वार्षिक प्रतिवेदन
Annual Report
2015-16

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 resources for 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.
- 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 ICAR-IIFSR with 75 centres to undertake on-station main (25 no's), on-station sub (12 no's), on-station voluntary (6 no's) and on-farm research (32 no's) spread across length and breadth of the country. The institute is also leading a Network Project on Organic Farming (NPOF) with 20 centres.

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON INTEGRATED FARMING SYSTEMS

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(Indian Council of Agricultural Research)

Modipuram, Meerut- 250 110, India

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Compiled and Edited by: Dr N. Ravisankar Programme Facilitator (Coordination Unit) &, PI(OFR)
Dr J.P. Singh, Ex.Programme Facilitator (Int. Farming Systems Mgt.)
Dr Prem Singh, Programme Facilitator (Cropping Systems & Resource Mgt.)
Dr R.P. Mishra, Programme Facilitator (Organic Agriculture Systems)
Dr Mohammad Shamim, Scientist (Coordination Unit)
Mr Raghuveer Singh, Scientist (Coordination Unit)
Dr Amit Kumar, Scientist (Coordination Unit)
Dr Lalit Krishan Meena, Scientist (Cropping Systems & Resource Mgt.)
Mr Dhananjay Tripathi, Chief Tech. Officer (Coordination Unit)
Dr Brij Mohan Garg, Asstt. Chief Tech. Officer (Coordination Unit)
Mr Manoj Kumar, Res. Associate (Coordination Unit)

Data Processing at IASRI, New Delhi by: Dr Anil Kumar, Principal Scientist & PI, AICRP-IFS
Dr (Mrs) Cini Varghese, Principal Scientist, OFR, AICRP-IFS
Mr Gyan Singh, Asstt. 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 75 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 2014-15 (period ending June 2015), under 'on-station' and 'on-farm' research programmes of AICRP on Integrated Farming Systems. The other details are relevant to 31st March 2016.
- 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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Phones: 011-28115949, 28116018; Mobile: 09811349619, 09953134595; E-mail: yugpress01@gmail.com

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All India Co-ordinated Research Project on Integrated Farming Systems (AICRP-IFS) initiated in 2010- 11 is operating with 25 main, 12 sub, 6 voluntary (ICAR Institute) and 32 on-farm centres in 23 states and 2 union territories. The results of the experiments conducted during 2014-15 by all the co-operating centres are processed and compiled in the Annual Report 2015-16 of the scheme. I take this opportunity to record my sincere thanks to Dr. T. Mohapatra, Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi for offering guidance at various stages of review. I extend my gratitude to Dr. K. Alagusundaram, Acting Deputy Director General (Natural Resource Management) for his constant support extended to the scheme. The time to time guidance received from Dr. S. Bhaskar, Assistant Director General (Agronomy, Agroforestry and Climate Change) for improving the performance and output of the scheme is also duly acknowledged. My sincere thanks also extended to Dr. S. Ayyappan, Former Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi, Dr. A.K. Sikka, Former Deputy Director General (Natural Resource Management) and Dr. B. Mohankumar, Former Assistant Director General (Agronomy, Agroforestry and Climate Change) for their critical comments, reviews and suggestions on the performance and improvement of scheme over the years. Scientific inputs received from Quinquennial Review Team (QRT), Research Advisory Committee (RAC) and Institute Management Committee (IMC) are thankfully acknowledged as those inputs provided immense help in taking new initiatives, shaping and improvement of the programme for practical utility. I am highly thankful to each and every one of the scientists and research fellows involved in the scheme at all the centres for putting the meticulous effort to conduct the field experiments, lab analysis and generating data. The sincere efforts put forth by Dr. N. Ravisankar, Principal Scientist and Programme Facilitator (Coordination Unit) deserves appreciation for compilation of the report. I also extend my appreciation to Dr. M. Shamim, Scientist, Dr. Raghuveer Singh, Scientist,Dr. Amit Kumar, Scientist, Mr. Dhananjay Tripathi, Chief Technical Officer, Dr. Brij Mohan Garg, Assistant Chief Technical Officer and Mrs. Jailata Sharma, PA for their cooperation in compilation of the data, its statistical analysis, drafting and proof corrections. Thanks and appreciations are also due to Dr. Kamta Prasad, Former Programme Facilitator (Co-ordination Unit) and Dr. J.P. Singh, Former Director (Acting) for extending the cooperation in preparation of report. The contributions of all the other scientific, technical, administrative and skilled supporting staff either directly or indirectly at various levels during preparation of this report are also acknowledged. I am sure; the significant findings obtained from the experiments especially region specific Integrated Farming System models, need based alternative cropping systems, resource management packages and refined farming system in farmer partcipatory mode are of practical in nature and can be adopted by small and marginal farmers for improving their livelihood.

(A.S. Panwar)
Director

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1. INTRODUCTION

The Genesis of the "All India Coordinated Research Project on Integrated Farming Systems" may be traced back to the visit of Dr A.B. Stewart of Macaulay Institute of Soil Research, Aberdeen U.K., somewhere in mid-forties. He was invited by 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 yields. 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 Trials at cultivators' Fields" scheme was initiated in 1953 under the IndoAmerican 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 fertilizer use for the production of crops

Subsequently in 1956, experiments on carefully selected centers called 'Model Agronomic Experiments' were added to the project and started as all India Coordinated Agronomic Experiments 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 acquired 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 1968-69, 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 agronomic factors such as fertilizer (including micronutrients), irrigation, weed control, liming etc.;

II. To study the manure requirements of important crop rotations 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-climate condition of the country; and

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

Under the revised scheme, 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 and in combination and to potassium in the presence of nitrogen and phosphorus under irrigated as well as dry land condition;

ii. To compare different methods of application of nitrogen on cereals 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 soils 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 foe 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 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 75 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 canters, 12 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 centers (earlier known as Experiments on Cultivators' Fields/ ECF Centers) are engaged in farmers' participatory research and are located in different agro-climatic zones. These OFR centers 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 centers during the year under report (2014-15) is depicted in Map-1& 2, and details are given in Table-3.

