains														
Nadia (West Bengal)/ lower gang etic plains/ 79 rainy days /1634 mm rain	Field crops + dairy (2)	0.63	8	Rice	Mustard / lentil	Cow (2)	-	Rice	Mustard / lentil / Lathyrus	Cow (2) + fishery	Training on Improved methodh of kharif rice cultivation			
	Field crops + dairy (2) + fishery	0.67	3	Rice	Rice / mus- tard / lentil	Cow (2) + fishery		Rice	Lathyrus/ mustard	Cow (2) + fishery	-Do-			
	Field crops + horticulture + dairy (1-2)	0.51	10	Rice / banana/ okra	Mustard /gram/ banana/ Coriender / pea	Cow (1-2)		Rice / banana	Mustard / marigold/ pea/lentil	Cow (2) +fishery	-Do-			
	Field crops + poultry (6) + fishery	0.53	3	Rice	Mustard	Poultry (6)+ fishery		Rice	Mustard	Cow (0-1)+ fishery	-Do-			

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model				
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fies if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion	
				Kharif	Rabi			Summer	Kharif			Rabi
Middle Gangetic plains												
Mirzapur (Ut- tar Pradesh)/ Vindhyan Zone / Per humid to hu- mid/ 22 rainy days/ 399 mm rain	Field crops + dairy (1-2)	0.48	16	Rice	Wheat/ mustard/ berseem	Pea	Cow (1) + Buffalo (2)	-	Rice	Wheat/ berseem	Cow (1) + Buffalo (2) + Goat (2-3)	-
Upper Gangetic plains												
Fatehpur (Ut- tar Pradesh)/ Central Plain Zone/ Dry sub-humid to semi arid / 979 mm rain	Field crops + dairy (1-2)	0.72	12	Rice/ Pearl Millet/ Sesame/ Arhar/ black- gram	Wheat/mus- tard/gram	Green Gram	Cow (0-1) + buffalo (1-2)	-	Rice/Pearl Millet/ Arhar/ blackgram/ sorghum	Wheat / mustard	Cow (0-1) + buffalo (1-2)	- ;
	Field crops + dairy (1-2)+ horticulture	0.85	12	Rice/cau- liflower/ sesame	Wheat/to- mato/gram/ pea/potato	Green Gram	Cow (0-1) + Buffalo (1-2)	-	Rice/Pearl Millet/ Arhar/cau- liflower/ sorghum/ sasamum	Wheat/ tomato/ mustard/ potato	Cow (0-1) + Buffalo (1-2)	-
Muzaffar- nagar (Uttar Pradesh) Western Plain Zone /Dry sub-humid to semi-arid /105 rainy days /711 mm rain	Field crops + dairy (3-4)	1.40	19	Sugar- cane/ rice/ maize / F. Sorghum/ pigeon- pea	Wheat / mustad/ oats/ bar- seem	Maize / green- gram / sorghum	Cow (2-3) + Buffalo (1-2)		Sugar- cane/ rice/ blackgram/ greengram / F. Sor- ghum/ pea	Wheat / mustad/ oats/ bar- seem	Cow (2-3) + Buffalo (1-2)	value addition in farm produces , Importance of mineral mix- ture in milk production
	Field crops + dairy (4) + horticulture	1.52	4	Sugar- cane/ rice/ maize / F. Sorghum/ pearlm- illet	Wheat / mustad/ oats/ bar- seem	Maize / green- gram / sorghum	Cow (2) + Buffalo (1-2)		Sugar- cane/ rice/ blackgram/ greengram / F. Sor- ghum/ pea	Wheat / mustad/ oats/ bar- seem	Cow (2) + Buffalo (1-2)	value addition in farm produces , Importance of mineral mix- ture in milk production
	Field crops + dairy (4) + poultry	0.60	1	Sugar- cane/ rice/ pearlm- illet	Wheat / oats/ bar- seem	sorghum	Cow (3) + Buffalo (1)		Sugarcane/ rice/ green- gram	Wheat / oats/ barseem	Cow (3) + Buffalo (1)	value addition in farm produces , Importance of mineral mix- ture in milk production

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fies if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion	Capacity building	
				Kharif	Rabi			Summer	Kharif				Rabi
Trans Gangetic Plains													
Fathehabad (Haryana) / Western/ 29 rainy days/272 mm rain	Field crops + dairy (1-2)	0.67	24	Rice / sorghum	Wheat/bar- seem	-	Cow (1) + Buffalo (1)	-	Rice	Wheat	-	Ghee mak- ing	-
Patiala (Pun- jab)/ Western Plain Zone/ Semi-arid to Dry sub-hu- mid/ 14 rainy days/ 105 mm rain	Field crops + dairy (3-4)	1.66	24	Rice	Wheat	-	Cow (3-4) + Buffalo (3)	-	Rice	Wheat	Green gram	Cow (3-4) + Buffalo (3))	-
Eastern Plateau and Hills													
Kanker (Chhattis- garh)/ Chat- tigarh Plain Zone / Moist sub-humid to dry sub-hu- mid /1369 mm rain	Field crop + dairy (2)+ fish + piggery (2-3) + poultry (16)	0.93	5	Rice / Arher	Rice/gram/ maize/brin- jal	-	Cow (2)+ fish- ery + piggery (2-3) +poultry (16)	Dal making	Rice/ blackgram/ Vegetable	Gram / sunflower/ linseed / vegetable	Vegetable	Cow (2) + buffalo (1-2)+goat (2)+Poultry (25-26) + pig (4)	Cropping sys- tem, fishery and livestock management
	Field crop + dairy (1-2)+ goat (6)+ piggery (3-4)+ poultry (9)	0.97	4	Rice	Lentil / tomato	-	Cow (1-2)+ goat (6)+ piggery (3-4)+poultry (9)	-	Rice/ black gram/ vegetable	Wheat/ maize / sunflower/ Vegetable	-	Cow (1-2) + buffalo (1)+Goat (6) + Poultry (19) + pig (4-5)	- do-
	Field crop + goat (8) + poultry (7)	0.89	4	Rice	Rice / lentil / brinjal	-	Goat (8) + poul- try (7)	-	Rice/black- gram / vegetable	Wheat / gram / maize / potato / vegetable	-	Goat (6-7) + poultry (17) + pig (0-1)	- do-
	Field crop + poultry (4)	0.94	11	Rice	Maize/ lentil / brinjal/ gram	-	Cow (1)+ Poultry (4)	-	Rice/black- gram / vegetable	Lathyrus / field pea	-	Buffalo (2) + poultry (14)	- do-

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model			
				Crop (s)/Cropping system (s)		Livestock / household (including fish- diversi- fication if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion
				Kharif	Rabi			Kharif	Rabi		
East sin- ghbhum (Jharkhand)/ South-east- ern Plateau Zone/ Moist sub-humid to dry sub-hu- mid /58 rainy days / 1125 mm rain	Field crop + goat/ sheep (4-5) + poul- try (7-8)	0.76	24	Rice	Tomato / brinjal	Goat/ sheep (4-5) + poultry (7-8)	-	Rice	Wheat/ Mustard	Goat (4-5)+ Pig (0-1) + Poultry (8-9)	-
Keon- jhar(Odisha)/ North-central Plateau Zone/ 75 rainy days / 1234 mm rain	Field crop + horticulture+ poultry (6)+ goat (5-6)	0.75	14	Rice/ black- gram/ maize/ kharif vegetable	Rice/maize/ chickpea/ toria/ rabi vegetable	Poultry (6)+ goat (5-6)	-	Rice/ blackgram/ maize/ kharif vegetable	Rice/ maize/ chickpea/ toria/ rabi vegetable	Poultry (6)+ goat (5-6)	-
	Field crops + dairy (1)+ horticul- ture+ poultry (5-6)+ goat (4-5)	0.75	5	Rice/pi- geon pea /kharif vegetable	Cauliflower / frenchbean / onion/ rabi vegetable	Cow (1)+ poultry (5-6)+ goat (4-5)	-	Rice/pi- geon pea /kharif vegetable	Cauliflow- er / french- bean / onion/ rabi vegetable	Cow (1-2)+ poultry (5-6)+ goat (4-5)	-
	Field crops + horticulture+ poultry (7-8)	0.79	5	Rice/ black- gram/ maize/pi- geon pea / kharif vegetable	Rice/chick- pea/ rabi vegetable	Poultry (7-8)	-	Rice/ blackgram/ maize/ pigeon pea / kharif vegetable	Rice/chick- pea/ rabi vegetable	Poultry (7-8)	-
Central Plateau and hills											
Dungar- pur(Rajast- han)/ South- ern Humid Plain Zone / Semi-arid (wetter half)/ 44 rainy days / 898 mm rain	Field crops + dairy (2-3)	0.88	4	Maize / black gram / cluster- bean	Wheat	Cow (1-) + Buffalo (2-3) + goat (3)	-	Maize	Wheat	Cow (1-) + Buffalo (2-3)	-
											Kharif crop production techniques and knowl- edge about soil testing

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved / diversified model					
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fies if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)			Livestock / household (including fisheries)	Product diversifica- tion	Capacity building
				Kharif	Rabi			Summer	Kharif	Rabi			
	Field crops + dairy (1-2)+ horticulture	0.82	8	Maize / black gram / cluster- bean/soy- abean	Wheat / gram	-	Cow (1-2) + Buffalo (1-2) + goat (3-4)	-	Maize/ veg- etable	Wheat/ vegetable	Cow (1-2) + Buffalo (1-2)	-	-do-
	Field crops + dairy (1-2) + poultry (3-4)	0.80	12	Rice / maize / black gram / cluster- bean/soy- abean	Wheat / gram / bar- ley / mustard	--	Cow (1-2) + Buffalo (1-2)+ poultry (3-4)	-	Maize	Wheat	Cow (1-2) + Buffalo (1-2)+ poultry (3-4)	-	-do-
Western Plateau and Hills													
Hingoli(Ma- harashtra)/ Central Vidarbha Zone / Semi-arid / 45 rainy days /886 mm rain	Field crops + dairy (1-2)	0.86	7	Soya- bean/ cotton/ pigeon pea / turmeric / green- gram	Wheat/ chickpea/ sorghum	-	Buffalo (1-2)	-	Cotton/ sugarcane/ soyabeen. napier/ blackgram / green- gram / turmeric	Chickpea / sorghum	Buffalo (2)	-	Dry spelt streemange- ment and integrated pest maneg- ment& pink bolwarman- agment
	Field crops + goat(6-7)	0.86	9	Soya- bean/ cotton/ pigeon pea / turmeric / maize/ green- gram	Wheat/ chickpea/ sorghum	-	Goat (6-7)	-	Soyabeen/ cotton/ pigeon pea / turmeric / maize/ greengram / black- gram	Wheat/ chickpea/ sorghum/ Napier	Goat (6-7)	-do-	-do-
	Field crop + horticulture	0.83	4	Soya- bean/ turmeric	Wheat / sorghum	-	Cow (1) + poul- try (4-5)	-	Soyabeen/ turmeric / chilli / Lime / orchids	Chickpea / sorghum / vegetable	-	-	-do-
	Field crop + sericulture	0.65	4	Soya- bean/ cotton / turmeric	Chickpea / sorghum	-	Goat (4-5)	-	Cotton / mulberry / greengram / sorghum/ Napier / maize / fodder	Wheat / sorghum / Cauliflow- er / lucern	-	-do-	-do-

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model				
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fication if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion	Capacity building
				Kharif	Rabi			Summer	Kharif			
Satara (Ma- harashtra)/ Western Maharashtra Plain Zone Ganesh- khind/ Semi-arid to dry sub-hu- mid / 35 rainy days/ 561 mm rain	Field crops + dairy (5-6)	0.55	4	Pearl millet / cotton / maize / onion	Wheat/ onion	Sorghum / ground- nut	-	Pearl millet / greengram / maize / onion	Wheat/ onion/ sorghum / chickpea	Cow (3) + goat (1-2)	Milk pro- cessing	-
	Field crop + dairy (3-4)+ goat (1-2)	0.63	7	Pearl millet / sorghum / maize / onion / moth	Wheat/ onion/ chick- pea	Sorghum / ground- nut	Cow (3-4) + buffalo (0-1) + goat (1-2)	Pearl millet / sorghum / maize / onion / moth bean / green- gram	Wheat/ onion/ chickpea/ sorghum	Cow (3) + buffalo (0-1) + goat (2)	Milk pro- cessing	-
	Field crop + dairy (3-4)+ goat (2-3) + poultry (9-10)	0.70	6	Pearl millet / sorghum / maize / onion	Wheat/ onion/ chick- pea	Sorghum / ground- nut	Cow (3-4) + buffalo (0-1) + goat (2-3) + poultry (9-10)	Pearl millet / sorghum / maize / onion / greengram	Wheat/ onion/ chickpea/ sorghum	Cow (2-3) + buffalo (1) + goat (3) + poultry (7-8)	Milk pro- cessing	-
	Field crop + dairy (4-5) + poultry (5)	0.84	7	Pearl millet / maize / onion	Wheat/ onion/ chick- pea	Sorghum / ground- nut	Cow (4-5) + buffalo (0-1) + poultry (5)	Pearl millet / maize / onion / greengram	Wheat/ onion/ chickpea/ sorghum	Cow (3-4) + buffalo (0-1) + goat (1-2) + poultry (7)	Milk pro- cessing	-
Katol(Maha- rashtra)/ Cen- tral Vidar- bha Zone / Semi-arid / 45 rainy days /886 mm rain	Field crop + bullock	0.77	7	Soybean/ cotton	Chickpea/ wheat	-	-	Soybean/ Soybean +Pigeon pea	Chickpea/ wheat / Wheat+lin- seed	-	Kitchen Garden, Dal Making, Compost, Mineral Mixture, Bur Bud- ding.	Soybean Based Mul- ti-tier/ Inter Cropping Syst em .
	Field crop + bullock + horticulture	0.88	5	Soyabean / cotton	Chickpea/ wheat	-	-	Soybean/ pigeonpea	wheat/ linseed	-	-do-	-
	Field crop + dairy (1-2)	0.82	5	Soyabean / cotton / pigeon pea	Chickpea / wheat	-	Cow (1-2)	Soybean/ Soybean +Pigeon pea	Chickpea/ Wheat+/ linseed / wheat	Cow (1)	-do-	Soybean Based Mul- ti-tier/ Inter Cropping System .
	Field crop + dairy (1-2) + horticulture	0.89	7	Soyabean / cotton / pigeon pea	Chickpea / wheat	-	Cow (1-2)	Soybean/ Soybean +Pigeon pea	Chickpea/ Wheat+/ linseed / Wheat	Cow (1-2)	-do-	Soybean Based Mul- ti-tier/ Inter Cropping System

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fies if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion		
				Kharif	Rabi			Summer	Kharif			Rabi	Summer
				Southern Plateau and Hills									
Medak (Telangana)/ Northern Tel- angana Zone/ Semi-arid (wetter half)/ 49 rainy days/ 616 mm rain	Field crops + dairy (3-4)	1.60	5	Rice/ maize	Rice/maize	Rice	Buffalo (3-4) + poultry (2-3)	-	Rice/maize	Rice/maize	Buffalo (1-2) + poultry (10)	-	livestock mangement for higher income & crop diversification
	Field crop + dairy (2)+ poultry (18-19)	1.30	5	Rice / maize	Rice/maize	Tomato	Buffalo (2) + poultry (18-19)		Rice /maize	Rice/maize	Buffalo (1-2) + poultry (28)	-	-do-
	Field crop + dairy (2-3)+ goat /sheep (35-36)	2.36	5	Rice/ maize	Rice/maize	-	Buffalo (2-3)+ Goat/ sheep (35-36)	-	Rice/maize	Rice/maize	Buffalo (1-2)+ goat / sheep (48)+ Poultry (10)	--	-do-
	Field crop + vegetable+ dairy (2-3)+ goat /sheep (30-31)	2.0	4	Rice/ maize/ cotton	Rice/maize / tomato	-	Buffalo (2-3)+ Goat/ sheep (30-31)	-	Rice / maize	Rice / tomato	Buffalo (1-2)+ goat / sheep (36- 37)+ Poultry (10)	--	-do-
Chikka- ballapura (Karnataka)/ KA-4/ Cen- tral Dry Zone / Semi-arid / 39 rainy days/ 803 mm rain	Field crop + vegetable+ dairy (2-3)	1.32	5	Rice/ maize	Rice/ tomato		Cow (0-1) +buff- falo (2-3)		Rice/maize	Rice/ tomato	Buffalo (1-2) + poultry (10)	--	-do-
	Field crops + dairy (2-3)	0.65	4	Finger- millet/ mulber- ry/finger- millet/ maize	Ragi / seri- culture	-	Cow (2-3)	-	Finger- millet/ mulberry/ fingermil- let/ maize/ Beetroot/ rice/chilli	Potato / knoll knol	Cow (3) + buffalo (1) +goat (1) + poultry (4)	-	Soil Health Management & Honey & Production
	Field crop + dairy (4)+ horticulture	0.88	6	Finger millet// maize / tomato / finger millet / ridge guard / sericul- ture	Finger millet / cucumber/ bitter guard / ridge guard / tomato	-	Cow (4)	-	Finger- millet/ Fenugreek / Seri- culture/ Guava/ Mango	-	Cow (2-3)	-	Soil Health Management & Honey & Production

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model			
				Crop (s)/Cropping system (s)		Livestock / household (including fish- eries if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion
				Kharif	Rabi			Kharif	Rabi		
	Field crop + dairy (2-3)+ horticulture + goat /sheep (6-7)+ poultry (10)	0.76	6	Fingermil- let/maize/ mulberry/ Ridgegourd /Guava/ mango/ Beetroot/ pumpkin	Rice / ragi / chilli/ maize /sericulture	Tomato/ mango/ mulber- ry	-	Fingermil- let/maize / redgram / finger- millet / sericulture /ground- nut	Beans	Cow (3-4)+ Poultry (2-3)	-
	Field crops + dairy (2-3) + poultry (8-9)	0.83	3	Finger- millet / maize / tomato / sericul- ture / ridge- guard	Sericulture	-	-	Bottle- guard / Finger Millet /chil- li / tomato / brinjal	Pearl Millet / beans / cucumber / chilli	Cow (1-2) + Poultry (3-4)	-
	Field crop + dairy (2)+ goat /sheep (9-10)	0.52	5	Finger- millet / tomato / sericul- ture / beans	Sericulture			Jasmine / rose /Bot- tleguard/ Ridgeguard /tomato / maize	Maize / coriander / Pole Beans / Gharkin / Cauli- flower / Marigold / Tomato	Cow (3) + poultry (1)	-
Dharwad(- Karnataka)/ KA-8/ North- ern Transi- tion Zone/ Semi-arid & arid/769 mm rain	Field crops + dairy (1-2)	1.01	11	Rice / Maize/ Soya- bean/ ground- nut/cot- ton	Wheat / chickpea / maize / groundnut / sorghum	-	Ghee prepa- ration	Cotton / soyabean/ pea	Bt- Cotton / chickpea / maize	Cow (1-2) + Buffalo (0-1) preparation	Ghee
	Field crops + horticulture + dairy (1-2)	1.03	13	Rice / Maize/ Soya- bean/ green- gram/ cotton / Kh. Veg- etable/ flower	Wheat / maize /soy- abean/sor- ghum / rabi vegetable	-	Ghee prepa- ration	Cotton / soyabean/ pea	Bt- Cotton / chickpea / maize	Cow (1-2) + Buffalo (0-1) preparation	Ghee

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model						
				Crop (s)/Cropping system (s)			Livestock / household (including fish-diversi- fication eries if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)			Livestock / household (including fisheries)	Product diversifica- tion	Capacity building
				Kharif	Rabi	Summer			Kharif	Rabi	Summer			
Yethur(Tamil- Nadu)/ TN-2 /North-west- ern Zone/ Semi-arid /35 rainy days / 722 mm rain	Field crop + dairy (4) + goat (5-6)	0.70	6	Rice/ Tapioca / cotton/ maize/ sorghum	Rice/Tapioca / sorghum/ coriander / turmeric	Coconut / Tapioca / tur- meric	Cow (4) + goat (5-6)	-	Rice/ Tapioca / cotton/ maize/ sorghum / Coconut	Maize / groundnut / sorghum/ Chrysan- themum / gingelly	-	Cow (3-4) + buffalo (1-2) + goat (3-4)	Kitchen garden	Oil seeds production Technology & balance nutrition
		0.86	12	Rice/ Tapioca / maize/ sorghum /sugar- cane / ragi / green gram / kh. vege- table	Sugarcane / maize / sesame / Tapioca / sor- ghum/ rabi vegetable	Coconut / Tapioca	Cow (2-3) + goat (7) + poul- try (14-15)	-	Rice/Cur- rey leaf/ sugarcane/ groundnut /Chrysan- themum/ sorghum / lab lab / Coconut / Finger mil- let / tomato / cotton / groundnut	Finger millet / groundnut / sorghum/ maize / gingelly	-	Cow (3-4) + goat (7-8) + poultry (11-12)	Kitchen garden	Oil seeds production Technology & balance nutrition
		0.83	6	Maize Tapioca / cotton/ maize/ Ridgegourd / chickpea / beans	Tapioca / sorghum/ sesame	Coconut	Cow (2-3) + goat (1) + poul- try (8-9)	-	Maize/ sorghum / Coconut / Tapioca / White gingely	Gherkin/ gingelly / Sorghum	-	Cow (3-4) + goat (7) + poultry (14-15)	Kitchen garden	Oil seeds production Technology & balance nutrition
	East Coast Plains and Hills													
Vizianagar- am (Andhra Pradesh)/ AP-7/ High Altitude and Tribal Zone/ Dry sub-humid /64 rainy days/ 885 mm rain	Field crop + dairy	1.33	6	Rice	Maize	-	Poultry (4)	-	Rice-	Maize / green- gram/ blackgram	sesame	Cow (1)+ buffalo (0- 1)+ poultry (8-9)	Vermicom- post	Management of kharif rice & deworming schedule
	Field crop + poultry (5-5)	1.29	12	Rice	Maize		Goat (1-2) + poultry (5-6)		Rice	Rice- Blackgram/ maize/fin- germillet	Sesame	Poultry (9)	-d0-	-do-
	Field crop + dairy + poul- try (6-7)	1.45	6	Rice	Maize		Poultry (6-7)		Rice	Rice / maize / fin- germillet / pigeonpea/ greengram	Sesame	Cow-(1-2) +, buffalo (0-1) +Poultry (9-10)	-do-	-do-

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model			
				Crop (s)/Cropping system (s)		Livestock / household (including fish-diversi- fies if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)		Livestock / household (including fisheries)	Product diversifica- tion
				Khharif	Rabi			Khharif	Rabi		
Bhavanis- agar(Tamil- Nadu) / TN-3 /Western Zone / Semi-arid /36 rainy days/ 775 mm rain	Field crop + dairy (4)+ poultry (14)	0.92	12	Rice / turmeric / Sugar- cane / maize/ Coconut	Sugarcane / banana/ rice	Cow (2-3) + buffalo (2) + poultry (14)		Sugarcane / maize / fodder grass	Rice / banana / gingelly/F. sorghum	Cow (2-3) + buffalo (2-3) + goat (0-1)+ poultry (11-12)	Turmeric and rice & INM and IPDM
	Field crop + dairy (4-5) + poultry (9-10) + goat/sheep (4-5)	0.90	12	Rice / turmeric / topioca/ Coconut	Maize / ba- nana/ rice	Cow (2-3) + buffalo (2) + goat (4-5) + poultry (9-10)		Sugarcane/ F. sorghum	Rice / maize / gingelly / Ground- nut / F. sorghum	Cow (2-3) + buffalo (2) + goat (8-9) + poultry (10)	do
West Coast Plains and Ghats											
Ratnagiri (Maharash- tra)/ MH-1 / South Kon- kan Coastal Zone/ Dry	Field crop + poultry (4-5)	0.23	12	Rice	Cowpea	Cow (1) + goat (3-4) + poultry (7)	-	Rice	Horse gram / cowpea	Cow (0-1) + Buffalo (0-1)	Making poha from Rice
sub-humid & per humid /93 rainy days/3868 mm rain	Field Crop+ dairy (1)	0.21	12	Rice	Okra	Cow (1) + Poultry (3)	-	Rice	Cowpea / horsegram	Cow (1) + Poultry (1-2)	Making poha from Rice
Vallayani (Kerala)/ KE-2 / Southern Zone/ Dry	Field Crop + horticulture + dairy (1-2)	0.49	8	Rice / coconut	Rice	Cow (1-2)	-	Rice / coconut	Banana / rice	Cow (1-2)	Kitchen gardening, Pisciculture
sub-humid & per humid / 84 rainy days /1538 mm rain	Horticulture + dairy (2-3)	0.35	4	Coconut	-	Cow (2-3)	-	Coconut	Banana	Cow (2-3)	Kitchen gardening, Pisciculture
	Horticulture + poultry (26-27)	0.34	12	Coconut	-	Poultry (26-27)	-	Coconut	Banana	Cow (Poul- try (56-57)	-do-
Gujarat Plains and Hills											
Adiya (Gu- jrat)/ GJ-4/ North Gujarat Zone / Arid to semi-arid / 15 rainy days / 972 mm rain	Field crops + dairy (3-4)	0.90	24	Cotton/ Cluster- bean/ Guar/ black- gram / green- gram/ Castor/ fodder sorghum	Wheat/ mustard/ lucerne/ Cumin	Cow (0-1) + Buffalo (3)	Ghee making	Cotton/ Cluster- bean/ Guar/ blackgram / green- gram/Cas- tor/ fodder sorghum	Wheat/ mustard/ lucerne/ Cumin/ Fennel	fodder sor- ghum	Production technology of oilseed crops and livestock management

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model						
				Crop (s)/Cropping system (s)			Livestock / household (including fish-diversi- fication eries if any)	Prod- uct diversi- fication	Crop (s)/Cropping system (s)			Livestock / household (including fisheries)	Product diversifica- tion	Capacity building
				Kharif	Rabi	Summer			Kharif	Rabi	Summer			
Dahod (Gujarat)/ GJ-3/ Middle Gujarat Zone	Field crops + dairy (2-3)	0.93	6	Rice/ maize/ pigeon pea	Maize/wheat / chickpea	-	Cow (1-2) + Buffalo (1)	-	Maize/pi- geonpea// soyabean	Maize/ Wheat/ chickpea	-	Cow (0-1) + Buffalo (1- 2)+ goat (4)	-	Modern Farming Technology Of Soybean
Semi-arid /23 rainy days /1086 mm rain	Field crops + dairy (1-2)+ goat (3-4)	0.88	14	Rice/ maize/ pigeon pea	Maize/wheat / chickpea	-	Cow (0-1)+ Buffalo (1-2) +Goat (3-4)	-	Soyabean / maize/pi- geon pea	Maize/ wheat / chickpea	-	Cow (1-2)+ Buffalo (1-2) +Goat (4)	-	-do-
	Field crops + dairy (2-3) + goat (6)+ Poultry (4)	0.93	4	Rice/ maize/ pigeon pea	Maize/wheat / chickpea	-	Cow (2) + Buffalo (1-2)+ Goat (6)+Poul- try (4)		Soyabean / maize/pi- geon pea	Maize/ wheat / chickpea	-	Cow (1) + Buffalo (1-2)+ Goat (4-5)+Poul- try (0-1)	-	-do-
Western Dry Region														
Dausa Rajasthan)/ Semi-arid Eastern Plain Zone	Field crop + dairy (4-5)	2.46	8	Pearl Millet	Wheat		Cow (2) + Buffalo (3)+	Milk pro- cessing	Pearl Millet	Wheat	Greengram/ vegetable	Cow (1-2) + Buffalo (1- 2)+ Poultry (5)	Vermi Compost	Crop & Vegetable production & vermicom- posting
Semi-arid (drier half) /12 rainy days /875 mm rain	Field crop + dairy (2-3) + goat(6)	3.14	8	Pearl Millet	Wheat		Cow (1) + Buffalo (2)+ goat (6)	Milk pro- cessing	Pearl Millet	Wheat	Greengram	Cow (2) + Buffalo (1)+ Poultry (10)	Vermi Compost	Crop & Vegetable production & vermicom- posting
	Field crop + dairy (4) +horticulture	4.16	8	Pearl Millet	Wheat		Cow (2) + Buffalo (2)+	Milk pro- cessing	Pearl Millet	Wheat	Greengram	Cow (1-2) + Buffalo (0- 1)+ Poultry (7-8)	Vermi Compost	Crop & Vegetable production & vermicom- posting

Table 7.4.2.2 Production (on equivalent basis of base crop), marketable surplus and economics of existing and improved farming systems in marginal households (For 2017-18)

Farming System	Area (ha)	No. of Households	Existing System				Improved (Diversified System)				P value Significance - Existing vs Improved						
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Bilaspur (Himachal Pradesh)																	
Field crop + dairy	0.55	24	3241 (481)	1155 (316)	15381 (1653)	49424 (8869)	7721 (5772)	5850 (432)	1568 (206)	8721 (933)	68284 (8018)	22631 (3675)	-	-	-	-	
Overall FS																	
CD [P = 0.05] FS1 vs FS2			4955	3310	17298	91657	60757	4531	2173	9766	84213	38831	0.0006 ***	0.019**	<0.0001 ***	0.007***	0.285
Jammu (Jammu and Kashmir)																	
Field crop + dairy	0.47	24	2022 (146)	918 (131)	23127 (1729)	27420 (2148)	15630 (2399)	3648 (41)	1554 (25)	24600	37611 (1027)	37760 (630)	-	-	-	-	-
Overall FS													<0.0001 ***	<0.0001***	<0.0001 ***	<0.0001 ***	0.266
Goalpara (Assam)																	
Field crop + Poultry + fishery + pigery	0.89	4	16525 (1451)	14220 (1338)	147388 (2171)	50913 (15867)	23250 (14540)	14718 (1458)	11303 (1377)	14975 (3259)	161639 (16701)	120656 (15535)	0.625	0.625	0.125	0.250	0.250
Field crop + goat + poultry	0.73	4	3266 (1451)	2143 (1338)	142500 (2171)	103310 (15867)	116785 (14540)	4673 (1458)	3910 (1377)	18000 (3259)	38072 (16701)	28921 (15535)	0.875	0.625	0.125	0.125	0.125
Field crop + Poultry + pigery	0.77	4	2173 (1451)	1188 (1338)	138688 (2171)	112613 (15867)	124438 (14540)	8856 (1458)	7325 (1377)	11125 (3259)	95153 (16701)	76780 (15535)	0.125	0.125	0.125	0.125	0.125
Field crop + dairy + Poultry + pigery	0.79	7	3122 (1097)	1561 (1012)	142036 (1641)	104570 (11994)	123301 (10991)	12884 (1102)	10352 (1041)	18729 (2464)	135882 (12624)	105493 (11744)	0.016**	0.016**	0.016**	0.016**	0.016**
Field crop + dairy + Poultry	0.81	5	2527 (1298)	1030 (1197)	140200 (1941)	109882 (14191)	127842 (13005)	2619 (1304)	2389 (1232)	15360 (2915)	16063 (14938)	13303 (13895)	0.100	0.125	0.063*	0.063*	0.063*
Overall FS													0.003***	0.004***	<0.0001 ***	<0.0001 ***	<0.0001***
CD [P = 0.05] FS1 vs FS2			4295	3962	6425	46965	43039	4317	4076	9647	49434	45985					
CD [P = 0.05] FS1 vs FS3			4295	3962	6425	46965	43039	4317	4076	9647	49434	45985					
CD [P = 0.05] FS1 vs FS4			3807	3512	5695	41630	38150	3826	3613	8551	43818	40761					
CD [P = 0.05] FS1 vs FS5			4075	3759	6095	44555	40830	4095	3867	9152	46897	43625					
CD [P = 0.05] FS2 vs FS3			4295	3962	6425	46965	43039	4317	4076	9647	49434	45985					
CD [P = 0.05] FS2 vs FS4			3807	3512	5695	41630	38150	3826	3613	8551	43818	40761					

Farming System	Area (ha)	No. of Households	Existing System					Improved (Diversified System)					P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
CD [P = 0.05] FS2 vs FS5			4075	3759	6095	44555	40830	4095	3867	9152	46897	43625					
CD [P = 0.05] FS3 vs FS4			3557	3281	5320	38890	35639	3575	3375	7989	40935	38079					
CD [P = 0.05] FS3 vs FS5			4295	3962	6425	46965	43039	4317	4076	9647	49434	45985					
CD [P = 0.05] FS4 vs FS5			4295	3962	6425	46965	43039	4317	4076	9647	49434	45985					
Nadia (West Bengal)																	
Field crop + dairy	0.63	8	6694 (1134)	4928 (1119)	75440 (10145)	24970 (8263)	1521 (8201)	7661 (875)	4541 (873)	82342 (7763)	32576 (8880)	14232 (12649)	0.109	0.195	0.250	0.313	0.039**
Field crop + dairy + fishery	0.67	3	5096 (1852)	3933 (1827)	60485 (16566)	15956 (13494)	1484 (13393)	6444 (1428)	3268 (1426)	61364 (12676)	35299 (14500)	12349 (20655)	0.500	1.000	1.000	0.500	1.000
Field crop + dairy + horticulture	0.51	10	11197 (1014)	9367 (1001)	105802 (9074)	62153 (7391)	34696 (7336)	11104 (782)	7872 (781)	104313 (6943)	62249 (4500)	13765 (11313)	1.000	0.322	1.000	1.000	0.131
Field crop + poultry + fishery	0.53	3	3153 (1852)	1727 (1827)	36602 (16566)	10688 (13494)	10697 (13393)	5372 (1428)	2610 (1426)	48880 (12676)	31696 (14500)	9743 (20655)	0.250	1.000	0.500	0.250	1.000
Overall FS													0.216	0.206	0.613	0.071*	0.025**
P value Significance - Existing vs Improved																	
CD [P = 0.05] FS1 vs FS2			4530	4469	40520	33006	32759	3494	3487	31007	35468	50523					
CD [P = 0.05] FS1 vs FS3			3174	3131	28391	23125	22953	2448	2443	21725	24851	35399					
CD [P = 0.05] FS1 vs FS4			4530	4469	40520	33006	32759	3494	3487	31007	35468	50523					
CD [P = 0.05] FS2 vs FS3			4405	4345	39400	32093	31853	3397	3391	30149	34487	49126					
CD [P = 0.05] FS2 vs FS4			5464	5389	48869	39806	39509	4213	4206	37396	42776	60933					
CD [P = 0.05] FS3 vs FS4			4405	4345	39400	32093	31853	3397	3391	30149	34487	49126					
Fatehpur (Uttar Pradesh)																	
Field crop + dairy	0.72	12	7367 (663)	5355 (640)	54267 (4651)	52557 (5785)	23382 (5836)	9728 (719)	7122 (722)	59561 (3746)	81497 (7496)	43709 (7803)	<0.001***	<0.001***	0.002***	<0.001***	0.003***
Field crop + dairy + horticulture	0.65	12	8907 (663)	6963 (640)	66864 (4651)	62282 (5785)	34094 (5836)	11025 (719)	8405 (722)	66564 (3746)	93300 (7496)	55313 (7803)	<0.001***	0.002***	0.424	<0.001***	<0.001***

Farming System	Area (ha)	No. of Households	Existing System				Improved (Diversified System)				P value Significance - Existing vs Improved						
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			1946	1878	13642	16968	17116	2109	2118	10987	21985	22886	<0.001***	<0.001***	0.284	<0.0001***	<0.0001***
Muzaffarnagar (Uttar Pradesh)																	
Field crop + dairy	1.40	19	38854 (1650)	30916 (1685)	414921 (6659)	556431 (40391)	357975 (42330)	76566 (5937)	72166 (5981)	405997 (11373)	508148 (148248)	398140 (149626)	<0.0001***	<0.0001***	0.396	<0.0001***	<0.0001***
Field crop + dairy + Horticulture	1.51	4	34243 (3595)	27987 (3672)	399025 (14513)	457048 (88030)	300662 (92257)	74606 (12939)	70758 (13035)	383075 (24787)	482068 (323100)	385866 (326102)	0.125	0.125	0.625	0.125	0.125
Field crop + dairy + poultry	0.60	1	42040	32691	411100	639910	406166	48645	46327	361350	854775	496814	-	-	-	-	-
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			8227	8401	33206	201421	211091	29606	29825	56714	739275	746146	<0.0001***	<0.0001***	0.135	<0.0001***	<0.0001***
Fathehabad (Haryana)																	
Field crop + dairy	0.67	24	17398 (1342)	15297 (1301)	116377 (5583)	266387 (28228)	220167 (27381)	312056 (788)	17980 (627)	196430 (6792)	490098 (12881)	199125 (10109)	-	-	-	-	-
Overall FS			P value Significance - Existing vs Improved														
Patiala (Punjab)																	
Field crop + dairy	1.66	24	4719 (179)	4454 (169)	77800 (-)	54342 (5020)	46903 (4733)	18510 (1694)	16021 (1714)	197203 (15464)	321084 (33903)	251378 (34518)	-	-	-	-	-
Overall FS			P value Significance - Existing vs Improved														
Kanker (Chhatisgarh)																	
Field crop + dairy + fishery + piggery	0.93	5	8360 (1502)	6328 (1420)	38600 (2755)	90985 (21780)	59491 (20443)	9475 (965)	6225 (718)	48144 (5124)	98713 (10814)	48345 (6988)	0.813	1.000	0.313	0.625	0.625
Field crop + goat + poultry	0.89	4	9065 (1679)	7436 (1587)	40126 (3080)	100374 (24351)	75135 (22856)	11253 (1079)	8119 (802)	61499 (5729)	112916 (12091)	64341 (7813)	0.125	0.625	0.125	0.375	0.875
Field crop + poultry	0.94	11	6265 (1013)	4839 (957)	32361 (1857)	64742 (14684)	42647 (13783)	7426 (650)	4758 (484)	39963 (3455)	75134 (7291)	33793 (4711)	0.123	0.638	0.054*	0.175	0.966
Field crop + dairy + goat + piggery	0.97	4	6833 (1679)	5705 (1587)	36293 (3080)	69626 (24351)	52138 (22856)	9296 (1079)	6473 (802)	55535 (5729)	88549 (12091)	44799 (7813)	0.125	0.250	0.125	0.125	0.875
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			4700	4443	8620	68149	63965	3019	2245	16033	33837	21865	0.004***	0.750	<0.0001***	0.111	0.284
CD [P = 0.05] FS1 vs FS3			3779	3572	6931	54794	51430	2427	1805	12891	27206	17580					