Map 1. Locations of on-station research centres of AICRP-IFS during 2014-15

Map 2. Locations of on-farm research centres of AICRP-IFS during 2014-15

Table-3/1: Location of Different AICRP-IFS centres during the year under report (2014-15)

S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
1.	A&N	CIARI,, Portblair	Voluntary	Island	Island region	Northern Zone AN-1
2.	Andhra Pradesh	Rajendranagar (Dist. Rangareddy)	Main centre	Semi-Arid	Southern Plateau and Hills Region/ South Telangana Sub-Region	Southern Telangana Zone (AP-5)
3.		Maruteru (Dist. W. Godavari)	Sub Centre	Coastal	East Coast Plains and Hills Region/ South Coastal Andhra Sub-Region	Krishna Godavari Delta Zone (AP-1)
4.		Rudrur (Dist. Nizamabad)	Sub Centre	Semi-Arid	Southern Plateau and Hills Region/ North Telangana Sub-Region	Northern Telangana Zone (AP-4)
5.		Warangal	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Telangana (AP-5)
6.		Srikakulam	OFR Centre	Sub-Humid	East Coast Plains and Hills Region	North Coastal zone (AP-2)
7.	Assam	Jorhat	Main Centre	Humid	Eastern Himalayan Region/Upper Brahmaputra Valley Sub-Region	Upper Brahmaputra Valley Zone (AS-2)
8.		Kokrajhar	OFR Centre	Humid	Eastern Himalayan Region	Central Brahmaputra Valley (AS-3)
9.	Bihar	Sabour (Dist. Bhagalpur)	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ South Bihar Plains Sub-Region	South Bihar Alluvial Plain Zone (B1-3)
10		Purnea	OFR Centre	Sub-Humid	Middle Gangetic Plains Region	North-east Alluvial Plain (B1-2)
11.	Chhattisgarh	Raipur	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	Chhattisgarh Plain Zone (CG-1)
12.		Kabirdham	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Chhattisgarh Plain Zone (CG-1)
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.		Deesa	OFR Centre	Semi-Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
17.		Thasra	OFR Centre	Arid	Gujarat Plains and Hills Region/ North west Sub-Region	Middle Gujarat Zone (GJ-3)
18.	Haryana	Hisar	Main Centre	Arid	Trans –Gangetic Plains Region/ Arid Sub-Region	Western Zone (HR-2)

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S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
19.		Sirsa	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.		Kangra	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
2 3.		Samba	OFR Centre	Humid	Western Himalayan Region	Low altitude Sub-Tropical Zone (JK-1)
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.		Jamtara	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Central and North Eastern Plateau Zone (JH-1)
26.	Karnataka	Kathalgere (Dist. Davangere)	Main Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Transition Zone (KA-7)
27.		Kolar	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Eastern Dry Zone (KA-5)
28.		Siruguppa (Dist. Bellary)	Main Centre	Arid	Southern Plateau and Hills Region/ Northern Dry Region of Karnataka	Northern Dry Zone (KA-3)
29.		Gadag	OFR Centre	Arid	Southern Plateau and Hills Region	Northern dry Zone (KA-3)
30.	Kerala	Karamana (Dist. Thiruvanthapuram)	Main Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)
31.		Pathinamthitta	OFR Centre	Coastal	West Coast Plains and Ghats	Problem Areas Zone (KE-5)
32.	Madhya Pradesh	Jabalpur	Main Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
33.		Indore	Sub-Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Malwa Plateau Zone (MP-10)
34.		Powarkheda (Dist. Hoshangabad)	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Central Narmada Valley Sub-Region	Central Narmada Valley Zone (MP-6)
35.		Rewa	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
36.		Dindori	OFR Centre	Semi-Arid	Eastern Plateau and Hills	Northern hill zone of Chattisgarh (CG-3)

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S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
37.		Katni	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.		Amravati	OFR Centre	Semi-Arid	West Coast Plains and Ghats	Central Maharasthra Plateau (MH-7)
40.		Karjat (Dist. Raigad)	Main Centre	Coastal	Western Plains & Ghat Regions/ Coastal Hilly Sub-Region	North Konkan Coastal Zone (MH-2)
41.		Raigad	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.		Aurangabad	OFR Centre	Semi-Arid	Western Plateau &Hills Region	Central Maharashtra Plateau Zone (MH-7)
44.		Rahuri (Dist. Ahemadnagar)	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Scarcity Sub-Region	Scarcity Zone (MH-6)
45.		Pune	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Western Maharashtra Plain Zone Ganeshkhind (MH-5)
46	Meghlaya	Umiam				
47.	Odisha	Bhubaneswar	Main Centre	Sub-Humid	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South –Eastern Coastal Plain Zone (OR-4)
48.		Chiplima(Dist. Sambalpur)	Sub-Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	West-Central Table Land Zone (OR-9)
49.		Angul	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Mid-Central Table Land (OR-10)
50.		Kendrapara	OFR Centre	Coastal	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South –Eastern Coastal Plain Zone (OR-4)
51.	Punjab	Ludhiana	Main Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
52.		Amritsar	OFR Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
53.	Rajasthan	Durgapura (Jaipur)	Main Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Semi-Arid Eastern Plain Zone (RJ-5)
54.		Hanumangarh	OFR Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Transitional Plain Zone of Inland Drainage (RJ-3)
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)

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S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
56.		Chittorgarh	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.		Paiyur	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	North western Zone (TN-2)
60.		Chettinad	OFR Centre	Semi-Arid	East Coast Plains and Hills Region	Sothern Zone (TN-5)
61	Telangana	Rajenderaanagar				
62	Rudrur					
63	Wrangal					
64.	Uttar Pradesh	Kanpur	Main Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-6)
65.		Kaushambi	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.		Santkabirnagar	OFR Centre	Sub-Humid	Eastern Himalayas Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-7)
68.		Bichpuri (Dist. Agra)	Sub Centre	Semi-Arid	Upper Gangetic Plains Region/ Western Plains Sub-Region	South-Western Semi-Arid Zone (UP-5)
69.		Varanasi	Sub Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains	Eastern Plain Zone (UP-9)
70		Modipuram	Vol. Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan(UP-3)
71		Modipuram	OFR Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan(UP-3)
72.	Uttarakhand	Pantnagar (Dist. US Nagar)	Main Centre	Sub-Humid	Western Himalayan Region/ Valley Temperate Sub-Region	Bhawar and Tarai Zone (UP-2)
73.		Nainital	OFR Centre	Sub-Humid	Western Himalayan Region/ High hill Temperate Sub-Region	Hill Zone (UK-1)
74.	West Bengal	Kalyani (Dist. Nadia)	Main Centre	Humid	Lower Gangetic Plains Region/ Central Alluvial Plains Sub-Region	New Alluvial Zone (WB-3)
75.		24-Parganas South	OFR Centre	Humid	Lower Gangetic Plains Region	Coastal Sline Zone (WB-6)

4. SOIL AND CLIMATE

The major group of soils (centre-wise), on which on-station experiments of CSR were conducted during the year 2014- 15 and geographical coordinates (Latitude and Longitude) of the different research locations are given in table-4/1. The general climatic conditions for the experimental locations are described below in brief.

Table-4/1: Soil type and geographical coordinates of different on-station CSR centres

S.No.	Centre	Soil Type	Latitude	Longitude
1.	Rajendranagar	Udic Ustochrepts, black soils	18^0 59' N	78^0 55' E
2.	Maruteru	Chromusterts clayey, medium black soils	16^0 38' N	81^0 44' E
3.	Rudrur	Chromusterts clayey, deep (90 cm depth), deep black soils	18^0 30' N	77^0 51' E
4.	Jorhat	Fluaquents/ Udicaquents association, very deep (90 cm depth), alluvial sandy clay loam soils	26^0 47' N	94^0 12' E
5.	Sabour	Eutrochrepts (Very deep), low and clay soils	25^0 23' N	87^0 07' E
6.	Raipur	Ochraquals association, deep black soils	21^0 16' N	81^0 36' E
7.	S.K. Nagar	Haplaquals, deep medium black soils	24^0 19' N	72^0 19' E
8.	Junagadh	Ustochrepts deep medium black soils	21^0 30' N	70^0 30' E
9.	Navsari	Vertic Ustochrepts deep black soils	20^0 57' N	72^0 54' E
10.	Hisar	Ustochrepts, very deep silty alluvial soils	29^0 08' 55"N	74^0 41'16" E
11.	Palampur	Udic Haplustalfs, red soils	32^0 06' N	76^0 03' E
12.	Chatha (Jammu)	Eutrochrepts very deep clay soils	32^0 05' N	74^0 04' E
13.	Ranchi	Ultic Palustalfs, very deep (90 cm) red soils	23^0 17' N	85^0 19' E
14.	Kathalagere	Alfisols, dark reddish brown sandy clay loam	13^0 02' N	76^0 15' E
15.	Siruguppa	Type Chromusterts, very deep (90 cm) black soils	15^0 38' N	76^0 54' E
16.	Karamana	Typic Tropofluvents, very deep (90 cm depth)	11^0 N	77^0 E
17.	Jabalpur	Chromusterts, very deep (90 cm depth), medium to deep black soils	23^0 10' N	79^0 57' E
18.	Indore	-	22^0 04' N	79^0 57' E
19.	Powarkheda	-	23^0 25' N	73^0 98' E
20.	Rewa	Ustochrepts-Vertic Ustochrepts association, fine loamy soils	24^0 41' N	81^0 15' E
21.	Akola	Medium deep black clayey soil	20^0 42' N	77^0 02' E
22.	Karjat	Haplustults Udic-Fluvents, red soils	18^0 33' N	75^0 03' E
23.	Parbhani	Chromusterts, deep (90 cm depth), deep black soils	19^0 08' N	76^0 05' E
24.	Rahuri	Chromusterts, fine clayey soils	19^0 47' N	74^0 18' E
25.	Bhubaneswar	Haplustalfs, very deep (90 cm depth), mediumtextured lateritic soils	20^0 15' N	85^0 52' E

Contd..../-

S.No.	Centre	Soil Type	Latitude	Longitude
26.	Chiplima	Haplaquents, very deep (90 cm depth) clay, ill-drained soils	20^0 21' N	80^0 55' E
27.	Ludhiana	Ustochrepts-Ustic Psamments Association, very deep (90 cm depth), alluvial sandy and sandy-loam soils	30^0 56' N	75^0 52' E
28.	Durgapura (Jaipur)	Torrid-Psamments/ Torrid-Fluvents Association, sandy loam soils	26^0 55' N	75^0 49' E
29.	Kota	Chromsterts-Paleusterts Association, very deep (90 cm depth) clay loam soils	25^0 26' N	75^0 30' E
30.	Coimbatore	Udic Rhodustalfs, fine loamy red sandy soils	11^0 59' N	78^0 55' E
31.	Thanjavur	Typic Pellusterts, clayey very deep (90 cm depth)/ deep black soils of deltaic origin	10^0 47' N	79^0 10' E
32.	Kanpur	Udic Ustochrepts, alluvial soils	26^0 28' N	80^0 21' E
33.	Faizabad	Udic Fluvents-Fluaquents Association, lowland clayey soils	26^0 47' N	82^0 12' E
34.	Bichpuri	Ustochrepts, very deep (90 cm depth) alluvial soils	27^0 02' N	77^0 09' E
35.	Varanasi	Aeric Chroquals very deep (90 cm depth) alluvial clayey soils	25^0 18' N	83^0 03' E
36.	Pantnagar	Hapludolls, very deep (90 cm depth) alluvium coarse loamy soils	29^0 08' N	79^0 05' E
37.	Kalyani	Fluventic Eutrochrepts, very deep (90 cm depth) alluvial soils	23^0 40' N	88^0 52' E

Weather condition at different farming system research centers during 2014-15

The annual conditions of important weather parameters e.g., rainfall, monthly average maximum temperature and minimum temperature prevailed during the reporting period (2014-15) at the various Integrated Farming Systems Research Centers of the AICRP on IFSare depicted in figures 1-3 and described below.

Akola: During the reporting period,756.3 mm rainfall was received out of this 83.3% rainfall was precipitated during the *kharif* season.Rainfall was evenly distributed in the *kharif* season and July was found to be the wettest month with 290.0 mm rainfall during the reporting period. Only one month i.e. October was observed as dry month during which no rainfall was recorded. The highest (42.9°C) and lowest (26.9°C) monthly average maximum temperature were recorded during Mayand January respectively whereas, December was observed as coldest (10.6°C) month of the year.

Bhubaneswar: Total rainfall received during the reporting year was 1538.5 mm which was near to the previous year. Southwest monsoon contributed about 69.5% to the annual rainfall.Distribution of rain was fairly good during *kharif*season howeverAugust month was received the highest rainfall (428.7 mm) and rainfall was continued up to October where 163.1 mm of rainfall was recorded.January, February, March, April and May were found to be the other wet months. The monthly average maximum temperature ranged between 26.9-42.9°C. The monthly average minimum temperaturedropped to 10.6°c in the month of December.

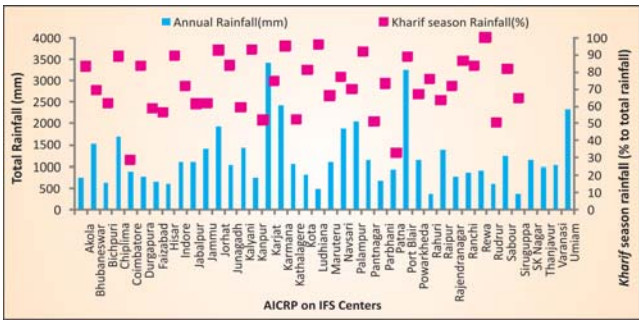


Fig. 1. Total rainfall (mm) and percentage rainfall precipitated during *kharif* season during the reporting year (2014-15) at various centers of the AICRP on IFS

Bichpuri: Comparativelyless rain (629.5 mm) was received during the reporting period over the

previous year. About 61.7% of the total rainfall was precipitated during the *kharif* season. With 141.2 mm rainfall, August was found to be the wettest month however; distribution of the rain was fairly good in the season.There was no rainy day was observed ding November, December and February.The highest monthly average maximum temperature (42.1°C) was recorded during the Maywhereas; lowest monthly average maximum temperature (16.6°C) was recorded in January. December was found to be the coldest months where mercury dropped down to 7.2°C.