Farming System		Area (ha)	No. of House-holds	Existing System				Improved (Diversified System)				P value Significance - Existing vs Improved						
				Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Keonjhar (Odisha)																		
CD [P = 0.05] FS1 vs FS4				4700	4443	8620	68149	63965	3019	2245	16033	33837	21865					
CD [P = 0.05] FS2 vs FS3				4091	3867	7503	59316	55674	2628	1954	13955	29451	19031					
CD [P = 0.05] FS2 vs FS4				4954	4683	9087	71836	67425	3182	2367	16900	35667	23047					
CD [P = 0.05] FS3 vs FS4				4091	3867	7503	59316	55674	2628	1954	13955	29451	19031					
Overall FS																		
P value Significance - Existing vs Improved																		
CD [P = 0.05] FS1 vs FS2				3453	3482	18369	28694	29307	3892	3518	15330	36419	31784					
CD [P = 0.05] FS1 vs FS3				3453	3482	18369	28694	29307	3892	3518	15330	36419	31784					
CD [P = 0.05] FS2 vs FS3				4191	4227	22299	34833	35578	4725	4270	18610	44211	38584					
Dungarpur (Rajasthan)																		
Field crop + dairy + horticulture		0.82	8	7993 (776)	5135 (768)	24525 (2156)	87381 (10855)	47368 (10616)	7080 (503)	3825 (441)	42950 (2200)	56166 (7801)	10603 (6724)	0.078*	0.016**	0.008***	0.008***	0.008***
Field crop + dairy		0.88	4	9943 (1098)	7231 (1086)	29900 (3049)	109300 (15351)	71328 (15013)	8668 (712)	5993 (623)	44912 (3112)	76440 (11032)	38993 (9510)	0.125	0.625	0.125	0.125	0.125
Field crop + dairy + poultry		0.80	12	7528 (634)	4614 (627)	22608 (1760)	82778 (8863)	41991 (8668)	6248 (411)	3488 (360)	38895 (1796)	48579 (6369)	9940 (5490)	0.005***	0.002***	<0.001***	<0.001***	<0.001***
Overall FS																		
P value Significance - Existing vs Improved																		
<0.001***																		

Farming System		Area (ha)	No. of Households	Existing System				Improved (Diversified System)				P value Significance - Existing vs Improved					
				Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
CD [P = 0.05] FS1 vs FS2				2797	2766	7765	39099	38239	1813	1587	7925	28098	24221				
CD [P = 0.05] FS1 vs FS3				2085	2062	5787	29143	28502	1351	1183	5907	20943	18053				
CD [P = 0.05] FS2 vs FS3				2637	2608	7320	36863	36052	1709	1496	7472	26491	22836				
Hingoli (Maharashtra)																	
Field crop + sericulture		0.65	4	25484 (5342)	25426 (5337)	28418 (8499)	277393 (61501)	276690 (61466)	9919 (3392)	9500 (3480)	53726 (9588)	65307 (38105)	60268 (39385)	0.375	0.125	0.375	0.375
Field crop + horticulture		0.82	4	44444 (5342)	4179 (5337)	31809 (8499)	21524 (61501)	18342 (61466)	14287 (3392)	13939 (3480)	45104 (9588)	126345 (38105)	122170 (39385)	0.125	0.125	0.125	0.125
Field crop + goat		0.86	9	7660 (3561)	7218 (3558)	45702 (5666)	46222 (41001)	40916 (40977)	7863 (2261)	6283 (2320)	47012 (6392)	47340 (25403)	28389 (26257)	1.000	0.652	0.570	0.496
Field crop + dairy		0.86	7	10838 (4038)	9293 (4035)	61131 (6424)	68920 (46490)	50384 (46464)	12574 (2564)	11012 (2631)	65125 (7248)	85768 (28805)	67024 (29773)	0.047**	0.109	0.469	0.469
Overall FS				P value Significance - Existing vs Improved													
CD [P = 0.05] FS1 vs FS2				15759	15745	25071	181428	181325	10007	10267	28286	112410	116187				
CD [P = 0.05] FS1 vs FS3				13393	13381	21307	154184	154096	8504	8725	24038	95530	98740				
CD [P = 0.05] FS1 vs FS4				13969	13956	22223	160819	160727	8870	9101	25073	99641	102989				
CD [P = 0.05] FS2 vs FS3				13393	13381	21307	154184	154096	8504	8725	24038	95530	98740				
CD [P = 0.05] FS2 vs FS4				13969	13956	22223	160819	160727	8870	9101	25073	99641	102989				
CD [P = 0.05] FS3 vs FS4				11231	11221	17868	129303	129230	7132	7317	20159	80114	82806				
Satara (Maharashtra)																	
Field crop + dairy + goat		0.63	7	5702 (1650)	4566 (1682)	58642 (7119)	197951 (70432)	146834 (71609)	3812 (459)	2957 (493)	79556 (9112)	92002 (16185)	53494 (17912)	0.078*	0.156	0.016**	0.031**
Field crop + dairy + goat + poultry		0.70	6	6571 (1782)	5102 (1816)	67253 (7689)	228437 (76075)	162325 (77346)	4212 (496)	2968 (5330)	89145 (9843)	100389 (17481)	44423 (19348)	0.031**	0.031**	0.031**	0.031**
Field crop + dairy + poultry		0.84	7	8046 (1650)	6575 (1682)	80727 (7119)	281320 (70432)	215157 (71609)	4138 (459)	3120 (493)	102687 (9112)	83540 (16185)	37711 (17912)	0.031**	0.078*	0.016**	0.016**
Field crop + dairy		0.55	4	3955 (2182)	3447 (2225)	57443 (9418)	120552 (93172)	97669 (94729)	3072 (607)	2639 (652)	87944 (12055)	50255 (21410)	30802 (23696)	0.031**	0.078*	0.016**	0.016**

Farming System	Area (ha)	No. of Households	Existing System					Improved (Diversified System)					P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			5065	5163	21859	216257	219871	1409	1514	27979	49694	54999	0.002***	0.005***	<0.001***	<0.001***	
CD [P = 0.05] FS1 vs FS3			4866	4961	21001	207773	211245	1354	1454	26882	47744	52842					
CD [P = 0.05] FS1 vs FS4			5706	5817	24626	243635	247707	1588	1705	31522	55985	61962					
CD [P = 0.05] FS2 vs FS3			5065	5163	21859	216257	219871	1409	1514	27979	49694	54999					
CD [P = 0.05] FS2 vs FS4			5876	5991	25361	250910	255103	1635	1756	32463	57657	63812					
CD [P = 0.05] FS3 vs FS4			5706	5817	24626	243635	247707	1588	1705	31522	55985	61962					
Nagpur (Maharashtra)																	
Field crop + dairy + horticulture	0.89	7	1184 (417)	1086 (398)	24834 (1505)	8312 (11219)	5584 (10675)	2276 (101)	1946 (101)	95065 (1705)	31347 (3002)	40564 (3453)	0.016**	0.016**	0.016**	0.016**	
Field crop + horticulture + bullock	0.88	5	835 (493)	803 (471)	41830 (1781)	18450 (13275)	19360 (12631)	1203 (120)	886 (120)	86556 (2017)	52859 (3553)	61760 (4086)	0.125	0.625	0.625	0.625	
Field crop + bullock	0.77	7	1116 (417)	1107 (398)	45686 (1505)	14443 (11219)	14686 (10675)	1524 (101)	1315 (101)	84636 (1705)	41975 (3002)	47816 (3453)	0.219	0.469	0.016**	0.016**	
Field crop + dairy	0.82	5	2563 (493)	2440 (471)	27780 (1781)	43972 (13275)	40540 (12631)	1865 (120)	1460 (120)	94468 (2017)	42252 (3553)	53602 (4086)	1.000	0.438	0.063*	0.063*	
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			1347	1286	4864	36256	34498	328	328	5509	9703	11160					
CD [P = 0.05] FS1 vs FS3			1230	1174	4440	33097	31492	299	299	5029	8857	10187					
CD [P = 0.05] FS1 vs FS4			1347	1286	4864	36256	34498	328	328	5509	9703	11160					
CD [P = 0.05] FS2 vs FS3			1347	1286	4864	36256	34498	328	328	5509	9703	11160					
CD [P = 0.05] FS2 vs FS4			1455	1390	5254	39161	37262	354	354	5950	10480	12054					
CD [P = 0.05] FS3 vs FS4			1347	1286	4864	36256	34498	328	328	5509	9703	11160					
Medak (Telangana)																	
Field crop + dairy + poultry	1.30	5	14497 (2699)	13214 (2725)	83408 (14951)	148536 (31832)	128011 (32629)	7786 (2537)	5817 (2092)	35086 (17566)	89495 (25438)	57981 (18716)	0.063*	0.063*	0.125	0.063*	

Farming System	Area (ha)	No. of House-holds	Existing System					Improved (Diversified System)					P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Field crop + dairy + sheep / goat	2.36	5	24539 (2699)	23000 (2725)	146306 (14951)	246320 (31832)	221695 (32629)	26783 (2537)	19321 (2092)	149862 (17566)	278681 (25438)	159281 (18716)	0.188	0.188	0.625	0.188	0.625
Field crop + dairy + sheep/ goat + horticulture	2.00	4	18243 (3018)	17106 (3047)	94050 (16716)	197840 (35590)	179646 (36480)	20559 (2836)	15416 (2339)	106618 (19639)	222321 100	140042 (20925)	0.375	0.625	0.625	0.250	0.375
Field crop + dairy	1.60	5	8588 (2699)	7320 (2725)	58780 (14951)	78624 (31832)	58339 (32629)	6728 (2537)	5488 (2092)	34262 (17566)	73393 (25438)	53550 (18716)	0.313	0.313	0.313	0.813	0.813
Field crop + dairy + horticulture	1.32	5	10280 (2699)	8987 (2725)	75898 (14951)	88577 (31832)	67892 (32629)	6679 (2537)	5598 (2092)	43828 (17566)	63029 (25438)	45732 (18716)	0.125	0.125	0.063*	0.313	0.625
Overall FS																	
P value Significance - Existing vs Improved																	
CD [P = 0.05] FS1 vs FS2			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS1 vs FS3			8475	8556	46940	99938	102439	7964	6569	55149	79864	58759					
CD [P = 0.05] FS1 vs FS4			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS1 vs FS5			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS2 vs FS3			8475	8556	46940	99938	102439	7964	6569	55149	79864	58759					
CD [P = 0.05] FS2 vs FS4			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS2 vs FS5			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS3 vs FS4			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
CD [P = 0.05] FS3 vs FS5			8475	8556	46940	99938	102439	7964	6569	55149	79864	58759					
CD [P = 0.05] FS4 vs FS5			7990	8067	44255	94223	96580	7509	6194	51995	75297	55398					
Chikkaballapura (Karnataka)																	
Field crop + dairy + sheep/ goat	0.52	5	11378 (2788)	10107 (2780)	114982 (20241)	112580 (38658)	87149 (39762)	9088 (2184)	8976 (2188)	79250 (26756)	102520 (26026)	100277 (26066)	0.313	0.813	0.063*	0.813	1.000
Field crop + dairy	0.65	4	13650 (2788)	12133 (3109)	113692 (22630)	159313 (43220)	128963 (44455)	7921 (2442)	7738 (2446)	96913 (29914)	61502 (29098)	57851 (29142)	0.125	0.125	0.250	0.125	0.125
Field crop + dairy + poultry	0.83	3	11166 (3599)	10512 (3590)	94387 (26131)	128933 (49907)	115860 (51332)	7784 (2820)	7683 (2825)	80011 (34541)	75666 (33599)	73645 (33650)	0.500	0.500	0.500	0.500	0.750

Farming System	Area (ha)	No. of Households	Existing System					Improved (Diversified System)					P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Field crop + dairy + horticulture +sheep/goat + poultry	0.76	6	13858 (2545)	12804 (2538)	130741 (18477)	16419 (35289)	125337 (36297)	8205 (1994)	8103 (1998)	80957 (24424)	83141 (23758)	81113 (23794)	0.313	0.563	0.313	0.438	1.000
Field crop + dairy + horticulture	0.84	6	9695 (2545)	8822 (2538)	94560 (18477)	99337 (35289)	81884 (36297)	11160 (1994)	11070 (1998)	103765 (24424)	119434 (23758)	117628 (23794)	0.844	0.438	0.563	0.688	0.563
P value Significance - Existing vs Improved																	
Overall FS													0.053*	0.187	0.083*	0.090*	0.43
CD [P = 0.05] FS1vs FS2			8753	8729	63546	121367	124833	6858	6870	84000	81709	81834					
CD [P = 0.05] FS1vs FS3			9529	9028	65718	125514	129099	7092	7105	86871	84502	84630					
CD [P = 0.05] FS1 vs FS4			7901	10185	74140	141599	145643	8001	8015	98004	95331	95476					
CD [P = 0.05] FS1 vs FS5			7901	7880	57361	109554	112683	6190	6201	75825	73757	73869					
CD [P = 0.05] FS2vs FS3			9966	9939	72351	138182	142129	7808	7822	95638	93030	93172					
CD [P = 0.05] FS2 vs FS4			8423	8400	61147	116785	120121	6599	6611	80829	78625	78744					
CD [P = 0.05] FS2vs FS5			8423	8400	61147	116785	120121	6599	6611	80829	78625	78744					
CD [P = 0.05] FS3 vs FS4			9226	9202	66984	127932	131585	7228	7241	88544	86129	86260					
CD [P = 0.05] FS3vs FS5			9226	9202	66984	127932	131585	7228	7241	88544	86129	86260					
CD [P = 0.05] FS4vs FS5			7533	7513	54692	104456	107439	5902	5913	72296	70324	70431					
Salem (Tamil Nadu)																	
Field crop + dairy + goat + poultry	0.86	12	1967 (628)	1690 (607)	44314 (14242)	44179 (17249)	31720 (16886)	6050 (1120)	4685 (996)	123276 (25028)	148989 (33845)	87571 (29351)	<.001***	0.002***	0.001***	<.001***	0.016**
Field crop + dairy + goat	0.70	6	3583 (888)	3346 (858)	68407 (20141)	92833 (24394)	82143 (23881)	6612 (1584)	5990 (1408)	199688 (35395)	97862 (47864)	69843 (41508)	0.031**	0.031**	0.031**	0.438	0.844
Field crop + dairy + poultry	0.83	6	1693 (888)	1595 (858)	27490 (20141)	48692 (24394)	44302 (23881)	4288 (1584)	3665 (1408)	90960 (35395)	101981 (47864)	73954 (41508)	0.031**	0.031**	0.031**	0.031**	0.094*

Farming System	Area (ha)	No. of Households	Existing System				Improved (Diversified System)					P value Significance - Existing vs Improved					
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			2262	2185	51298	62131	60824	4033	3587	90152	121910	105721	<0.001***	<0.001***	<0.001***	0.001***	0.048**
CD [P = 0.05] FS1 vs FS3			2262	2185	51298	62131	60824	4033	3587	90152	121910	105721					
CD [P = 0.05] FS2 vs FS3			2612	2524	59234	71742	70233	4657	4142	104099	140769	122077					
Erode (Tamil Nadu)																	
Field crop + dairy + poultry	0.91	12	12732 (2710)	10088 (2576)	89810 (14724)	164831 (49116)	111951 (47310)	11710 (3131)	10708 (3151)	43020 (6375)	191173 (58429)	171138 (58956)	0.380	0.910	0.005***	0.910	0.380
Field crop + dairy + poultry + goat	0.89	12	12043 (2710)	9460 (2576)	119392 (14724)	121461 (49116)	69800 (47310)	5228 (3131)	4229 (3151)	25531 (6375)	79020 (58429)	59044 (58956)	0.002***	0.009***	0.0005***	0.733	0.570
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			7949	7555	43185	144053	138756	9182	9241	18696	171367	172911	0.077*	0.269	<0.0001***	0.831	0.508
Vizianagaram (Andhra Pradesh)																	
Field crop + dairy	1.33	6	6563 (842)	4553 (851)	47945 (5972)	43938 (6892)	15793 (7524)	4677 (328)	3950 (245)	24542 (1925)	40933 (2982)	30764 (2110)	0.313	0.563	0.063*	0.844	0.438
Field crop + poultry	1.29	12	4695 (595)	3572 (602)	32283 (4223)	33444 (4873)	17720 (5320)	3153 (232)	3072 (173)	13100 (1361)	31036 (2109)	29913 (1492)	0.003***	0.470	<0.001***	0.970	0.012**
Field crop + dairy + poultry	1.45	6	8053 (842)	6121 (851)	47167 (5972)	65580 (6892)	38523 (7524)	5596 (328)	4901 (245)	30270 (1925)	48068 (2982)	38331 (2110)	0.031**	0.156	0.063*	0.031**	1.000
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			2145	2167	15210	17554	19163	836	623	4904	7596	5375	<0.001***	0.122	<0.001***	0.134	0.011**
CD [P = 0.05] FS1 vs FS3			2476	2503	17563	20269	22127	965	720	5662	8771	6206					
CD [P = 0.05] FS2 vs FS3			2145	2167	15210	17554	19163	836	623	4904	7596	5375					
Ratnagiri (Maharashtra)																	
Field crop + dairy	0.21	12	3289 (540)	2159 (429)	33690 (2366)	17283 (6256)	222 (4720)	5647 (583)	4683 (479)	37146 (1674)	50380 (7565)	35441 (5984)	0.005***	0.001***	0.151	0.002***	0.001***
Field crop + poultry	0.23	12	4076 (540)	2640 (429)	41442 (2366)	21743 (6256)	515 (4720)	8356 (583)	6679 (479)	44233 (1674)	85277 (7565)	59285 (5984)	0.016**	0.007***	0.380	0.005***	0.002***
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			1583	1258	6938	18349	13843	1709	1404	4911	22189	17551	<0.001***	<0.001***	0.165	<0.001***	<0.001***

Farming System	Area (ha)	No. of Households	Existing System				Improved (Diversified System)				P value Significance - Existing vs Improved					
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return
Thiruvananthapuram (Kerala)																
Field crop + dairy + horticulture	0.49	8	8611 (1078)	4430 (668)	65991 (5399)	114844 (19008)	27029 (9893)	17461 (1476)	15214 (1413)	474336 (49275)	107658 (20967)	154846 (21947)	0.008***	0.008***	0.008***	0.008***
Horticulture + poultry	0.34	12	4829 (880)	4680 (546)	49802 (4408)	51615 (15520)	48469 (8077)	5711 (1205)	5554 (1154)	92087 (40233)	27837 (17119)	24545 (17919)	0.176	0.176	<0.001***	0.027**
Horticulture + dairy	0.35	4	9966 (1525)	3592 (945)	44067 (7635)	165211 (26882)	31358 (13990)	21788 (2088)	20205 (1998)	700531 (69686)	242989 (29651)	276222 (31037)	0.125	0.125	0.125	0.125
Overall FS																
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			2894	1794	14494	51033	26559	3963	3793	132293	56291	58922	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05] FS1 vs FS3			3883	2407	19445	68468	35633	5317	5089	177489	75522	79052				
CD [P = 0.05] FS2 vs FS3			3661	2270	18333	64553	33595	5013	4798	167339	71203	74531				
Adiva (Gujarat)																
Field crop + dairy	0.90	24	4208 (359)	474 (1260)	169015 (16038)	20326 (4835)	190322 (61170)	6148 (564)	5107 (550)	157606 (19500)	119054 (11414)	72210 (11100)	-	-	-	-
Overall FS																
P value Significance - Existing vs Improved																
Dahod (Gujarat)																
Field crop + dairy + goat	0.93	14	8457 (1218)	6363 (1172)	29730 (2059)	80217 (15217)	52984 (14736)	10119 (988)	7232 (678)	40352 (2069)	91197 (11647)	53666 (8022)	0.013**	0.326	<0.001***	0.042**
Field crop + dairy	0.88	6	7072 (1860)	4929 (1791)	23650 (3145)	68292 (23245)	40433 (22509)	10046 (1509)	7252 (1035)	35162 (3160)	95435 (17791)	59114 (12253)	0.031**	0.063*	0.031**	0.062*
Field crop + dairy + goat + poultry	0.93	4	8920 (2278)	7036 (2193)	30228 (3852)	85734 (28469)	61244 (27568)	9886 (1848)	6708 (1268)	43153 (3871)	85360 (21790)	44051 (15007)	0.625	1.000	0.125	1.0000
Overall FS																
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			4624	4452	7818	57778	55950	3751	2573	7856	44223	30457	0.002***	0.146	<0.0001***	0.076*
CD [P = 0.05] FS1 vs FS3			5372	5172	9084	67131	65008	4358	2989	9127	51382	35387				
CD [P = 0.05] FS2 vs FS3			6116	5889	10343	76433	74015	4962	3404	10392	58501	40290				
Dausa (Rajasthan)																
Field crop + dairy	2.46	8	3329 (325)	1338 (253)	32746 (5091)	8868 (5957)	16026 (6241)	6488 (984)	4668 (978)	18244 (714)	62861 (12171)	40100 (12263)	0.008***	0.008***	0.008***	0.008***

Farming System	Area (ha)	No. of Households	Existing System					Improved (Diversified System)					P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Return	Profit (Rs)
Field crop + dairy + horticulture	4.16	8	2703 (325)	755 (253)	32779 (5091)	1004 (5957)	23347 (6241)	9121 (984)	7149 (978)	18219 (714)	95794 (12171)	71144 (12263)	0.008***	0.008***	0.023**	0.008***	0.008***
Field crop + dairy + goat	3.10	8	3430 (325)	1242 (253)	40121 (5091)	2753 (5957)	24592 (6241)	11536 (984)	9418 (978)	18807 (714)	125390 (12171)	98919 (12263)	0.008***	0.008***	0.008***	0.008***	0.008***
Overall FS			P value Significance - Existing vs Improved														
CD [P = 0.05] FS1 vs FS2			955	743	14973	17519	18354	2895	2878	2101	35796	36067	<0.0001***	<0.0001***	<0.0001***	<0.0001***	<0.0001***
CD [P = 0.05] FS1 vs FS3			955	743	14973	17519	18354	2895	2878	2101	35796	36067					
CD [P = 0.05] FS2 vs FS3			955	743	14973	17519	18354	2895	2878	2101	35796	36067					

7.4.3 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 264 farm households were covered during the year. The average holding size of households in the study locations ranged from 0.50 to 2.00 ha for small households, but in Goalpara (Assam) and Dausa (Rajasthan), the mean holding size was found be higher than 2 ha.

Locations: During 2017-18, a total of 22 districts in 13 agro climatic regions covering 22 NARP zones where in programme was implemented with the

interventions in different modules. The details of locations, number of households covered and farming systems are given in Table 7.3.1. Ten locations namely Nalanda (Bihar), Bilaspur (Himachal Pradesh), East Singhbhum (Jharkhand), Dharwad (Karnataka), Umaria and Anuppur (Madhya Pradesh), Satara (Maharashtra), Kalahandi (Odisha), Mirzapur (Uttar Pradesh), US Nagar (Uttarakhand) have partially implemented the interventions and hence, the data is not included in this report.

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 7.3.1. 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. Farming system with more than one household was subjected to ANOVA and paired t-test analysis. Paired t-test has been carried out for comparing existing and diversified systems with respect to production, marketable surplus, cost and profit. Similarly, one-way ANOVA has been carried out to identify the best farming system with respect to production, marketable surplus, cost and profit for the district. Standard error of mean values is also presented in parenthesis in Table 7.3.2.

Results

The interventions made in different modules are given in Table 7.3.1, while the production, marketable surplus and economics of different farming systems are given in 7.3.2. Location wise and summary of results is explained briefly below.

Western Himalaya

Jammu (Jammu and Kashmir): Only one farming system of field crops+ dairy was observed with mean area of 0.93 ha. Interventions in crop, livestock and optional module did not result in improvement in production, marketable surplus, cost and profit which might be due to the first year of farming system intervention.

Eastern Himalaya

Goalpara (Assam): Three farming systems namely field crops + dairy +piggery + poultry + fishery, field crops + goat + piggery + poultry and field crops + dairy + goat + poultry was found. Interventions made in

crop, livestock, processing and optional module in field crops + goat + piggery + poultry resulted in significantly higher improvement in profit (Rs 98,268 from 2.12 ha).

Lower Gangetic plains

Nadia (West Bengal): Two farming systems namely field crop + dairy + fishery and field crop + dairy + horticulture were found with mean area of 1.16 and 1.07 ha respectively. Interventions made in crop, livestock, processing and optional modules resulted in significant improvement in production, marketable surplus and profit in both the farming systems. Among the farming systems, field crop + dairy + horticulture resulted in higher profit of Rs 1,80,084 from 1.07 ha after the interventions.

Upper Gangetic plains

Fathepur (Uttar Pradesh): Two farming systems namely field crops + dairy + horticulture and field crops + dairy was found with mean area of 0.92 and 1.32 ha respectively. Interventions made in crops, livestock, processing and optional resulted in significant improvement in production, marketable surplus and profit of both the systems. Among the systems, field crops + dairy + horticulture resulted in higher profit of Rs 1,81,787 from 1.32 ha.

Muzaffarnagar (Uttar Pradesh): Two farming systems namely field crops + dairy and field crops + dairy + horticulture was found with mean area of 1.78 and 1.95 ha respectively. Interventions made in crops, livestock, processing and optional resulted in significant improvement in production, marketable surplus and profit of both the systems. Among the systems, field crops + dairy + horticulture resulted in higher profit of Rs 6,52,627 from 1.95 ha.

Trans Gangetic plains

Fathehabad (Haryana): All the households were having only one farming system of field crops + dairy with mean area of 0.91 ha. Interventions in crop, livestock, processing and optional modules did not result in significant change in production, marketable surplus and profit mainly due to the first year of interventions.

Patiala (Punjab): All the households were having only one farming system of field crops + dairy with mean area of 1.73 ha. Interventions in existing systems in different modules such as crop, livestock, processing and optional modules resulted in significant change in production and marketable surplus.

Eastern plateau and hills

Kanker (Chhattisgarh): Three farming systems namely field crops + dairy + piggery + fishery + poultry + vegetables, field crops + dairy + goat + poultry and field crops + poultry was found among which 41% households were having field crops + poultry with mean area of 1.14 ha area. Interventions in crop, livestock, processing and optional resulted in significantly higher production, marketable surplus and profit in all the systems. Among the farming systems, field crops + dairy + piggery + fishery + poultry + vegetables resulted in higher profit of Rs 3,20,374 from 1.92 ha.

Keonjhar (Odisha): Three farming systems namely field crops + horticulture + goat + poultry, field crops + horticulture + goat + poultry + fishery and field crops + dairy + horticulture + goat + poultry with mean holding area of 1.13, 1.22 and 1.05 ha respectively. Interventions made in crop, livestock, processing and optional modules resulted in significantly higher production, marketable surplus and profit in all the systems. Among the three farming systems, after interventions, field crops + dairy + horticulture + goat + poultry system resulted in higher profit of Rs 1,25,546 from 1.05 ha.

Central Plateau and hills

Dungarpur (Rajasthan): Two farming systems namely field crops + dairy and field crops + dairy + poultry were found with mean holding size of 0.87 and 0.93 ha, respectively. Interventions made in crop, livestock, processing, and optional modules did not result in improvement in production, marketable surplus and profit owing to the first year of intervention.

Western Plateau and hills

Hingoli (Maharashtra): Three farming systems namely field crop + horticulture, field crop + goat and field crops + dairy was practiced with mean holding size of 1.13, 0.92 and 1.13 ha respectively. Interventions made in crop, livestock and processing resulted in marginal improvement in production and profit in all the farming systems.

Nagpur (Maharashtra): Three farming systems namely field crop + dairy, field crop + bullock and field crop + dairy + horticulture was found among which 50 % households were practicing field crops + dairy + horticulture system with mean area of 1.35 ha. Interventions made in crop, livestock, processing and optional resulted in marginal improvement in production from field crop + dairy system and profit from field crop + dairy + horticulture system.

Southern Plateau and hills

Medak (Telangana): Three farming systems namely field crop + dairy + goat/sheep, field crop + dairy and field crop + dairy + vegetables were found among which 50 % households were having field crops + dairy with mean area of 0.87 ha. Interventions made in crop, livestock, processing and optional did not result in improvement in production, marketable surplus and profit owing to first year of interventions.

Chikkaballapura (Karnataka): Three farming systems namely field crops + dairy + horticulture, field crops + dairy + goat/sheep + horticulture + poultry and field crop + dairy + sheep/goat + horticulture were found among which 50 % households were having field crop + dairy + sheep/goat + horticulture + poultry system with mean area of 0.63 ha. Interventions made in crop and livestock module resulted in improvement of production, marketable surplus, and profit of field crop + dairy + sheep/goat + horticulture + poultry and field crop + dairy + sheep/goat + horticulture systems. Among the farming systems, field crop + dairy + sheep/goat + horticulture + poultry was found to be more profitable (Rs 3,08,525 from 0.63 ha).

Salem (Tamil Nadu): Two farming systems namely field crops + dairy and field crops + horticulture + goat/sheep + poultry was found among which 66 % households were practicing field crops + horticulture + goat/sheep + poultry system with mean area of 1.20 ha. Interventions made in field crop + dairy resulted in significant improvement in production, marketable surplus and profit (Rs 62,842/ha) compared to benchmark system.

Erode (Tamil Nadu): Two farming systems namely field crops + dairy + poultry and field crops + dairy + goat/sheep + poultry was found among which 75 % households were practicing field crops + dairy + poultry system with mean area of 1.15 ha. Interventions made in both the systems resulted in significant improvement in profit. Among the systems, field crop + dairy + goat/sheep + poultry recorded higher profit of Rs 1,88,847 from 1.34 ha.

East coast plains and hills

Vizianagaram (Andhra Pradesh): Three farming systems namely field crops + dairy, field crops + dairy + poultry and field crop + poultry were found among which 50 % households were practicing field crop + poultry with mean holding size of 0.98 ha. Interventions made in different modules did not influence on the production, marketable surplus and profit owing to first year of interventions.

West Coast Plains and ghats

Ratnagiri (Maharashtra): Two farming systems namely field crop + dairy and field crop + poultry were found with mean holding size of 0.60 and 0.50 ha respectively. Interventions in crop, livestock and optional modules resulted in significant improvement in production (12621 kg), marketable surplus (10345 kg) and profit (Rs 1,01,558) of field crop + poultry system in 0.50 ha.

Thiruvananthapuram (Kerala): Two farming systems namely field crops + dairy + horticulture and horticulture + poultry were found with mean area of 0.99 and 0.95 ha respectively. The interventions made in crop, livestock, processing and optional

in both the systems resulted in improvement in production and marketable surplus.

Gujarat plains and hills

Adiya (Gujarat): Field crops + dairy was found in all the households with mean holding area of 1.48 ha. Interventions made in crop and livestock modules did not result in significant improvement owing to first year of intervention.

Dahod (Gujarat): Two farming systems namely field crops + dairy and field crops + dairy + poultry were found with mean area of 1.60 and 1.06 ha, respectively. Interventions made in crop, livestock, processing and optional did not result in significant improvement owing to first year of intervention.

Western Dry

Dausa (Rajasthan): Two farming systems namely field crop + dairy and field crop + dairy + horticulture was found with mean holding size of 3 and 2.60 ha. Marginal improvement in production, marketable surplus and profit was observed in field crop + dairy farming system after first year of intervention.

The results across the locations are summarized as below:

- The number of farming systems in different districts ranged between 1 (Jammu, Fathehabad, Patiala, Adiya) to 3 (Goalpara, Kanker, Keonjhar, Hingoli, Nagpur, Medak, Chikkaballapura, Vizianagaram).
- Among all the farming systems, field crops + dairy was found to be the dominant farming system based on number of households in 15 districts (40 % of total households) with mean area of 1.28 ha. Due to diversification, the production on equivalent basis improved by 9.3 % while marketable surplus by 27 %.
- Two component systems such as field crop + dairy, field crop + poultry, field crop + sericulture, field crop + goat, field crops + bullock and horticulture + poultry were practiced by 53 % of study households with mean holding size of 1.17

ha whose production and marketable surplus improved by 11.3 and 20 % respectively.

- Three component systems such as field crop + dairy + fishery, field crop + dairy + horticulture, field crops + dairy + poultry, field crops + dairy + goat/sheep, field crop + dairy + vegetables were practiced by 28 % of study households with mean holding size of 1.29 ha whose production improved by 4.4 %.
- Four component systems such as field crop + goat + piggery + poultry, field crop + dairy + goat +poultry, field crop + horticulture + goat+poultry, field crop + dairy + sheep/goat + horticulture, field crop+ horticulture + goat/sheep+ poultry and field crop + dairy + goat / sheep+ poultry were practiced by 11 % of study households with mean holding size of 1.71 ha whose production improved by 12.8 % on yield equivalent basis and profit by 15.3 %.
- Five components' systems such as field crop + dairy + piggery + poultry + fishery, field crops + horticulture + goat + poultry + fishery, field crop + dairy + horticulture + goat + poultry and field crop + dairy + sheep/goat + horticulture + poultry were practiced by 7 % households while six component system of field crop + dairy + piggery + fishery + poultry + vegetables were practiced by 1 % household only.
- In general, at all the locations, constraint-based interventions in crop, livestock, processing and optional modules resulted in improvement in production (1.14 times).

Table 7.4.3.1 Components of existing and diversified farming systems in marginal farm households at different locations

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					
				Crop (s)/Cropping system (s)			Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)			Pro- cess- ing mod- ule	Optional module
				Kharif	Rabi	Summer			Kharif	Rabi	Summer		
I. Western Himalaya													
Bilaspur (Himachal Pradesh) / HP-1/ Sub-Mon- tane and Low Hills Sub-Trop- ical Zone / Semi-arid to humid/ 73 rainy days/ 1230 mm rain	Field crops + dairy (1-2)	0.58	6	Maize/ rice	Wheat	-	Cow (0-1) + Buffalo (1-2)	-	Maize/ sorghum/ rice	Wheat/ barseem / oats	-	Buffalo (1)	NKG
	Field crops + dairy (1-2) + goat (2)	0.44	6	Maize	Wheat	-	Cow (0-1) + Buffalo (1-2) + goat (2)	-	Maize/ sorghum/ rice	Wheat	-	Cow (0-1)+ buffalo (0-1) + goat (2-3)	Kitchen Garden
Jammu (J&K)/ JK-1/ Low altitude Sub-Trop- ical Zone/ Semi-arid to humid/ 1030 mm rain	Field crops + dairy (1-2)	0.93	12	Rice/ mash / Fodder	Wheat / Berseem	-	Cow (1-2) + Buffalo (0-1)	-	Rice	Wheat / veg. pea	Water- melon	Cow (1-2) + Buffalo (0-1)	Kitchen Garden-
Udam singh Nagar (Ut- tarakhand)/ UK-1/ Hill Zone / Semi-arid to humid /55 rainy days /1428 mm rain	Field crops +dairy(1-2)	0.76	5	Rice	Wheat/ sugarcane/ mustard	-	Cow (1-2)	-	Rice	Wheat/ sugar- cane/ mus- tard	-	Cow (1-2)	-
	Field crops	0.66	7	Rice	Wheat / mustard	-	-	-	Rice	Wheat / mustard	-	-	-

District (state)/ NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2017)				Improved / diversified model						
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversification	Crop (s)/Cropping system (s)			Processing module	Optional module		
				Kharif	Rabi			Summer	Kharif	Rabi			Summer	
II. Eastern Himalaya														
Goalpara(As-sam) / AS-3/ Central Brahmaputra Valley Zone / Per humid to humid /63 rainy days/ 1687 mm rain	Field crop + dairy (1-2) +goat (3)+poultry (14-15)	3.53	4	Rice	Rice/mustard	Cow (2)+goat (3) + Poultry(14-15)	-	Rice/ Arecanut	Toria	Cow (2-3) + goat (3)+ Pig (0-1) + Poultry(14-15)	Arecanut fruit	NKG		
	Field crop + dairy (1-2) +poultry (14-15) + pig (1-2) + fishery	1.70	4	Rice	-	Cow (2) + poultry (14-15)+ pig (1-2)	-	Rice/ Arecanut	-	Cow (2-3) + poultry (17-18)+ pig (1-2) + goat (0-1)	-do-	-do-		
	Field crop +goat(1-2) +poultry (16-17) + pig (1-2)	2.12	4	Rice	Mustard	turmeric	Cow (2-3) + goat (3-4)+ poultry (13-14) + Piggery (1-2)	-	Rice/Arecanut	Banana/ Rabi Vegetables	Cow (1) + pig (1)+poultry (7)+ fishery	-do-	-do-	
III. Lower Gangetic Plains														
Nadia (West Bengal)/ lower gang etic plains// 79 rainy days /1634 mm rain	Field crops + Dairy (1.6)+ Fishery	01.17	6	Rice	Mustard / cauliflower/ sesame	Rice/ jute/ pumpkin/ sesame	Cow (1.6)+ fishery	-	Rice	Mustard / lentil / Lathyrus/ Spinach/ Cauliflower	Gourd Chaiti/ boro rice/ jute	Cow (2) + fishery	Mustard seed oil extraction	NKG
	Field crops + dairy (3) + horticulture	1.01	6	Rice	Rice / mustard / Coriander/ banana/ onion	Rice / jute/ okra/ sesame/ banan	Cow (3) + fishery	-	Rice / banana	Coriander /mustard / banana/ pea	Seasame/ boro rice/ jute/okra	Cow (3) + fishery	-Do-	-Do-
IV. Middle Gangetic Plains														
Mirzapur (Uttar Pradesh)/ UP-8 /Vindhyana Zone / Per humid to humid/ 22 rainy days/ 399 mm rain	Field crops + dairy (4)	0.78	8	Rice	Wheat/ mustard/ berseem/ pea	-	Cow (1-2) + Buffalo (2-3)	-	Rice	Wheat/ mustard	Cow (1-2) + Buffalo (1-2)			NKG-

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2017)				Improved /diversified model				Optional module		
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversification	Crop (s)/Cropping system (s)		Live-stock / household (including fisheries)				
				Kharif	Rabi			Summer	Kharif		Rabi		Summer	
V. Upper Gangetic plains														
Fathepur (Uttar Pradesh)/UP-4 /Central Plain Zone/ Dry sub-humid to semi arid / 979 mm rain	Field crops + dairy (1-2)	1.32	6	Rice/ Pearl Millet/ Sorghum/ pigeon pea	Wheat/ mustard/ chickpea	Green Gram	Cow (0-1) + buffalo (1-2)	-	Rice/ Pearl Millet/ pigeon pea/ sorghum/ sesame	Wheat/ mustard	green-gram	Cow (0-1) + buffalo (1-2)	-	-,
	Field crops + dairy (2)+horticulture	0.92	6	Rice/ cauliflower/ sorghum / chilli	Wheat/ mustard/ potato	Green Gram	Buffalo (2)	-	Rice/ / sorghum/ cauliflower flower	Wheat/ mustard/ potato	green-gram	Buffalo (1-2)	-	-
Muzaffarnagar (Uttar Pradesh) Western Plain Zone /Dry sub-humid to semi-arid /105 rainy days /711 mm rain	Field crops + dairy (3-4)	1.79	8	Sugar-cane/ rice/ maize/ F. Sorghum/ pigeon-pea	Wheat / mustard/ oats/ bar-seem	Maize / green-gram / sorghum	Cow (2-3) + Buffalo (1-2)		Sugar-cane/ rice/ black-gram/	Wheat / mustard/ oats/ barseem	Maize / green-gram/ sorghum/ Dhaincha/ Teosinte/ cowpea	Cow (2-3) + Buffalo (1-2)		NKG
	Field crops + dairy (2-3) + horticulture	1.95	4	Sugar-cane/ rice/ F. Sorghum/ pigeon-pea	Wheat / mustard/ oats/ bar-seem	Maize / green-gram / sorghum	Cow (2-3) + Buffalo (0-1)		Sugar-cane/ rice	Wheat / mustard/ oats/ barseem	Sorghum/ cowpea/ maize/ black-gram	Cow (2-3) + Buffalo (0-1)		NKG
VI. Trans Gangetic Plains														
Fathehabad (Haryana) / Semi-arid to Dry sub-humid /561 mm rain	Field crops + dairy (1)	0.91	12	Rice / sorghum	Wheat/ barseem	-	Cow (0-1) + Buffalo (1)	-	Rice	Wheat	-	Cow (0-1) + Buffalo (1)		NKG

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved / diversified model						
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)			Live- stock / household (including fisheries)	Pro- cess- ing mod- ule	Optional module	
				Kharif	Rabi			Summer	Kharif	Rabi				Summer
Patiala (Punjab)/ PB-4 / Western Plain Zone/ Semi-arid to Dry sub-humid/ 14 rainy days/ 105 mm rain	Field crops + dairy (11-12)	1.73	12	Rice	Wheat	-	-	Rice	Wheat	-	Cow (14- 15) + Buffalo (3))	-	NKG	
VII. Eastern Plateau and Hills														
Kankar (Chhat- tisgarh)/ CG-1/ Chattisgarh Plain Zone / Moist sub-humid to dry sub-humid /1369 mm rain	Field crop + vegetable- dairy(2)+ fish + piggery (34) +poultry (19)	1.93	4	Rice / pi- geonpea / maize/ brinjal	Wheat / chickpea / cauliflower /brinjal	-	Cow (2)+ fish- ery + piggery (34) +poultry (19)	-	Rice/ black- gram/ Vegetable	Wheat / chickpea /maize/ lathyrus/ field pea / vegetable	Sweet corn / vegetable	Cow (2) + buffalo (1-2)+ goat (2)+Poultry (25-26) + pig (4)	Pi- geon- pea Dal	NKG
	Field crop + dairy (2-3) + goat (5) + poultry (3)	1.29	3	Rice / okra / maize	Wheat / lentil / brinjal / chickpea / Pearl Millet	-	Cow (2-3) + goat (5) + poultry (3)	-	Rice/ black- gram / vegetable	Linseed / fieldpea / chickpea / lathyrus / vegetable	Sweet corn / vegetable	Cow (8) + goat (4-5) +poultry (39-40)+ pig (2-3)	Pi- geon- pea Dal	NKG
	Field crop + poultry (9)	1.14	5	Rice / kutki / finger- millet	Maize/ len- til / brinjal/ chickpea/ wheat / pearlmillet	-	Poultry (9)	-	Rice/ black- gram / vegetable	Maize / chickpea / sunflower / vegetable	-	Cow (4-5) + buffalo (1-2) + poultry (20-21)+ pig (1)	- do-	- do-
East singbhum (Jharkhand)/ JH- JH-3 / South-east- ern Plateau Zone/ Moist sub-humid to dry sub-hu- mid /58 rainy days / 1125 mm rain	Field crop + goat/ sheep (3-4) + poultry (8)	1.25	12	Rice / tomato / brinjal	-	-	Goat/ sheep (3-4) + poultry (8)	-	Rice	Wheat/ Mustard		Goat/ sheep (3-4) + poultry (8)	-	-

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					Optional module		
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)		Live- stock / household (including fisheries)	Pro- cess- ing mod- ule				
				Kharif	Rabi			Summer	Kharif			Rabi		Summer	
Keon- jhar(Od- isha)/ North-cen- tral Plateau Zone/75 rainy days / 1234 mm rain	Field crops+hor- ticulture+ Poultry (12-13+ Goat (3) + fishery	1.22	5	Rice/ maize/ black- gram/ pigeon- pea/ kharif vegeta- ble	Cauliflower / maize / green- gram/ rabi vegetable	-	-	Poultry (12- 13+ goat (3)+ fishery	-	Rice/ black- gram/ maize/ kharif vegetable	Rice/ maize/ chickpea/ toria/ rabi vegetable	-	Poultry (12-13)+ goat (3)+ fishery	-	-
	Field crops + dairy (1-2)+ horticul- ture+ goat (4) + poul- try (2-3)	1.05	4	Rice/ maize/ kharif vegeta- ble	Rice / maize / green- gram/ rabi vegetable	-	-	Cow (1-2)+ poultry (2-3)+ goat (4)	-	Rice/ maize/ kharif vegetable	Rice / wheat / maize / green- gram/ cowpea / sunflow- er / rabi vegetable	-	Cow (1-2)+ poultry (2-3)+ goat (4)	-	-
	Field crops + horticul- ture+ goat (6-7) + poul- try (6)	1.13	3	Rice/ black- gram/ maize / kharif vegeta- ble	Rabi vege- table	-	-	Goat (6-7) + poultry (6)	-	Rice/ black- gram/ maize / kharif vegetable	Rabi vege- table	-	Goat (6-7) + poultry (6)	-	-
VIII. Central Plateau and hills															
Dungar- pur/Rajast- han/ RJ-8/ Southern Humid	Field crops + dairy (4)	0.87	6	Maize /black gram/ soya- bean	Wheat / barley	-	-	Cow (2-) + Buffalo (2) + goat (2)	-	Maize	Wheat	-	Cow (1-) + Buffalo (1) + goat (1)	-	-
Plain Zone / Semi-arid (wetter half)/ 44 rainy days / 898 mm rain	Field crops + dairy (2)+ poultry	0.93	6	Maize /black gram / sesame/ soya- bean	Wheat / chickpea / barley	-	-	Cow (0-1) + Buffalo (2) + goat (1-2)	-	Maize	Wheat	-	Cow (0-1) + Buffalo (2) + goat (1)	-	--

District (state)/ NARP	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)		Live- stock / household (including fisheries)	Pro- cess- ing mod- ule	Optional module	
				Kharif	Rabi			Kharif	Rabi				
				Kharif	Rabi			Kharif	Rabi				
IX. Western Plateau and Hills													
Hingoli(Ma- harashtra)/ MH-7/ Central Ma- harashtra Plateau Zone, Semi-arid (wetter region)/32 rainy days / 709 mm rain	Field crops + dairy (2)	1.13	3	Soya- bean/ cotton/ pigeon pea / green- gram	Wheat/ chickpea/ sorghum	-	Buffalo (2)	Cotton/ soya- bean/ black- gram / green- gram / turmeric	Chickpea /wheat / sorghum	Buffalo (2)	Milk pro- cess- ing	-	
	Field crops + goat(7)	0.92	5	Soya- bean/ cotton/ pigeon pea / green- gram	Chickpea/ sorghum	-	Goat (7)	Cotton/ soya- bean/ black- gram / green- gram	Chickpea / sorghum	Goat (6-7)	-	-	
	Field crop + sericulture	1.13	4	Soya- bean/ cotton / turmeric	Wheat / sorghum	-	Cow (1)	Cotton / mulberry / green- gram / sorghum/ sugar- cane/ turmeric	Wheat / sorghum / chickpea	-	-	-	
Satara (Maharash- tra)/ MH-5/ Western Maharash- tra Plain Zone Gane- shkhind/ Semi-arid to dry sub-humid / 35 rainy days/ 561 mm rain	Field crops + dairy (0-1)	1.10	3	Soya- bean / cotton / sericul- ture	Sorghum / chickpea	-	Buffalo (0-1) + Goat (5)	Soyabean / green- gram / maize	Wheat/ sorghum / chickpea	goat (4)	-	-	
	Field crop + dairy (0-1)+ goat(6-7)	0.87	3	Soya- bean / cotton / pigeon pea	Sorghum/ chickpea	-	Buffalo (0-1) + goat (6-7)	Soyabean / cotton / mulbary/ green- gram	Chickpea / sorghum	goat (6-7)	-	-	
	Field crop + dairy (1-2)+ goat + poultry	1.13	3	Soya- bean / cotton / turmeric	Wheat sorghum/ chickpea	-	Buffalo (1-2)	Soya- bean / turmeric/ sugar- cane / cotton	Wheat/ chickpea / sorghum	Buffalo (1-2)	Milk pro- cess- ing	-	

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					Optional module	
				Crop (s)/Cropping system (s)			Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)			Live- stock / household (including fisheries)		Pro- cess- ing mod- ule
				Kharif	Rabi	Summer			Kharif	Rabi	Summer			
Katol(Ma- harashtra)/ MH-8/ Central Vidarbha Zone / Semi-arid / 45 rainy days /886 mm rain	Field crop + dairy+ poultry (I)	1.07	3	Soya- bean / pigeon- pea/ cotton / turmeric /green- gram	Wheat sorghum/ chickpea		Buffalo(0-1)		Soyabean /turmeric /black- gram/ green- gram	chickpea / sorghum	Buffa- lo(0-1)	Milk pro- cess- ing	-	
	Field crop + bullock	0.93	3	Soy- bean/ cotton	Wheat		-	-	Soybean/ Soybean +Pigeon pea	Chickpea/ wheat	Bullock (2)	fortifi- cation of wheat flour.	NKG	
	Field crop + bullock + dairy (1-2)+ horticul- ture	1.36	6	Soya- bean / cotton	Chickpea/ wheat		-	Cow (1-2)	Soybean/ pigeon- pea	wheat/ chickpea	Cow (1-2)	fortifi- cation of wheat flour.	NKG	
X. Southern Plateau and Hills	Field crop + dairy (1-2)	1.07	3	Soya- bean / cotton	Chickpea / wheat		Cow (1-2)		Soybean/ Soybean +Pigeon pea	Chickpea / wheat	Cow (1-2)	fortifi- cation of wheat flour.	NKG	
	X. Southern Plateau and Hills													
	Medak (Telanga- na)/ AP-4 Northern Telanga- na Zone/ Semi-arid half/ 49 rainy days/ 616 mm rain	Field crops + dairy (5)	0.87	6	Rice/ maize / sor- ghum	Rice/maize	-	Buffalo (5) + poultry (13-14)	-	Rice/ maize	Rice/ maize	Buffalo (5) + poultry (14-15)	-	-
	Field crop + vegetable + diary (4-5)	1.28	4	Rice / maize/ cotton	Rice/ groundnut / okra		Cow (1-2) + buffalo (3-4)		Rice / maize	Rice/to- mato	Buffalo (3-4)	-	-	
	Field crop + diary (2)+ goat /sheep (5-6)	1.05	2	Rice	Rice	-	Buffalo (2)+ Goat/ sheep (5-6) + poultry (3-4)	-	Rice / maize	Rice	Buffalo (2)+ Goat/ sheep (50-52) + poultry (3-4)	--	-	

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model						
				Crop (s)/Cropping system (s)			Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)			Pro- cess- ing mod- ule	Optional module	
				Kharif	Rabi	Summer			Kharif	Rabi	Summer			
Chikka- ballapura (Karnata- ka)/ KA-4/ Central Dry Zone / Semi-arid / 39 rainy days/ 803 mm rain	Field crop + dairy (2)+ horticul- ture	1.33	3	Potato/ beet- root/ maize/ sericul- ture/ pome- granate	Coriander / finger millet	-	Cow (2)	-	Maize / tomato / finger millet	Cucumber / okra	Pole beans/ fodder maize / finger- millet	Cow (2) + +goat (33))	-	NKG
	Field crop + dairy (2-3)+ goat/sheep (18-19) + poultry (4-5)	0.63	6	Rice / finger millet/ maize / tomato/ sericul- ture	Finger millet / sericulture	-	Cow (2-3) + buffalo (0-1)+ sheep/goat (18-19)+ poul- try (4-5)	-	Maize/ sericul- ture/ pome- granate / finger millet/ potato/ mulberry / man dram / redgram	Bitter- guard/ chikidi / pole beans /Finger Millet/ marigold/ cucumber	Cori- ander / maize	Cow (2-3) + buffalo (0-1)+ sheep/goat (12-13)+ poultry (1-2)	-	NKG
	Field crop + dairy (2) + horticul- ture + goat /sheep (12)	1.43	3	Maize / sericul- ture / brinjal/ beans / tomato	Bittergaurd / seri- culture / beans	Tomato/ mango/ mulberry	Cow (2) + goat /sheep (12)	-	Finger- millet/ redgram / tomato / sericul- ture / ridge- guard	-	Tomato	Cow (2)+goat /sheep (19) + Poultry (8)	-	do
Dharwad(- Karnata- ka)/ KA-8/ Northern Transition Zone, Semi-arid & arid,769 mm	Field crops + dairy (1-2)	0.86	4	Soya- bean/ ground- nut/ cotton	Wheat / maize / sorghum	-	Cow (1-2) + Buffalo (0-1)	-	Peas / soyabean	Shibaragatti /Inam- veerapur/ Karadikop- pa/ Kuradik- eri	-	Cow (1)+ Buffalo (0-1)	Ghee prepa- ration	NKG
	Field crops + horti- culture + dairy (1-2)	1.23	8	Rice / ground- nut/Soy- abean/ green- gram/ cotton/ maize / kh. Veg- etable/ flower	Wheat / blackgram/ chickpea / sorghum / rabi vege- table	Ridgegourd / maize	Cow (1) + Buffalo (1-2)	-	Peas / soyabean	Kurubaga- tti/ lokur / shibaragatti /Inam- veerapur/ Karadikop- pa/ Kuradik- eri	-	Cow (0-1) + Buffalo (0-1)	Ghee prepa- ration	NKG

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved /diversified model					Optional module	
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)			Live- stock / household (including fisheries)	Pro- cess- ing mod- ule		
				Kharif	Rabi			Summer	Kharif	Rabi				Summer
Yeth- pur(Tamil- Nadu)/ NWZ/Bi- modal rain- fall/Start of deccan plateau/50 rainy days/869 mm rain	Field crop + dairy (2-3)	1.08	4	Rice/ banana /cotton/ maize/ ground- nut	Tapioca	Coconut	Cow (3) + buffalo (0-1)	-	Rice/ banana / cotton/ maize/ sorghum / cowpea	Rice / horse- gram/ sorghum/ /gingelly	Coconut	Cow (3-4) + buffalo (0-1) + goat (1)+ poul- try (4)	-	NKG
	Field crop + dairy (2-3)+ goat/sheep (10-11) + poultry (22-23)	1.16	8	Rice/ banana /cotton/ maize/ sugar- cane / ragi / ground- nut / tapioca / turmeric / black- gram / beans	Rice / chickpea / sorghum / coriander / beans	Coconut	Cow (2-3) + goat / sheep (10-11)+ poul- try (22-23)	-	Rice / cotton/ maize/ Finger millet/ Chrysan- themum /Mul- berry/ Fodder grass/ ground- nut / Lab Lab	Sugar- cane / / Finger millet/ sorghum/ /gingelly/ ground- nut/ cowpea / tapoica	Coconut	Cow (2-3) + goat (8-9)+ poultry (17-18)	-	NKG
XI. East Coast Plains and Hills														
Vizianagar- am (Andhra Pradesh)/ AP-7/ High Altitude and Tribal Zone/ Dry sub-humid /64 rainy days/ 885 mm rain	Field crop + dairy (1-2)	0.93	3	Rice	Maize	-	Cow (1-2)+ goat (2-3)	-	Rice-	Maize	-	Cow (0-1)+ buffalo (1- 2)+ poultry (9)	-	NKG
	Field crop + dairy (3-4) + poultry (11-12)	1.27	3	Rice	Maize		Cow (3-4) + poultry (11-12)		Rice	Maize	-	Cow-(1-2) +buffalo (1-2)+ Poul- try (8-9)	-	NKG
	Field crop + poultry (4-5)	0.98	6	Rice	Maize		Poultry (11-12) + goat (2)		Rice	Maize	Sesame	Cow-(0-1) + buffalo (1) +Poul- try (8-9)	-	NKG

District (state)/ NARP zone/soil type/rain- fall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm house- holds	Existing components (As per benchmark, 2017)				Improved / diversified model				Optional module	
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversi- fication	Crop (s)/Cropping system (s)		Live- stock / household (including fisheries)			
				Kharif	Rabi			Summer	Kharif		Rabi		Summer
Bhavanis- agar(Tamil- Nadu) / TN-3 / Western Zone / Semi-ar- id /36 rainy days/775 mm rain	Field Field crop + dairy (4-5) + goat/ sheep (8-9) + poultry (7)	1.34	3	Turner- ic / Sugar- cane / Coconut	Maize / banana	Cow (2) + buffalo (3-4) + goat / sheep (8-9) + poultry (7)		fodder sorghum	Rice / sugarcane / turmeric /ground- nut/ fod- der grass	Coconut	Cow (1-2) + buffalo (3-4) + goat (11)+ poultry (12-13)	Grad- ed seed	NKG
	Field Field crop + dairy (4-5) + poultry (16-17)	1.15	9	Sugar- cane / tur- meric / topioca/ Coconut	Rrice/ brinjal	Cow (3-4) + buffalo (1) + poultry (16-17)		Sugar- cane / turmeric / F. sor- ghum	Rice / gin- gelly // F. sorghum	Cotton / coconut	Cow (4) + buffalo (1-2) + poultry (14)	Grad- ed seed	NKG
XII. West Coast Plains and Ghats													
Ratna- giri(Maha- rashtra)/ MH-1 / South Kon- kan Coastal Zone/ Dry sub-hu- mid & per humid /93 rainy days/3868 mm rain	Field crop + poultry (3-4)	0.50	6	Rice	Cowpea / okra	Cow (1-2) + poultry (3-4)	-	Rice	Cowpea / cucumber	-	Cow (0-1) + Buffalo (0-1)	Mak- ing poha from Rice	NKG
	Field Crop+ Dairy (1-2)	0.60	6	Rice	Cowpea	Cow (1-2) + Poultry (4-5)	-	Rice	Horseg- ram		Cow (0-1) + Poultry (1-2)	Mak- ing poha from Rice	NKG
Vallayani(- Kerala)/ KE-2 / Southern Zone / Dry sub-hu- mid & per humid./ 84 rainy days /1538 mm rain	Field Crop + horticul- tur + dairy (3)	0.99	6	Rice / coconut	Rice / banana	Cow (3)	-	Rice / coconut	Rice / banana	-	Cow (3)	-	NKG
	Horti- culture + poultry (26-27)	0.95	6	Coconut	Banana	Poultry (26- 27)	-	Coconut	Banana	-	Poultry (56-57)	De-husk- ing, grad ing and sale of coconut	NKG

District (state)/NARP zone/soil type/rainfall (mm)/rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2017)				Improved /diversified model					Optional module	
				Crop (s)/Cropping system (s)		Livestock / household (including fisheries if any)	Product diversification	Crop (s)/Cropping system (s)			Live-stock / household (including fisheries)			
				Kharif	Rabi			Summer	Kharif	Rabi		Summer		
XIII. Gujarat Plains and Hills														
Adival(Gu-jarat)/ GJ-4/ North Gujarat Zone / Arid to semi-arid / 15 rainy days / 972 mm rain	Field crops + dairy (2-3)	1.48	12	Cotton/ Cluster-bean/ black-gram/ black-gram / green-gram/ Castor/ fodder sor-sorghum	Wheat/ mustard/ lucerne/ Cumin/ Dilseed	Fodder Pearl-millet	Cow (0-1) + Buffalo (2-3)	-	Maize / fennel / Cluster-bean/ Guar/ cotton/ black-gram / green-gram/ Castor/ fodder sorghum	Wheat/ mustard/ lucerne/ Cumin/ Fennel	fodder sorghum	Cow (0-1)+ Buffalo (2-3)	Ghee making	-
	Field crops + dairy (2-3)	1.61	6	Rice/ maize/ pigeon pea	Maize/ wheat / chickpea	-	Cow (1-2)+ Buffalo (1-2)+ goat (7) + poultry (2)	-	Rice / maize / pigeon-pea	Wheat/ chickpea	-	Cow (1-2) + Buffalo (1-2)	-	NKG
Dahod (Gu-jarat)/ GJ-3/ Middle Gu-jarat Zone / Semi-arid / 23 rainy days /1086 mm rain	Field crops + dairy (2-3)+ poultry (2)	1.06	6	Rice/ maize/ pigeon pea	Maize/ wheat / chickpea	-	Cow (1-2)+ Buffalo (1-2)+Goat (9-10)+ poultry (2)	-	Rice / maize / pigeon-pea	Wheat/ chickpea	-	Cow (0-1)+ Buffalo (1-2)+poultry (9)	-	NKG
	XIV. Western Dry region.													
Dausa (Rajasthan)/ Semi-arid Eastern Plain Zone / Semi-arid (drier half) /12 rainy days /875 mm rain	Field crop + dairy (0-1)	3.00	6	Pearl Millet	Wheat/ mustard		Cow (0-1)	-	Maize / vegetable	Wheat / vegetable	vegetable	Cow (2-3) + Buffalo (2)+goat (1)	Ver-mi Com-post	-
	Field crop + dairy (0-1) + goat	2.62	6	Pearl Millet	Wheat / mustard		Cow (0-1)	-	Maize / vegetable	Wheat / vegetable	-	Cow (1) + Buffalo (1)+goat (1)	Ver-mi Com-post	-

Table 7.4.3.2 Production (on equivalent basis of base crop), marketable surplus and economics of existing and improved farming systems in marginal households (For 2017-18)

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved							
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)		
Jammu (Jammu and Kashmir)																
Field crop + dairy	0.93	12	3476 (491)	2491 (366)	35340 (9342)	27227 (11567)	931 (81)	183 (103)	6375 (949)	10379 (589)	-	-	-			
Overall FS								P value Significance - Existing vs Improved								
Goalpara (Assam)																
Field crop + dairy + piggery + poultry + fishery	1.70	4	11435 (1040)	9968 (972)	32238 (7116)	104988 (9238)	8418 (1881)	8216 (1883)	23875 (4135)	77140 (20796)	0.375	0.875	0.125	0.625		
Field crop + goat + piggery + poultry	2.12	4	11210 (1040)	9497 (972)	39400 (7116)	95125 (9238)	10576 (1881)	10385 (1883)	28650 (4135)	98268 (20796)	0.625	0.625	0.875	1.000		
Field crop + dairy + goat + poultry	3.53	4	10191 (1040)	8644 (972)	56863 (7116)	65425 (9238)	5444 (1881)	5278 (1883)	26125 (4135)	39205 (20796)	0.125	0.125	0.125	0.125		
Overall FS								P value Significance - Existing vs Improved				0.017*	0.184	0.012*	0.144	
CD [P = 0.05] FS1 vs FS2			3326	3110	22766	29553	6018	6024	13229	66530						
CD [P = 0.05] FS1 vs FS3			3326	3110	22766	29553	6018	6024	13229	66530						
CD [P = 0.05] FS2 vs FS3			3326	3110	22766	29553	6018	6024	13229	66530						
Nadia (West Bengal)																
Field crop + dairy + fishery	1.16	6	15346 (3566)	12006 (3666)	123468 (20061)	45335 (21488)	20383 (3884)	14954 (4088)	110208 (16534)	114001 (38065)	0.031*	0.094	0.438	0.031*		
Field crop + dairy + horticulture	1.07	6	19358 (3866)	17607 (3666)	148098 (20061)	64836 (21488)	31412 (3884)	25287 (4088)	179736 (16534)	180084 (38065)	0.094	0.313	0.313	0.0625		
Overall FS								P value Significance - Existing vs Improved				0.016*	0.109	0.827	0.012*	
CD [P = 0.05] FS1 vs FS2			10605	10922	63213	67709	12238	12882	52101	119947						

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved							
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)		
Fatehpur (Uttar Pradesh)																
Field crop + dairy + horticulture	0.92	6	20382 (2412)	17748 (2349)	87651 (13130)	156932 (19052)	22980 (2545)	19853 (2598)	93948 (11174)	181787 (21303)	0.219	0.563	0.156	0.219		
Field crop + dairy	1.32	6	20787 (2412)	17398 (2349)	97843 (13130)	151599 (19052)	22649 (2545)	19582 (2598)	95031 (11174)	176759 (21303)	0.313	0.313	0.563	0.313		
Overall FS																
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			7600	7402	41372	60034	8019	8185	35209	67126						
Muzaffarnagar (Uttar Pradesh)																
Field crop + dairy	1.78	8	45062 (6255)	27081 (2189)	407775 (9017)	944094 (186791)	64111 (7998)	58110 (8411)	387263 (8837)	536070 (243970)	0.375	0.125	0.125	0.375		
Field crop + dairy + horticulture.	1.95	4	37131 (4423)	30602 (1548)	400438 (6376)	713484 (132081)	68448 (5655)	63009 (5948)	400819 (6249)	652627 (172513)	0.008**	0.008**	0.945	0.008**		
Overall FS																
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			17069	5974	24606	509735	21825	22953	24115	665770	0.002**	<0.001**	0.268	0.002**		
Fatehabad (Haryana)																
Field crop + dairy	0.91	12	9711 (1189)	7763 (1274)	114469 (9119)	99175 (18528)	3752 (740)	3656 (726)	33370 (4641)	49165 (12430)	-	-	-	-		
Overall FS											<0.001**	<0.001**	<0.001**	<0.001**		
Patiala (Punjab)																
Field crop + dairy	1.73	12	10344 (741)	8770 (719)	29800	314668 (11786)	23757 (10281)	21900 (10043)	76128 (0.4)	301601 (163468)	-	-	-	-		
Overall FS											0.232	0.231	<0.001**	0.344		
Kanker (Chhatisgarh)																
Field crop + dairy + piggery + fishery + poultry +Veg.	1.92	4	10646 (1613)	101257 (54153)	47658 (6436)	112035 (18608)	49369 (16971)	45709 (16690)	420165 (161742)	320374 (93178)	0.125	0.875	0.125	0.125		
Field crop + dairy + goat + poultry	1.28	3	7298 (1862)	14561 (62531)	30233 (7432)	79238 (21487)	12475 (19597)	9472 (19272)	73677 (186763)	113443 (107593)	0.250	1.000	0.250	0.500		

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved			
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)
Field crop + poultry	1.14	5	7009 (1443)	7027 (48436)	38440 (5757)	66693 (16644)	10804 (15180)	8066 (14928)	65408 (144666)	96652 (83341)	0.188	0.625
Overall FS											0.142	0.569
CD [P = 0.05] FS1 vs FS2			5573	187127	22241	64300	58644	57671	558899	321978		
CD [P = 0.05] FS1 vs FS3			4895	164356	19535	56475	51508	50653	490887	282796		
CD [P = 0.05] FS2 vs FS3			5329	178928	21267	61483	56075	55144	534410	307869		
Keonjhar (Odisha)												
Field crop + horticulture + goat + poultry	1.13	3	6166 (5637)	4906 (5505)	43478 (33531)	49013 (51772)	9269 (5999)	5818 (5819)	43872 (33468)	95161 (57555)	0.250	0.250
Field crop + horticulture + goat + poultry + fishery	1.22	5	10445 (4367)	8816 (4264)	67555 (25973)	89126 (40102)	11172 (4647)	8631 (4508)	64542 (25924)	103031 (44582)	0.313	0.313
Field crop + dairy + horticulture + goat + poultry	1.05	4	9670 (4882)	8046 (4767)	53133 (29039)	91917 (44836)	12077 (5195)	9018 (5040)	55614 (28984)	125546 (49844)	0.125	0.125
Overall FS											0.003**	0.127
CD [P = 0.05] FS1 vs FS2			16131	15751	95948	148142	17166	16652	95767	164688		
CD [P = 0.05] FS1 vs FS3			16870	16473	100344	154930	17953	17415	100156	172235		
CD [P = 0.05] FS2 vs FS3			14817	14468	88133	136077	15768	15296	87968	151276		
Dungarpur (Rajasthan)												
Field crop + dairy	0.87	6	6596 (721)	5273 (705)	13350 (1858)	78992 (9322)	2539 (333)	714 (161)	21367 (2048)	14175 (2682)	0.031*	0.031*
Field crop + dairy + poultry	0.93	6	6209 (721)	4934 (705)	16950 (1858)	69975 (9322)	2739 (333)	896 (161)	24467 (2048)	13883 (2682)	0.031*	0.031*
Overall FS											<0.001**	<0.001**
CD [P = 0.05] FS1 vs FS2			2271	2222	5856	29375	1051	509	6453	8453		

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved				
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)
Hingoli (Maharashtra)													
Field crop + sericulture	1.13	4	3386 (523)	3386 (544)	48339 (6320)	36323 (7733)	3887 (661)	3988 (1556)	39479 (4936)	57699 (15354)	1.000	0.625	0.625
Field crop + goat	0.92	5	3119 (468)	3104 (486)	36538 (5653)	41444 (6917)	3352 (591)	1681 (1392)	39692 (4415)	44099 (13733)	0.438	0.625	0.438
Field crop + dairy	1.13	3	6378 (604)	6304 (628)	77408 (7298)	82034 (8930)	6630 (763)	3616 (1797)	78918 (5700)	86842 (17730)	0.250	0.750	0.500
Overall FS			P value Significance - Existing vs Improved										
CD [P = 0.05] FS1 vs FS2			1587	1650	19182	23471	2006	4722	14981	46601			0.236
CD [P = 0.05] FS1 vs FS3			1807	1879	21839	26723	2284	5376	17057	53057			
CD [P = 0.05] FS2 vs FS3			1728	1797	20882	25552	2184	5141	16310	50732			
Nagpur (Maharashtra)													
Field crop + dairy	1.06	3	1274 (591)	1108 (607)	89000 (11199)	50766 (16008)	1431 (136)	970 (173)	20662 (2935)	22254 (3368)	1.000	0.750	0.250
Field crop + bullock	0.93	3	1266 (591)	1128 (607)	67167 (11199)	29183 (16008)	943 (136)	760 (173)	8455 (2935)	19822 (3368)	0.500	0.500	0.250
Field crop + dairy + horticulture	1.35	6	3245 (418)	2996 (430)	117783 (7919)	20433 (11320)	1332 (96)	1143 (122)	18450 (2076)	21510 (2382)	0.031*	0.031*	0.063
Overall FS			P value Significance - Existing vs Improved										
CD [P = 0.05] FS1 vs FS2			1889	1945	35828	51214	436	553	9390	10775	1889	0.027*	<0.001**
CD [P = 0.05] FS1 vs FS3			1636	1684	31028	44353	378	479	8132	9331	1636		
CD [P = 0.05] FS2 vs FS3			1636	1684	31028	44353	378	479	8132	9331	1636		
Medak (Telangana)													
Field crop + dairy + goat/sheep	1.05	2	29051 (5356)	27524 (5255)	132430 (23903)	303330 (59558)	29031 (5613)	19005 (3222)	172170 (35594)	263302 (48756)	1.000	0.500	0.500
Field crop + dairy	0.87	6	10012 (3092)	8311 (3034)	23531 (13800)	126654 (34386)	4710 (3241)	3713 (1860)	32007 (20550)	38646 (28149)	0.031*	0.313	0.031*

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved							
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)		
Field crop + dairy + vegetables	1.27	4	14990 (3787)	12594 (3716)	37865 (16902)	186989 (42114)	6652 (3969)	5664 (2278)	37121 (25169)	62654 (34475)	0.125	0.125	1.000	0.125		
Overall FS											0.002**	<0.001**	0.216	<0.001**		
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			12513	12278	55845	139149	13114	7527	83160	113910						
CD [P = 0.05] FS1 vs FS3			13087	12841	58404	145526	13715	7872	86971	119130						
CD [P = 0.05] FS2 vs FS3			11494	11278	51297	127817	12046	6914	76388	104633						
Chikkaballapura (Karnataka)																
Field crop + dairy + horticulture	1.33	3	29424 (12759)	28250 (12509)	102333 (28186)	339028 (172537)	28621 (12250)	28080 (12307)	151306 (33452)	278003 (156908)	0.195	0.313	0.078	0.461		
Field crop + dairy + sheep/goat + horticulture + poultry	0.63	6	26539 (9022)	25801 (8845)	136701 (19930)	261379 (122002)	30707 (8662)	29762 (8702)	152073 (23654)	308525 (110951)	0.875	0.875	0.875	0.625		
Field crop + dairy + sheep/goat + horticulture	1.43	3	15507 (12759)	14943 (12509)	89767 (28186)	142843 (172537)	27157 (12250)	26558 (12307)	129247 (33452)	278114 (156908)	0.250	0.250	0.250	0.250		
Overall FS											0.469	0.462	0.130	0.624		
P value Significance - Existing vs Improved																
CD [P = 0.05] FS1 vs FS2			35350	34657	78090	478025	33941	34098	92680	434725						
CD [P = 0.05] FS1 vs FS3			40819	40018	90171	551976	39191	39373	107018	501977						
CD [P = 0.05] FS2 vs FS3			35350	34657	78090	478025	33941	34098	92680	434725						
Salem (Tamil Nadu)																
Field crop + dairy	1.00	4	6999 (8669)	6424 (8609)	58715 (26704)	46272 (106900)	11393 (5464)	10116 (5214)	108060 (40520)	62842 (44351)	0.250	0.250	0.250	0.250		
Field crop + horticulture + sheep + poultry	1.20	8	25016 (6130)	24160 (6087)	113597 (18883)	261649 (75589)	21415 (3864)	19822 (3687)	146751 (28652)	174479 (31361)	0.742	0.641	0.039*	0.383		

Farming System	Area (ha)	No. of House-holds	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved							
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Pro-duction (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)		
Overall FS			P value Significance - Existing vs Improved													
CD [P = 0.05] FS1 vs FS2			23656	23492	72874	291719	14912	14228	110575	121030	0.761	0.589	0.005**	0.270		
Erode (Tamil Nadu)																
Field crop + dairy + poultry	1.15	9	32527 (15858)	31190 (15895)	110946 (32191)	86487 (444354)	9717 (1557)	8454 (1481)	108843 (11920)	182667 (36434)	0.426	0.496	0.301	0.203		
Field crop + dairy + goat / sheep + poultry	1.34	3	11152 (27466)	9626 (27531)	68104 (55756)	26645 (769644)	11312 (2696)	9068 (2566)	150513 (20647)	188847 (63105)	1.000	1.000	0.250	0.750		
Overall FS			P value Significance - Existing vs Improved													
CD [P = 0.05] FS1 vs FS2			70666	70833	143451	1980166	6937	6602	53121	162359	0.215	0.209	0.492	0.173		
Vizianagaram (Andhra Pradesh)																
Field crop + dairy	0.93	3	10646 (3523)	9648 (3311)	77886 (12529)	81804 (42142)	5845 (1163)	3525 (812)	25243 (12172)	62437 (7703)	0.250	0.250	0.250	0.250		
Field crop + dairy + poultry	1.27	3	20232 (3523)	18281 (3311)	107241 (12529)	196236 (42142)	7788 (1163)	5347 (812)	49402 (12172)	67411 (7703)	0.250	0.250	0.250	0.250		
Field crop + poultry	0.98	6	13352 (2491)	11894 (2341)	80178 (8859)	120095 (29799)	6070 (823)	3777 (574)	26826 (8607)	64231 (5447)	0.031*	0.031*	0.031*	0.063		
Overall FS			P value Significance - Existing vs Improved													
CD [P = 0.05] FS1 vs FS2			11271	10593	40083	134821	3722	2598	38941	24642	<0.001**	<0.001**	<0.001**	0.013*		
CD [P = 0.05] FS1 vs FS3			9761	9174	34713	116759	3223	2250	33724	21341						
CD [P = 0.05] FS2 vs FS3			9761	9174	34713	116759	3223	2250	33724	21341						
Ratnagiri (Maharashtra)																
Field crop + dairy	0.60	6	5875 (1524)	3975 (1416)	48573 (9415)	21925 (10316)	4951 (2380)	3136 (2304)	27762 (7104)	31651 (21856)	0.688	0.688	0.063	0.563		
Field crop + poultry	0.50	6	10878 (1524)	9276 (1416)	78787 (9415)	51743 (10316)	12621 (2380)	10345 (2304)	49892 (7104)	101558 (21856)	1.000	1.000	0.156	0.563		
Overall FS			P value Significance - Existing vs Improved													
CD [P = 0.05] FS1 vs FS2			4801	4463	29667	32506	7499	7261	22385	68869	0.867	0.960	0.025*	0.166		

Farming System	Area (ha)	No. of Households	Existing System			Improved (Diversified System)			P value Significance - Existing vs Improved						
			Production (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Pro-duction (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	Produc-tion (kg)	Marketable Surplus (kg)	Cost (Rs)	Profit (Rs)	
Thiruvananthapuram (Kerala)															
Field crop + dairy + horticulture	0.99	6	18978 (7094)	17865 (7081)	123231 (34643)	180423 (90150)	29694 (6480)	27503 (6448)	550999 (80512)	75902 (45041)	0.031*	0.031*	0.031*	0.031*	
Horti-culture + poultry	0.95	6	15606 (7094)	15082 (7081)	70645 (34643)	179051 (90150)	26618 (6480)	23605 (6448)	304031 (80512)	121863 (45041)	0.219	0.313	0.031*	1.000	
Overall FS															
CD [P = 0.05] FS1 vs FS2			22352	22314	109164	284069	20419	20319	253697	141928		0.020*	0.047*	<0.001**	0.020*
Adiwa (Gujarat)															
Field crop + dairy	1.48	12	15561 (5961)	14494 (5844)	108128 (18112)	171961 (91390)	13577 (1555)	19797 (4773)	201308 (26260)	43071 (10136)	-	-	-	-	
Overall FS												0.724	0.506	<0.001**	0.210
Dahod (Gujarat)															
Field crop + dairy	1.60	6	8357 (1653)	5853 (1613)	29979 (3076)	70300 (17788)	8326 (737)	7608 (755)	37803 (2809)	62114 (7419)	1.000	0.438	0.156		0.563
Field crop + dairy + poultry	1.06	6	8603 (1653)	7093 (1613)	25486 (3076)	77749 (17788)	7026 (737)	6521 (755)	30998 (2809)	53315 (7419)	0.688	1.000	0.031*		0.063
Overall FS												0.337	0.486	0.008**	0.109
CD [P = 0.05] FS1 vs FS2			5209	5084	5084	56052	2321	2380	8852	23377					
Dausa (Rajasthan)															
Field crop + dairy	3.00	6	7213 (653)	4569 (490)	6750 (1242)	79800 (7870)	9402 (497)	7190 (391)	32398 (1290)	80424 (6243)	0.063	0.031*	0.031*		1.000
Field crop + dairy + horticulture	2.60	6	4712 (653)	2636 (490)	7983 (1242)	48564 (7870)	5893 (497)	4307 (391)	24260 (1290)	46456 (6243)	0.063	0.031*	0.031*		0.844
Overall FS												0.004**	<0.001**		0.898
CD [P = 0.05] FS1 vs FS2			2057	1544	3913	24800	1566	1231	4065	19671					

7.4.4 Front Line Demonstrations on Cropping/farming systems involving oilseeds

Objective

- 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.