Chiplima: During the reporting period, comparatively a good rainfall of 1701.7 mm was recorded over the previous year but distribution was not fair and half (787.5 mm) of the total rainfall was poured in only one month i.e. August. About 89.2% of total rain was received during *kharif* season. Only two months December and April were deprived of the rainfall. May was observed as hottest (40.9°C) during the year whereas,January was very cool with 7.2°C monthly minimum temperature.

Coimbatore: The total rainfall (888.3 mm) received during the reporting year which was about double of rainfall occurred during previous year (464.0 mm). As usual South-west monsoon contributed only 28.63% to the total annual rainfall whereas North-east monsoon was strong and 352.1 mm rainfall occurred in the month of October. Pre-monsoon rainfall was also good where 195.8 mm rainfall was precipitated in the month of May. Distribution of rainfall was quite good throughout the whole seasonand only Januaryand February were found to be dry months.The monthly average maximum temperature was ranged between 28.8°C-34.5°C during the reporting year. The winter season was also remained moderately warm wheremonthly average minimum temperature remained above 19.5°C.

Faizabad: The total rainfall of 651.0 mm was recorded during the reporting year where Southeast monsoon contributed 58.6% to the total rainfall. Good distribution of rain fall was observed during the year where only two months *viz.,* November and June were found to be dry during the reporting period. With 40.2°C monthly average maximum temperature, May was recorded the hottest month whereas day temperature remained above 17.7°C even in January where mercury dropped to 6.8°C during night time.

Hisar: In comparison to last crop season lower rainfall (619.9 mm) was received at the centre during the reporting period. *Kharif*season received about 56.4% of total rainfall with good distribution. Among all the months of reporting period, only November and May months were found to be dry.As usual summer was very hot and monthly maximum temperature (43.9°c) was reported highest during the mayand winter was severe during which average monthly minimum temperature dropped below 0.8°C in January.

Indore: The centre received 1096.9 mm rainfall during the reporting period. 89.2% of the total rainfall with god distribution was precipitated during the *kharif* season. With 375.6 mm rain July was found to be the wettest month during the period. Rainfall was recorded in all the months the months of November, February and May. The range of the monthly maximum temperature was 21.5°C - 42.3°C. With 7.5°C minimum temperature, December was recorded as coldest month during the period.

Jabalpur: About half of the rainfall (1094.5 mm) occurred in the previous season (2067.0 mm) was recorded during the reporting period and the contribution of the southwest monsoon was only 71.07% to the total rainfall. Rainfall was fairly distributed in *kharif* season however, July with 351.1 mm rain was found to be the wettest month under the reporting period. Rainfall was also recorded during almost all months except November. Summer season was hot and the range of monthly average maximum temperature was 21.4 to 41.4°C. The mercury reached up to dropped up to 8.0°C during December.

Jammu: The center received 1415.2 mm total rainfall out of which 61.4% was contributed by southeast monsoon.Almost all the months received rainfall except December and June.

Terminal heavy rainfall was recorded during the last phase of monsoon where 512.4 mm rainfall was received in September. The range of monthly average maximum temperature was 15.9 to 38.0°C. December month was fond to be coldest where night temperature was dropped to 5.0°C.

Jorhat: The reporting period received 1927.6 mm rainfall where 61% of total rain was received during June to September. Almost all the months received rainfall except December whereas July was recorded as the wettest months during the reporting period. The highest monthly mean maximum temperature (33.56°C) was observed during October, lowest monthly mean minimum temperature (10.8°C) was recorded during January.

Junagarh: The rainfall received during reporting period was 1043.8 mm and these were the strong monsoon rain which contributed 92.5% to the total annual rainfall. The distribution of rainfall was fair in the season but July was observed as the wettest month with 542.2 mm rainfall. The highest monthly average maximum temperature (40.4°C) was observed during Aprilwhereas, lowest minimum temperature (10.2°C) was recorded during January.

Kalyani: Total rainfall received during the reporting period was 1428.1 mm which was mostly contributed by southwest monsoon (83.7%). There was no rain during the consecutive months of December to February. September month was recorded as the wettest month with 330.5 mm rainfall. The range of monthly average maximum temperature was 24.2 to 37.6°C.Lowest monthly average minimum temperature (10.4°C) was recorded during January.

Kanpur: The total rainfall of 759.7mm was recorded during the reporting season out of which 59.5 was contributed southwest monsoon. Highest rainfall (213.6 mm) was precipitated in the month of July. Distribution of rainfall was quite good throughout the season and only one month of November of deprived of that. With 41.3°C monthly average maximum temperature, May was recorded the hottest month whereas day temperature remained above 16.6°C even in January where mercury dropped to 8.8°C during night time of December.

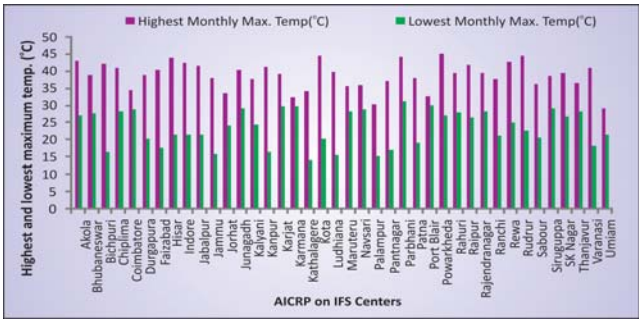


Fig. 2. Highest and lowest monthly average maximum (°C) temperature during the reporting year (2014-15) at various centers of the AICRP on IFS

Karjat: The rainfall received during reporting period wasquite higher than the previous season and it was 3410.1 mm where southeast monsoon poured about 93.0% to the total amount of rain. Half of the total rainfall was received only in the month of July. June, January and February months were recorded as dry months where no any rainy days were observed. The range of monthly average maximum temperature recorded was 29.7-39.20°C. The night temperature was moderate in January where mercury remained above 12.9°C.

Karmana: During the reporting period, the total rainfallreceived was 2430.2 which were quite higher than the previous season. Not a single month was recorded as dry whereas August month was observed as wettest month of the season where 524.3 rainfall was precipitated and about 50.0% of the total rainfall was contributed by the southeast monsoon. The range of monthly average maximum temperature was 29.7 to 32.3°C. Night temperature remained above 22.0°C during the reporting period.

Kathalagere: Total rainfall received during the reporting period was more than double of the previous season and it was 1051.1 mm where southeast monsoon contributed 74.8%. August month was recorded as the wettest month of the season where 238.9 mm rainfall was received. There was no rainfall during January to March. The

range of monthlyaverage maximum temperature was 14.0 to 34.0°C.

Kota: Total annualrainfall precipitated during the reporting period was 829.7 mm where95.0% of total rain was precipitated during the *kharif* season. With 500.1 mm rainfall August was recorded as the wettest month of the season. The highest average monthly maximum temperature (44.4°C) was recorded during May whereas lowest minimum temperature (7.4°C) was recorded during january.

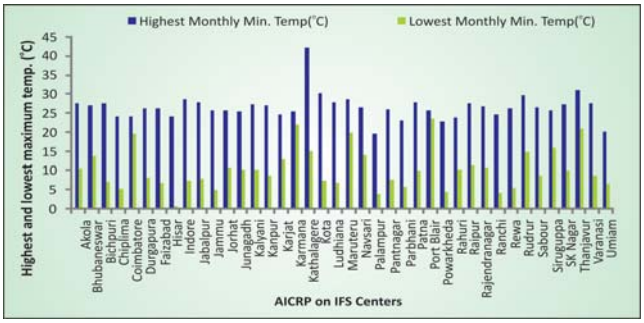


Fig. 3. Highest and lowest monthly average minimum (°C) temperature during the reporting year (2014-15) at various centers of the AICRP on IFS

Ludhiana: The total annual rainfall received during the reporting period was 496.5 mm which was about 52.1% was contributed by the southeast monsoon season. There was no rainy days recorded during September to November whereas with 152.2 mm rainfall, July month was observed as the wettest month of the season. The highest monthly mean maximum temperature (39.6°C) was observed during Maywhereas, lowest minimum temperature (6.9°C) was recorded during December.

Maruteru: The reporting period received 1096.0 mm of rainfall where 81.2% was poured only in the *kharif* season. The highest rainfall (316.2 mm) was received in the staring month of the season. Three consecutive months i.e. January to March was recorded as dry months where no rainy day was observed. The highest monthly mean maximum temperature (35.5°C) was observed during Maywhereas; lowest monthly mean minimum temperature (19.8°C) was recorded during December.

Navsari: The reporting period received 1879.0 mm rainfall which was quite higher than the previous season. Distribution of the rain was not good during the season and July month was recorded as the wettest month of the season where 719.0 mm rainfall was recorded. Therange of highest monthly mean maximum temperature was 28.2-35.9°C. whereas, lowest monthly mean minimum temperature (14.0°C) was recorded during December.

Palampur: Total rainfall received during the reporting was about 500.0 mm lesser than the previous year out of which 1349.2 mm (66.0% of total) rain was precipitated during the *kharif* season with smooth distribution where not a single month was recorded as dry month. The range of average monthly maximum temperature was 15.2 to 30.2°C. Mercury was dropped to 4.0°C during the night of January.

Pantnagar: The rainfall received during reporting period was 1383.0 mm. With 74 per cent to the total rainfall, well distributed was received during the *kharif* season. Except November and June all the months were found to be wet whereas, with 429.6 mm rain July month was recorded as wettest in the entire season. The highest monthly average maximum temperature (37.4°C) was recorded in the month of May however, average minimum temperature (7.3°C) was observed during the month of December.

Parbhani: The total annual rainfall received during the reporting period was 676.5 mm which was about 69.8% was contributed by the southeast monsoon season. Therewas no rainy days recorded during December whereas with 135.7 mm rainfall, September month was observed as the wettest month of the season. The highest monthly mean maximum temperature (44.2°C) was observed during Maywhereas, lowest minimum temperature (5.8°C) was recorded during January.

Patna: During the reporting year, the total rainfall received was 947.5 mm where more than 90.0% rainfall occurred during the *kharif* season. Almost

all the months received rain except November and May whereas with 472.4 mm rainfall August was recorded as the wettest month of the season. May was observed as hottest (37.9°C) during the seasonwhereas, December was very cool with 10.0°C monthly minimum temperature.

Portblair: The total rainfall recorded during the reporting period was 3251.8. Southeast monsoon contributed 51.2% to the total of the rainfall precipitated during the reporting period. Almost all months received rain except February. July month was recorded as the wettest month with 696.5 mm rainfall. The highest average monthly maximum temperature (32.6°C) was recorded during March.

Powarkheda: Total rainfall recorded during the reporting period was 1158.0 mm which was almost equal to the previous season rainfall. About 73.2% rain was occurred during *kharif* season and it was highly distributed in the entire season. July was found to be wettest of the season and 386.3 mm rain was precipitated during this month. The range of monthly average maximum temperature was 27.1 to 44.9°C whereas, January was observed as coldest month and monthly mean minimum temperature was 4.6°C.

Rahuri: Total annualrainfall precipitated during the reporting period was 380.0 mm which was 92.0 mm lowerthan the preceding season and it was due to less contribution of the rain by the southeast monsoon season where only 32.7% of total rainfall was received.Almost all months received the rain except December. It was fairly distributed in the season. The highest average monthly maximum temperature (39.4°C) was recorded during May whereas lowest minimum temperature (10.3°C) was recorded during December.

Raipur: The total annual rainfall received during the reporting period was 1397.1 mm. Distribution of rainfall was good during the *kharif* season but July was observed as very wet and 525.4 mm rain was precipitated in this month. The highest monthly mean maximum temperature (41.9°C) was observed during Maywhereas, lowest minimum temperature (11.3°C) was recorded during December.

Rajendranagar: Total rainfall recorded during the reporting period was 765.4 mm out of which 512.7mm (66.9%) rain was received during *kharif*monsoon. The distribution of rain was fairly good duringthe*kharif* season.December, January and February months were found to be dry where no rainy day was observed. The range of average monthly maximum temperature was 28.3 to 39.3°C whereas January was recorded as the coldest month with 10.8°C night temperature.

Ranchi: During the reporting period, the total rainfall received was 859.6 mm. *Kharif* season received good amount of rain (652.5 mm) with smooth distribution in the entire season. May was observed as hottest (37.6°C) during the year whereas, December was very cool and dry with 4.3°C monthly minimum temperature.

Rewa: Total rainfall recorded during the reporting period was 909.4mm and 63.5% rainfall with very good distribution waspoured down during the *kharif* season. Except November each and every months received some rain. The range of average monthly maximum temperature was 24.9 to 42.6°C whereas December was recorded as the coldest month with 5.5°C night temperature.