Progress

The FLD's were conducted at 9 OFR centres and 1 on-station centre of All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) in four agro ecosystems viz., Arid, Semi-Arid, Sub Humid, and Humid; covering 9 states. Crops/cropping systems in which FLDs were conducted are given in Table 7.4.4.1. In Arid ecosystem, a total of 62 demonstrations were conducted at Patan & Dahod (Gujarat) and Thiruvananthapuram (Kerala). Under Semi-Arid ecosystem, 47 demonstrations

were conducted in Punjab, Rajasthan and Telangana States. Under Sub humid agro-ecosystem, 40 demonstrations were conducted at Nalanda (Bihar) and Kanker (Chhattisgarh). Under humid ecosystem, 14 demonstrations were conducted at Bilaspur (Himachal Pradesh) and Umiam (Meghalaya). In all, 163 demonstrations were conducted during 2018-19.

Major cropping systems in which oilseed crops were tested are hybrid castor without sun hump in farmers practice and with sun hump in improved practice and blackgram-mustard at Patan, Soybean at Dahod and rice-rice-sesame under ecosystem. In Semi-Arid ecosystem, gobhi-sarson at Patiala, clusterbean-mustard at Dausa, rice-groundnut, rice-sesame and maize-groundnut at Medak districts were evaluated. Mustard was evaluated at Nalanda and Kanker districts under sub humid system while toria and maize-Gobhisarson at Ri-Bhoi and Bilaspur districts respectively under humid ecosystem. In all the locations, farmers practice (FP) and improved practice (IP) were taken.

Table 7.4.4.1: List of Front-Line Demonstrations (FLD) on farming systems involving oilseeds (2018-19)

Agro-Ecosystem	District (State)	Crop/cropping system (s)	Number of demonstrations conducted
1. Arid	Patan (Gujarat)	Hy. castor with green manuring in improved practice	12
		Blackgram - mustard	12
	Dahod (Gujarat)	Soybean	25
	Thiruvananthapuram (Kerala)	Rice -rice - sesame	13
2. Semi-Arid	Patiala (Punjab)	Gobhisarson	17
	Dausa (Rajasthan)	Cluster bean -mustard	12
	Medak (Telangana)	Rice - groundnut	7
		Maize - groundnut	4
		Rice - sesame	7
3. Sub humid	Kanker (Chhattisgarh)	Mustard	25
	Nalanda (Bihar)	Mustard	15
4. Humid	Ri-Bhoi (Meghalaya)	Toria	10
	Bilaspur (Himachal Pradesh)	Maize-Gobhisarson	4
Total			163

Crop varieties along with other management practices adopted in farmers and improved practice under various cropping systems are presented in Table 7.4.4.2.

At Patan district of Gujarat, 12 demonstrations each on hybrid castor with green manuring and black-gram systems were taken. In hybrid castor, improved variety of castor (GCH-7), dibbling method of sowing and intercropping of sunhemp as green manure was undertaken in improved practice against sole castor of farmers practice. In blackgram -mustard system, improved varieties such as Gujarat Urd-1 of blackgram and GM-4 of mustard against the local variety practiced by farmers. At Dahod district, new variety of NRC-37 was introduced against the existing variety of GS-1, 2 in soybean. In Thiruvananthapuram district, sesame was tested as catch crop with improved variety Tilak. Under Semi-Arid eco system, GSC-7 of Gobhisarson at Patiala district, K-6 variety of groundnut in rice-groundnut and maize-groundnut system and Shwetha til variety of sesame in rice-sesame system were evaluated in Medak district along with farmers practice. In sub-humid ecosystem, PM-24 variety in Kanker and Super Goldie mustard of mustard in Nalanda district were evaluated under FLDs. TS-38 with line sowing of Toria in Ri-Bhoi district and HPN-3 of Gobhisarson in Bilaspur district were tested under humid ecosystem.

Table: 7.4.4.2 Details of interventions in FLD (2018-19)

Agro-Ecosystem	District (State)	Crop/cropping system (s)	Number of demonstrations conducted
1. Arid	Patan (Gujarat)	Hy. castor with green manuring in improved practice	12
		Blackgram - mustard	12
	Dahod (Gujarat)	Soybean	25
	Thiruvananthapuram (Kerala)	Rice -rice - sesame	13
2. Semi-Arid	Patiala (Punjab)	Gobhisarson	17
	Dausa (Rajasthan)	Cluster bean -mustard	12
	Medak (Telangana)	Rice - groundnut	7
		Maize - groundnut	4
3. Sub humid	Kanker (Chhattisgarh)	Rice - sesame	7
		Mustard	25
	Nalanda (Bihar)	Mustard	15
4. Humid	Ri-Bhoi (Meghalaya)	Toria	10
	Bilaspur (Himachal Pradesh)	Maize-Gobhisarson	4
Total			163

Fertilizer and other management of crops in FLD's across different regions is given in Table 7.4.4.3. At Patan, recommended dose of NPK, hybrid castor GCH-7 and dibbling with spacing of 180 X 90 cm were tested under 12 demonstrations while recommended NPK was applied to mustard in blackgram-mustard system in another 12 demonstrations. At Dahod, application of 130 kg of DAP with urea as top dressing @ 8 kg and seed treatment with thiram @ 3 g with proper spacing was tested in improved practice compared

to farmers application of only 80 kg DAP and 10 kg of urea as top dressing. At Thiruvananthapuram, recommended NPK was applied while at Patiala, spacing of 45 X 10 cm was maintained by thinning in improved practice compared to farmers practice of broadcasting. In Dausa, application of 60:40 kg N and P₂O₅ was tested with 30 X 15 cm spacing in mustard. At Medak, 22.5 X 10 cm spacing for groundnut with application of 16 kg N and 500 kg gypsum/ha was tested under improved practice. In Sesame, 30 X 15

cm spacing with 5 t/ha of FYM was evaluated. At Kanker, 80:50:30:20 NPKS with spacing of 30 X 10 cm of mustard were evaluated. Application of 80:60:40 kg N P₂O₅ and K₂O with 30 X 10 cm of toria was tested

at Ri-Bhoi district. In Bilaspur district, along with improved variety, recommended dose of nutrients were also included in the improved practice.

Table 7.4.4.3: Fertilizer management of crops in FLD (2018-19)

Agro- Ecosystem (Centre)	Cropping system		Particulars of package	Farmer Practice		Improved Practice	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi
1.Arid							
Patan (Gujarat)	Hy.castor with green manuring in improved practice	-	Sole castor	-	-	-	Green manuring (GM)
							GCH- 7
							Dibbling method sowing
	Black gram (Kh)	Mustard	Variety	-	-	Guj. Urd- 1	GM- 4
Dahod (Gujarat)	Soybean	-	Variety	GS-1,2	-	NRC-37	-
Thiruvananthapuram (Kerala)	Rice	Sesame (As catch crop)	Variety		Kayamkulam-1		Tilak
2. Semi Arid							
Patiala (Punjab)	-	Gobhi-sarson	Spacing	-	Local	-	GSC 7
Dausa (Rajasthan)	Cluster bean	Mustard	Variety	Local	Local	RGC- 1003	DRMRIJ-31
Medak (Telangana)	Rice	Groundnut	Variety	-		-	K-6
	Maize	Groundnut	Variety	-		-	K-6
	Rice	Sesame	Variety				ShwethaTil
3. Sub Humid							
Kanker (Chhattisgarh)	-	Mustard	Variety	Local	Improved variety	-	PM- 24
Nalanda (Bihar)	-	Yellow Mustard	Variety	-	Improved variety	-	Super Goldie Mustard
4. Humid							
Ri-Bhoi (Meghalaya)	-	Toriamustard	Variety	Local	Local	-	TS-38
							Line sowing

Yield

The influence of different improved production practices on the yield of different crops is presented in Table 7.4.4.4. At Patan (Gujarat), 13.8 % increase in hybrid castor yield was observed due to improved practice of green manuring with sunhemp, improved variety and dibbling over farmer's practice. At Dahod, the yield of soybean was improved by 40.8 % while

in Thiruvananthapuram, the improved practice resulted in 31.5 % improvement in yield of Sesame under Arid ecosystem. In Semi Arid ecosystem, the yield of Gobhisarson was improved by 21.5 % at Patiala while mustard yield was improved to the tune of 26.9 % in Dausa district. Improvement in ground nut yield at Medak district was found to be 3 to 9 % in rice-groundnut and maize-groundnut

cropping systems. There was not difference in yield of sesame was observed in the same district. Under sub humid ecosystem, Improved practice at Kanker district recorded 796 kg of mustard while in Nalanda, it was observed that improved practice resulted in 61.9 % improvement in yield. Under humid ecosystem, improved practices in Toria resulted in 56.4 % improvement in yield while Gobhisarson in Bilaspur, the yield was improved by 120 % due to improved practices.

Cost of cultivation

The improved practice has resulted in decrease in cost of cultivation marginally compared to farmers practice especially mustard at Patan district, Gobhsarson in Patiala (reduction by 7.8%), groundnut (by 14 % in rice-groundnut and 4 % in maize-groundnut systems) and 21.8% in rice-sesame systems in Medak district of Telangana. This has helped the farmers to increase the net income from cropping systems involving oilseeds. In other crops such as marginal to significant increase in cost of cultivation was observed (Table 7.4.4.5). The crops such as Castor at Patan, Sesame at Thiruvananthapuram, mustard at Dausa and Nalanda and Toria at Ri-bhoi district recorded 0.2, 2.3, 9.8, 12 and 45 % increase in cost.

Gross and Net returns

Gross and net returns were higher in improved package for all the crops at all locations due to increase in yield (Table 7.4.4.6 & 7.4.4.7). During 2018-19, total of 12 demonstrations involving Hybrid castor were conducted at Patan (Gujarat) centre. The mean data of 12 demonstrations revealed that green manuring with sun hemp in hybrid castor gave 13.9 and 25.70% higher gross and net returns than farmers practice of sole castor. Improved practice in mustard resulted in 17 and 19 % improvement in gross and net returns respectively. At Dahod, improved practice in soybean resulted in 40 and 122 % gross and net returns. In case of Sesame at Thiruvananthapuram resulted in 31 and 107 % improvement of gross and net returns over farmers practice in Arid ecosystem. In Semi Arid ecosystem, improved practice in Gobhisarson at Patiala could result in 6 and 37 % improvement of gross and net returns from 17 demonstrations. The improvement in economics of groundnut and sesame at Medak district is found to be marginal. Under sub humid ecosystem, 15 demonstration in mustard resulted in 61 and 99 % increase in gross and net returns. Gross and net returns from toria in Ri-Bhoi district could be improved by 56 and 74 % respectively due to demonstration of improved practice in 10 FLDS.

Table 7.4.4.4: Influence of farmers and improved practices on grain or pod yield (kg/ha) of various crops under FLD (2018-19)

Agro-Ecosystem (Centre)	Cropping system		No. of demonstra- tions	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Patan (Gujarat)	Hy. castor with green manuring	-	12	2346	-	2670	-	13.81	-
	Moong	Mustard	12	846	1425	995	1610	15.56	13.02
Dahod (Gujarat)	Soybean	-	25	989	-	1393	-	40.87	-
Thriuvananthapu- ram (Kerala)	Rice	Sesame	13	-	387	-	509	-	31.52
2. Semi Arid									
Patiala (Punjab)	-	Gobhisarson	17	-	1158	-	1407	-	21.56

Agro-Ecosystem (Centre)	Cropping system		No. of demonstra- tions	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Dausa (Rajasthan)	Clusterbean	Mustard	12	927	1396	1205	1772	29.97	26.99
Medak (Telangana)	Rice	Groundnut	7	5864	6321	5864	2554	-	9.77
	Maize	Groundnut	4	6563	6084	6563	2598	-	3.18
	Rice	Sesame	7	5438	970	5438	970	-	-
3. Sub Humid									
Kanker (Chhattisgarh)	-	Mustard	25	-	-	-	796	-	-
Nalanda (Bihar)	-	Mustard	15	-	908	-	1470	-	61.98
4. Humid									
Ri-Bhoi (Meghalaya)	-	Toria	10	-	393	-	615	-	56.40
Bilaspur (Himachal Pradesh)	Maize	Gobhisarson	4	1450	621	2826	1371	94.91	120.64

Table 7.4.4.5: Influence of farmers and improved practices on cost of cultivation (Rs/ha) of various crops under FLD (2018-19)

Agro-Ecosystem (Centre)	Cropping system		No. of demonstra- tions	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Patan (Gujarat)	Hy. castor with green manuring	-	12	53873		53991		0.22	
	Moong	Mustard	12	18614	26766	21034	26577	13.00	-0.71
Dahod (Gujarat)	Soybean	-	25	21435	-	23510	-	9.68	-
Thriuvananthapu- ram (Kerala)	Rice	Sesame	13	-	69792		71417		2.33
2. Semi Arid									
Patiala (Punjab)	-	Gobhisarson	17	-	37078	-	34179	-	-7.82
Dausa (Rajasthan)	Clusterbean	Mustard	12	20200	23300	21300	25600	5.45	9.87
Medak (Telangana)	Rice	Groundnut	7	49146	48426	49146	34474	-	-14.30
	Maize	Groundnut	4	39463	37683	39463	34588	-	-4.01
	Rice	Sesame	7	44318	43726	44318	24474	-	-21.87
3. Sub Humid									
Kanker (Chhattis- garh)	-	Mustard	25	-	-	-	18605	-	-
Nalanda (Bihar)	-	Mustard	15	-	17752	-	19898	-	12.09
4. Humid									
Ri-Bhoi (Meghalaya)	-	Toria	10	-	13190	-	19200	-	45.56
Bilaspur (Himachal Pradesh)	Maize	Gobhisarson	4	-	-	-	-	-	-

Table 7.4.4.6: Influence of farmers and improved practices on gross returns (Rs/ha) of various crops under FLD (2018-19)

Agro-Ecosystem (Centre)	Cropping system		No. of demon- strations	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Patan (Gujarat)	Hy. castor with green manuring	-	12	116396	-	132583	-	13.91	-
	Moong	Mustard	12	52475	50298	61475	56758	17.15	12.84
Dahod (Gujarat)	Soybean	-	25	29670	-	41797	-	40.87	-
Thriuvanan- thapuram (Kerala)	Rice	Sesame	13	-	96712	-	127192	-	31.52
2. Semi Arid									
Patiala (Punjab)	-	Gobhisarson	17	-	55218	-	59059	-	6.96
Dausa (Rajasthan)	Clusterbean	Mustard	12	35188	55680	45752	70880	30.02	27.30
Medak (Telangana)	Rice	Groundnut	7	207157	-	207157	227407	-	9.8
	Maize	Groundnut	4	252925	-	252925	261125	-	3.24
	Rice	Sesame	7	184571	-	184571	184594	-	0.01
3. Sub Humid									
Kanker (Chhattisgarh)	-	Mustard	25	-	-	-	33417	-	-
Nalanda (Bihar)	-	Mustard	15	-	40851	-	66174	-	61.99
4. Humid									
Ri-Bhoi (Meghalaya)	-	Toria	10	-	21217	-	33183	-	56.40
Bilaspur (Him- achal Pradesh)	Maize	Gobhisarson	4	-	-	-	-	-	-

Table 7.4.4.7: Influence of farmers and improved practices on net returns (Rs/ha) of various crops under FLD (2018-19)

Agro-Ecosystem (Centre)	Cropping system		No. of demon- strations	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Patan (Gujarat)	Hy. castor with green manuring	-	12	62523	-	78592	-	25.70	-
	Moong	Mustard	12	33861	23532	40441	30182	19.43	28.26
Dahod (Gujarat)	Soybean	-	25	8235	-	18287	-	122.06	-
Thriuvanan- thapuram (Kerala)	Rice	Sesame	13	-	26920	-	55775	-	107.20
2. Semi Arid									
Patiala (Punjab)	-	Gobhis- arson	17	-	18140	-	24880		37.16
Dausa (Rajast- han)	Clusterbean	Mustard	12	14988	32380	24452	45280	63.14	39.84

Agro-Ecosystem (Centre)	Cropping system		No. of demon- strations	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
Medak (Telan- gana)	Rice	Ground- nut	7	76710	-	76710	100651	-	31
	Maize	Ground- nut	4	175780	-	175780	187075	-	6.43
	Rice	Sesame	7	96528		96528	115801	-	19.97
3. Sub Humid									
Kanker (Chhat- tisgarh)	-	Mustard	25	-	-	-	14812	-	-
Nalanda (Bihar)	-	Mustard	15	-	23129	-	46216	-	99.82
4. Humid									
Ri-Bhoi (Megha- laya)	-	Toria	10	-	8027	-	13983	-	74.21
Bilaspur (Him- achal Pradesh)	Maize	Gobhis- arson	4	-	-	-	41840	-	-

Results for large scale application

The cropping systems involving oilseeds promise to increase the production of oilseeds on the one hand and improve the profitability for farmers on

the other hand. In all the FLDs, it was proved that yield and net returns can be increased by adopting improved package in place of farmers practice. The gist of the practices for various crops is given below for large scale adoption.

Sl. No.	Crop	Location (ecosystem)	Improved Package	Increase in yield (%)	Increase in net returns (%)
1.	Mustard	Dausa (Semi Arid)	Variety DRMRIJ-3 1+ 60:40:0 kg NPK/ha	26.99	39.84
		Patan (Arid)	Improved Variety GM-4	13.02	28.26
		Nalanda (Sub humid)	Variety: Super Goldie Mustard	61.98	99.82
2.	Hybrid Castor	Patan (Arid)	Improved Variety GCH-7, Green manuring	13.81	25.70
3.	Soybean	Dahod (Arid)	Variety: NRC-37	40.87	122.06
4.	Sesame	Thiruvananthapuram (Semi Arid)	Tilak variety	31.52	107.20
		Medak (Telangana)	Variety: Shwethatil	0.01	19.97
5.	Gobhisarson	Patiala (Semi Arid)	Variety: GSC 7 + 100: 30:0 kg NPK /ha + Two sprays: Actara 25WG 1.0 liter/ha and Nuva 85 SL @ 500 ml/ha	21.56	37.16
		Bilaspur (Hhumid)	Improved variety HPN-3	120.64	-
7.	Groundnut	Medak (Semi Arid)	Variety : K-6	9.77	31
8.	Toria	Ri-Bhoi (Humid)	Variety :TS-38	56.40	74.21

II. Training on New technologies and development in oilseeds cultivation

As per new guidelines of NMOOP, four OFR centres were allotted the training programmes on new

technologies in oilseeds cultivation for the benefit of extension officers, input dealers and development officials. The details of the training conducted are given below.

Sl. No.	Location (State)	Title of training	Date (s)	Number of participants		
				Extension officials	Input dealers	Total
1	Medak (Telangana)	Advances in oil seed production technologies	15-16 March 2019	20		20
2	Jammu (J&K)	New Technologies and Developments in Oilseeds Cultivation	25-26 March, 2019	13	-	13
3	Kanker (Chhattisgarh)	New technologies and development in oilseeds cultivation	4-5 January, 2019	20	-	20
4	Pantnagar (Udam singh nagar)	New Technologies and Developments in Oilseeds Cultivation	14-15 March. 2019	21	4	25
5	Modipuram (Uttar Pradesh)	New technologies and developments in oil seeds cultivation for changing climate	March 18-19, 2019	25	-	25
Total				99	4	103

(N. Ravisankar) (M.Shamim) (Raghuveer Singh) (Amit Kumar) (Brij Mohan)

Head of Institution Glimpses of FLDs and trainings

Glimpses of FLDs and trainings

FLDs on Oilseeds



FLD on Soybean at Dahod (Gujarat)



FLD on Sesame at Thiruvananthapuram (Kerala)



Field day on mustard at Dausa (Rajasthan)

Training on Oilseeds to Extension officials/input dealers



Training on oilseeds at Pantnagar (Uttarakhand) for extension officials and input dealers



Training on oilseeds at Kanker (Chhattisgarh) for extension officials



Training on oilseeds at Medak (Telangana) for extension officials



Training on oilseeds at Jammu (Jammu and Kashmir) for extension officials

Certificate

This is to certify that the “Front Line Demonstrations on Farming Systems involving Oilseeds and training on new technologies in oilseeds cultivation” was under taken by ICAR-Indian Institute of Farming Systems Research, Modipuram through AICRP on Integrated Farming Systems. The following scientists

and technical officers contributed for coordination and successful compilation of report. The 179 demonstrations were conducted through AICRP-IFS centres and results are compiled and interpreted at ICAR-IIFSR. A total budget of Rs. 4.80 lakhs were utilized for the same during 2018-19.

Dr. N. Ravisankar Principal Scientist (Agronomy)	
Dr. M. Shamim Scientist (Agricultural Meteorology)	
Dr Raghuveer Singh Scientist (Agronomy)	
Dr Amit Kumar Scientist (Agronomy)	
Dr.Brij Mohan CTO (On-farm)	

Head of the Institution

7.4.5 Scheduled Tribe Component (STC/TSP)

Under scheduled tribe component, on-farm research programmes on nutrient response of cropping systems, diversification and improvement of existing farming systems were undertaken at 6 identified OFR centres in 6 States with the participation of 60 tribal households in each district. Further, on-farm participatory research in tribal farming systems through Cluster approach were undertaken in 5 States during the year.

Objectives

- To identify the farming systems practiced by tribal households in different regions
- To improve the profitability of the tribal farming systems by addressing technological constraints

Year of start: 2015-16

Households: As per the tribal sub plan guidelines, tribal households have been selected for characterization, identification of constraints and technological interventions.

Locations: During 2017-18, the programme was undertaken in 11 districts in 10 states under STC. It includes 6 OFR centres namely Kanker (Chhattisgarh), East Singhbhum (Jharkhand), Dungarpur (Rajasthan), Vizianagaram (Andhra Pradesh), Ratnagiri (Maharashtra), Dahod (Gujarat) and 5 cluster programmes at Carnicobar (Andaman and Nicobar Islands), Kanker (Chhattisgarh), Chamba (Himachal Pradesh), Samba (Jammu and Kashmir) and Nainital & Haridwar (Uttarakhand).

Results

The salient findings from tribal farming systems study are given below.

On-Farm Research programmes under Scheduled Tribe component

Kanker (Chhattisgarh): Higher grain yield of rice (5.4 t/ha) and chickpea (1.4 t/ha) were recorded with application of NPK + micronutrients (ZnSO_4 for rice and sulphas for chickpea) @ 100:60:40: 20 kg/ha and 20:40:20:20 kg NPKS/ha respectively in rice-chickpea system. Net returns of rice (Rs. 56,028

/ha) and chickpea (Rs. 36,724 /ha) were higher with recorded application of NPK and micronutrients. Four farming systems namely crop + dairy + fish + pig + poultry (0.93ha), crop + dairy + pig + goat + poultry (0.97ha), crop + goat + poultry (0.89 ha) and crop + poultry (0.94ha) were identified in Kanker



Azolla production unit (Kanker district, Chhattisgarh)

district. Higher mean net income was recorded in crop + dairy + fish + pig + poultry (Rs. 84,181 over benchmark Rs 50,400) followed by crop + dairy + pig + goat + poultry (Rs. 74,738 over benchmark Rs 48,750), crop + goat + poultry (Rs. 74,674 over benchmark Rs 38,750) and crop + poultry (Rs. 66,614 over benchmark Rs 32,818). Under holistic approach three farming systems crop + vegetable + dairy + fish + pig + poultry (1.93ha), crop + dairy + goat + poultry (1.29ha) and crop + poultry (1.14ha) were identified in Kanker district. Higher mean net income was recorded with crop + vegetable + dairy + fish + pig + poultry (Rs. 2,71,792 over benchmark Rs. 63,750) followed by crop + dairy + goat + poultry (Rs. 1,62,202 over benchmark Rs. 53,666) and crop + poultry (Rs. 80,044 over benchmark Rs 37,200). FLDs (27 no's) on linseed under rice-linseed system were conducted. Improved package resulted in gain yield of 660 kg to 1000 kg/ha with mean of 839 kg/ha. Average cost of cultivation was (Rs. 16,180 /ha), gross return (Rs. 37,755 /ha) and net return (Rs. 21,575 /ha) recorded. Increase in net return of Rs. 21,575 /ha was recorded with cost of cultivation of Rs. 16,180 /ha under improved package of linseed.

East Singhbhum (Jharkhand): Higher system yield (rice equivalent) 8389 kg/ha was recorded with application of recommended NPK and Zinc in rice – wheat system. Higher system net return (RS. 5,387 /ha) was also recorded with same application. Higher nutrient response of 11.4 kg grain /Kg in rice and 11.98 kg grain /kg in wheat was obtained with NPK + Zinc. Significant increase in net return due to diversification of crops was observed with improved varieties. The net return of Rs. 59,638 /ha was obtained due to diversification in cropping system module. In the holistic approach the average net return of Rs. 64,340 /ha was obtained with diversification of crops specially with improved varieties.

Dungarpur (Rajasthan): Significantly higher grain and stover /straw yields of maize-wheat system was obtained with application of 90 kg N, 35 kg P_2O_5 & 30 kg K_2O /ha along with Zn to maize and 120 kg N, 40 kg P_2O_5 and 30 kg K_2O /ha to wheat. Significantly higher net returns (Rs 79,075 /ha) and benefit: cost ratio (1.53) was also obtained with same application. Under innovative approach three farming system were identified for interventions. Crop+ dairy + horticulture system recorded higher benchmark net income (Rs. 41,523 from 0.82 ha) with interventional cost of (Rs. 7,913) it recorded about 36 % higher income compared to benchmark. Two farming systems were identified for holistic approach of interventions. Crop + dairy + poultry system recorded higher benchmark net income (Rs. 35,336 from 0.93 ha) with interventional cost of (Rs. 8,898) it recorded 48 % increase in net income compared to benchmark.

Vizianagaram (Andhra Pradesh): Application of NPK + Zn recorded significantly higher rice equivalent grain yield (12,573 kg/ha) in rice – maize system and it was on par with recommended dose of NPK application (12048 kg/ha). NPK + Zn application also recorded higher net returns (Rs.1,19,023 /ha) nutrient response 11.5:9.5:9.3 and 8.7 kg/kg of N,P,K and Zn respectively. Benefit cost ratio were higher in NPK + Zn (1.57) followed by NPK (1.56) and farmer practice (1.33). Crop + livestock are the major farming system identified. The net benefit due to cropping system diversification was found to be Rs.25,240 to 37,090 /ha. In the livestock diversification module,



**Fodder intervention
(Vizianagaram district, Andhra Pradesh)**

the net income Rs.11,836 to 18,935 /household. Product diversification resulted in net income of Rs.5,363 /household. The total system net income increase was found to be Rs. 47,456 to 69,568 /ha with total intervention cost of Rs. 5,925 under marginal households. In small and marginal household crop + dairy, crop + poultry and crop + dairy + poultry were the 3 major farming systems identified with mean area of 0.98, 0.93 and 1.13 ha respectively. The net income of crop + dairy system income increased due to different modules which ranged from Rs. 65,700 to 93,910 /ha with B: C ratio 3.26 similarly crop + poultry system resulted in net income improvement from Rs. 58,750 to 82,445 /ha with B: C ratio of 3.23. Crop + dairy + poultry systems net income was increased Rs. 73,450 to 1,04,900 /ha with B: C ratio of 3.44. The total intervention cost of Rs. 8645, 8345 and 9145 was observed for crop + dairy, crop + poultry and crop + dairy + poultry systems respectively. Front Line Demonstrations were conducted on sunflower and sesame during *rabi* in rice-sunflower and rice-pulse-sesame systems. Adoption of improved practices recorded economic yield of 1880 kg/ha which is 82 % higher over farmers practice (1030 kg/ha). B: C ratio was also higher in improved practice (3.23) than farmers practice (1.76). Sesame recorded yield of 870 kg/ha which is 83 % higher than farmers practice (475 kg/ha). B: C ratio was also higher in improved practice (3.11) than farmers practice (1.59).

Ratnagiri (Maharashtra): Application of recommended dose of NPK and micronutrients (zinc) recorded significantly higher grain and straw/haulm yield of rice during *khari*f and horse gram during *rabi*. This has resulted in gross returns of (Rs. 1,19,652 /ha), net returns of (Rs. 38,388 /ha) and net returns per rupee invested of Rs. 0.47 from rice- horse gram system. The nutrient response was higher in NPK + Zn (9.17 kg grain/kg of nutrient). Three dominant farming systems such as crop + dairy, crop + dairy + horticulture and crop + dairy + goat adopted were found in marginal households which are adopted by 50, 41 and 9 % households in the district. The net incomes generated due to interventions were Rs. 54,236, Rs. 82,580 and Rs. 60,812 from 0.53, 0.68 & 0.62 ha respectively which is 25, 27 and 31% more compared to benchmark. In the holistic approach, mean total net income from crop + dairy, crop + poultry and crop + dairy + horticulture farming systems were found to be Rs. 55,686, Rs. 29,397 and Rs. 84,320 from 0.83, 1.30 & 0.57 ha respectively in benchmark. Net income generated after interventions were found to be Rs. 69,744, Rs. 35,941 and Rs. 1,02,753 respectively which is 25, 22 and 22 % higher over benchmark.

Dahod (Gujarat): Significantly higher system maize equivalent yield (5038 kg/ha), net return (Rs. 50,229 /ha) were recorded with the application of recommended NPK along with 20 kg ZnSo₄ /ha in maize - chickpea system. Nutrient response 6.91 grain /kg of nutrient was obtained with application of 100:50:50:20 kg N P K Zn /ha in Maize and 20:40:20:20 kg N P K Zn /ha in chickpea were applied. Three farming systems such as crop + dairy, crop + dairy + goat and crop + dairy + goat + poultry were identified in households. Soybean was taken as diversified crop while variety diversification was made in wheat. Further, mineral mixture was given to dairy farmers and a total of 8 trainings were organized for farmers. Among the different farming systems, crop + dairy + goat + poultry registered higher net return (Rs. 63,816 from 0.92 ha, 31 % increase over benchmark) followed by crop-dairy - goat (Rs. 53,599 from 0.86 ha, 25 % increase over benchmark), crop + dairy (Rs. 69,286 from 0.93 ha, 20 % increase over benchmark). Two farming systems



Kitchen garden intervention (Dahod district, Gujarat)

such as crop + dairy and crop + dairy + poultry was identified for holistic intervention. Improved variety of maize (GM-6) and chickpea (GJG-3) were introduced alone with intensive trainings. Crop + dairy registered higher net returns (Rs. 67,102 from 1.27 ha, 26 % increase over benchmark) followed by crop + dairy + poultry (Rs. 61,712 from 1.41 ha, 23 % increase over benchmark). Conducted 25 FLD's. The result indicates improved variety with practices recorded 1390 kg/ha of soybean seed, average net return of Rs. 19,200 which is 35 % higher than farmer's practice. Training programme on "new technologies in oil seeds cultivation were organized during 27-28 February, 2018 in which 20 extension officials and input dealers participated.

On-Farm participatory research in tribal farming systems through Cluster approach

Kanker (Chhattisgarh): In Uttar Bastar Kanker district 84 households were covered in 6 villages of 2 blocks namely Kanker and Durgukondal. Interventions made in crops module were improved varieties/ hybrids, balance nutrient management, integrated pest management and suitable cropping system. In livestock module, improved breeds of pigs and poultry, feed management, *Azolla* production pits were done besides farmers training and exposure visits for skill development. The result revealed that, 22% higher returns were obtained from crops due to interventions of improved varieties/ hybrids of crops and 30-35% higher returns were obtained from

livestock due to interventions. It is estimated that around of 7-10 % higher returns were obtained from farming due to training and exposure visits.

Samba (Jammu and Kashmir): In Samba district 100 farmers in three clusters namely Meencharkan, Khatana and Badikhad were adopted for farming system intervention. High yielding Varieties of maize and fruits plants were incorporated in the tribal farming system. The interventions were made in 0.2 ha of each household which resulted in the 70% higher yield (2700 kg/ha of maize equivalent yield) over farmer practice (1600kg /ha). One poultry unit of 1200 birds capacity was established at Badikhad, involving two physically challenged tribal youths (Sh.



Poultry production under STC (Samba district, J&K)

Altaf Choudhary, 21 years and Mohd. Rafiq, 35 years) for promotion of self-employment by adoption IFS approach. The unit was established in participatory mode involving Rs. 2.64 lakhs investment from youths for establishing the infrastructure and scheme support of Rs. 70,250/- under TSP for supply of one day old chicks, feed and medicines and technical support for first batch. The efforts were successful and the unit on an average has realized a profit of Rs. 1,90,815 /year. In a year of birds batches of could be realized successfully. A horticulture based farming system was developed for rainfed areas under TSP of AICRP-IFS. Mr. Blauchdi, rain fed farmer in Badi village samba in was developed by utilizing rainwater harvesting pond for irrigation.

The component consists of intercropping with crops, vegetables and fodder in orchards + animals + farm waste recycling (Vermicompost) + Backyard poultry + nutritional kitchen garden. The model is under study and establishment stage.

Chamba (Himachal Pradesh): On-Farm participatory research in tribal farming systems through cluster approach was under taken in Chamba, typically a backward district situated between 32° 11' 30" and 33° 13' 6" north latitude and 75° 49' and 77° 3' 30" east longitude. Seventy households within 3 village clusters comprising of 6 villages have been adopted for implementation of tribal sub plan activities. four types of farming systems namely field crops + dairy, field crops + dairy+ horticulture, field crops + dairy+ goats/sheep and field crops + dairy + goats/sheep + horticulture were identified in the operational area. Average annual benchmark income of the households varied from Rs. 55,000 /ha (field crops + dairy) to Rs.1,55,400 /ha (field crops + dairy + goats/ sheep + horticulture). The interventions such as improved varieties and management practices of crop and feed supplementation and mineral mixture resulted in increase in income up to 15% in field crops + dairy + goat/ sheep system and 20% in field crops + dairy system.