Rudrur: The total rainfall received during the reporting period was 604.1 mm. About 71.0% rain occurred during the *kharif* season. With 145.7 mm rain August was recorded as the wettest month in entire reporting period. The highest monthly average maximum and minimum temperature recorded during the period was 44.5°C and 29.6°C respectively.

Sabour: During the reporting period, the total rainfall received was 1248.5 mm. *Kharif* season received very good amount of rain (1080.8 mm.0 mm) with smooth distribution in the entire season. Except November each and every months received some rain during the reporting period. May was observed as hottest (36.1°C) during the period

whereas, January was very cool with 8.8°C monthly minimum temperature.

Parbhani: The total annual rainfall received during the reporting period was 375.5 mm which was about 83.4% was contributed by the southeast monsoon season. No rainy day was recorded after December in the season. The highest monthly mean maximum temperature (38.4.2°C) was observed during Maywhereas, lowest minimum temperature (15.9°C) was recorded during January.

SK Nagar: Total rainfall recorded during the reporting period was 1153.4 mmwhich was totally contributed by the southeast monsoon season. The distribution of rain was fairly good during the *kharif* season. The range of average monthly maximum temperature was 28.2 to 39.4°C whereas January was recorded as the coldest month with 10.0°C night temperature.

Thanjavur: The total rainfall received during the reporting period was 998.2 mm.About half of the total rain occurred during the *kharif* season. With 258.3 mm rain August was recorded as the wettest month in entire reporting period. Except February each and every months received some rain. The highest monthly average maximum and minimum temperature recorded during the reporting period was 36.5°C and 31.8°C respectively.

Varanasi: A higher rainfall (1034.7 mm) than the preceding season 808.0 mm) was observed during the reporting period. More than 80.0% of the total rainfall was precipitated during the *kharif* season and it was highly distributed. Only two months i.e. November and May were deprived of the rainy daysWith378.0 mm rain, July was recorded as the wettest month in the entire period. The highest average monthly maximum temperature (40.8°C) was observed during May whereas; lowest minimum temperature (8.8°C) was recorded during December.

Umiam: Total rainfall recorded during the reporting period was 2343.6 mm and 64.5% of the total rainfall with very good distribution was poured during the *kharif* season. Not a single month was deprived of rainy days whereas August was found to be the wettest month of the reporting period where 582.8 mm rainfall occurred. The range of average monthly maximum temperature was 21.6 -29.1°C whereas December was recorded as the coldest month with 6.5°C night temperature.

5. STAFF POSITION

Out of 618 total staff sanctioned for different centers, 459 staff were actually in position as on 31st March 2016, suggesting that 25.7 per cent of total posts were vacant (Table-5/1 and Appendix-III).

Table-5/1: Staff position under AICRP-IFS (university-wise) as on 31.3.2016

S.No.	Name of the University	Scientific		Technical		Administrative		Supporting	
		Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled
1.	ANGRAU, Hyderabad	8	8	23	16	5	3	3	1
2.	AAU, Jorhat	5	3	11	10	2	2	2	2
3.	BAU, Sabour	4	4	11	5	2	1	2	2
4.	IG KV, Raipur	5	4	11	7	2	2	2	2
5.	SDAU, S.K. Nagar	5	5	11	8	2	2	2	2
6.	JAU, Junagadh	1	1	3	3	1	1	-	-
7.	NAU, Navsari	1	1	3	2	1	0	-	-
8.	AAU, Anand	1	1	8	6	1	0	1	0
9.	CCS HAU, Hisar	5	5	11	7	2	2	2	0
10.	CSK HPKVV, Palampur	4	4	11	11	2	2	2	1
11.	SKUAST, Jammu	4	4	11	11	2	1	2	2
12.	BAU, Ranchi	4	4	11	11	2	2	2	2
13.	UAS, Bangalore	5	4	11	2	2	0	2	1
14.	UAS, Dharwad	1	1	8	7	1	0	1	0
15.	UAS, Raichur	3	3	3	3	1	1	1	1
16.	KAU, Thrissur	5	5	11	10	2	2	2	2
17.	JNKVV, Jabalpur	8	7	23	11	5	2	3	1
18.	RVS KVV, Gwalior	1	1	3	1	1	1	-	-
19.	MPKV, Rahuri	5	5	11	9	2	2	2	1
20.	MAU, Parbhani	4	3	11	7	2	0	2	0
21.	DPD KV, Akola	4	3	11	6	2	0	2	2
22.	DBS KKV, Dapoli	4	3	11	10	2	0	2	1
23.	OUAT, Bhubaneswar	7	7	22	21	4	4	3	3
24.	PAU, Ludhiana	4	4	11	8	2	2	2	2
25.	SK MAU, Joba ner	4	2	11	7	2	0	2	2
26.	MP UAT, Udaipur	3	3	8	7	2	1	1	1
27.	TNAU, Coimbatore	7	7	22	16	4	4	3	3
28.	CSA UAT, Kanpur	4	4	11	8	2	1	2	2
29.	ND UAT, Faizabad	4	3	11	9	2	2	2	1
30.	ICAR-IIFSR, Modipuram	1	0	8	0	1	0	1	0
31.	BHU, Varanasi	1	1	3	0	1	1	-	-
32.	RBS College, Bichpuri	1	1	3	2	1	1	-	-
33.	GBP UAT, Pantnagar	5	4	11	7	2	0	2	1
34.	BC KVV, Kalyani	4	3	11	11	2	1	2	2
	TOTAL	**132**	**117**	**360**	**259**	**69**	**42**	**57**	**41**

6. BUDGET

Table-6/1. Funds (Rs. in lakhs) released during financial years 2014-15 and 2015-16 under AICRP on Integrated Farming Systems (ICAR share only)

S. No.	Name of the University/ ICAR Institute	Pay & Allow.	T.A.	Other Contin-gencies	Contr. services	Vehicle Hiring/ POL	NRC	TSP (includ-all NRC)	Total
				Fin. Year 2014-15					
1	ANGRAU, Hyderabad	121.00	1.63	10.08	5.42	0.12	3.00	25.02	166.27
2	HPKVV, Palampur	114.00	0.78	5.44	3.42	0.08	1.50	0.00	125.22
3	GBPUA&T, Pantnagar	66.00	0.79	5.44	5.42	0.08	1.25	0.00	78.98
4	CSAU&T, Kanpur	65.00	0.78	5.44	4.42	0.08	2.00	0.00	77.72
5	NDUA&T, Faizabad	71.00	0.78	5.44	3.42	0.08	2.50	0.00	83.22
6	BHU, Varanasi	25.40	0.44	3.98	3.42	0.05	1.00	0.00	34.29
7	BAU, Ranchi	26.50	0.28	0.72	1.42	0.05	1.00	15.58	45.55
8	BAU, Sabour	43.00	0.68	3.52	4.42	0.08	1.00	0.00	52.70
9	BCKVV, Kalyani	50.00	0.48	3.14	1.95	0.05	1.00	21.50	78.12
10	AAU, Jorhat	18.00	0.28	2.23	2.50	0.05	1.50	0.00	24.56
11	PAU, Ludhiana	82.00	0.94	5.44	3.00	0.08	1.00	0.40	92.86
12	HAU, Hisar	75.00	0.94	5.44	5.42	0.08	1.00	0.00	87.88
13	SKNAU, Jobner	62.00	0.78	5.44	4.42	0.08	1.00	0.00	73.72
14	SDAU, S.K. Nagar	70.00	0.91	5.00	4.42	0.08	2.00	14.51	96.92
15	NAU, Navsari	9.61	0.23	2.73	0.58	0.05	1.00	0.00	14.20
16	JAU, Junagadh	20.00	0.28	3.00	1.08	0.05	1.00	0.00	25.41
17	AAU, Anand	10.17	0.43	0.00	0.00	0.00	1.00	9.50	21.10
18	JNKVV,Jabalpur	74.00	0.80	6.13	4.42	0.15	2.00	17.98	105.48
19	RVSKVV, Gwalior	32.00	0.58	4.25	1.58	0.05	1.00	0.00	39.46
20	IGKV, Raipur	61.00	0.68	3.73	3.42	0.05	1.50	17.98	88.36
21	OUAT, Bhubaneswar	125.00	1.17	8.92	6.00	0.11	3.00	0.00	144.20
22	PDKV, Akola	51.00	0.78	5.20	4.92	0.08	2.25	0.00	64.23
23	MAU, Parbhani	51.00	0.78	5.20	5.42	0.08	1.00	0.00	63.48
24	MPKV, Rahuri	64.00	0.78	5.40	6.00	0.08	1.00	0.00	77.26
25	KKV, Dapoli	56.00	0.78	4.23	6.00	0.08	1.00	12.23	80.32
26	UAS, Raichur	30.00	0.55	3.73	6.00	0.08	1.00	0.00	41.36
27	UAS, Dharwad	25.00	0.43	3.98	1.08	0.05	1.00	0.00	31.54
28	UAS, Bangalore	16.50	0.23	2.53	1.00	0.03	1.00	13.52	34.81
29	UAHS, Shimoga	23.50	0.59	3.73	5.00	0.08	1.00	0.20	34.10
30	TNAU, Coimbatore	120.00	1.17	9.42	6.00	0.12	3.00	17.53	157.24
31	SKUAST, Jammu	83.50	0.83	5.40	5.00	0.08	1.50	0.00	96.31
32	KAU, Thrissur	88.00	0.83	5.40	5.00	0.08	1.50	0.00	100.81
33	MPUAT, Udaipur	28.00	0.36	0.70	0.00	0.00	1.00	23.98	54.04
34	AU, Kota	9.50	0.28	2.25	1.08	0.05	1.00	0.00	14.16
35	RBS College, Bichpuri	6.00	0.13	0.75	0.58	0.03	1.50	0.00	8.99
36	ICAR-IIFSR, Modipuram	0.00	0.34	4.25	9.00	0.10	0.00	0.00	13.69
37	ICAR-IIFSR (Coord.Unit.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	ICAR Res. Comp., Patna	0.00	0.34	1.50	3.39	0.08	0.00	10.09	15.40
39	ICAR Res. Comp., Umiam	0.00	0.24	2.08	4.25	0.20	0.00	16.41	23.18
40	ICAR Res. Comp., Old Goa	0.00	0.34	4.25	3.39	0.08	0.00	0.00	8.06
41	ICAR-CIARI, Port Blair	0.00	0.34	2.42	3.39	0.08	0.00	18.57	24.80
	Total	1872.68	24.78	167.93	146.65	2.96	50.00	235.00	2500.00

S. No.	Name of the University/ ICAR Institute	Pay & Allow.	T.A.	Other Contin-gencies	Contr. services	Vehicle Hiring/ POL	NRC	TSP (includ-all NRC)	Total
				Fin. Year 2015-16					
1	ANGRAU, Hyderabad	43.00	0.75	3.10	1.30	0.10	0.37	5.00	53.62
2	PJTSAU, Hyderabad	87.00	1.00	9.60	5.60	0.20	1.83	0.00	105.23
3	HPKVV, Palampur	89.00	0.75	5.60	6.00	0.20	1.46	0.00	103.01
4	GBPUA&T, Pantnagar	76.00	1.00	5.60	7.00	0.20	3.71	0.00	93.51
5	CSAU&T, Kanpur	54.00	1.00	6.50	6.00	0.20	1.46	0.00	69.16
6	NDUA&T, Faizabad	78.00	1.00	5.50	7.00	0.20	0.96	0.00	92.66
7	BHU, Varanasi	27.00	0.50	3.00	3.60	0.10	0.96	0.00	35.16
8	BAU, Ranchi	36.00	1.00	4.00	5.00	0.20	0.71	3.00	49.91
9	BAU, Sabour	55.00	1.00	5.10	7.00	0.20	3.71	0.00	72.01
10	BCKVV, Kalyani	53.00	1.00	5.00	7.00	0.20	0.71	6.00	72.91
11	AAU, Jorhat	48.00	1.50	8.53	5.50	0.00	0.37	0.00	63.90
12	PAU, Ludhiana	86.00	1.00	6.50	6.50	0.20	3.71	0.00	103.91
13	HAU, Hisar	62.00	1.00	6.00	7.00	0.20	1.46	0.00	77.66
14	SKNAU, Jobner	40.00	1.00	5.00	7.00	0.20	1.46	0.00	54.66
15	SDAU, S.K. Nagar	66.00	1.40	5.60	7.00	0.20	3.71	0.00	83.91
16	NAU, Navsari	14.00	0.50	2.00	1.35	0.10	0.37	0.00	18.32
17	JAU, Junagadh	27.00	0.50	2.00	1.35	0.10	0.71	0.00	31.66
18	AAU, Anand	15.00	0.60	0.00	1.35	0.07	0.00	2.00	19.02
19	JNKVV,Jabalpur	93.00	1.50	8.00	7.00	0.30	2.20	3.00	115.00
20	RVSKVV, Gwalior	32.50	0.50	3.00	0.85	0.10	0.71	0.00	37.66
21	IGKV, Raipur	51.00	1.00	4.00	5.00	0.10	0.71	4.00	65.81
22	OUAT, Bhubaneswar	91.00	1.50	10.50	7.50	0.30	4.08	0.00	114.88
23	PDKV, Akola	46.00	1.00	5.60	7.00	0.20	1.21	0.00	61.01
24	MAU, Parbhani	46.00	1.00	5.10	7.00	0.20	1.46	0.00	60.76
25	MPKV, Rahuri	46.00	1.00	5.10	6.50	0.20	1.46	0.00	60.26
26	KKV, Dapoli	65.00	1.00	4.60	6.50	0.13	1.46	4.00	82.69
27	UAS, Raichur	31.00	0.80	4.00	6.10	0.20	0.96	0.00	43.06
28	UAS, Dharwad	38.00	0.80	3.10	1.35	0.10	0.00	0.00	43.35
29	UAS, Bangalore	20.00	0.50	3.10	5.00	0.10	0.00	5.00	33.70
30	UAHS, Shimoga	29.00	0.60	3.50	5.60	0.20	1.46	0.00	40.36
31	TNAU, Coimbatore	130.50	2.25	13.92	3.28	0.30	4.10	2.00	156.35
32	SKUAST, Jammu	87.38	0.80	5.60	6.50	0.20	3.21	2.00	105.69
33	KAU, Thrissur	91.00	1.00	5.10	6.50	0.20	1.46	0.00	105.26
34	MPUAT, Udaipur	33.00	0.50	0.00	0.00	0.00	0.34	5.00	38.84
35	AU, Kota	12.00	0.50	2.50	0.50	0.10	0.37	0.00	15.97
36	RBS College, Bichpuri	11.00	0.50	2.50	0.00	0.10	0.37	0.00	14.47
37	ICAR-IIFSR, Modipuram	0.00	0.19	6.36	14.96	0.00	1.00	0.00	22.51
38	ICAR-IIFSR(OFR)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	P.C.Unit,IIFSR, Modipuarm	0.00	0.00	2.30	0.00	0.00	1.00	0.00	3.30
40	ICAR Res. Comp., Patna	0.00	0.50	3.00	4.25	0.10	0.00	0.00	7.85
41	ICAR Res. Comp., Umiam	0.00	0.50	4.58	4.50	0.00	0.84	0.00	10.42
42	ICAR Res. Comp., Old Goa	0.00	0.50	6.00	2.00	0.20	1.34	0.00	10.04
43	CARI, Port Blair	0.00	0.50	2.00	5.00	0.20	0.00	4.48	12.18
44	IASRI, New Delhi	0.00	0.20	4.50	0.00	0.00	0.34	0.00	5.04
	Total	1909.38	35.64	206.59	205.44	6.40	57.75	45.48	2466.68