Haridwar (Uttarakhand): Two villages namely Nayagaon and Mohallapuri, in Haridwar district were adopted for tribal farming system development. In Nayagaon, 90 farm families out of 100 belong to voksha tribals. In Mohallapuri, 100 out of 110 farm



Training on use of Tricho cards in Sugarcane (Haridwar district, Uttarakhand)

families belongs some tribal community to tribal. The major farming systems in the villages were found to be crops+ livestock with most families working as contractual labor outside the village. It was found that contractual laborer's, employment was not available throughout the year. Low productivity of sugarcane due to water scarcity during April-June attack of top borer in sugarcane, mealy bug and loss in yield of rice due to attack of leaf folder, yellow stem borer, false smut, blast etc.; yellow rust and karnal bunt in wheat lack of knowledge for integrated pest management and pesticide dealer based pest management spurious pesticide; wild animal problems low milk productivity in cattle's and buffalo due to inferior breed and lack of proper feed management low conception rate and infertility problems in cattle and buffalo etc. were identified as a major constraints in these villages. Based on the identified constraints, 13 farming system interventions were formulated for improving the productivity of farming systems. The interventions such as integrated nutrient and pest management in rice and sugarcane kitchen /nutrition garden (*kharij*); improved varieties of oilseeds (mustard RH 749 and RH 406) and wheat (HD 3086); kitchen/nutrition gardening (*rabi*) through improved varieties of vegetables seeds and improved community nursery were made. Kisan Gosthies/training and awareness programme were organized on integrated nutrient and pest management in crops, biological control of insect-pests in rice and sugarcane using Trichocards, seed treatment of rice for disease management and pokah Boeng Jagrukta Abhiyan for sugarcane in which total of 251 farm families in Nayagaon and 188 farm families in Mohallapuri benefited.

Nainital (Uttarakhand): High Yielding Variety of wheat (HD 3086) timely sown and basmati rice (PB1121) were introduced in 5.28 ha covered 80 tribal households. Diversification of rice-wheat system with mustard (RH 749) and pulses in 0.85 ha and 1.32 ha area respectively in the cluster resulted in enhancement household nutrition and income. The productivity of rice - wheat system was observed to be 5.99 t/ha compared to farmers practice (5.79 t/ha). Additional return of Rs. 7685/ household/year was

noted in Crop + dairy system due to interventions. Nutritional kitchen garden with seasonal vegetables like brinjal, cowpea, okra, bottle gourd and ridge gourd were done in 100 households with total kitchen garden area of 1000 m². Mineral mixture (51 No's milch animals), Calcium & Vitamin mixture (40 households) and integration of backyard poultry for livelihood security with poultry feed, calcium, vitamin mixture and drinkers for safe water drinking practices were done in 58 tribal households having 690 number of poultry birds.

Port Blair (Andaman and Nicobar Island): Distinct farming systems exists in Nicobar Islands where coconut is the predominant with pig and backyard poultry. A small-scale homestead farming was made as intervention to improve household nutritional



Coconut dehusker for drudgery reduction
(Nicobar district, A&N)

security of tribal households in remote islands. A small -scale homestead IFS model in an area of 400 m² with home garden, pig/goat, backyard poultry and composting was made to ensure household nutritional security. Integration of different farm enterprises not only increased the productivity but also farm income, employment generation and spread of the farm income throughout the year. The IFS systems also helped in on-farm management of agro-biodiversity.

8

GENERAL / MISCELLANEOUS

8. GENERAL/MISCELLANEOUS

8.1 LIST OF PUBLICATION

8.1.1 Research Papers

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
A & N Islands, Port Blair				
Velmurugan, A., Jaisankar, I. and Swarnam, T.P. 2017.	Imparting climate resilience to island farming system through bio shield	<i>Journal of the Andaman Science Association</i>	22(1):35-43	3.94
Swarnam, T.P., Velmurugan, A., Ravisankar, N., Jaisankar, I. and Singh, A.K. 2017.	Environmental change resilience in agriculture through farm diversification	<i>Trends in Biosciences</i>	10(48):9641-9645.	3.68
Swarnam, T.P., Ravisankar, N., Velmurugan, A., Jaisankar, I., Ajit Waman and Panwar, A.S. 2017.	Cultivation of horticultural crops pays	<i>Indian Horticulture, Special Issue, Sep-Oct. 28-32.</i>	-	2.86
AAU, Jorhat				
Baishya, A., Gogoi, Bhabesh, Hazarika, J., Hazarika, J.P., Bora, A.S., Das, A.K., Borah, M. and Sutradhar, P. 2017.	Comparative assessment of organic, inorganic and integrated management practices in rice (<i>Oryza sativa</i>)-based cropping system in acid soil of Assam	<i>Indian Journal of Agronomy</i>	62(2):118-126	5.46
Baishya, A., Sutradhar, P., Borah, M., Gogoi, Bhabesh, Hazarika, J., Bora, A.S., Borah, B. and Ekka, S. 2017.	Impact of Scientific Interventions into Existing Farming Systems on Productivity, Soil Properties and Income Enhancement of Tribal Farmers of Jorhat District of Assam	<i>Indian Journal of Ecology</i>	44(4): 813-820	4.96
Baishya, A., Gogoi, Bhabesh, Bora, A.S., Hazarika, J., Borah, M., Das, A.K., and Sutradhar, P. 2017	Soil fertility and on-farm crop response to NPK and Zn fertilization in rice-rice cropping sequence of Lower Brahmaputra Valley Zone of Assam.	<i>Agricultural Science Digest</i>	37(2):87-93	4.21
ANGRAU, Maruteru				
B Anusha, M. Srinivas and N Srinivasa Rao. 2018.	Survey on rodent species composition in High altitude and tribal zone (HAT) zone of Andhra Pradesh.	<i>Journal of Entomology and Zoology studies</i>	6(6): 600-602	NR

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Tejaswini KLY, Srinivas M and Ramana Rao P V 2018	Genetic divergence and cluster analysis studies in rice (<i>Oryza sativa</i> L.) using D2 statistics	Journal of Pharmacognosy and Phytochemistry	SP 4:108-116.	NR
Anusha B and Srinivas M 2018.	Biology of spotless ladybird beetle, <i>Cycloneda sanguinea</i> (Limbifer) on two spotted spider mite, <i>Tetranychus urticae</i> (Koch)	Indian Journal of Entomology	80(3): 997-999	5.08
Tejaswini KLY, Srinivas M, Ravi Kumar B N V S R, Ramana Rao P V, Lal Ahamed M and Krishnam Raju S 2018	Application of principal component analysis for rice F ₅ families characterization and evaluation.	Emergent Life Sciences Research	4(1):72-84.	NR
S. Sivaleela, M. Srinivas, Ch. Pulla Rao and A. Sireesha. 2018.	Response of medium duration rice varieties to nitrogen in coastal Andhra Pradesh.	The Andhra Agricultural Journal	65(4):819-822.	3.61
BAU, Sabour				
S. K. Chaudhary, S. K. Yadav, D. K. Mahto, R. P. Sharma and Mahesh Kumar (2018)	Response of Growth, Yield Attributes and Yield of Cabbage (<i>Brassica oleracea</i> var. capitata) to Different Organic and Inorganic Sources of Nutrients in Magadha Plain of Bihar	International Journal of Current Microbiology and Applied Sciences	ISSN: 2319-7706 Special Issue-7 pp. 4748-4756	5.38
Rakshit, Rajiv, Das, Anupam, Padbhushan, Rajeev, Sharma, Rajendra Prasad, Sushant and Kumar, Sanjay 2018.	Assessment of soil quality and identification of parameters influencing system yield under long-term fertilizer trial.	Journal of the Indian Society of Soil Science	66 (2) :166-171.	5.31
Chaubey, Dayanidhi, Pathak, S.K., Sushant, Prakash, Ved, Kohli, Anshuman and Das, Anupam 2018.	Sustainable rice-wheat cropping system in eastern India-long term effects on soil physical conditions with integrated nutrient management	Journal of Soil and Water Conservation.	17 (4) :378-386	5.20
Mamta, R. Kumar, Shaweta, Shambhavi, Rajesh Kumar and Sanjay Kumar, 2018	Effect of Conservation Agriculture on Root Distribution of Maize Crops.	Journal of Agricultural Physics	Vol. 18, No. 2, pp. 203-209 (2018)	5.10
D. K. Mahto, S. K. Chaudhary, S. K. Yadav, Vikash Kumar, R. P. Sharma and Mahender Pal (2018)	Response of Nitrogen, Phosphorus, Potassium and Zinc Nutrition on Rice (<i>Oryza sativa</i> L.) – Maize (<i>Zea mays</i> L.) Cropping System	International Journal of Current Microbiology and Applied Sciences	ISSN: 2319-7706 Special Issue-7 pp. 5182-5188	5.38

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Santosh Kumar Chaudhary, Sushil Kumar Yadav, Dilip Kumar Mahto and Neha Sinha (2018)	Effect of diversification and intensification of rice-wheat cropping system on weed dynamics in different vegetable based crop sequences in Nalanda District of South Bihar	Journal of Pharmacognosy and Phytochemistry	SP1: 3258-3260	5.21
D.K. Mahto, SK Chaudhary, SK Yadav, Vikash Kumar, RP Sharma (2018)	On farm crop response to plant nutrients in rice-maize cropping system	Journal of Pharmacognosy and Phytochemistry	SP1: 3261-3264	5.21
ICAR-Patna				
Dwivedi, S.K., Basu Sahana, Kumar Santosh, Kumar Gautam, Ved Prakash, Kumar Sanjeev, Mishra, J.S., Bhatt, B.P., Malviya, N., Singh, G.P. and Arora, A. 2017.	Heat stress induced impairment of starch mobilization regulates pollen viability and grain yield in wheat: Study in Eastern Indo-Gangetic Plains	Field Crops Research	206: 106-114	9.03
Kumar Sanjeev, Shivani, Mishra J S, Kumar Santosh, Kumar Ujjwal and Bharti R C. 2018.	Efficacy of pre- and post-emergence herbicides on complex weed flora in direct-seeded rice (<i>Oryza sativa</i>) in the eastern plains.	Indian Journal of Agricultural Sciences	88 (3): 387-92.	6.22
Kumar Sanjeev, Shivani, B.P. Bhatt and Abhay Kumar. 2018.	Enhancement in livelihood of resource poor farmers through Integrated Farming Systems in the eastern region.	Multilogic in Science	8: Special Issue (D): 111-114	5.20
SDAU, S K Nagar				
A. M. Patel, P. K. Patel, A. K. Saini and K. M. Patel (2018)	Organic nutrient management packages of green manuring potato groundnut sequence.	International Journal of Agriculture Sciences	10(10): 6025-6027.	NR
A. M. Patel, P. K. Patel, A. K. Saini and K. M. Patel (2018).	Kharif greengram – drilled rabi fennel + cauliflower (1:1): A Promising Cropping System of North Gujarat Condition.	Indian Agriculturist	62 (1&2): 47-51.	3.76
A. K. Saini, P.K. Patel and K.M. Patel (2017)	Impact assessment of diversified source of plant nutrition and management practices on sustainability and profitability of potato crop	Trends in Biosciences	10(2), pp. 884-888	3.94

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
NAU, Navsari				
Gudadhe Nitin, Thanki J. D., Patel K. K., Patel D. D. and Arvadia M. K. 2018	Integrated nitrogen management package for sustainable maize yield and soil health with and without vermiwash	Indian Journal of Fertilisers	14 (11):1-7.	4.76
HAU Hisar				
Prasad, G., Chand, M., kumar Pawan and Singh, A. 2017.	Effect of sowing dates on yield attributes and yield in maize (<i>Zea mays</i> L.) hybrids in <i>Kharif</i> season in Haryana	Chemical Science Review and Letters.	6(24): 2182-2185	5.21
Prasad, G., Chand, M., Kumar Pawan and Rinwa, R.S. 2017	Performance of maize (<i>Zea mays</i> L.) hybrids with respect to growth parameters and phonological stages under different sowing dates in <i>Kharif</i> season.	International Journal of Microbiology and Applied Sciences	6(10): 1203-1210.	5.38
HPKV, Palampur				
Gurpreet Singh, Pawan Pathania, S. C. Negi and S.S. Rana. 2018.	Yield and Nutrient losses due to weeds in prominent cropping sequences under mid hills of Himachal Pradesh, India.	International Journal of Current Microbiology and Applied Sciences.	Vol 7 (11): 141-147.	NR
Harsha K N, V K Sharma, Suresh Kumar, Pawan Pathania, Yudhvir Singh, Ajay Kumar Sood and S P Dixit. 2018..	Optimization of seed rhizome type and multiplication method of turmeric (<i>Curcuma longa</i> L.) for mid hills of North West Himalayan region.	International Journal of Chemical Studies	Vol 6 (6): 2088-2092.	NR
SK Sharma, SC Negi SS Rana, Rajju Priya Soni and Mittu Katoch 2017.	Evaluation of maize-based cropping sequences on cultivators fields in low hills subtropical zone of Himachal Pradesh.	Green Farming	8(4): 877-881	4.38
SKUAST JAMMU				
Kour, Sarabdeep, Gupta, Meenakshi, Kachroo, Dileep and Bharat, Rajeev (2017).	Direct and Residual Effect of Zinc and Boron on Productivity, Nutrient Uptake and Quality on Mustard (<i>Brassica juncea</i>) and Succeeding Maize (<i>Zea mays</i>) in Subtropical Inceptisols of Jammu.	Journal of the Indian Society of Soil Science.	65 (3): 334-340.	5.23

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Sharma, Arpita, Kachroo, D., Puniya, R., Sharma, Ashu, Bhagat, Sapna, Joshi, Deepa, Soni, P.G., Yadav, Taramani and Yadav, M.R. (2017).	Water expense efficiency and Economics of Basmati rice (<i>Oryza sativa</i> L.) grown in System of rice intensification under different nutrient management practices and transplanting windows.	Chemical Science Review and Letters	6(21), 269-273.	5.21
Sourbh Khajuria, M. C. Dwivedi, Sandeep Kumar, Dileep Kachroo and R. Puniya (2017).	Yield Performance and Nutrient Uptake of Indian Mustard (<i>Brassica juncea</i> L.) Varieties under Different Dates of Sowing and Planting Geometry.	International Journal of Plant & Soil Science	15 (1): 1-6	4.77
Datta Ashim, Mandal Bismalwapati, Basak Nirmalendu, Badole Shrikant, Chaitany Krishna, Majumder S.M., Thakur N. P., Kumar Parshotam and Kachroo Dileep (2017).	Soil carbon pools under long-term rice-wheat cropping system in Inceptisols of Indian Himalayas.	Archives of Agronomy and Soil Science.	https://doi.org/10.1080/03650340.2017.1419196	7.12
Singh, P., Kachroo, D., Thakur, N.P., Khajuria, V., Kumar, P., Kumar, Mahesh and Kour, G. (2018).	Comparative Performance of Vanaraja, Gramapriya and Indigenous Desi Bird under Backyard System of Rearing in Jammu Province, India.	Int. J. Curr. Microbiol. App. Sci.	7 (2): 101-105.	5.38
Kumar, P., Kachroo, D., Thakur, N.P., Gupta, A.K., Sharma, Rohit, Archana, Singh, P. And Khajuria, V. (2018).	Effect of Resource conservation practices on productivity of Maize Inter cropped with soybean under Maize + Soybean-Wheat cropping system and soil Microbial population.	Int. J. Curr. Microbiol. App. Sci.	7(4): 434-444.	5.38
UAHS, Kathalagere				
Kumara, O., Rajini, S.R., Sannathimmappa, H.G., Vijay S. Danaraddi and Umesh, C., 2018	Integrated Farming system for doubling the farm income through sustainable resource management for ensuring livelihood security of resource poor farmers.	International journal of agricultural sciences.	10(17):7029-7032	4.73

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Kumara ,O., H. G. Sannathimmappa, Basavarajappa, D. N, Vijay S. Danaraddi ⁴ Akmal pasha ⁵ and S.R.Rajini,2017	Integrated Farming System -An Approach Towards Livelihood Security, Resource Conservation And Sustainable Production For Small And Marginal Farmers.	<i>I J plant and soil science</i>	15(3):1-9	4.98
Kumara, O, H. G. Sannathimmappa, Rajani.,S.R., Vijay S. Danaraddi and Sanjeev Kyathappanavar ,2017,	Integrated nutrient management on sustainable production of Rice -Maize cropping system in Bhadra command area of Karnataka, India	<i>I j curr microbial app sci.,</i>	6 (8):1501-1513	5.36
UAS, Raichur				
Mallikarjun, Koppalkar, B. G., Desai, B. K. Basavanneppa ,M. A., Narayana Rao K. and Mahadev Swamy, 2018,	Performance of Pigeonpea (<i>Cajanus cajan</i>) Intercropping as Influenced by Row Ratios and Nutri Cereal Crops,	<i>Int.J.Curr.Microbiol. App.Sci</i>	7(6): 2653-2658	5.38
Basavanneppa M.A. and Ashok Kumar Gaddi,2017.	An Alternative Cropping Systems for Tunga Bhadra Command Area of Karnataka , India	<i>Int.J.Curr.Microbiol. App.Science</i>	(2017) 6(12): 1865-1872	5.38
OUAT,Bhubaneswar				
A K Patra, B K Mohapatra, S K Swain, L M Garnayak, K N Mishra, T R Mohanty and R K Paikaray. 2018.	On-farm evaluation of rice (<i>Oryza sativa</i>)-based cropping systems for increasing system productivity, profitability, resource-use efficiency and energy productivity in mid-central table land zone of Odisha	<i>Indian Journal of Agronomy</i>	63(3): 264-270.	5.55
K N Mishra, A K Patra, L M Garnayak, A K Mohanty, S K Swain 2017.	Long term effects of integrated nutrient management on productivity and soil properties of rice (<i>Oryza sativa</i>)-rice cropping system in coastal Odisha.	<i>Indian Journal of Agronomy</i>	62(3): 239-246 (2017)	5.46

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
A K Patra, K N Mishra, L M Garnayak, A K Mohanty 2017.	Influence of long term organic nutrient management on soil quality and crop productivity in rice (<i>Oryza sativa</i>)-potato (<i>Solanum tuberosum</i>)-okra (<i>Abelmoschus esculentus</i>) cropping system under irrigated condition.	Indian Journal of Agronomy	62(3): 268-274 (2017)	5.46
JNKVV, Jabalpur				
Sahu R. P., Shukla V.K. and Vishwakarma S. K. (2018).	Nutrient management practices on crop productivity, production efficiency and water productivity under various cropping system	JNKVV Res. J	51: (3) : 154-156	NR
Jain Vikas, Kushwaha, H. S. and Vishwakarma, S. K. (2018)	Productivity, profitability and soil health as affected by various diversified rice (<i>Oryza sativa</i>) based cropping system.	Multiloic in science (8) special issue	:389-392	NR
Sallam Kuldeep Singh, Shukla V. K., Sahu Rajendra Prasad and Vishwakarma S. K. 2018.	Performance of suitable variety of rice under organic nutrient management system.	JNKVV Res. J	51: (1) 127-130.	NR
Mory Govind, Sahu Rajendra Prasad, Vishwakarma S. K., Kewat M.L., and Sharma J. K. 2018.	Effects of different weed control treatments on yield attributes and yield of transplanted rice.	JNKVV Res. J	51: (2) 154-156	NR
Mory Govind, Sahu Rajendra Prasad, Shukla V. K. and Sharma J. K. (2018).	Evaluation of economical viability of different weed control treatments on rice crop under transplanted rice	JNKVV Res. J	51: (2) 157-159	NR
Rajul Soni, Sahu Rajendra Prasad, Sharma J. K. and Kewat M.L. (2018).	Evaluation of post emergence applications of pyribenzoxim against weeds in direct seeded rice.	JNKVV Res. J	51: (3) 358-362	NR
Jugnahke, Monika, Prajapati Rohit, Maurya, B.M. and Kurmvanshi S.M. (2018).	Identification of cropping system module for Irrigated farming system of Rewa region.	International J. of Current Microbiology and Applied Science	54 (10): 687-694	NR

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Kurmvanshi S.M. Tiwari R.K. Maurya B.M. and Singh J. 2018	Long term effect of organic, inorganic and integrated nutrient management on rice-wheat cropping system.	International J. of Current Microbiology and Applied Science.	7 (8) : 1317-1322	NR
Kurmvanshi S.M., Maurya B.M. and Tiwari R.K. (2018)	Long term effect of Chemical fertilizer in rice-wheat cropping system under irrigated condition of Kymore- Satpura Agro climatic zone	International J. of Current Microbiology and Applied Science.	7 (8) : 3918-3925.	NR
PDKV,Akola				
B. V. Saoji, B. S. Morwal and P. H. Bansod 2018.	Productivity, Profitability and soil fertility as influenced by diversified soybean based cropping systems in Vidarbha region of Maharashtra	PKV Res. Journal,	41(2)	NR
MAU,Parbhani				
W.N. Narkhede, R.N. Khandare, S.K. Nayak, and G.S. Kazi 2017.	Effect of organic and inorganic nutrient resources and their integrated nutrient management on productivity, economics efficiency, available N,P,K and microbial population in soyabean (Glycine Max) – Onion (Allium cepa) Cropping sequence	Indian Journal of Agronomy	62 (2): 147-154	5.55
Ashim data ,Biswapati-mandal ,Shrikant badole ,Krishna chitanya, S.P.Mu-jumdar ,Dnaneshwar-Padau,Nirmalendu Barak Ajit Burman Ritesh Kundu ,W.N.Narkhede 2018.	Interrelationship of biomass yield ,carbon input ,aggregation ,carbon pool and its sequestration in vertisol under long term sorghum-wheat cropping system in semiarid tropics.	Soil and Tillage	0167-1987	10.68
Karle A. S. V. Gite, G. S. Khazi and D. N. Gokhale 2018.	Production potential and profitability of soybean (<i>Glycine max (L.) Merrill</i>) as influenced by different production factors	Journal of Oilseeds Research	35 (1) 74-76	5.02

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Narkhede, R.N. Khandare, G.S. Khazi and M.J. Bhende 2017	Effect of Tillage nutrient management and mulch on productivity and profitability of cropping sequences under vertisol in central plateau zone of Maharashtra	Indian Journal of Ecology	2017 44 Special issue -4 109-114.	4.96
Meshram N.A. Syed Ismail, Shirale S.T. and Patil V.D. 2018	Impact of long term fertilizer experiment on Soil fertility, nutrient uptake, growth and productivity of Soybean -Safflower Cropping Sequence in Vertisol	legume Research an International Journal.	42(2)2019 182-189	6.34
S.P. Dasharthe, S.T. Shirale and Syed Ismail 2018.	Response of potassium to soybean crop on yield and soil properties in vertisol on farmers field	J.Agric. Res. Techno.	43(2) 426-431	4.18
MPKV ,Rahuri				
Dr. J. S. Kumbhar & Dr. S. V. Satpute & B. J. Deshmukh 2017	Economics of production and Marketing of Gourds (Bitter and Bottle gourds) in Western Maharashtra state	Contemporary Research in India	Vol.7, Issue 1(2017), PP 57-66.	NR
Dr. B. T. Kamble, Dr. J. S. Kumbhar & Dr. S. S. Kaware 2017.	Trends in Area, Production and Productivity of Cotton in Western Maharashtra region of Maharashtra State.	Contemporary Research in India	Vol.7, Issue 1(2017), PP 24-29.	NR
Dr. B.S.Kakad, C.B.Kakad, J.S.Kumbhar & S.D.Patole 2017	Comparative Economics of Sugarcane Production in Western Maharashtra	Co-operative Sugar	Vol.49(2) : pp.17-20,	
S.V. Satpute, J.S. Kumbhar & K.L. Jadhav 2018.	Economic analysis of risk in dryland agriculture for doubling farmers' income	<i>Maharashtra Journal of Agricultural Economics</i>	PP(33)	2.97
J.S. Kumbhar, S.V. Satpute & S.S. Bhosale 2018	Minimization of Risk in Dryland Agriculture for Increasing Farmers' Income	<i>Maharashtra Journal of Agricultural Economics</i>	PP(35)	2.97

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
B.J. Deshmukh, J.S. Kumbhar & S.K. Nawale 2018	Technology Adoption Pattern by the Grape Growers in Maharashtra	<i>Maharashtra Journal of Agricultural Economics</i>	PP(103)	2.97
DBSKKV,Karjat				
S B Bhagat, Jadhao Y S, Dahiphale A V and Mardane R D.2018.	Effect of different levels of phosphorus on growth, yield and economics of fodder cowpea (<i>Vigna unguiculata</i> L. Walp) varieties.	International Journal of Chemical Studies .	6(6): 378-376	5.31
Bhagat S B, Nikas S B, Dahiphale A V and Mhaskar N V . 2018.	Effect of intercropping and nitrogen levels on growth, yield and uptake of nutrient on finger millet (<i>Eleusine coracana</i> G.)	International Journal of Chemical Studies .	6(6): 311-313	5.31
Bhagat S B, Nikas S B, Dahiphale A V, Dhekale J S and Mardane R D 2018.	Effect of nitrogen levels and intercropping on yield and economics of finger millet (<i>Eleusine coracana</i> G.)	The pharma Innovation .	Vol. 7 (10), 651-654	5.03
Bhagat SB, Jadhao YS and Dahiphale AV.2018.	Effect of different levels of phosphorus on nutrient uptake and quality parameter of fodder cowpea (<i>Vigna unguiculata</i> L. Walp) varieties under lateritic soil of Konkan region	Journal of Pharmacognosy and Phytochemistry	7(6): 183-185	5.21
Basavaraj Shellikeri, Malashe K. V. and Mhaskar N. V. 2018	Growth performance and herbage yield of different colocasia (<i>Colocasia esculenta</i> L.) genotypes under Konkan climatic conditions	Journal of Eco-friendly Agriculture	13 (2) Pp 31-34	5.23
PAU,Ludhiana				
Kumar R, Kumar J, Brar A S, Walia S S and Gill B S 2017.	Effect of straw mulch and integrated nitrogen management on yield and quality of turmeric under North Indian plains.	<i>Indian Journal of Horticulture</i>	74(2): 240-244.	6.13

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Singh Balwinder, Aulakh C S and Walia S S 2017.	Productivity and water use of organic wheat-chickpea intercropping system under limited moisture conditions in Northwest India.	<i>Renewable Agriculture and Food Systems</i>	10.1017/S1742170517000370: 1-10.	7.44
Singh G, Walia S S and Singh Sompal (2017)	Effect of integrated nutrient management on Agro climatic environment and yield of baby corn (<i>Zea mays</i> L.) in northwestern India	<i>Journal of Agrometeorology</i>	19 (4): 355-358.	6.36
Aulakh C S, Singh H, Walia S S, Phutela R P and Singh G 2018	Effect of farmyard manure and jeevamrit in maize-wheat organic production system in Punjab	<i>Agricultural Research Journal</i>	55(3): 485-489.	4.71
Aulakh C S, Singh H, Walia S S, Phutela R P and Singh G (2018)	Evaluation of nutrient sources for organic production of rice (<i>Oryza sativa</i>)-wheat (<i>Triticum aestivum</i>) cropping system in north west India.	<i>Indian Journal of Agronomy</i>	63(2): 137-144	5.55
Gosal S. K., Gill G. K., Sandeep Sharma and Walia S S (2018).	Soil nutrient status and yield of rice as affected by long-term integrated use of organic and inorganic fertilizers.	<i>Journal of Plant Nutrition</i>	41(4): 539-544.	6.62
Kaur J, Gosal S K and Walia S S (2018)	Correlation of microbial population with enzymatic activities and nutrient levels of soil during paddy growth.	<i>Current Journal of Applied Science and Technology.</i>	29(6): 1-9	5.32
Kaur Tejpreet, Singh Kulbir, Jindal SK, Walia SS, Talwar Dilpreet (2018)	Effect of Mulch Application and Different dates of Transplanting under Low Tunnel on Growth, Yield and Economics of Chilli (<i>Capsicum annuum</i> L.)	<i>Indian Journal of Extension Education</i>	54(2): 201-210.	5.32
Kumar Jaswinder, Walia SS, Gill BS(2018)	Influence of straw mulching and nitrogen sources on turmeric yield, nutrient uptake and soil health.	<i>Annals of Agricultural Research</i>	39 (3): 251-257.	4.01

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Patidar Abhishek, Walia SS, Shamim Mohammad (2018)	LAI and PAR interception in maize as influenced by fertilizer management in Punjab.	<i>Journal of Agrometeorology</i>	20(4): 338-339.	6.3
PJTSAU, Rajenderanagar				
Mahendar, B., Goverdhan. M., Sridevi, S and Ramana .M.V2017	Influence of iron and zinc management on drymatter production and nutrient removal by rice (<i>Oryza sativa</i> .L) and soil fertility status under aerobic cultivation.	<i>Chemical Science Review and Letters.</i>	6 (24) : 2627-2635	5.21
Madhu, M., Ramana, M. V and Sridevi, S. 2017	Economics of zero-tilled rabi castor (<i>Ricinus communis</i> L.) under the influence of different preceding crops.	Indian Journal of Dryland Agricultural Research and Development	32 (2): 13-17.	4.58
Spandana Bhatt.P., Yakadri.M., Madhavi.M., Sridevi, S. and Rani.P. L2017	Productivity of Transplanted Rice as influenced by herbicide combinations.	Indian Journal of Weed Science.	49(2) : 128-131	5.17
Madhu. M., Venkata Ramana. M and Sridevi .S2017	Performance of rabi castor (<i>Ricinus communis</i> L) under zero tilled conditions after different preceding crops.	Indian Journal of Dryland Agriculture and Development	32(1): 71-74.	4.58
Chowdary, K. A., Umadevi, M., Bharath, T. and Sridevi, S. 2017	Leaf area index and quality of Sorghum influenced by irrigation under poor quality water with different management practices	Research in Environment and Life Sciences	10 (5): 476-479	3.74
Spandana Bhatt. P, Yakadri. M., Madhavi. M., Sridevi. S and Rani, P. L. 2017	Efficacy of herbicides on the soil microflora during the crop growth of transplanted rice.	International Journal of Agricultural Science and Research.	7(3): 163-172	4.13
Sunitha Rani. M, Sridevi, S, Padmaja. G, Praveen Kumar. Y and Ramulu. V. 2017	Response of Bt cotton and changes in soil properties under different fertilizer management practices in rainfed black soils.	Green Farming (An International Journal)	8(1): 87-92.	4.38
Madhu. M., Venkata Ramana. M and Sridevi .S2017	Influence of different preceding crops and N levels on productivity and profitability of zero till rabi castor (<i>Ricinus communis</i> L.)	Journal of Oilseeds Research	34(3):137-140	5.02

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
M.Goverdhan Md.Lateef Pasha,2018	Effect of different levels of Nitrogen and seed rates on growth and yield of non traditional crop wheat (<i>Triticum aestivum</i>) in Telangana	International Journal of Chemical studies	14(1):158-162	5.31
Goverdhan, M., Latheef Pasha, Md., Sridevi, S and Pragathi kumari, Ch2018.	Integrated Farming approaches for doubling the income of small and marginal farmers.	International Journal of current microbiology and applied sciences	7(3): 3353-3362.	5.38
Latheef Pasha, Md and Raghu Rami Reddy, P. 2018	Effect of different N and P levels on yield, nutrient uptake and N use efficiency of transplanted rice under canal commands of irrigated eco systems.	International Journal of current microbiology and applied sciences	7(3): 1323-1332.	5.38
Latheef Pasha, Md., Sridevi, S., Goverdhan, M., Raghu Rami Reddy and Pragathi kumari, Ch2018.	Farmers Participatory evaluation on performance of redgram + soy bean intercropping vis-à-vis sole cotton under rainfed medium soils of Telangana.	International Journal of current microbiology and applied sciences.	7(4): 1002-1009.	5.38
Latheef Pasha, Md., Sridevi, S., Ramana, M.V., Raghu Rami Reddy, P and Goverdhan, M. 2018	Influence of balanced fertilization on productivity, economics and soil fertility of rice-rice (<i>Oryza Sativa</i> L.) cropping systems under southern deccan plateau of Telangana.	Journal of crop and weed	14(1): 158-162.	5.28
Mohammed Latheef Pasha and pakanati Raghu Rami Reddy. 2018	Response of rice to different N and P levels under irrigated condition.	Journal of Pharmacognosy and Phytochemistry	7(3): 675-678.	5.21
TNAU,Coimbatore				
Vimalendran Loganathan, D. Udhaya Nandhini and K.R. Latha. 2017.	Effect of drip fertigation on pigeonpea [<i>Cajanus cajan</i> (L.) Millsp] – A review	<i>Agricultural Reviews</i> ,	38(4): 304-310.	4.63
Sathiya Bama,K., E Somasundaram, SD Sivakumar and KR Latha. 2017.	Soil health and nutrient Budgeting as influenced by different cropping sequences in an Vertisol of Tamil Nadu”.	International Journal of Chemical Studies	5(5): 486-491.	NR

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Sathiya Bama,K., E Somasundaram, KR Latha and R Sathya Priya. 2017.	Soil health and carbon stock as influenced by farming practices in Vertisol of Tamil Nadu.	International Journal of Chemical Studies	5(5): 2313-2320.	NR
Sathiya Bama,K., E Somasundaram and S.Thiageshwari 2017.	Influence of tillage practices on soil physical chemical and biological properties under cotton maize cropping sequence”.	International Journal of Chemical Studies.	5(5).480-485.	NR
Sathiya Bama.K. 2017	Cumbu napier hybrid grass yield, quality and soil Fertility status as influenced by different Nutrient sources.	Forage Res., 213-218.	43 (3)	4.84
Sathiya Bama.K And E.Somasundaram. 2017	Soil quality changes under different fertilization and cropping in a vertisol of Tamil Nadu.	International Journal of Chemical Studies	5(4): 1961-1968.	NR
Pavithra, M., K.R. Latha and N. Thavaprakash 2018.	Effect of planting pattern and fertilization levels on light interception, chlorophyll content and productivity of babycorn,	International Journal of Chemical Studies	6(6): 59-64	4.6
Pavithra, M., K.R. Latha and N. Thavaprakash 2018.	Weed characteristics and green cob yield as influenced by crop geometry and nitrogen and iron in babycorn,	Journal of Pharmacognosy and Phytochemistry	7(6): 129-133.	NR
CSAUAT,Kanpur				
Rentapalli Balaji, Karam Husain, Aman Kumar Panday and Prabhakara Reddy Kallam 2018.	Discerning of Remunerative and streamlined cropping systems and their assesment.	Multilogic in Science	Vol. 8 (25): 258-259	4.51
Karam Husain, S.D.Dubey, Dhananjai Singh and R.L. Srivastava (2017)	Effect of nutrient management on yield, economics and nutrient status of soil in Maize - linseed cropping system	Journal of Pharmacognosy and Phytochemistry	Vol. 6 (6) : 327-330	NR
GBPUAT,Pantnagar				
Singh, R; Pramanick, B.; Singh, A.P; Chaturvedi, S; Singh, D.K.; Neelam and Singh, G. 2018.	Integrated Farming System: A Prospective Approach towards Sustainable Agriculture	International Journal of Tropical Agriculture	36(3): 763-769.	3.94
Pandey, V.; Gautam, P. and Singh, A.P. 2018.	Assessment of physical properties of soil under different land use systems in a Mollisol.	Journal of Pharmacognosy and Phytochemistry	7(6): 2645-2648.	NR

Authors	Title of paper	Journal	Volume, Number, Pages	NAAS rating
Pandey, V.; Gautam, P. and Singh, A.P. 2018.	Correlation between physical, chemical and biological properties of soil under different land use systems in a Mollisol.	<i>International Journal of Chemical Studies.</i>	7(1): 469-471.	
BCKVV, Kalyani				
A. S. Panwar, M. Shamim, Subhash Babu, N. Ravishankar, Ashisa Kumar Prusty, N. M. Alam, D. K. Singh, J. S. Bindhu, Jashanjot Kaur, L. N. Dashora, M. D. Latheef Pasha, Soumitra Chatterjee, M. T. Sanjay and L. J. Desai (2018).	Enhancement in Productivity, Nutrients Use Efficiency, and Economics of Rice-Wheat Cropping Systems in India through Farmer's Participatory Approach,	<i>Sustainability</i> , 11, 122;	doi:10.3390/su11010122	8.08
S. Saha, B. Saha, M. Ray, S.K. Mukhopadhyay, P. Halder, A. Das, S. Chatterjee and M. Pramanick (2018).	Integrated nutrient management (INM) on yield trends and sustainability, nutrient balance and soil fertility in a long-term (30 years) rice-wheat system in the Indo-Gangetic plains of India,	<i>Journal of Plant Nutrition</i> ,	https://doi.org/10.1080/01904167.2018.1510509	8.12

8.1.2 Paper presented in seminar/symposia

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
AAU, Jorhat					
Bhabesh Gogoi, A. Baishya, A.S. Borah, M. Borah, J. Hazarika, S. Ekka, B. Borah and K.K. Sharma.	2018	13-16 Dec 2018	Carbon Footprint Estimation in the Integrated Farming System: An Assam Agriculture Experience.	<i>International Conference Climate Change, Biodiversity and Sustainable Agriculture (ICCBS-2018)</i>	AAU, Jorhat
BAU, Sabour					
Sushant, Kumar Sanjay, Sharma, R. P., Pathak, S.K., Singh, Satyaveer and Raman, K.R. 2018	2018	23-24 Dec 2018	Integrated farming system model for small and marginal farmers of Bihar towards profitability, sustainability and livelihood security.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
JAU, Junagadh					
Gohil, P.J., Sagarka, B.K., Chatrabhuji, B.J. and Solanki R.M	2018	7-9 April, 2018	Groundnut Based Cropping System Diversification under Saurashtra Region.	National Conference on "Enhancing Productivity of Oilseeds in Changing Climate Scenario ICAR-DGR, Junagadh	Indian Society of Oilseeds Research (ISOR), Hyderabad
Chatrabhuji, B.J., Gohil, P.J., Sagarka, B.K. and Solanki, R.M.)	2018	7-9 April, 2018	Influence of Wheat Crop Residue Management on Groundnut in Groundnut-Wheat Cropping Sequence.	National Conference on "Enhancing Productivity of Oilseeds in Changing Climate Scenario ICAR-DGR, Junagadh	Indian Society of Oilseeds Research (ISOR), Hyderabad
Thanki, R.B., Solanki, R.M. and Modhawadia, J.M.	2018	7-9 April, 2018	Enhancing the Productivity of Summer Sesame through Irrigation and Fertilization.	National Conference on "Enhancing Productivity of Oilseeds in Changing Climate Scenario ICAR-DGR, Junagadh	Indian Society of Oilseeds Research (ISOR), Hyderabad
Sagarka, B. K. and Solanki, R.M.	2018	7-9 April, 2018	Enhancing Summer Sesame Yield through Drip Irrigation and Nitrogen.	National Conference on "Enhancing Productivity of Oilseeds in Changing Climate Scenario ICAR-DGR, Junagadh	Indian Society of Oilseeds Research (ISOR), Hyderabad
Solanki, R.M. and Dodiya, C.J. (2018).	2018	7-9 April, 2018	Effect of Spacing and Fertility Levels on Rabi Castor	National Conference on "Enhancing Productivity of Oilseeds in Changing Climate Scenario ICAR-DGR, Junagadh	Indian Society of Oilseeds Research (ISOR), Hyderabad
Der, Y.A., Solanki, R.M. and Modhawadia, J.M.	2018	24-26 October, 2018	Response of coriander (<i>Corandrum sativum</i> L.) to irrigation schedule based on IW/CPE ratios and organic manures. XXI Biennial national symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Kher, U.A., Solanki, R.M. and Modhawadia, J.M	2018.	24-26 October, 2018	Response of summer green gram [<i>Vigna radiata</i> (L.) Wilczek] to irrigation scheduling based on IW/CPE ratio and spacing	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Solanki, R.M., Vasava, M.S. and Sagarka, B.K.	2018	24-26 October, 2018	Response of cumin (<i>Cuminum cyminum</i> L.) to drip irrigation and integrated nutrient management under medium black calcareous soils	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
R. M. Solanki, P.J. Gohil; B.K. Sagarka and A. R. Pathak	2018	23-24 December 2018	Cropping System Diversification and/or intensification under Saurashtra Region of Gujarat.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
JNKVV, Jabalpur					
Arvind Ahirwal, Nisha Sapre, K.K. Agrawal and R.P. Sahu	2018	21-24 November 2018.	Efficacy of pyroxasulfone 5% + pendimethalin 40% ready mixture for controlling weeds in soybean	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS ", ICAR-Directorate of Weed Research, Jabalpur, India
Bankerlang Khongwir, R.P. Sahu, M.L. Kewat and Rajendra Patel	2018	21-24 November 2018.	Bio-efficacy of bispyric-sodium in growth and yield of transplanted rice – A review	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS ", ICAR-Directorate of Weed Research, Jabalpur, India
Rajul Soni, Rajendra Prasad Sahu, Shobha Sondhia and Jitendra Patidar	2018	21-24 November 2018.	Efficacy of pyribenzoxim against weeds in direct-seeded rice under Kymoreplateau and Satpura hills	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS ", ICAR-Directorate of Weed Research, Jabalpur, India
Sahu Rajendra Prasad, Shukla V.K., Vishwakarma S.K. and Jha	2018	24-26 October, 2018	Doubling the income of small and marginal farmers through integrated farming	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Shukla V. K., Vishwakarma S. K., Sahu Rajendra Prasad and Patel Balram	2018	23-24 December	Doubling the income of small and marginal farmers through integrated farming systems modal for their sustainability, profitability and economic viability.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Shukla V.K., Vishwakarma S.K., Sahu R.P. and Jha G	2018	24-26 October, 2018	Study of IPNS on soil properties under rice - wheat cropping system at Kymore Plateau and Satpura Hills zone of Madhya Pradesh.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Vishwakarma S.K., Shukla V.K., Sahu R. P. and. Jha G	2018	24-26 October, 2018	Long-term effect of integrated nutrient management on productivity of rice- wheat cropping system at Kymore Plateau and Satpura Hills of Madhya Pradesh.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Sahu M P, Jain Namrata, Bermaiya Uma and Patidar Jitendra	2018	21-24 November 2018.	Bioefficacy of herbicides for weed control in Sesame.	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS ", ICAR-Directorate of Weed Research, Jabalpur, India
Bermaiya Uma, Jain Namrata, Sahu M P and Jain Vinamarta	2018	21-24 November 2018.	Pre and post emergence herbicides for weed control in soybean.	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS ", ICAR-Directorate of Weed Research, Jabalpur, India
CSKHPKV, Palampur					
S.C.Negi, S.K.Sharma, Pawan Pathania, Sanjay K. Sharma and Mittu Katoch	2018	23-24 December	Integrated Farming System Models/Modules for Enhancing Productivity and Profitability in North Western Himalayan Region.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
S.C.Negi, Pawan Pathania, S.K. Sharma Sanjay K. Sharma and Mittu Katoch	2018	23-24 December	Integrated Farming System Approach for Income Enhancement of Marginal and Small Farmers of Himachal Pradesh	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Sanjay K. Sharma, S.C. Negi, Pawan Pathania, S.K. Sharma and Mittu Katoch	2018	23-24 December	Effect of different cropping systems on productivity, energy parameters and nutrient uptake under mid-hills of North Western Himalayas.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Pawan Pathania, Gurpreet Singh, Rana S.S, Negi S.C., Sharma S.K. and Sanjay Sharma	2018	23-24 December	Response of soybean to levels and sources of sulphur under mid - hill conditions of Himachal Pradesh.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Sharma S. K., Negi S.C., Pawan Pathania, Sanjay K.Sharma and Mittu Katoch	2018	23-24 December	Economics of diversification of existing farming systems under marginal household conditions in low hills subtropical zone of Himachal Pradesh.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
CCSHAU, Hisar					
Kumar, Pawan, Kumar, Manoj, Hooda, V.S., Devi, Uma, Kumar, Amit and Babli.	2018	23-24 December	Integrated Farming: An approach for income enhancement, resource use and organic agriculture for farmers of upper gangetic plains of Haryana.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
UAHS,Shimoga					
Kumara, O., San-nathimmappa, H.G and Rajini, S. R	2018	24-26 October, 2018	Integrated Farming system – A approach for doubling income of resource poor small and marginal farmers.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Kumara, O., Vijay S Danaraddi., Rajini, S. R. and Sannathimmappa, H.G.	2018	23-24 December	Ecologically Sustainable and profitable Integrated Farming System for small and marginal farmers under irrigated condition of southern transition zone of Karnataka.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Kumara, O., Vijay S Danaraddi., Rajini, S. R. and Sannathimmappa, H.G.,	2018	23-24 December	Dry land based Integrated Farming System for Sustainable and profitable for small and marginal farmers under southern transition zone of Karnataka.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
GBPUAT, Pantnagar					
Singh, D.K., Singh, R, Singh, A.P., Pramanick, B., Chaturvedi, S and Singh	2018	24-26 October, 2018	Response of rice wheat cropping system to NPK inputs at farmers' fields under Garhwal Himalayas conditions	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Singh, A.P., Singh, R, Singh, D.K., Chaturvedi, S, Pramanick, B.,Jaipaul, Tyagi, A.K. and Sachan, S.	2018	24-26 October, 2018	Use of gibberellic acid to increase wheat production.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Pramanick, B., Singh, R, Singh, A.P., Chaturvedi, S,Singh, D.K., Dushyant, Singh, G. and Sanjeev	2018	24-26 October, 2018	Attaining livelihood security through integrated farming system approach.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Singh, R, Pramanick, B., Singh, A.P., Chaturvedi, Sand Singh, D.K.	2018	24-26 October, 2018	Resource recycling through an integrated farming system model	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Chaturvedi, S, Chauhan, S., Singh, R, Singh, A.P., Singh, D.K. and Dhyani, V.C.	2018	24-26 October, 2018	Tillage and nutrient management module for sustainable rice-wheat system.	National symposium on “Doubling Farmers’ Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Singh, R, Pramanick, B., Singh, A.P., Chaturvedi, Sand Singh, D.K.	2018	23-24 December	Sustainable development and resource recycling through integrated farming system.	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Pramanick, B., Singh, R, Singh, A.P., Chaturvedi, Sand Singh, D.K. 2018	2018	23-24 December	Sustainable production and livelihood security through integrated farming system approach	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Singh, D.K., Singh, R, Kumar, P., Singh, A.P., Pramanick, B., Chaturvedi, S, Singh, G., Neelam, Kumar S. and Prabhakar, D	2018	23-24 December	Diversification of rice-wheat cropping system for higher system productivity under Garhwal Himalayas.	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Singh, A.P., Singh, R, Singh, D.K., Chaturvedi, Sand B. Pramanick.	2018	23-24 December	Long term effect of nutrient supply system on soil fertility and crop productivity	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Chaturvedi, S, Chauhan, S., Singh, R, Singh, A.P., Singh, D.K. and Dhyani, V.C.	2018	23-24 December	Tillage and nutrient management module for sustainable rice-wheat system.	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
ANGRAU, Guntur					
M. Srinivas, B. Anusha, P.V. Satyanarayana, C.V. Reddy and P. Munirathnam	2018	21-23, February 2018	Effect of planting methods on yield and economics of rice based cropping system under selective mechanization.	National Seminar on "Futuristic Agriculture for Sustainable Food Security" at S.V. Agricultural College, Tirupati	
Manukonda Srinivas, B. Anusha, P.V. Satyanarayana and P. Munirathnam	2018	16-20 March, 2018	Suitable and profitable rice based cropping system for Godavari delta region of Andhra Pradesh.	105 th Indian Science Congress held at Manipur Central University, Imphal	105 th Indian Science Congress
Manukonda Srinivas, B. Anusha, C.V. Reddy, M. Srinivasa Rao and P. Munirathnam	2018	9-11 November, 2018	Evaluation of Organic weed management practices in rice under Godavari delta region of Andhra Pradesh.	Andhra Pradesh Science Congress APSC, 2018 held at Yogi Vemana University, Kadapa	Andhra Pradesh Science Congress
Manukonda Srinivas, B. Anusha, C.V. Reddy, M. Srinivasa Rao and P. Munirathnam	2018	21-24 November, 2018.	Effect of organic weed management practices in rice based cropping system.	Golden Jubilee International Conference on "Weeds and Society: Challenges and Opportunities. Jabalpur,	ISWS " ICAR-Directorate of Weed Research, Jabalpur, India
PAU, Ludhiana					
Kaur T and Walia S S	2018	24-26 October, 2018	Scope of organic farming in India.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Pushpa Parameswari and Walia S S	2018	24-26 October, 2018	Agroforestry: A tool for climate smart agriculture.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Rekha Ratnoo and Walia S S	2018	24-26 October, 2018	Applications of nano technology in precision nutrient management.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Walia S S, Aulakh C S, Rani Neeraj, Gosal S K and Kaur	2018	24-26 October, 2018	Organic farming in maize-potato-onion cropping system.	National symposium on "Doubling Farmers' Income through Agronomic Interventions under changing scenario MPUAT, Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Neeraj Rani and Walia S S	2018	23-24 December	Organic carbon dynamics after thirty five years of integrated nutrient supply in rice-wheat system.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Pushpa Parameswari and Walia S	2018	23-24 December	Integrated farming system: a step towards sustainable agriculture.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Walia S S, Aulakh C S, Gosal S K, Neeraj Rani and Tamanpreet Kaur	2018	23-24 December	Integrated farming systems for doubling farmers' income.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Walia S S, Aulakh C S, Gosal S K, Neeraj Rani and Tamanpreet	2018	23-24 December	Integrated farming system model for income enhancement.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR, Modipuram, CIM-MYT, New Delhi, ICAR, New Delhi
Pushpa Parameswari and Walia S S	2018	21-24 November 2018	Allelopathy: A potential tool for weed management in sustainable agriculture.	ISWS golden jubilee International conference on Weeds and Society: Challenges and opportunities	ISWS, ICAR-Directorate of Weed Research, Jabalpur, India

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
UAS,Raichur					
Ashok Kumar Gaddi, Basavanneppa M.A. and Prabhuling Tevari,	2018	23-24 December	Soil quality and nutrient removal in integrated farming system model for livelihood security of small farmers in Tungabhadra Project Area of Karnataka.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Basavanneppa M.A., Ashok Kumar Gaddi and Prabhuling Tevari	2018	23-24 December	Integrated Farming System Model for Livelihood Security of Small Farmers in Tungabhadra Project Area of Karnataka	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Pavankumar Deshetty and Prabhuling Tevari,	2018	23-24 December	Study on knowledge level and adoption mechanism of DSR method in North Eastern Karnataka	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Shivanand Kammar and Prabhuling Tevari,	2018	23-24 December	Involvement of farm women in dairy enterprises in North Eastern Karnataka.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
KAU,Karamana					
Meera A.V., John, J., Sudha, B., Sajee-na, A., Jacob D. and Bindhu J.S.	2018	23-24 December	Comparative evaluation of greenhouse gas emission from rice and banana based IFS models in southern tracts of Kerala (pp 163)	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Sudha, B., John, J., Meera A.V and Sajeena, A.	2018	23-24 December	A model coconut based integrated farming system for lowland tracts of Kerala	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Jacob D., Bindhu J.S., John,J. Sudha B., Meera A.V., Sajeena A.	2018	23-24 December	Comparative evaluation of GHG emission from IFS in Southern Coastal Plain of Thiruvananthapuram	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Bindhu, J.S., Jacob D., John, J. Sudha B., Meera A.V. and Sajeena, A.	2018	23-24 December	Ecological suitability index for below sea level farming system in Kerala	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
TNAU,Coimbatore					
Latha, K.R. , V. Vasuki and K. Sathiya Bama,	2018	23-24 December	Integrated farming system model for irrigated upland of Western zone of Tamil Nadu.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Vasuki, V. , K.R. Latha, and K. Sathiya Bama	2018	23-24 December	Suitable complementary cropping systems for farming system modules of Western zone of Tamil Nadu	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Satheeshkumar, N., K.R. Latha, T. Myrtle Grace and N.K. Prabhakaran	2018	23-24 December	On-farm evaluation of farming systems modules improves farm profitability and sustainability	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
Satheeshkumar, N., K.R. Latha, T. Myrtle Grace and N.K. Prabhakaran.	2018	23-24 December	Diversification through integrated farming systems approach enhances income under marginal household condition	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Sathiya Bama, K., K.R. Latha and V. Vasuki	2018	23-24 December	Identification of hot spot of GHG emission in integrated farming system model of western zone of Tamil Nadu through prediction tool	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Latha, K.R., V.Vasuki and K. Sathiya Bama	2018	23-24 December	Integrated farming system for western zone of Tamil Nadu	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Vasuki, V., K.R.Latha and K.Sathiya Bama	2018	23-24 December	Suitable complementary cropping systems for farming system modules of Western zone of Tamil Nadu	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
RMVRSKV, Gwalior					
Choudhary, S.K.; Kushwaha Singh, Artika; Chourey, Deepika and Sinha, N.K.	2018	23-24 December	Effect of innovative farming practices on the economic viability of crops.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Choudhary S.K.; Chourey, Deepika; Kushwaha Singh, Artika and Sinha, N.K	2018	23-24 December	Productivity and profitability of different cropping system with land configuration under Malwa Condition of M.P.	National symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi

Author	Year	Date	Title of the Paper	Conference Name and venue	Organized by
AU,Kota					
Tetarwal J.P., Baldev Ram, Prusty, A.K, Ravisankar, N., Panwar, A.S., Santiago L Ridaura, Jeroen Groot, Roos de adelhart Toorop and Jelle van den Akker, and Jat, M.L.,	2018	23-24 December	Farm design application in prototype IFS models in Western India.	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Prusty, A.K, Ravisankar, N., Panwar, A.S., Ghasal, P.C., Tetarwal J.P., Jat M.L., Ridaura L.,Jeroen C.J. Groot, Roos de adelhart Toorop and Jelle van den Akker	2018	23-24 December	Application of quantitative analysis tools in farming systems	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi
Tetarwal, J. P., Baldev Ram, Narottam Malav, MC, Jain and Pratap Singh	2018	24-16 October 2018	Crop diversification options is compliance to integrated farming systems objectives for south-eastern ecologies of Rajasthan	National symposium on “Doubling Farmers’ Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
Ram, Baldev, Tetarwal, J. P. and Singh, Pratap.	2018	24-16 October 2018	Productivity and profitability of fieldpea (<i>Pisum sativum</i> var. <i>arvense</i>) as influenced by water soluble fertilizers and nutrient management practices.	National symposium on “Doubling Farmers’ Income through Agronomic Interventions under changing scenario MPUAT,Udaipur	Indian Society of Agronomy, and ICAR, New Delhi
DPDKVV,Akola					
B. V. Saoji, M. R. Ghanbahadur, B. S. Morwal and P. H. Bansod	2018	23-24 December	Economics, employment and biomass recycling for sustaining soil fertility and productivity in irrigated IFS model of Vidarbha	National symposium on “Integrated Farming Systems for 3Es” (Ecological sustainability, Enhanced productivity and Economic prosperity). UAS, Bengaluru	Indian Society of Agronomy, UAS, Bengaluru IIFSR,-Modipuram,CIM-MYT,New Delhi, ICAR, New Delhi

8.1.3 Popular Articles

BAU, Sabour

Sushant, Pathak, S. K. and Dutta, S. K. 2018. Phasalo mei samekit poshak tatva prabandha Keun aur kaise. Regional Kisan Mela Smarika (24-26 February, 2018) :, B.A.U., Sabour

Kumar, Sanjay, Singh Durgesh, Chaurasia, Ashish and Dutta, S. K. 2018. Jalwayuo smart krishi mei soochana evam sanchar takniki ki upyogita. *Krishi Prodhogiko Se Khadhya Suraksha-Smarika for eastern India 2018*, Directorate of Extension Education, B.A.U., Sabour, Bhagalpur.

Sushant, Pathak, S.K. and Dutta, S. K. 2018. Phasalo mei samekit poshak tatva prabandhan : Keun aur kaise. *Krishi Prodhogiko Se Khadhya Suraksha-Smarika for eastern India 2018*, Directorate of Extension Education, B.A.U., Sabour, Bhagalpur.

GBPUAT, Pantnagar

Singh, R.; Singh, A.P. and Singh, D.K. 2018. Samanvit krishi pranali apnayan, Kissanon ko samridhe avam khushaal banayan. *KisanBharti*, 50 (1) 33-36.

CCSHAU, Hisar

Kumar, Amit, Dhaka, Anil Kumar, Kumar, Satish and Kumar, Pawan. (2018). Prakartik sansadhanon ka bachaav sanrakshit kheti. *Modern Kheti* (August 2018, p48-49)

KAU, Karamana

John, J., Sudha, B., Sajeena, A., Meera A.V 2018. Commendable success by IFSRS, Karamana in niraputhari cultivation *Kalpadhenu* 38 (4) : 33- 34

Sudha, B. 2018. Growing ginger in homesteads and terraces *Spice India* 31 (08) : 23-25

Sudha, B. 2018. Foliar nutrition for vegetables in terrace gardens *Krishiankanam* 31 (08): 23-25

UAHS, Kathalagera

Kumara, O., Rajini, S. R. 2018. Simple and easy methods of bio-mass production ways 4(7): pp 28-29 *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

Kumara, O., Rajini, S. R. 2018. Alternative cropping system for late on-set of Kharif 4(8): pp 04 -25. *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

Kumara, O., Rajini, S. R. 2018. Importance of Boron in Agricultural crops 4(9): pp 14 *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

Kumara, O., Rajini, S. R. 2018. Importance of Nano based technology in Agriculture. 4(5): pp 05 *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

Kumara, O., Rajini, S. R. 2018. Importance of Silicon in Agricultural crops 4(2): pp 26-27 *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

Kumara, O., Rajini, S. R. 2018. Implication of integrated farming system for doubling the farm income of small and marginal farmers. 4(10): pp 12-15. *Negali Miditha* (UAHS, Shivamogga Monthly magazine)

PAU, Ludhiana

Neeraj Rani, Walia S S and Aulakh C S (2018). Farm yard manure: important source of nutrition. *Jagbani* Walia S S (2018) Tips for production of organic wheat. *Bhumantvi kheti* 1(4): 8.

Walia S S and Kaur T (2018) Management of rice residues. *Modern Kheti* 31 (13): 26.

Walia S S, Rani Neeraj and Kaur T (2018) Adopt maize-wheat cropping system for remunerative returns. *Progressive Farming* 55(5): 12-13.

ANGRAU, Maruteru

M. Srinivas, P. Munirathnam and C. Venkata Reddy. 2018. Sarva vari sagulo eruvula yajamanyam. *Vyavasayam*, Sep, 2018, 16-18

PJTSAU, Rajenderanagar

Pragathi Kumari, Ch., Pasha, Md. L., Sridevi, S. and Goverdhan, M. 2018. Drum paddathilo Silage thayari. *Annadata* : 58-60.

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8.2: PARTICIPATION OF SCIENTIST IN SYMPOSIA/SEMINAR CONFERENCES/WORKSHOP/ TRAINING

AAU,Jorhat

Bhabesh Gogoi attended a three days training on "GHG emission /C sequestration estimation in IFS models using β version of excel tool and on 4R nutrient management strategy".on 26-29 June, 2018 at IIFSR -ICAR, Modipuram, Meerut.

BAU,Sabour

Dr.Sanjay kumar attended National Symposium on "Integrated Farming Systems for 3 Es (Ecological sustainability, Enhanced Productivity and Economic Prosperity)" CIMMYT and other organizations including ICAR-IIFSR, Modipuram University of Agricultural Sciences, Bengaluru (Karnataka) 20-24 Dec 2018.

JNKVV,Jabalpur

Dr. V.K. Shukla attended the Quinquennial Review Teams (QRT) meeting of QRT of ICAR-IIFSR (including AICRP-IFS and NPOF) at RARI, Durgapur, Jaipur during 10-11 October,2018.

Dr. V.K. Shukla attended the "V Biennial Workshop (XXXIII of project) of "AICRP on Integrated Farming Systems" at University of Agricultural Sciences, Bengaluru (Karnataka) during 20-23 December 2018- Updated list of Guests from UAS, Bengaluru.

Dr. V.K. Shukla attended and presented research paper entitled "Doubling the income of small and marginal farmers through integrated farming systems modal for their sustainability, profitability and economic viability" in the National Symposium on "Integrated Farming Systems for 3Es" (Ecological sustainability, Enhanced productivity and Economic prosperity) organized by UAS, Bengaluru, IIFSR, Modipuram and Indian Society of Agronomy, ICAR and CIMMYT New Delhi on 23-24 December 2018, at UAS, GKVK, Bengaluru.

Dr. B.M. Maurya, Principal Scientist IFS Sub- Centre-Rewa has attended the annual workshop of IFS held at UAS Hebbal Bengaluru w.e.f. 20-23 December 2018.

Vinod Kumar, Scientist (Agronomy) under AICRP - IFS, ZARS Powarkheda has participated , attended National symposium and Presented of Summery of result in Biennial workshop of AICRP on IFS, during 20-23 December 2018 at University of Agriculture Sciences , Begaluru,Karnataka

Dr. Namrata Jain attended and paper presented in National Seminar on Innovative Approaches for Rural and Agriculture Advancement at JNKVV, College of Agriculture, Tikamgarh, M.P. during 10-11 January, 2019.

Dr. Namrata Jain attended three days training on "GHG emission/carbon sequestration estimation using β version of excel tool" organized for on-station and on-farm centres under AICRP on Integrated Farming Systems by ICAR-IIFSR, Modipuram during 26-28th June, 2018.

Dr. Namrata Jain attended One day training on 4R Nutrient stewardship: Concepts, principles and application" by ICAR-IIFSR, Modipuram and International plant Nutrition Institute (IPNI) at IIFSR, Modipuram on 29th June, 2018.

CSAUAT, Kanpur

Dr Karam Husain Agri-Input dealer conclave 2018 organised by CSAU Kanpur, 28-29 Au, 2018

Dr U S Tiwari Training Workshop Series on "Quantitative Farming System typologies applications with the R statistical computing software" organised by IIFSR, Modipuram, Meerut, 17-21 sep, 2018

PJTSAU, Rajenderanagar

Dr. M.Goverdhan ,Dr.S.Sridevi, Dr. Pasha, Md. L Dr. Ch.Pragathi Kumari Smt. Shahana, F.2018.attended V-biennel workshop of ICAR-IIFSR (XXXIII project) of AICRP on IFS centers at UAS, Bangalore

Dr. M.Goverdhan ,Dr.S.Sridevi, Dr. Pasha, Md. L Dr. Ch.Pragathi Kumari Smt. Shahana, F.2018.attended National symposium on IFS for 3E at UAS, Bangalore

Dr.S.Sridevi 2018 attended 83rd Annual Convention of Indian Society of Soil Science at Anand Agricultural University, Anand, Gujarat

M.Goverdhan, attended ISEE National seminar-2018 on IFS for enhancing farmers income and nutritional security at West Bengal University of Animal And Fisheries, Kolkata

PAU, Ludhiana

Dr. S S Walia attended Research and Extension Specialists Workshop for *rabi* crops at August 16, 2018

Dr. S S Walia attended Workshop on Strengthening Agriculture and Allied Sector Contributions to India's National Biodiversity Action Plan (NBAP) 2008 and the National Biodiversity Targets (NBTs) FAO UN and PAMETI at CRRID, Chandigarh, October 17, 2018

Dr. S S Walia attended National symposium on "Doubling Farmers' Income Through Agronomic Interventions Under Changing Scenario" Indian Society of Agronomy at Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan October 24-26, 2018

Dr.S S Walia attended National Symposium on "Integrated Farming Systems for 3 Es (Ecological sustainability, Enhanced Productivity and Economic Prosperity)" CIMMYT and other organizations including ICAR-IIFSR, Modipuram University of Agricultural Sciences, Bengaluru (Karnataka) 20-24 Dec 2018.

DPDKV, Akola

.O.S.Rakhonde, Mr.B.S. Morwal attended and participated Short training course on "*GHG emission /carbon sequestration estimation using β version of excel tools*" in continuation to this IPNI sponsored training on "*4R nutrient management strategy*" ICAR-IIFSR, Modipuram, Meerut U.P 26-29 June, 2018.

Dr.B.V.Saoji, Mr.O.S.Rakhonde, Mr.B.S. Morwal attended and participated International Symposium

on "Advancement of soil, water and plant nutrient research" and "IPNI Cooperator's Meet" Jointly organized by Department of soil science & Agril. Chemistry, Dr. PDKV, Akola and International Plant Nutrition Institute (IPNI), South Asia VANAMATI, Nagpur (M.S.) November 2-3, 2018

Dr.B.V.Saoji, Mr.O.S.Rakhonde, Mr.B.S. Morwal attended and participated National Seminar on "Potential, Prospects & Strategies for Doubling Farmers Income" Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola 15-16 Dec 2018

Dr.B.V.Saoji, Mr.O.S.Rakhonde, Mr.B.S. Morwal attended National Symposium on "Integrated Farming Systems for 3 Es (Ecological sustainability, Enhanced Productivity and Economic Prosperity)" CIMMYT and other organizations including ICAR-IIFSR, Modipuram University of Agricultural Sciences, Bengaluru (Karnataka) 20-24 Dec 2018.

MAU, Parbhani

Dr. A. S. Karle attended and presented the report in ZREACKharif and *Rabi* crop meeting held at Aurangabad on 30-05-2018 and during September, 2018.

\Dr. S. T. Shirale attended training on GHG emission/carbon sequestration estimation using β -version of excel tool for on station and on Farm Centers of AICRP on Integrated Farming Systems at ICAR - IIFSR, Modipuram during 26-28 June 2018.

Dr. S. T. Shirale attended IPNI sponsored training on 4R nutrient management strategy on 29th June 2018 at ICAR - IIFSR, Modipuram (UP)

TNAU, Coimbatore

Dr.K.R.Latha and Dr.V.Vasuki attended National Symposium on Integrated Farming Systems for 3 Es. ICAR-IIFSR and UAS, Bengaluru, 23-24 Dec 2018

Dr.K.Sathiya Bama GHG emission / Carbon sequestration estimation using β version of excel 4R nutrient management strategy tool IIFSR, Modipuram, 29 June 2018.

8.3: TRAINING, GROUP MEETING, WORKSHOP ORGANIZED

Biennial Workshop of ICAR-AICRP on Integrated Farming Systems

The V (XXXIII of project) Biennial workshop of ICAR-AICRP on Integrated Farming Systems was organized during 20-23 December, 2018 at University of Agricultural Sciences, Bengaluru (Karnataka) in which review of on-going research programmes of on-station and on-farm centres including Tribal Sub Plan, GHG emission estimation, farming systems typology, discussion and finalization of new experiments, administrative, financial issues and special lectures on identified topics were undertaken.

The biennial workshop of AICRP on Integrated Farming Systems was inaugurated on 21 December, 2018 at University of Agricultural Sciences, Bengaluru (Karnataka). The inaugural programme of the workshop started with the State song and ICAR song followed by the lighting of lamp. Dr S. Rajendra Prasad, Vice Chancellor, UAS Bengaluru graced the inaugural session as Chief Guest. The session was also attended by Dr A S Panwar, Director, ICAR-IIFSR and Dr Y.G Shadakshari Director of Research,

University of Agricultural Sciences, Bengaluru as Guest of Honour. Dr Y.G Shadakshari welcomed the guests and delegates. Dr A S Panwar Director, ICAR-IIFSR while welcoming the guests, presented the brief achievements of the scheme. He emphasized on the importance of AICRP-IFS scheme for doubling the farmer's income by 2022. He further focused on the new initiatives taken up by the various OFR centers viz. farming system typology, water and energy efficient cropping systems, market linkage and soil health card distribution etc.

Dr S. Rajendra Prasad emphasized on integrated approach as an important solution against the challenges of abridging the gap amongst Indian population growth and food grain production. He highlighted the importance of co-operative farming/ women associations/commodity based associations including custom hiring centers as an effective way to transfer the benefits to the farmer as an entrepreneur. Publication brought out by ICAR-IIFSR and AICRP-IFS centers were also released in the inaugural session (List attached in Annexure-II) Swacchta pledge was also administered to all by Chief Guest in the inaugural session. Dr M T Sanjay, Local organizing secretary and Agronomists, AICRP-IFS, UAS Bengaluru proposed the vote of thanks.



The following recommendations for research and general were finalized in the workshop after discussions.

On-station Research

Recommendations

1. The recycling of wastes as inputs was found to be low at many of the locations. Reasons for the same needs to be identified and technologies available for recycling of agricultural waste should be adopted to increase the same.
2. The percentage share of labour in cost of production in several IFS models were found to be more than 30%. Hence, efforts should be made by all the centres to identify labour consuming operation in IFS and evaluate suitable farm implements/machineries.
3. Observations on weather related parameters especially soil, air temperature, relative humidity etc. should be taken in the IFS model areas well as adjacent cropped area to find out the effect of IFS on microclimate.
4. Weed management under organic production system experiment should be strengthened by periodical observations related to weeds, soil physical, chemical and biological properties.
Separate data sheet having minimum data sets should be prepared and circulated to all the centres within two months.
5. Feasibility study on vertical farming modules in IFS should be initiated at Modipuram, Karamana, Maruteru and Umiam.
6. Pesticide application in IFS models and its effect on aquaculture module should be studied at all the locations where fish module is existing. The IFS models have to be classified as low, medium and high based on pesticide use. Pesticide residues in water, feed and fish should be analyzed. Measurement of GHG emission from fish module should be under taken at Modipuram, Jammu, Umiam and Ludhiana.
7. Analysis should be carried out for developing suitable futuristic crops/cropping system plan

for year 2030 and 2050 considering water availability, food requirement, socio-economic aspect, climate change etc with available information or data.

8. Pilot scale economic analysis of IFS models based on Commission for Agricultural Costs and Prices (CACP) method should be undertaken for 6 IFS models viz., at Siruguppa, Varanasi, Coimbatore, Kalyani, Jorhat and Ludhiana by Agricultural Economists in the scheme.

On-Farm Research

9. Biofortified varieties of crops should be incorporated and evaluated in cropping systems diversification module of on-farm farming systems experiments to find out the improvement in family nutrition compared to farmers practice.
10. Typology analysis should be strengthened by increasing the sample size and collecting all the parameters as per the defined proforma. The number of sample households should be minimum of 120. This should be from all the six villages where the OFR experiments are being undertaken. The data should be submitted within 6 months for 120 (20 per village in six villages) households.
11. The modified data sheets, benchmark and post intervention is approved for implementation from 2018-19. The information/data pertaining to GHG and farming system typology should be collected and reported with proper checking by the centres.
12. Creation of farming system clusters by adopting whole village with community interventions should be given importance under Scheduled Tribe Component (STC).

General

13. Hands on training for On-Farm Agronomists for on-line submission and analysis of on-

farm farming systems research data should be organized during 3rd week of April, 2019 at ICAR- IASRI, New Delhi.

14. Cropping System Atlas of India needs to be updated and preparation of crop plan for 2030 and 2050 should be attempted for which services of specialists /expert may be utilized by providing TA/DA as per ICAR guidelines.
15. User friendly app (*Krishi Pranali app*) should be developed for farming system in collaboration with all the AICRP centres. The app should be developed by June 2019.
16. A writing lab may be organized to synthesize the Farm Design and farming systems typology work undertaken through centres by involving national and international experts.
17. Research papers in high NAAS rated/impact journals and popular articles from long term nutrient management, cropping systems, on-farm farming systems research and impact evaluation of farming systems interventions should be brought out on cropping systems as well as ecosystem wise as applicable by convening the meeting of identified scientists from AICRP centres and outside experts.
18. Article charges/publication charges can be allowed for publication of research papers in high NAAS rated (> 8) and journals having international impact factor as per guidelines of ICAR. Funds may be earmarked for the purpose in PC unit budget for the purpose.
19. New email ids are to be created by the centres and communicated to CU within 15 days as per the procedure discussed in the workshop for effective communication with coordinating unit.

Recommendations finalized for up-scaling through development schemes

State	Name of the technology	Technology details
Assam	Intensified and diversified Cropping systems for irrigated conditions	Winter rice-Chilli-Blackgram Winter rice-Cabbage-Greengram
	Resource Conservation through cropping system and land configuration management under rainfed situation	Greengram and Sesamum (in 2:1 ratio) in broad bedded (BB) system and Rice in furrow (F) during <i>Kharif</i> ; following Chili in broad bed (BB) and Toria in furrow during <i>Rabi</i> as well as growing of Cowpea during <i>Summer</i>
	IFS Model for 0.80 ha area	IFS Model with Field crops + Horticultural crops + Apiary along with additional return from processing in an area of 0.80 ha
Andhra Pradesh	50% RDF + 50% N through either FYM or Green manure in Rice-Rice cropping system	Integrated nutrient supply system viz., 50 % RDF through inorganic and remaining 50% N through either FYM or Sesbania green manure
Bihar	Integrated Nutrient Management in Rice-wheat System	Substitution of 25-50% N through FYM or G.M or wheat straw in rice- wheat system
	Two-acre IFS model	Crops + Livestock (two cows) + Fish/Duck
Chhattisgarh	Remunerative rice based cropping system	Rice- onion + coriander (1:1) - cowpea cropping system.
Gujarat	Permanent plot experiment on integrated nutrient supply system for a cereal based crop sequence	75 % recommended dose of NPK through fertilizer + 25 % N through gliricidia leaves & tender twigs to <i>kharif</i> pearl millet and 75 % recommended dose of NPK to wheat

State	Name of the technology	Technology details
Gujarat	Cropping system diversification and /or intensification	Groundnut + sweet corn (2:1) – Coriander + vegetable pea (2:1)- sesame + vegetable cow pea (2:1)
	Development of organic farming package for system based high value crops	FYM 6 t + vermicompost 4 t + castor cake 700 kg/ha in rice and FYM 1.5 t + vermicompost 1 t + castor cake 170 kg/ha in summer groundnut
Goa	Integrated farming system	Adoption of diversified integrated farming system to improve the livelihood security
Haryana	Integrated nutrient management	Integrated nutrient management in pearl millet – wheat cropping system
Himachal Pradesh	Alternative cropping system to improve productivity and profitability of hill farmers	Rice-palak-cucumber Okra-radish-onion Rice-letuce-potato Turmeric-pea-summer squash
	Development and validation of On-Station Integrated Farming System Model	Crop + livestock + horticulture + mushroom
Jharkhand	50% N FYM+ 50% RDF - 100% RDF in cereal-cereal cropping system	50% N through FYM and 50% RDF through chemical fertilizers in kharif and 100% RDF through chemical fertilizers in rabi in maize- wheat system
Maharashtra	IFS model	Crop + Dairy + Goat + Poultry + Vermicompost
	Bio-intensive complementary cropping system	Planting on broad bed furrow at 1.5 in Kharif season Maize + Soybean (Bed), sesbania (Furrow) (2:1:2) and in rabi season, Chick pea (Bed) + Wheat (Furrow) (3:2) and in summer season Cowpea for veg (Bed) + Okra (Furrow) (3:2)
Odisha	Bio-intensive cropping system	Rice – potato + radish – pumpkin + amaranth, Rice-maize + coriander-cowpea + amaranth
	IFS Model	IFS with crops, horticulture, dairy, fishery and poultry modules.
Tamil Nadu	Bio-intensive complementary cropping systems	Onion - cotton - maize Green gram - cotton + sunnhemp -sunflower
	Organic farming packages for Chillies – Cowpea- Baby corn sequence	100% N to both chillies and cowpea given as EFYM + Vermicompost + NC (1/3rd each) with biofertilizer and phosphorus solubilising bacteria
	Integrated farming systems for irrigated uplands	Crop - horticulture - dairy (2 cows and one calf) - goat rearing (10+1) - biogas – vermicompost
Uttar Pradesh	Efficient and profitable cropping system	Maize + Black gram- Potato-Onion
	Organic Nutrient Management for Maize-Potato-Onion System.	50% N through (FYM) + bio-fertilizers for N (Azoto) + Rockphosphate + PSB
Uttarakhand	Bio-intensive complementary cropping systems	Rice (DSR) - Veg. Pea – Maize Maize+Cowpea + Sesbania- Veg. Pea + Toria – Ground nut + Mentha
	Integrated farming system model for small farmers	Crops + dairy + horticulture / agroforestry + vermicompost + biogas
West Bengal	Raised bed sunken bed model	Raised bed for vegetable cultivation and sunken beds for rice and fish cultivation in rainy season. Slope in the junction of beds utilized for fodder cultivation and some vegetable creepers may be grown above the sunken beds on netted scaffolds.

9

APPENDIX

APPENDIX I: WEATHER PARAMETERS (MONTHLY AVERAGES RAINFALL) AT DIFFERENT FARMING SYSTEM CENTERS DURING 2017-18

	Name of FSR centre	June	July	August	September	October	November	December	January	February	March	April	May
1	Akola	87	185.3	128.8	54.2	62	0	0	0	0	0	0.0	0.0
2	Bhubneswar	191.2	390.5	442.6	181.4	204.5	55.2	36.3	0.0	0.0	0.0	43.9	205.7
4	Chiplima	266.0	727.0	607.0	278.0	304.0	93.0	98.0	13.9	17.4	12.5	17.2	28.8
5	Coimbatore	16.7	27.8	38.5	218.1	132.6	55.5	27.8	2.2	0	18.2	45.4	259
6	Durgapura	77.8	163.0	118.2	61.6	0.0	0.0	5.4	1.4	0.0	0.0	6.4	8.0
7	Faizabad	71.9	397	227.8	158.2	0	0	0	0	0	0	8.8	11
8	Goa	Not Reported											
9	Hisar	12.8	83.0	95.5	56.6	0.0	0.0	3.8	10.9	1.2	0.0	14.0	0.0
10	Indore	4.8	12.4	9	6.6	0.6	0	0	0	0.1	0	0.1	0.1
11	Jabalpur	Not Reported											
12	Jammu	279.0	181.8	49.5	0	10.6	51.2	9.6	50.8	12.6	45.2	13.8	66.2
13	Jorhat	267.5	576.0	269.1	324.4	192.0	14.7	0.0	2.7	29.1	76.0	111.8	226.9
14	Junagadh	147.8	330.5	282.6	43.5	0.0	0.0	2.5	0.0	1.2	0.0	0.0	0.0
15	Kalyani	197.7	467.9	280.0	161.1	237.7	37.0	15.4	0.0	0.0	1.5	51.5	71.6
16	Kanpur		323.1	205.9	38.3	0	0	1.2	4.2	0	0	10.4	8
17	Karmana	263.0	42.0	100.0	263.0	222.0	169.0	143.0	1.5	15.6	0.0	74.6	304.1
18	Kathalagere	79.9	79.3	126.0	233.1	315.5	0.0	15.0	0.0	2.1	69.0	11.6	112.5
19	Kota	50	139	225	53.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
20	Ludhiana	25.0	32.1	10.5	7.4	0.0	7.0	24.0	18.4	9.0	0.0	10.0	10.4
21	Modipuram	60.9	118.3	202.5	230.6	0.0	0.0	7.2	2.9	3.3	0.0	14.0	18.3
22	Maruteru	Not Reported											
23	Navsari	295.0	611.0	303.0	80.0	28.0	0.0	37.0	0.0	0.0	0.0	0.0	0.0
24	Palampur	Not Reported											
25	Parbhani	259.8	115.9	285.1	164.7	170.2	0.0	0.0	0.0	3.6	6.1	0.0	0.0
26	Patna	Not Reported											
27	Pantnagar	73.0	402	657	231.2	0.0	0.0	2.8	6.8	4	0	42.2	47
28	Portblair												

	Name of FSR centre	June	July	August	September	October	November	December	January	February	March	April	May
29	Powarkheda	Not Reported											
30	Rahuri	Not Reported											
31	Raipur	174.6	169.4	173.6	183.6	50.4	1	0	0	16.4	1.2	39.4	15.6
32	Rajendranagar	213.4	158.4	171	143.2	370.4	0.0	0.0	0.0	0.0	2.0	24.8	37.9
33	Ranchi	Not Reported											
34	Rewa	154.4	511.4	90.4	94.4	0.0	0.0	0.0	0.0	50.4	0.0	0.0	0.0
35	Rudrur	134.6	63.6	196.4	92.2	38.8	0	0	0	0	0	0.00	0.00
36	Sabour	43.5	328.2	283.2	147.3	237.0	0.0	0.0	0.0	0.0	24.2	65.0	61.0
37	Siruguppa	0	17.3	58.8	111.0	50.6	205.3	320.6	155.4	1.4	0.0	19.0	17.2
38	Thanjavur	52.5	2.6	299.4	132.7	115.1	143.8	6.7	0.0	0.0	3.4	10.6	3.4
39	SK Nagar	366.8	1532.3	172	0	9	0	1.5	2.5	0	0	0	0
40	Umiam	380.4	396.7	290.9	429.7	259.1	33.2	24.8	1.4	1.8	2.6	0	0
41	Varanasi	Not Reported											

Appendix II : Maximum and minimum temperature(°C) (June 2017 to May 2018)

	Name of CSR centre	Temperature (°C)																							
		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
1	Akola																								
2	Bhubneswar	35.6	26.5	31.7	25.9	33.0	25.8	33.6	25.8	32.3	24.6	29.8	18.7	28.1	14.6	27.8	12.0	32.8	15.1	36.9	22.0	37.4	24.7	35.6	25.8
4	Chiplima	36.4	25.5	31.3	24.8	31.6	24.5	32.8	24.7	31.6	23.6	30.5	17.5	28.5	13.5	28.7	11.2	32.7	15.0	37.9	18.9	38.2	21.5	40.9	21.6
5	Coimbatore	32.5	24.2	32.3	23.5	31.4	23.4	30.6	23.1	31.3	22.5	30.4	22.3	29.5	20.7	30.3	18.7	32.4	19.5	34.3	22.3	35.5	24.8	32.8	23.5
6	Durgapura	37.7	25.8	33.3	25.6	32.5	24.2	34.8	24.4	36.1	19.9	29.0	13.8	24.8	9.6	24.5	7.4	27.7	12.0	33.3	16.8	38.2	24.2	42.0	27.6
7	Faizabad	37.1	26.9	31.9	26.4	32.8	26.3	33.6	25.9	33.3	21.7	27.8	12.3	23.6	9.1	20.1	5.8	27.0	11.1	33.4	13.9	36.9	20.1	38.3	25.5
8	Goa	Not Reported																							
9	Hisar	42.6	24.4	35.1	27.1	34.7	26.4	34.9	23.5	35.0	17.2	27.2	10.8	22.3	6.1	20.3	4.8	24.5	7.9	30.9	12.2	36.7	19.5	40.6	23.7
10	Indore	35.9	26.0	31.1	23.9	30.2	23.1	30.4	22.4	31.3	19.5	29.7	14.0	28.6	12.5	30.1	12.0	33.6	16.2	37.9	20.8	41.8	24.3	43.7	27.8
11	Jabalpur	Not Reported																							
12	Jammu	34.5	25.1	33.7	25.0	33.9	22.7	32.8	16.3	25.1	8.9	21.0	6.2	19.1	3.9	22.6	7.4	28.5	11.9	33.6	16.5	38.3	20.5	38.1	25.8
13	Jorhat	32.3	25.2	33.0	25.3	31.1	25.7	32.7	25.3	31.1	23.0	28.4	16.2	25.8	12.7	23.9	11.0	24.5	13.2	27.3	16.0	29.7	19.4	30.7	22.3
14	Junagadh	37.0	26.6	30.9	25.4	31.9	24.6	32.4	24.5	36.5	22.9	33.1	16.7	29.1	14.8	30.0	13.2	33.0	16.2	37.6	20.2	40.3	23.7	41.1	24.9
15	Kalyani	35.0	27.0	31.8	26.3	32.9	26.2	34.2	26.7	32.1	24.4	29.7	17.8	26.3	14.3	24.6	8.8	30.6	15.7	35.1	21.1	35.4	23.5	35.0	25.5
16	Kanpur			31.6	25.5	32.2	25.7	34.7	25.0	34.9	19.7	26.6	12.2	23.6	8.8	20.8	6.5	26.4	10.9	33.3	15.7	37.4	21.4	40.1	25.3
17	Karmana	30.0	25.0	30.0	25.0	30.0	25.0	30.0	24.0	31.3	25.0	31.0	24.0	31.0	23.0	31.0	23.0	31.8	23.6	31.5	24.7	33.0	26.0	32.0	25.0
18	Kathalagere	35.0	21.0	31.0	22.0	33.0	22.0	35.0	23.0	36.0	22.0	39.0	17.0	37.0	16.0	37.0	16.0	37.0	15.0	40.0	18.0	40.0	22.0	38.0	23.0
19	Kota	39.6	28.1	33.3	26.8	32.8	25.4	33.3	16.4	30.8	15.2	28.9	12.9	24.7	11.0	24.2	7.3	27.0	10.0	37.7	17.7	41.7	24.4	44.7	28.4
20	Ludhiana	36.9	26.6	34.5	27.8	33.9	30.0	38.0	27.1	29.7	16.7	24.8	11.5	23.8	8.6	17.0	5.6	22.8	9.2	28.9	13.8	39.6	21.9	38.1	25.4
21	Modipuram	36.7	24.4	33.7	25.3	33.4	25.3	33.0	23.8	32.5	18.1	25.7	11.6	22.8	8.0	20.0	6.6	24.2	10.6	30.1	15.2	35.7	19.1	38.5	22.1
22	Maruteru	Not Reported																							
23	Navsari	33.0	26.1	30.2	25.2	30.3	25.0	32.4	24.3	35.5	22.1	33.7	15.3	29.5	15.2	30.3	12.5	33.3	14.4	35.9	17.6	35.8	21.9	35.1	25.7
24	Palampur	Not Reported																							
25	Parbhani	34.5	24.0	31.8	23.0	29.6	22.7	25.7	22.6	32.3	19.8	31.1	13.5	28.9	10.2	30.3	10.2	31.5	12.8	36.9	17.6	40.5	21.4	42.3	26.3
26	Patna	Not Reported																							
27	Pantnagar	38.2	24.7	33.9	25.2	32.7	25.0	34.0	23.4	33.6	14.5	28.6	7.7	25.7	8.2	20.6	4.2	28.7	5.6	33.6	10.7	37.2	16.2	39.7	21.1
28	Portblair																								

	Name of CSR centre	Temperature (°C)																							
		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
29	Powarkheda	Not Reported																							
30	Rahuri	Not Reported																							
31	Raipur	41.4	25.0	32.7	24.6	32.1	24.9	33.4	24.5	33.5	18.5	30.3	12.0	30.0	9.5	30.8	9.9	35.5	14.5	39.2	19.6	41.2	21.8	42.9	26.0
32	Rajendran-agar	33.0	23.2	30.8	22.2	29.6	22.1	30.6	21.7	30.9	20.1	30.3	14.6	28.7	11.1	29.4	10.9	31.6	13.0	35.9	17.4	37.6	21.7	39.3	24.1
33	Ranchi	Not Reported																							
34	Rewa	39.4	24.9	32.0	23.3	32.5	24.3	33.8	22.2	34.5	19.2	29.4	11.7	25.8	9.0	25.1	5.7	27.8	11.1	34.2	15.3	40.9	19.5	44.0	27.5
35	Rudrur	31.6	23.3	34.3	26.7	32.7	27.7	32.1	27.8	32.4	26.1	31.5	20.5	29.7	17.1	29.6	16.9	31.0	20.6	36.4	22.3	38.6	27.7	38.4	26.5
36	Sabour	34.4	25.8	31.6	25.7	32.8	26.1	33.1	25.9	32.0	22.6	28.9	14.4	25.0	10.0	18.6	6.4	26.2	11.5	32.5	16.0	33.7	20.6	34.4	
37	Siruguppa	35.1	24.6	34.2	24.0	33.2	23.3	31.9	23.0	30.8	21.9	30.3	19.3	29.4	16.2	30.5	16.2	32.7	17.7	36.6	21.2	38.5	24.4	38.0	24.8
38	Thanjavur	37.2	27.1	37.6	27.7	35.0	26.1	34.1	25.5	33.2	25.3	29.7	24.4	29.1	22.2	29.3	20.6	31.7	20.4	34.2	23.4	36.1	26.6	36.2	27.1
39	SK Nagar	41.8	27.1	32.7	22.6	33.7	24.9	37.4	22.7	38.2	15.6	34.2	11.0	29.6	9.4	30.7	6.2	36.3	9.8	39.7	13.7	41.9	17.0	43.9	25.6
40	Umiam	28.1	19.9	27.9	20.4	29.6	20.6	27.1	19.3	25.1	16.1	24.2	12.8	20.5	6.9	18.8	6.5	20.8	7.9	24.6	11.3	-	-	-	-
41	Varanasi	Not Reported																							

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. IGKV, 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
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, Devgad**

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 HPKV, PALAMPUR (H.P.)**Main Centre, Palampur**

Chief Agronomist	Dr.S.C Negi
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	Prof. Dileep Kachroo
Jr. Soil Scientist	Dr.N. PThakur
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. M. S. Yadava
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. O Kumara
Jr. Soil Scientist	Dr. Rajashakhar L
Jr. Agronomist	Dr.H.G.Sannathimmappa
Technical Asstt.	Mr. VijayS.Dannaraddi

14. UAS, Bangalore (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.V.K.Shukla
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. RMVRSU A&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.Rabindra Kumar Paikaray
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
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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. PYadagiri
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. PKasthuri
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.N.B.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.J.S.Bohra
Tech. Assistant	Vacant
35.GBPUIAT,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 2017-18

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 CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Bhubneswar	Kharif	OC%	0.73	0.74	0.78	0.79	0.74	0.72	0.74	0.73	0.74	0.74		
		N	296.3	283.7	303.3	308	289.7	291.3	276.3	290.7	302.7	292.3		
		P	12.7	12.5	14.1	13.8	14.3	13.2	12.9	13.2	12.5	12.5		
		K	174	179.3	186.3	181.7	188	180.3	192	167.3	189	170.3		
Chiplima	Kharif	OC%	0.66	0.65	0.68	0.68	0.68	0.69	0.67	0.68	0.65	0.66		
		N	290.0	290.3	308.3	309.7	295.3	304.0	299.0	298.7	292.3	286.7		
		P	13.9	13.8	13.3	14.1	13.9	14.4	13.5	14.1	14.1	13.8		
		K	188.3	183.3	181.0	179.3	186.3	183.3	187.0	190.0	191	187.7		
	Rabi	OC %	0.66	0.63	0.67	0.66	0.58	0.62	0.69	0.59	0.67	0.58		
		N	305.0	299.0	312.4	311.0	300.0	297.0	322.0	318.0	311.4	321.0		
		P	14.10	15.20	17.30	16.40	16.50	17.10	18.00	17.00	17.20	16.70		
		K	183.5	192.0	189.0	193.0	187.4	177.0	189.0	179.6	182.4	189.5		
	Summer	OC%	0.59	0.59	0.59	0.68	0.65	0.66	0.65	0.66	0.58	0.62		
		N	301.0	299.0	302.0	311.0	302.6	313.0	309.0	299.0	258.0	279.8		
		P	16.00	15.60	17.00	15.90	17.20	15.90	16.20	17.00	14.90	15.00		
		K	185.00	189.00	176.00	199.00	186.90	198.30	199.90	189.60	179.00	188.80		
Coimbatore	Summer	O.C. %	5.52	5.42	5.65	5.7	5.62	5.58	5.52	5.54	5.81	5.98		
		N	262	252	274	269	248	248	246	248	236	238		
		P	21.4	20.6	21.6	20.6	20.8	21.3	20.7	21	21.2	22		
		K	569	548	565	558	560	552	548	568	542	532		
Ayodhya	Summer	OC%	4.6	4.8	5	5.1	4.7	4.9	4.6	4.4	4.7	4.5		
		N	198	213	224	229	208	212	190	193	124	230		
		P	17.1	18	18.3	17.4	16.3	17	16.8	18	19.8	18.1		
		K	264	268	272	265	255	260	248	259	274	270		

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Indore	Kharif	OC%	0.46	0.44	0.46	0.45	0.4	0.4	0.43	0.44	0.42			
		N	192	188	192	190	180	180	186	188	184			
		P	12.95	12.69	13.1	12.95	11.78	11.98	12.3	12.64	12.25			
		K	569	560	572	563	548	552	556	560	552			
	Rabi	OC%	0.43	0.46	0.45	0.45	0.46	0.46	0.45	0.45	0.47			
		N	186	190	189.3	189	190.3	190.3	189.3	188.7	191.3			
		P	14.5	13.5	15.9	14.4	15.5	15.9	13.5	14.7	17.6			
		K	552.7	550	547.7	553	544.3	554.7	541	540.7	573			
	Summer	OC%	0	0	0	0.47	0.46	0.48	0.48	0.47	0.48			
		N	0	0	0	192.4	192	191	192.4	191.2	192.8			
		P	0	0	0	14.8	15.8	15.8	13.8	14.8	17.7			
		K	0	0	0	560	545	559.8	546.6	544.4	573.4			
Jabalpur	Rabi	OC (g/Kg)	6.9	6.6	6.7	6.7	6.8	6.8	6.9	6.7	6.7	6.8		
		N	229	220	219	220	226	227	227	221	226	227		
		P	10	9	10	10	10	10	10	10	9	10		
		K	303	300	297	301	302	301	302	298	300	301		
Jammu	Kharif	OC%	0.55	0.67	0.66	0.64	0.65	0.63	0.6	0.61	0.61	0.6		
		N	211	222	226	232	228	230	225	220	210	198		
		P	18.3	22.1	22.7	19.75	20.15	20.1	19.7	20.25	20.1	21.15		
		K	115	118	122	118	120	130	125	118	117	120		
	Summer	OC%	0.56	0.66	0.65	0.64	0.62	0.6	0.62	0.62	0.6	0.61		
		N	217	240	232	220	236	228	230	225	212	202		
		P	19.6	26.2	24.7	21.2	22.5	22.8	21.5	23.1	23.4	24.2		
		K	120	130	134	122	124	128	130	122	127	125		
Jorhat	Summer	OC (g/Kg)	6.4	6.54	6.51	6.59	6.83	7.12	7.08	7.39	7.03			
		MBC (µg/g)	104.18	119.85	127.25	131.33	148.57	144	151.74	168.57	143.68			
		N	215.4	223.51	177.35	226.07	236.9	235.05	233.83	260.77	257.97			
		P	7.67	8.24	8.33	8.66	9.44	10.1	10.69	12.11	11.72			
		K	77.5	83.13	78.67	85.92	89.86	100.45	94.75	107.85	93.37			
Junagadh	Summer	OC%	0.75	0.71	0.79	0.75	0.75	0.67	0.7	0.76	0.71	0.71		
		N	256.66	258.66	261.33	249	257	252	246	265	261.66	252.66		
		P	28.69	25.24	28.45	24.55	27.89	23.82	23.28	22.59	29.21	27.87		
		K	206	211.33	176.66	216.33	196.33	214	206.33	215.66	220.66	235		

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Kanpur	Summer	OC%	0.422	0.424	0.425	0.436	0.434	0.426	0.432	0.424	0.426	0.428	0.426	
		N	13.24	13.24	13.26	13.32	13.3	13.26	13.28	13.24	13.26	13.28	13.26	
		P	186.2	186.5	186.8	187.3	187.15	187.1	186.8	186.3	186.4	187	186.85	
		K	186.2	186.5	186.8	187.3	187.15	187.1	186.8	186.3	186.4	187	186.85	
Karamana	Rabi	OC%	1.792	1.851	1.524	1.495	1.22	1.317	1.228	1.168	1.235	1.391		
		N	305	317	343	326	322	330	330	326	318	347		
		P	20	17	25	29	25	28	31	30	28	30		
		K	180	194	182	215	224	184	158	186	184	231		
Kathalagere	Kharif	OC%	0.49	0.5	0.56	0.51	0.58	0.5	0.51	0.51				
		N	143.08	146	163.52	148.92	169.36	146	148.92	148.92				
		P	24.5	24.8	28.5	26.4	29.8	26.45	26.58	26.2				
		K	167.3	154.6	180.6	168.3	186.2	172.5	158.4	170.5				
	Summer	OC%	0.51	0.52	0.56	0.53	0.58	0.5	0.51	0.53				
		N	148.92	151.84	163.52	154.76	169.36	146	148.92	154.76				
		P	24.77	25.17	28.85	27.55	30.07	26.66	26.97	27.03				
		K	169.71	156.04	184.51	170.61	188.09	174.11	160.53	174.88				
Kota	Summer	OC%	0.62	0.68	0.71	0.65	0.69	0.71	0.72	0.65	0.65	0.61		
		N	402	428	451	402	443	451	463	422	405	385		
		P	19.3	22.72	22.88	24.07	18.85	21.15	24.35	18.72	23	18.76		
		K	433	451	535	426	438	508	520	533	462	442		
Ludhiana	Summer	OC%	0.55	0.38	0.58	0.33	0.49	0.37	0.46	0.36	0.57	0.33		
		N	100.35	100.35	106.62	109.76	103.79	112.9	116.03	109.76	134.85	116.03		
		P	18.4	13.2	40.9	25.5	35.3	42.6	30.4	29.3	42.9	37.6		
		K	74.8	74.2	69.2	85.4	82.6	89.6	96.6	79.8	67.8	100.1		
Navsari	Summer	OC%	0.443	0.427	0.43	0.449	0.432	0.443	0.44	0.415	0.442	0.414		
		N	222.67	216.67	218	224	218	222.33	223.67	218	222.67	221		
		P	30.44	29.94	28.77	32.37	31.49	29.88	32.08	31.32	31.01	29.21		
		K	136.67	125	116	136	122	134.33	124.33	122	129.67	121.33		
Palampur	Rabi	OC%	0.93	0.95	0.93	0.97	0.97	0.94	0.97	0.97				
		N	234.6	298	297.9	314.7	297.9	296.3	303.7	317.6				
		P	56.3	60.9	63.5	77.4	63.4	81	72.6	73.2				
		K	104.7	118.4	137.7	139.9	110.3	117.9	125.3	132.4				

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Parbhani	Kharif	OC%	0.62	0.57	0.62	0.63	0.56	0.57	0.54	0.56	0.63	0.62		
		N	147.05	146.3	147.21	149.23	140.9	142	141.12	142.1	146.67	147.81		
		P	15.27	14.56	15.65	15.78	14.72	14.91	14.64	14.72	14.44	14.65		
		K	500.45	493.47	498.87	502.54	487.46	490.45	485.78	490.52	493.32	497.92		
	Rabi	OC%	0.64	0	0.61	0.59	0.6	0.59	0.54	0.64	0.64	0.67		
		N	153.1	0	150.36	142.8	149.26	145.23	140.31	148.9	150.34	149.61		
		P	16.02	0	16.12	15.31	15.84	15.1	14.7	15.79	14.9	15.12		
		K	502.13	0	500	491.43	501.78	496.2	497.43	500.02	500	503.61		
	Summer	OC%	0	0.6	0	0.62	0.57	0.62	0.51	0.64	0.67	0.66		
		N	0	155	0	157.13	148.92	147	139.23	141.86	148	145.13		
		P	0	15.92	0	16.4	15.37	15.52	14.9	15	14.97	14.8		
		K	0	498.49	0	510.67	502.11	501.18	494.16	496.37	499.17	500.86		
Pantnagar	Summer	OC%	0.74	0.8	0.85	0.96	0.88	0.86	0.89	0.92	0.79	0.8		
		N	178	232	235	240	239	236	233	237	211	219		
		P	24.7	35.4	33.2	38.5	36.5	31.5	30	31.3	27.3	29.2		
		K	239	286	281	314	301	288	258	265	248	252		
	Kharif	OC%	0.62	0.63	0.64	0.63	0.62	0.64	0.65	0.63	0.67	0.66	0.61	
		N	207	210	201	220	216	210	220	204	216	201	216	
		P	13	13	13	12	13	14	14	13	14	14	13	
		K	500	534	504	537	518	523	532	538	545	575	567	
	Rabi	OC%	0.64	0.65	0.62	0.64	0.63	0.66	0.67	0.66	0.68	0.65	0.64	
		N	198	202	192	211	208	202	211	195	208	192	208	
		P	12	12	13	12	13	13	14	11	13	13	13	
		K	493	526	497	511	519	530	538	530	538	567	560	
Raipur	Kharif	OC%	0.68	0.67	0.67	0.67	0.66	0.67	0.67	0.66				
		N	276.08	273.25	277.78	266.14	279.41	274.23	276.02	277.79				
		P	26.24	26.77	24.63	25.24	26.04	25.35	25.4	26.28				
		K	300.36	302.28	303.15	298.08	305.7	297.99	299.72	299.37				
	Rabi	OC%	0.67	0.67	0.65	0.65	0.66	0.67	0.66	0.66				
		N	283.97	285.92	279.59	272.38	281.6	284.98	277.76	280.14				
		P	27.91	27.75	26.4	25.94	28	27.09	27.32	26.36				
		K	327	304	314	307	314	314	310	313				

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Raipur	Summer	OC%	0.68	0.67	0.66	0.66	0.67	0.67	0.67	0.67				
		N	273.94	278.82	269.75	266.58	268.17	272.51	272.38	265.07				
		P	24.68	24.43	23.5	24.58	24.79	25.04	24.63	24.49				
		K	297.05	301.86	298.79	299.97	297.39	305.47	298.6	295.2				
Rajenderanagar	Rabi	OC%	0.3	0.37	0.41	0.39	0.35	0.4	0.36	0.41	0.37	0.42		
		N	106.2	111	102.4	115.2	112.9	101.6	105.6	106.6	105	110		
		P	19.15	22.2	23.67	21.46	19.99	20.62	21.36	25.99	25.99	24.3		
		K	180.8	182.3	189.4	165.8	156.5	162.1	177.8	174	200.2	158.7		
Rewa	Summer	OC%	0.49	0.52	0.49	0.5	0.51	0.51	0.51	0.59	0.58	0.56		
		N	145.9	139.9	142.7	145.3	142.9	140.9	130.1	129.8	146.2	169.5		
		P	11.9	11.5	12.6	13.7	14.1	14.1	17.2	15.8	16.1	13.2		
		K	315.8	319.9	316.9	320.7	321.1	319.8	220.1	311.2	315.3	228.3		
		Sulphur kg/ha	32.81	32.78	36.71	29.99	32.02	33.03	19.76	27.65	28.42	21.52		
		Zinc PPM	2.01	2.07	2.12	2.05	2.01	4.99	1.96	2.79	2.14	1.97		
Rudrur	Kharif	Fe PPM	16.15	17.09	15.1	15.12	14.92	14.87	12.87	13.45	22.4	19.75		
		Boron PPM	2.42	2.39	2.49	3.01	3.05	3.02	2.42	2.48	2.02	3.42		
		OC%	0.52	0.55	0.58	0.61	0.5	0.64	0.6	0.57	0.61	0.49	0.62	0.58
		N	220.4	204.6	187.2	188.2	214.3	196.5	186.3	178.2	180.5	227.4	19589	200.2
Sabour	Summer	P	36.3	37.1	42.8	42.7	34.9	43.5	36.5	38.1	43.1	38.8	36.5	45.3
		K	432.1	426.5	505.4	386.4	324.7	402.4	406.7	425.1	416.2	461.3	422	405.3
		OC%	0.52	0.46	0.44	0.51	0.48	0.49	0.52	0.46	0.50	0.47		
		N	224.8	208.1	253.1	217.8	202.8	281.2	281.7	242.2	253.5	253.5		
Siruguppa	Rabi	P	10.9	9.9	9.7	10.7	10.2	10.7	11.2	15.6	13.5	13.0		
		K	156.9	189.6	157.7	148.0	163.1	159.1	165.2	194.3	199.2	164.7		
		OC%	0.62	0.69	0.75	0.67	0.66	0.73	0.81	0.81	0.72	0.66		
		N	177	187	198	184	181	210	219	232	196	192		
SK Nagar	Kharif	P	10.8	13.9	17.2	13.7	14.4	14.5	19.6	17.5	12.7	14		
		K	366	357	372	382	375	368	380	394	382	385		
		OC%	0.343	0.349	0.352	0.344	0.346	0.347	0.336	0.359				
		N	231	225	226	229	225	227	230	225				
		P	25.5	21.89	24.59	24.41	23.3	22.23	25.1	22.87				
		K	250	242	239	239	239	240	248	238				

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Thanjavur	Kharif	OC%	0.56	0.55	0.55	0.58	0.55	0.56	0.55					
		N	259	218	253	257	268	288	270					
		P	18.5	19	19.1	20.4	20.9	20.8	20.2					
		K	239	226	220	228	228	233	236					
	Rabi	OC%	0.59	0.59	0.63	0.62	0.62	0.64	0.63					
		N	214	217	223	216	222	223	220					
		P	19.6	19.4	19.2	19.6	20.6	20.3	20.5					
		K	188	189	196	196	198	195	196					
	Summer	OC%	0.64	0.57	0.57	0.56	0.57	0.62	0.62					
		N	210	195	191	186	187	197	214					
		P	19.3	18.8	18.8	18.8	20.3	20	20.6					
		K	185	192	192	187	192	189	195					

APPENDIX IV: SOIL FERTILITY STATUS AND NUTRIENT UPTAKE 2017-18

Table A : Nutrient uptake N P and K kg/ha in exp no1(a) 2017-18

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Bhubneswar	Kharif	N	78.1	70.5	81.5	81.3	74.7	69.1	72.3	65.7	58.0	61.0		
		P	20.5	21.2	23.6	22.8	21.4	20.9	22.0	19.7	16.9	18.2		
		K	83.9	84.6	102.0	98.1	93.6	85.9	90.3	79.8	67.0	70.2		
	Rabi	N	89.3	44.8	95.4	56.6	25.0	83.4	57.4	51.7	90.6	62.4		
		P	11.0	6.5	11.2	8.0	6.9	9.9	9.5	8.2	13.6	5.6		
		K	28.8	17.4	28.9	24.5	21.8	24.7	54.8	20.7	42.9	21.1		
	Summer	N	30.1	18.8	55.9	42.5	42.5	42.9	88.1	86.4	28.0	14.2		
		P	13.3	3.4	5.9	5.1	5.1	5.6	7.4	7.0	12.8	8.1		
		K	58.9	16.5	37.0	12.7	11.7	13.2	47.3	47.5	63.3	25.6		
	Chiplima	N	71.9	73.8	71.1	75.7	76.4	72.1	74.0	72.1	67.2	65.3		
		P	17.8	18.7	17.3	19.0	19.5	18.4	19.0	18.7	18.2	17.7		
		K	77.5	83.0	79.0	80.9	84.3	80.1	85.0	77.7	74.9	73.6		
	Rabi	N	84.7	48.5	95.7	63.8	24.7	84.4	66.2	60.2	99.6	67.0		
		P	10.2	5.9	11.2	8.7	6.8	9.5	11.7	10.4	14.2	5.9		

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
		K	25.7	18.1	28.0	26.4	20.9	24.2	56.1	22.8	47.1	21.5		
	Summer	N	36.8	18.2	62.6	41.3	45.3	44.6	106.5	107.2	34.0	15.7		
		P	15.5	3.2	6.4	4.4	5.3	5.5	9.5	8.4	13.6	8.2		
		K	74.7	15.4	41.0	12.9	12.2	13.7	50.2	52.4	74.1	26.5		
Indore	Kharif	N	96.5	95.7	128.5	118.6	68.1	90.4	101.2	106.5	98.5			
		P	9.5	8.2	18.2	15.6	6.9	7.9	12.4	14.7	12.4			
		K	97.5	99.7	136.4	123.9	57	80.1	108.5	117.2	91.5			
	Rabi	N	149.5	81.2	172	139.2	74.2	92.4	122.2	157.5	146.3			
		P	40.1	9.6	56	33.7	13.6	17.2	26.3	49.7	45			
		K	107.5	52.4	130.1	106.5	43.7	60.1	98.3	126.3	120.1			
	Summer	N	0	0	0	13.9	18.8	18.7	10.6	8.9	9.7			
		P	0	0	0	1.3	1.9	1.9	1.1	0.9	1			
		K	0	0	0	14.6	19.9	20.2	11.5	9.3	10.3			
Jabalpur	(Kh+Rb)	N	220	194	186	191	305	146	197	250	290	316		
		P	55	32	15	17	65	28	37	45	63	59		
		K	309	219	130	245	310	217	190	304	306	308		
Junagadh	Kharif	N	95.2	89.89	35.57	91.8	64.71	57.84	145.85	26.27	79.03	95.68		
		P	10	10.41	29.9	9.76	9.63	5.41	28.73	2.24	8	15.66		
		K	34.88	34.44	57.89	39.57	56.19	21.32	58.14	7.23	32	32.02		
	Rabi	N	106.19	40.71	22.25	60.97	32.6	79.45	9.37	33.1	10.72	22.84		
		P	20.75	9.35	3.73	11.34	13.57	10.46	6	7.25	1.94	4.39		
		K	74.73	74.36	17.41	46.59	47.27	55.2	14.64	27.85	3.56	43.33		
	Summer	N	0	47.4	44.11	83.56	40.01	19.01	32.09	47.32	14.04	27.8		
		P	0	35.71	7.28	56.43	8.76	2.6	6.33	18.33	2.38	7.42		
		K	0	49.58	21.71	88.9	42.68	16.7	18.45	39.92	13.95	26.64		
Karnana	Kharif	N	51.9	53.95	62.84	54.01	62.8	55.74	62.64	62.28	56.92	59.41		
		P	9.46	10.73	10.42	9.46	10.88	11.28	9.97	10.75	9.62	10.68		
		K	26.87	28.63	31.1	28.29	33.57	28.28	28.6	31.9	28.06	32.7		
	Rabi	N	0	33.91	39.18	41.2	35.57	38.17	16.86	35.53	3.54	4.26		
		P	0	4.47	7.33	5.42	3.45	4.13	2.91	7.81	0.76	0.93		
		K	0	6.41	21.52	6.95	36.97	37.92	12.81	33.13	2.95	3.78		
	Summer	N	0	0	0.49	2.58	7.71	0.5	90.51	33.77	11.75	2.91		
		P	0	0	0.02	0.15	0.78	0.03	7.49	6.2	0.79	0.13		

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Kathalagere		K	0	0	0.19	0.97	8.22	0.19	59.96	57.92	11.92	1.15		
	Kharif	N	80.98	64.23	79.86	73.88	77.81	62.12	72.75	62.08				
		P	26.36	28.41	27.63	26.61	33.58	27.63	27.07	29.07				
	Summer	N	50.32	31.57	42.56	35.94	41.37	27.66	38.02	24.71				
		P	61.19	61.62	41.33	57.49	39.02	87.51	32.63	60.06				
Kota		P	32.56	16.28	55.47	14.25	92.4	19.45	26.64	28.58				
		K	92.3	95.87	33.86	69.07	28.33	133.84	39.86	63.55				
	Kharif	N	91.86	98.85	127.87	62.58	67.2	128.78	57.84	78.96	53.58	54.77		
		P	11.98	12.28	16.63	10.75	15.21	17.54	6.81	26.82	18.28	13.42		
		K	46.5	51.1	74.42	104.47	111.9	112.36	40.74	85.89	60.63	101.32		
Ludhiana	Rabi	N	187.61	71.55	42.42	134.54	71.76	153.25	84.78	53.47	79.46	53.78		
		P	47.94	23.75	24.75	32.56	15.67	37.74	16	12.96	13.64	12.91		
		K	209.7	51.94	144.4	158.07	203.33	167.98	45.86	19.18	44.78	69.12		
	Summer	N	0	38.32	31.06	26.09	0	0	41.63	0	19.96	0		
		P	0	5.76	3.6	3.42	0	0	5.86	0	9.27	0		
Navsari		K	0	28.18	21.96	18.08	0	0	27.98	0	12.26	0		
	Kharif	N	70.78	54.71	42.94	77.47	83.6	84.79			303.27	55.51		
		P	12.23	7.55	8.13	10.36	10.45	9.23			41.47	7.61		
		K	13.97	11.26	8.15	11.59	11.45	10.38				9.51		
	Rabi	N	75.01	129.08	20.73	21.46	300.81	211.08			560.34	324.09		
		P	19.57	18.52	17.06	6.96	65.11	50.33			72.69	73.82		
		K	19.81	18.36	16.96	6.91	54.58	50.34				43.45		
	Summer	N			16.43		63.11	15.34			10.22			
		P			4.82		17.42	4.48			3.25			
		K			3.87		17.54	4.45			5.14			
	Kharif	N	49.34	50.71	57.60	50.32	57.55	49.46	46.12	58.53	56.11	59.76		
		P	9.47	9.87	11.03	9.77	11.02	9.46	8.72	11.21	10.69	11.48		
		K	51.65	53.69	59.95	53.15	59.37	50.45	46.40	61.05	56.46	61.50		
	Rabi	N	68.12	28.08	54.86	0.00	32.82	36.63	77.49	30.90	46.37	47.77		
		P	9.33	7.78	8.72	0.00	11.50	5.28	16.50	13.42	7.68	15.15		
Summer		K	47.69	31.20	43.24	0.00	26.72	28.50	113.90	60.85	99.61	76.42		
		N	0.00	48.64	53.67	53.42	108.53	47.32	41.69	38.60	34.73	97.87		
		P	0.00	7.45	10.79	8.08	22.74	6.71	8.88	5.93	7.35	19.66		

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Palampur	(Kh+Rb+Sum)	K	0.00	38.17	53.54	41.28	122.39	29.72	65.20	53.11	49.43	20.61		
		N	194.40	128.10	94.60	96.70	155.80	100.40	147.90	92.20				
		P	38.00	32.80	21.70	17.40	32.60	24.30	34.70	22.60				
Parbhani	Kharif	K	94.10	85.70	50.60	50.30	55.50	51.70	69.70	31.80				
		N	175	149	38	204	50	187	46	85	97	92		
		P	32	34	2	37	13	23	15	13	8	20		
		K	136	144	37	157	83	116	73	106	53	117		
		N	123	0	125	150	116	28	134	69	137	21		
		P	19	0	19	36	18	14	60	7	60	4		
		K	81	0	83	242	76	37	235	59	219	12		
		N	0	171	0	38	29	36	113	178	179	55		
		P	0	30	0	2	16	2	17	37	12	21		
	Summer	K	0	111	0	35	18	34	141	109	153	74		
		N	110.78	101.61	75.52	107.26	81.19	102.43	64.37	123.35	74.94	71.64		
		P	37.06	32.71	25.88	40.62	28.27	42.93	54.01	75.75	24.72	24.82		
Pantnagar	Kharif	K	156.27	102.74	91.3	172.56	91.58	152.41	101.48	175.19	88.37	102.88		
		N	99.15	328.43	98.26	88.67	27.56	64.17	38.85	28.74	299.94	352.43		
		P	37.68	105.3	39.23	43.08	12.3	30.17	16.92	12.91	57.15	37.4		
		K	134.36	287.96	141.21	138.23	24.62	52.54	50.9	34.42	472.66	295.16		
		N	0	64.32	234.4	442.74	43	51.09	195.75	128.16	117.64	104.57		
		P	0	23.11	77.67	101.45	14.28	13.73	95.3	47.45	23.48	16.99		
	Summer	K	0	89.93	189.43	409.47	27.16	34.71	258.7	177.62	104.23	92.21		
		N	94.1	91.6	100.0	85.5	132.5	130.0	259.3	185.0	155.3	43.0		
		P	26.1	9.6	10.7	9.7	31.4	14.3	22.5	28.2	71.4	9.0		
Rajendranagar	Kharif	K	119.4	62.3	62.7	44.9	97.3	55.7	155.1	344.5	209.7	63.9		
		N	71.7	0.0	62.1	32.0	64.2	63.1	24.5	229.1	187.2	97.2		
		P	30.7	0.0	7.3	6.7	7.3	8.7	4.7	12.9	23.5	14.4		
		K	83.0	0.0	16.6	14.2	17.3	23.0	30.0	154.4	94.5	91.8		
		N							157.6			140.0		
		P							8.2			23.9		
Rahuri	Kharif	K							140.2			44.7		
		N	136.18	149.37	139.87	177.6	150.5	166.82	173.38	168.68	180.85	189	192.97	105.31
		P	64.96	35.9	65.33	40.17	68.41	40.86	26.46	40.07	28.85	47.39	30.89	19.54

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
		K	113.63	80.44	116.08	92.47	121.09	92.71	71.24	90.52	75.87	113.07	81.21	119.2
	Rabi	N	186.39	85.09	35.07	140.76	73.71	218.32	238.89	191.67	45.04	42.2	76.41	143.27
		P	42.58	30.97	8.2	52.92	29.1	43.79	48.94	29.39	9.46	7.97	29.41	28.51
		K	36.25	58.98	30.61	154.52	91.34	43.11	45.22	132.12	37.1	35.41	94.25	99.1
Rudrur	Kharif	N	50.58	107.81	146	103.18	102.91	117.52	130.5	159.89	99.75	184.19	142.16	187.88
		P	13.96	31.91	34.14	11.04	35.55	29.52	30.98	21.84	34.39	36.76	46.74	17.09
		K	55.33	95.74	136.61	124.87	30.92	96.56	30.06	78.56	109.73	80.75	201.49	38.04
	Rabi	N	55.08	100.06	56.9	49.86	93.81	88.44	34.76	16.91	64.39	56.46	506.59	48.93
		P	16.69	21.01	14.9	7.71	18.51	12.65	6.52	4.22	12.42	14.45	80.11	7.03
		K	57.2	59.25	57.93	25.73	59.6	25.91	29.42	8.24	42.18	89.16	130.32	8.82
Sabour	Kharif	N	130.5	118.8	116.2	115.3	124.1	118	124.3	121.9	115.4	116.8		
		P	34.8	35.4	35.3	34.2	37	34.9	37.2	36.7	34.8	34.7		
		K	142.1	143.1	150.3	136.9	152.6	144	153.6	153.5	140.6	143.9		
	Rabi	N	83	96.2	164.9	229.3	130.1	318	86.1	173.8	49.4	19.9		
		P	22.1	23.9	44	59.5	48	108.3	7.2	41.3	11.8	7.6		
		K	94.1	112.2	129.2	166.4	159.5	290.4	10.4	89.3	16.1	25.3		
	Summer	N	0	82	30.7	96.7	98.5	18.9	20.8	59.5	84.6	74.5		
		P	0	19.9	8.7	28.4	20.8	4.3	7.3	15.1	21.4	16.9		
		K	0	42.1	16	60.1	42.3	7.3	25	36.5	44.9	51.8		
Siruguppa	Kharif	N	90.2	103.3	95.5	86.6	101.3	119.4	117.4	115.4	111.8	118.4		
		P	24.5	31.7	29.1	26.3	28	32.3	33	31.5	31.5	31		
		K	119.9	143.2	128.4	126.7	139	154.4	135.4	156.6	147.9	164.8		
	Rabi	N	66.7	66.3	23.2	46.8	17.9	11.7	40.1	36.8	72.7	69.8		
		P	18.4	12.8	2.6	5.7	2	3.3	6.6	3.9	17	17.5		
		K	93.8	72.1	13	35.4	11.1	16.3	24.8	19.6	98.4	94.6		
SK Nagar	Kharif	N	68.3	81.8	67	75.6	27.8	37.7	53.3	84				
		P	11.3	15.6	12.3	13.9	4.5	8.1	17	14.5				
		K	45.4	51.5	45.3	40.3	22.5	38.9	49.1	38.7				
	Rabi	N	105.4	0	103.6	70.4	100.6	78.5	100.9	104.5				
		P	41.53	0	25.2	17.169	22.86	16.56	41.28	20.9				
		K	109.4	0	78.2	57.1	46.5	37.1	110.3	76.4				
	Summer	N	79.9	38.4	46.4	27.1	0	0	93.4	51.6				
		P	22.2	5.9	6.4	7.7	0	0	13.7	9.3				

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Thanjavur	Kharif	K	23.7	28.9	31.7	24.6	0	0	51	47.3				
		N	102.5	108.6	100.1	103.1	101.8	101.4	97.5					
		P	6.7	6.9	6.7	6.8	6.9	6.9	6.5					
	Rabi	K	63.4	63.7	63.1	63.2	62.7	61.2	60.2					
		N	41.5	40.5	44.2	48.4	47.1	44.7	46.5					
		P	8.4	8.0	9.2	10.1	11.5	11.8	9.8					
	Summer	K	58.3	58.4	60.6	61.5	64.2	61.2	66.1					
		N	22.4	17.9	64.1	103.5	46.7	36.8	-					
		P	2.3	2.5	7.8	13.8	6.4	3.3	-					
		K	44.0	46.4	85.0	402.1	133.4	91.9	-					

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ANNEXURES

Annexure-I

CURRENT ADDRESS OF CONTACT PERSON

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
ICAR-IIFSR, Modipuram Meerut				
1	Uttar Pradesh	Modipuram (Head Quarter)	Dr A.S. Panwar , Director, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Off.) 0121-288 8611; (Mob.) 09412078001; (Fax) 0121-288 8546 Email: directorpdfsr@yahoo.com
			Dr N .Ravisankar , Pr. Scientist, Project Coordinator (In-charge), AICRP-IFS -Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Off.) 0121-288 8611; (Mob.) 08410020345 Email: ifsofr@gmail.com,
			Dr. A K Prusty , Sr. Scientist, Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Mob: 07599157944 Email: ashish.prusty@icar.gov.in
			Dr. Mohammad Shamim , Sr. Scientist, Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Mob: 9045040407 Email: mohammad.shamim@icar.gov.in
			Dr. Meraj Alam Ansari , Scientist Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Mob.) 9089654323; Email: meraj.ansari@icar.gov.in
			Dr. Raghuveer Singh , Scientist Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Mob.) 9458613219; Email: rsbicar@gmail.com
			Dhananjay Tripathi , Chief Technical Officer Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Mob.) 9412579462; Email: ctoosr@gmail.com
			Dr. Vipin Kumar , Chief Technical Officer Coordinator unit, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.	Tel: (Mob.) 9457267100; Email: vipin.kumar2@icar.gov.in
IASRI, New Delhi				
	New Delhi	New Delhi (Data Analysis)	Dr Anil Kumar , Principal Scientist, Division of Design of Experiments, IASRI, Library Avenue, Pusa, New Delhi-110 012	Tel: (Off.) 011-25847121 (Ext-4154); (Mob.) 09868891600, (Fax) 011-25841564 Email: akumar@iasri.res.in, akumarchi72@gmail.com
			Dr (Mrs) Cini Varghese , Principal Scientist, Division of Design of Experiments, IASRI, Library Avenue, Pusa, New Delhi - 110012	Tel: (Off.) 011-25847121 Email: cini.varghese@icar.gov.in

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
AICRP-IFS Centre State wise				
1	A & N Islands	Port Blair(Voluntary)	Dr T.P. Swarnam , Pr. Investigator (AICRP-IFS), Natural Resource Management Division, Central Agricultural Research Institute, PB No. 181, Port Blair-744 101	Tel.: (Off.) 03192-250341, (Mob.) 09679541781, Email:portblair.icar@gmail.com
2	Andhra Pradesh	Maruteru (Sub-centre)	Dr M. Srinivas , Agronomist (AICRP-IFS), A.P. Rice Research Station, RARS, Maruteru-534 122, Dist. W. Godavari (AP)	Tel.: (Off.) 08819-246283, (Mob.) 09949599965, Email:maruteru.sub@gmail.com
3		Vizianagaram (OFR)	Dr.M.M.V.Srinivasa Rao , OFR Agronomist, AICRP-IFS, Gajularega OFR centre, Vizianagaram Distt. (Andhra Pradesh)	(Mob.) 09440123223 Email: vizianagaram.ofr@gmail.com
4	Assam	Jorhat (Main centre)	Dr.K.K. Sharma , Chief Agronomist (AICRP-IFS), Department of Agronomy, Assam Agricultural University, Jorhat-785 013 (Assam)	Tel.: (Off.) 0376-2311379, (Mob.) 09435352157, Email: jorhat.main@gmail.com
5		Goalpara (OFR)	Mr Ajoy Sankar Bora , Jr. Agronomist (OFR) AICRP on IFS, Livestock Research Station, Hekera, Mondira-781 127, Dist. Kamrup (Assam)	Tel.: (Mob.) 09508408214 Email:goalpara.ofr@gmail.com
6	Bihar	Sabour (Main centre)	Dr. Sanjay Kumar , Chief Agronomist (AICRP-IFS), Bihar Agricultural University, Sabour, Dist. Bhagalpur-813 210 (Bihar)	Tel.: (Off.) 0641-2451263, (Mob.) 09431310417, Email: sabour.main@gmail.com
7		Nalanda (OFR)	Dr.D.K. Mahto , OFR Agronomist (AICRP-IFS), Department of Agronomy Bholu Paswan Shatri Agricultural College, Purnea City Farm, Kasba Road, Purnea-854 302 (Bihar)	Tel.: (Mob.) 09431720807, Email: nalanda.ofr@gmail.com
8		Patna (Voluntary)	Dr Sanjeev Kumar , Sr. Scientist & Pr. Investigator (AICRP-IFS), ICAR Research Complex for Eastern Region, ICAR Parisar, BVC Campus P.O., Patna-800 014 (Bihar)	Tel.: (Off.) 0612-2223962, (Mob.) 09431840189, Email: patna.icar@gmail.com
9	Chhattisgarh	Raipur (Main centre)	Dr.M.C. Bhambri , Chief Agronomist (AICRP-IFS), Indira Gandhi Krishi Vishwavidyalaya, Krishak Nagar, Raipur-492 006 (Chhattisgarh)	Tel: (Off.) 0771-2442177, (Mob.) 09406470437 Email: raipurifs.main@gmail.com
10		Kankar (OFR)	Dr Adikant Pradhan , OFR Agronomist, AICRP-IFS, Programme Coordinator, KrishiVigyan Kendra, Singarbhat, Kanker District Kanker- 494 334 (Chhattisgarh)	Tel.:07868-241467 (Mob.) 09424270194 Email: kanker.ofr@gmail.com
12	Gujarat	S.K. Nagar (MC)	Dr L.J. Desai , Chief Agronomist (AICRP-IFS), Sardar Krushi nagar-Dantiwada Agricultural University, Sardar Krushi nagar, Dist. Banaskantha -385 506 (Gujarat)	Tel.: (Off.) 02748-278434, (Mob.) 09429310273, Email: sknagar.main@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
13		Junagadh (Sub-centre)	Dr. R M Solanki , Agronomist (AICRP-IFS), Farming System research Centre, Department of Agronomy, Junagadh Agricultural University, Junagadh-362 001 (Gujarat).	Tel.: (Off.) 0285-2670139, (Mob.) 09428338680 Email: junagadh.sub@gmail.com
14		Navsari (Sub-centre)	Dr.L. K. Arvadiya , Agronomist (AICRP-IFS), N.M. College of Agriculture, Navsari Agricultural University, Navsari-396 450 (Gujarat)	Tel.: (Off.) 02637-282771-75, Ext. 1207, (Mob.) 08128681260. Email: navsari.sub@gmail.com
15		Devgadh (OFR)	Dr. Girish J. Patel , OFR Agronomist (AICRP-IFS), Tribal Research Cum Training Centre, Anand Agricultural University, Devgad Bariya, Dahod-389 380 (Gujarat)	Tel.: (Off.) 02676-235528;(Mob.)9825930039, Email: dahod.ofr@gmail.com
16		Patan (OFR)	Dr. L.J. Desai , I/c: Agronomist, On Farm Research Centre, Agricultural Research Station, Adiya-384 255, Dist: Patan, Gujarat	(Mob):09106618244 Email: patan.ofr@gmail.com
17	Goa	Old Goa(Voluntary)	Dr Paramesh V. , Pr. Investigator (AICRP-IFS), ICAR ICAR-Central Coastal Agricultural Research Institute, Ela, Old Goa-403 402 (Goa)	Tel.: (Off.) 0832-2284678, (Mob.) 09172693349, Email: oldgoa.icar@gmail.com
18	Haryana	Hisar (Main centre)	Dr.R.S.Dadarwal , I/C Agronomist (AICRP-IFS), Department of Agronomy, CCS Haryana Agricultural University, Hisar-125 004 (Haryana)	Tel.: (Off.) 01662-289151, (Mob.) 09729596590 Email: hisar.main@gmail.com
19		Fatehabad (OFR)	Dr. Anil Mehta , OFR Agronomist Dept. of Agronomy, CCS HAU Hisar 125 004, (Haryana)	(mob): 8168432331 Email: fatehabad.ofr@gmail.com
20	Himachal Pradesh	Palampur (Main centre)	Dr.S.K.Sharma , Chief Agronomist (AICRP-IFS), Department of Agronomy, CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Dist. Kangra-176 062 (H.P.)	Tel.: (Off.) 01894-230392, (Mob.) 09418253340,) 9418167556, 09805944889 Email: palampur.main@gmail.com
21		Bilaspur (OFR)	Dr S.K. Sharma , OFR Agronomist (AICRP-IFS), Shivalik Agricultural Research and Extension Centre (CSK HPKV), Kangra-176 002 (H.P.)	Tel.:(Mob) 09805944889, 9418167556 Email: bilaspur.ofr@gmail.com
22	J & K	Chatha (Main centre)	Dr Anil Kumar , Chief Agronomist (AICRP-IFS), Sher-E-Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu-180 012 (J&K)	Tel.: (Off.) 0191-2262026, (Mob.) 08825087701, Email:jammu.main@gmail.com
23		Jammu (OFR)	Dr A.K. Gupta , OFR Agronomist (AICRP-IFS), Farming Systems Research Centre, SKUAST-J& K. Main Campus Jammu-180009(J&K),	Tel.:(Off.)0191- 2106409, (Mob.)09419100401, Email: jammu.ofr@gmail.com
24	Jharkhand	Kanke(Main centre)	Dr M S Yadava , Chief Agronomist (AICRP-IFS), Department of Agronomy, Birsa Agricultural University, Kanke, Ranchi-834 006 (Jharkhand)	Tel.: (Off.) 0651-2450608, (Mob.) 09934313050 Email: ranchiifs.main@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
25		East Singhbhum (OFR)	Dr.Shambhu Saran Kumar , OFR Agronomist (AICRP-IFS), Zonal Research Station, Darisai, P.O., Bara Khursahi, District East Singhbhum-832 304 (Jharkhand),	Tel.: (Off.) 06434-222052, (Mob.) 09431194519, Email:eastsinghbhum.ofr@gmail.com
26	Karnataka	Kathalgere (Main centre)	Dr O. Kumara , I/C Chief Agronomist (AICRP-IFS), Agricultural Research Station, Kathalgere, (UAHS,Navile, Shimoga), Dist. Davanagere-577 219 (Karnataka)	Tel.: (Off.) 08180-273555,(Mob.) 9740018935 Email: kathalgere.main@gmail.com
27		Siruguppa (Main centre)	Dr M.A. Basavanneppa ,Chief Agronomist (AICRP-IFS), UAS-R Agricultural Research Station, Siruguppa, Dist. Bellary-583 121 (Karnataka)	Tel.: (Off.) 08396-220249, (Mob.)09480696333, Email: siruguppa.main@gmail.com
28		Chikkaballapura. (OFR)	Dr M.T.Sanjay OFR Agronomist (AICRP-IFS), 1 st Floor, Directorate of Extn. Office Building, University of Agricultural Sciences, Hebbal Campus, Kolar, Bangalore-560024(Karnataka),	Tel.:(Off.)080-65325146, (Mob.)09243075082, Email:chikkaballapura.ofr@gmail.com
29		Dharwad (OFR)	Dr. C.P. Chandrashekar , OFR Agronomist (UAS, Dharwad) OFR Scheme Institute of Organic Farming (2 nd Floor), Main Agricultural Research Station Yettinagudda campus, Krishi nagar, Dharwad-580 005 (Karnataka)	(Mob.) 091-7829165693 Email: dharwad.ofr@gmail.com
30	Kerala	Karamana (Main centre)	Dr Jacob John , Chief Agronomist (AICRP-IFS), CSRC, Karamana, Thiruvananthapuram-695002 (Kerala)	Tel.: (Off.) 0471-2343586, (Mob.) 09847022929/ 9740018935 Email: karamana.main@gmail.com
31		Thiruvananthapuram(OFR)	Dr Jacob D. , OFR Agronomist (AICRP-IFS), KAU On-Farm Research Centre, Quarters V/13, College of Agriculture, Vellayani P.O., Thiruvananthapuram (Kerala),	Tel.: (Off.) 0469-2700343, (Mob.)09446355002, Email: thiruvananthapuram.ofr@gmail.com
32	Madhya Pradesh	Jabalpur (Main centre)	Dr.P.B.Sharma , Chief Agronomist (AICRP-IFS), Department of Agronomy, JNKVV, Adhartal, Jabalpur-482 004 (M.P.)	Tel.: (Off.) 0761- 2681771, (Mob.) 09893211994 Email: jabalpur.main@gmail.com
33		Indore (SC)	Dr A K Sharma , Agronomist (AICRP-IFS), RVSKVV College of Agriculture, Indore-452 001(M.P.).	Tel.: (Off.) 0731-2702911, (Mob.) Email: indore.sub@gmail.com
34		Powarkheda (SC)	Dr Vinod Kumar , Agronomist (AICRP-IFS), Zonal Agricultural Research Station, Powarkheda, Dist. Hoshangabad-461 110 (M.P.)	Tel.: (Off.) 07547-227257, (Mob.)09425044950, 9009291588 , Email:powarkheda.sub@gmail.com
35		Rewa (SC)	Dr B.M. Mourya , Agronomist (AICRP-IFS), Regional Agricultural Research Station, Kuthulia Farm, College of Agriculture, Rewa-486 001 (M.P.)	Tel.: (Off.) 07662-220732, (Mob.) 09981463851, Email:rewa.sub@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
36		Anuppur (OFR)	Dr D.N. Shrivash , OFR Agronomist (AICRP-IFS), JNKVV Regional Agricultural Research Station (Near Collectorate), Dindori-481 880 (M.P.)	Tel.: (Off.) 07692-223765, (Mob.) 09424688898, (Fax) 07692-223765 Email:anuppur.ofr@gmail.com
37		Umaria (OFR)	Dr.(Mrs.) Namrata Jain , Agronomist (OFR) E.C.F. Scheme (KVK) Umaria, J.N.K.K.V. (KVK), Village Dabroha, Post Kachharwar, Distt. Umaria (M.P.) 484 661	Tel: 07653-280518 (Mob) 09424677473,09926350772 Email: umaria.ofr@gmail.com
38	Maharashtra	Akola(Main centre)	Dr.J.P.Deshmukh , Chief Agronomist (AICRP-IFS), Department of Agronomy, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar, Akola-444 104 (Maharashtra)	Tel.: (Off.) 0724-2800628 (Mob.) 7588884649 Email:akolaifs.main@gmail.com
39		Karjat(Main centre)	Dr.S B Bhagat , Chief Agronomist (AICRP-IFS), DBSKKV Agricultural Research Station, Karjat, Dist. Raigad -410 201 (Maharashtra)	Tel.: (Off.) 02148-222072, (Mob.)08879247408, Email: karjat.main@gmail.com
40		Parbhani(Main centre)	Dr. W.N.Narkhede , Chief Agronomist (AICRP-IFS), Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani-431 402 (Maharashtra)	Tel.: (Off.) 02452-230089, (Mob.)07588082184, Email: parbhaniifs.main@gmail.com
41		Rahuri(Main centre)	Dr.U.S.Surve , Chief Agronomist (AICRP-IFS), Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar-413 705 (Maharashtra)	Tel.: (Off.) 02426-243106, (Mob.)09822606511 Email:rahuri.main@gmail.com
42		Nagpur (OFR)	Dr S.N. Potkile , OFR Agronomist (AICRP-IFS, Akola), C/O Horticulturist Regional Fruit Research Station, Katol-441302 Dist. Nagpur (Maharashtra)	Tel.:(Mob.) Email: nagpur.ofr@gmail.com
43		Thane (OFR)	Dr Shoukat Pingari , OFR Agronomist (AICRP-IFS, Dapoli, Regional Agricultural Research Karjat-410 201 Dist. Dist.Raigad (Maharashtra)	Tel.:(Off.)02148-222035 (Mob.)0976278754 Email: thane.ofr@gmail.com
44		Hingoli (OFR)	Dr. S.P. Kausale Agronomist (OFR) AICRP on IFS, Regional Sugarcane Research Station, Bas math nagar Dist. Hingoli (Maharashtra)	Mob: 9422703022 Email: hingoli.ofr@gmail.com
45		Padegaon (OFR)	Dr A.D. Tumpare , OFR Agricultural AICRP-IFS, Entomology Section, Central Sugarcane Research Station, Padegaon Tal: Phaltan Dist. Satara-415 521 (Maharashtra) (Mob.)	Mob:08275201107, Email: padegaon.ofr@gmail.com
46	Meghalaya	Umiam(Voluntary)	Dr. Jayanta Layek , Pr. Investigator, AICRP-IFS, Division of Crop Production, ICAR Res. Complex for NEH Region, Umroi Road, Umiam, Ri Bhoi-793 103 (Meghalaya)	Tel.:(Off.)0364-2570257, (Mob.)09101011194 Email: umiam.icar@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
47	Odisha	Bhubaneswar (Main centre)	Dr Alok Kumar Patra , Chief Agronomist (AICRP-IFS), Odisha University of Agriculture & Technology, Bhubaneswar-751 003 (Odisha)	Tel.:(Off.)0674-2397176, (Mob.)7978445236 Email:bhubaneswar.main@gmail.com,
48		Chiplima (Sub-centre)	Dr.(Mrs) Sanjukta Mahapatra , Agronomist (AICRP-IFS), RRTTS Campus Chiplitma, Dist. Sambalpur-768 025 (Orissa)	Tel.: (Off.) 0663-2460507, (Mob.) 07978929978 Email: chiplitma.sub@gmail.com
49		Kedujhar (OFR)	Dr. Kishore Chandra Sahoo , OFR Agronomist, On-Farm Research Centre (AICRP-IFS), Kendujhar RRTTS Campus, Judia Farm PO.- Kendujhar, Dist. Kendujhar-758 002(Odisha)	(Mob): 08637264120 Email:kedujhar.ofr@gmail.com
50		Kendrapara (OFR)	Dr Bhavani Shankar Nayak I/C OFR Agronomist (AICRP-IFS), Kalahandi, RRTTS Campus, Arkabhalipara Farm Bhawanipatna, Dist. Kalahandi-766 001 (Odisha)	(Mob.)09437321675 Email: ofrkalahandi@gmail.com
51	Punjab	Ludhiana(Main centre)	Dr S.S. Walia , Chief Agronomist (AICRP-IFS), Department of Agronomy, Punjab Agricultural University, Ludhiana-141 004 (Punjab)	Tel.: (Off.) 0161-2401960 (Ext.-308), (Mob.) 09464760134, Email: ludhiana.main@gmail.com
52		Patiala (OFR)	Dr. (Mrs.) Jashanjot Kaur , Agronomist (OFR) AICRP on IFS, Krishi Vigyan Kendra, Raunl, Patiala (Punjab)	Tel.: (Off.) 0183-2501989, (Mob):09646300349 Email:patiala.ofr@gmail.com
53	Rajasthan	Durgapura(Main centre)	Dr K C Gupta , Chief Agronomist (AICRP-IFS), SKNAU Rajasthan Agricultural Research Institute, Durgapura, Jaipur-303 329 (Rajasthan)	Tel.: (Off.) 0141-2720160, (Mob): 09414287447 Email: durgapura.main@gmail.com
54		Kota (Sub-centre)	Dr J.P. Tatarwal , Jr. Agronomist (AICRP-IFS), Agricultural Research Station, Ummedganj Farm, P.B. No. 7, GPO Nayapura, Kota-324 001 (Rajasthan)	Tel.: (Off.) 0744-2844369, (Mob.) 09530091236, Email: kotaifs.sub@gmail.com jptatarwal@gmail.com
55		Dausa (OFR)	Dr Babu Lal Meena , OFR Agronomist (AICRP-IFS), SKNAU College of Agriculture, Didwana, Lalsot, Dausa-303 511 (Rajasthan)	(Mob.) 09461730510 dausa.ofr@gmail.com
56		Dungarpur (OFR)	Dr Hari Singh , Agronomist (OFR), AICRP on IFS, Rajasthan College of Agriculture, M.P.U.A. & T., Udaipur-313001(Raj.)	Tel.: (Off.) 294-2417374, (Mob): 09414801551 dungarpur.ofr@gmail.com
57	Telangana	Rajendranagar (Main centre)	Dr M.Venkata Ramana , Chief Agronomist (AICRP-IFS), Professor Jayashankar Telangana State, Agricultural University, Diamond Jubilee Block, College of Agriculture, Rajendranagar, Hyderabad-500 030	Tel.: (Off.) 040-24017463, (Mob) 09440019029 Email:rajendranagar.main@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
58		Rudrur (Sub)	Dr.(Mrs.)Firdoz Shahana , Agronomist (AICRP-IFS), PJTSAU, Regional Sugarcane & Rice Res. Stn., Rudrur-503188 (Telangana)	Tel.: (Off.) 08467-284024, (Mob.) 09010104998, Email: rudrur.sub@gmail.com
59		Madak (OFR)	Dr.Kodam Chiranjeevi Senior scientist (Agro) & Officer I/c OFR Centre Madak, AICRP on IFS, DJ block, College of Agriculture, Rajendranagar, Hyderabad, 500030	(Mob):083743304031 Email: medak.ofr@gmail.com
60	Tamil Nadu	Coimbatore(Main centre)	Dr. K.R. Latha , Chief Agronomist (AICRP-IFS), Department of Agronomy, TNAU, Coimbatore-641 003 (Tamil Nadu)	Tel.: (Off.) 0422-6611254, (Mob.) 09487507182, Email: coimbatore.main@gmail.com
61		Thanjavur (Sub)	Dr.S. Porpavai , Agronomist (AICRP-IFS) Soil & Water Management Research Institute Kattuthottam, Thanjavur-613501 (Tamil Nadu).	Tel.: (Off.) 04362-267680, (Mob.) 09751241522, Email: thanjavur.sub@gmail.com
62		Erode (OFR)	Dr. N.Sathish Kumar , Agronomist, (OFR) AICRP on IFS Dryland Agricultural Research Station, Bhavanisagar-638 451 Erode District (T.N)	(mob): 098945 63397 Email:erode.ofr@gmail.com
63		Salem (OFR)	Dr. (Mrs.) R. Nageswari , Agronomist (OFR), AICRP on IFS, Tapioca and Castor Research Station, Yethapur, P.G. Palayam(PO)-636 293526 (T.N)	(Mob.) 04282-293526, 7502840470 salemofr@gmail.com
64	Uttar Pradesh	Kanpur (Main centre)	Dr. Mohd. Zafar Siddiqui , Chief Agronomist (AICRP-IFS), Department of Agronomy, CS Azad University of Agriculture & Technology, Kanpur-208 002 (U.P.)	Tel.: (Off.) 0512-253456-62 (Ext.-218 & 193, (Mob.) 7007876523, (Fax)0512-253808 Email:kanpurifs.main@gmail.com
65		Ayodhya (Main centre)	Dr A K Singh , Chief Agronomist (AICRP-IFS), Department of Agronomy, Acharya Narendra Deva University of Agriculture & Technology Kumarganj, Ayodhya-224.229 (U.P.)	Tel.: (Off.) 05270-262053, (Mob.) 09450766594 Email:faizabadmain@gmail.com
66		Varanasi(Sub-centre)	Dr. J.S. Bohra , Agronomist (AICRP-IFS), Dept. of Agronomy, Institute of Agricultural Science, B.H.U., Varanasi-221 005 (U.P.)	Tel.: (Off.) 0542-2368381, (Mob.) 09415396460, Email: varanasiifs.sub@gmail.com
67		Muzaffarnagar (OFR)	Dr. P.C.Jat , Senior Scientist ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.,	(Mob.) 09410034958, Email:muzaffarnagar.ofr@gmail.com
68		Fatehpur (OFR)	Dr. Ravi Prakash , Agronomist (OFR), Krishi Vigyan Kendra, Tharion, Distt.-Fatehpur-212622	(Mob): Email:fatehpur.ofr@gmail.com

S. No	State	Name of the Centre	Principal Investigator & Location along with complete address	Phone, Fax and E-mail addresses
69		Mirzapur (OFR)	Dr A K Singh , Agronomist Deptt. Of Agronomy, College of Agriculture NDUA&T Faizabad UP (Crop Research Station Tisui, Marihan, Mirzapur-231310 (UP)	(Mob.) 09450766594 Email: mirzapurifs.ofr@gmail.com
70		Modipuram (Voluntary)	Dr N .Ravisankar , Pr Scientist & Programme Facilitator (IFS), ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.,	Tel: (Mob.) 08755195404, Email: modipuram.icar@gmail.com
71	Uttarakhand	Pantnagar (MC)	Dr Rohitashv Singh , I/C Chief Agronomist (AICRP-IFS), Department of Agronomy, GB Pant University of Agriculture and Technology, Pantnagar-263 145, Dist. Udham Singh Nagar (Uttarakhand)	Tel.: (Off.) 05944-233034; (Mob.) 09411088549 Email: pantnagar.main@gmail.com
72		Pantnagar (OFR)	Dr Dinesh Kumar Singh , Agronomist - OFR (AICRP-IFS), Deptt. Of agronomy GBPUA&T, Pantnagar - 263 145 Udamsinghnagar - Distt (Uttarakhand)	(Mob.) 9410187299 Email: usnagar.ofr@gmail.com
73	West Bengal	Kalyani (MC)	Dr Swapan Kumar Mukhopadhyay , Chief Agronomist (AICRP-IFS), Agri. Research Complex Building, BCKVV, Kalyani, Nadia-741 235 (W.B.)	Tel.: (Mob.) 0 9477231319, Email: kalyaniifs.main@gmail.com
74		Nadia (OFR)	Dr. Manabendra Ray AICRP on Integrated Farming Systems Regional Research Station Bidhan Chandra Krishi Viswavidyalaya Gayeshpur-741234, Nadia, West Bengal	(Mob.) 09432960882 / 09830844300 Email: nadiaifs.ofr@gmail.com

Annexure-II

PRICE (Rs./Q) & CALORIE PER 100 GM FOR 2018-19

Crops	Price (Rs./q) 2017-18	Price (Rs./q) 2018-19	Cal./ 100 gm	Crops	Price (Rs./q) 2017-18	Price (Rs./q) 2018-19	Cal./ 100 gm
All Fodders**	180	190	16	Groundnut*	4650	4890	567
All green manuring**	280	285	16	Knolkhol**	1020	1100	43
Amaranthus grain**	1400	5000	49	Ladyfinger**	1550	1640	35
Arhar/Pigeonpea/*	5675	5675	335	Lentil /Masur*	4350	4475	343
Redgram							
Baby Corn**	2450	3000	125	Linseed**	4050	4175	530
Barley*	1410	1440	336	Maize(Grain)*	1425	1700	342
Beetroot**	450	500	25	Maize (green cobs)**	1.20/cob or 410/q	1.50/cob or 450/q	125
Berseem (seed)**	15120	16450	344	Maize Sweet Corn**	1750	1850	342
Bitter Gourd**	650	1000	25	Marigold**	2375	2400	4
Blackgram/Urad*	5500	5600	347	Rapeseed& Mustard*	4100	4200	541
Bottle gourd (Lauki)**	925	2000	12	Gobi sarson/Hayola**	2650	2725	541
Brinjal**	1350	1500	24	Niger Seed*	4050	5877	515
Broccoli**	3800	4000	45	Oat**	1450	1475	374
Buck Wheat**	925	1000	346	Onion (big)**	1400	1500	50
Cabbage**	875	500	27	Pea*	2875	6400	315
Carrot**	850	1000	48	Pea (veg.)**	1900	2000	93
Cassava**	1630	1675	134	Pearlmillet/Bajra**	1425	1950	361
Castor**	4235	4500	440	Potato**	925	1000	97
Cauliflower**	1000	1150	66	Pumpkin**	1020	1600	25
Chillies(green)**	2700	2500	29	Radish (White)**	450	500	17
Clusterbean **	1490	2200	35	Ragi/Fingermillet**	1850	2000	328
Coleus**	2000	2100	86	Rice(coarse)*	1550	1750	346
Coriander(S)**	4200	5500	288	Ricebean fodder**	190	210	16
Coriander(L)**	1480	1500	49	Ridge /Round gourd**	1550	3000	17
Cotton(F-4/1180)*	3860	5150	332	Safflower**	4300	4945	356
Cotton (H-1380)*	4160	5450	332	Sesamum/Gingely/ Til**	5400	6249	563
Cowpea/Lobia(S)**	2600	2650	323	Sorghum/Jowar*	1750	2430	349
Cowpea (Veg.)pod**	1540	1590	48	Soyabean (b)*	2850	2900	432
Cucumber**	1430	700	13	Soyabean (y)*	2850	3399	432
Cumin/SiyaZeera**	4950	13500	356	Sugar beat**	750	975	48
Fennel grain**	6900	7200	31	Sugarcane*	275	275	34
Fennugreek (seed)**	4950	5100	333	Summer Squash**	1320	1450	16

Crops	Price (Rs./q) 2017-18	Price (Rs./q) 2018-19	Cal./ 100 gm	Crops	Price (Rs./q) 2017-18	Price (Rs./q) 2018-19	Cal./ 100 gm
Fennugreek leaves/ spinach**	1450	1475	49	Sweet Potato**	1200	1500	120
Field bean**	2750	2800	48	Tomato (green)	1450	2000	23
Fieldpeas/Veg.peas**	1850	2500	93	Toria/Raya/*	3900	4100	541
Frenchbeans**	2690	2000	26	Turmeric**	6000	7000	349
Garlic**	4950	5200	145	Wheat*	1735	1840	346
Ginger**	1800	2000	67	White gingely**	6900	7100	563
Gram/Chickpea/ Bengalgram*	4550	4620	360	Rajmash/Rajmah**	3580	5700	346
Greengram/Moong*	5575	6975	334	Sunflower seed *	4300	5388	620

* Minimum support price fixed by Government of India for 2018-19.

**Farm gate price at OFR centre.

Annexure- III

S.N	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 hirsutum 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
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 usitatissimum 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

S.N	COMMON NAME	Botanical name	Hindi Name
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	Solanum 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 esculentum/L.lycopersicum	Tamatar
61	Turmeric	Curcuma longa L.	Haldi
62	Wheat	Triticum aestivum L.emend .Fiori \$ Paol.	Gehun



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

ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut. 250 110 (UP), India