7. RESEARCH RESULTS

7.1 INTEGRATED FARMING SYSTEMS

7.1.1 DEVELOPMENT OF REGION-SPECIFIC ON-STATION IFS MODELS

1. WESTERN HIMALAYAN REGION

Chhatta

Integrated farming system model of one hectare cultivated land designed for small and marginal farmers of five farmer's family members under irrigated condition of Jammu region comprises different enterprises *viz*. Crop+ horticulture (intercropped with high value vegetable crop)+ animal including vermin-compost and biogas, Fish cum Poultry, Mushroom, Apiary and boundary plantation with Albizia, Grewia, Lucenia, Rajhard, Anola, Bael, popular and Karonda as bio fencing and the second row has been planted with mango trees (Amarpali) has been established in the year 2011-12 at research farm of SKUAST-J Main Campus, Chatha under subtropical irrigated condition of Jammu region of J&K. This IFS model of one hectare provides round the year average production of 23.35t REY/Year during last 4th and 5th year of the study, net profit of 3.05 lakh year ha^{-1} (Table 7.1.1/1) was quite comparable to existing farming system. Total employment of 595 man days/year was generated with main salient achievement to generate income on monthly basis. Recycling of farm wastes, crop residues etc. contributed 50 kg N, 15 kg P_2O_5 and 37 kg K_2O/ year in form of recycling/vermi-composting besides bio-gas unit of 2m^3 generated biogas equivalent to 17 LPG cylinders of 14.5 kg capacity, respectively. Moreover this IFS model under sub-tropical condition of Jammu is having the potential to improve the farm income to three fold besides will address the sustainability issues in the long run.

Table 7.1.1/1: Area allocation and component wise economics (Average of 2014-15 and 2015-16) in IFS Model

Component	Net Area (ha)	Gross Return (Rs)	Total cost (Rs/ha)	Net return (Rs)
		Crop unit		
Cropping system	0.3802	61671	37420	24241
		Horticulture unit		
Fruit crops	0.3	17709	6195	11514
Vegetables (intercrop)	-	31163	15663	15500
Floriculture	0.07	5365	1445	3920
Agro-forestry	-	1507	299	1209
		Livestock unit		
Dairy animals (including vermicompost)	0.08	342770	192895	149875
Bio gas		15870	7380	8490
		Fish cum poultry unit		
Poultry/Ducks	-	60201	25857	24343
Fisheries	0.1	29829	9129	20700
Apiary unit (03 boxes)	-	3750	2150	1600
Green fodder (Fodder-fodder cropping system and on bunds planted perennial fodder crops (Hybrid napier)	0.07	13421	2781	10640
Mushroom unit (6 qts wheat straw)	0.02	33583	10904	22681
Grand total	**1.02**	**616839**	**312131**	**304713**

The profit is quit comparable to existing farming system, which works out to be 0.80-0.90 lakh/ha

Table 7.1.1/2: Month wise cost of production, gross return, net return and employment generation (average of 2014-15 & 2015-16)

Month	Total cost involved (Rs)	Gross return (Rs)	Net return (Rs)	Employment generated (Man days)	Production (REY kg/ha)
July	27132	48892	21760	46	1877
August	26658	48634	21975	48	1944
September	24103	27376	3273	42	1092
October	24994	32467	7473	61	1304
November	20287	23077	2790	49	921
December	25857	47787	21930	48	1844
January	34653	67778	33125	54	2507
February	28201	56295	28095	48	2186
March	24689	74300	49612	51	2808
April	19801	33518	13717	42	1315
May	23408	60254	36846	62	2297
June	28656	88526	59870	44	3262
Total	**308439**	**608904**	**300466**	**595**	**23357**

Among all the enterprises, the highest average net profit of Rs. 149875 was realised from animal unit having two cow and one buffalo including Vermi-compost/farm waste recycling component then followed by crop block including fodder block (Rs. 34881), Poultry (Rs. 24343), Mushroom (Rs. 22681) and Fisheries (Rs. 20700), respectively. The overall average net profit (Rs. 304713 year^{-1}) was quite comparable to existing farming system which works out to be 0.80 to 0.90 lakh ha^{-1}.

Average (last two years) month wise farm income and employment generation round the year presented in table provides around the year average production of 23.35 t ha^{-1}, net profit of Rs. 3.05 lakh year^{-1} with generating employment of 595 man days year^{-1}. The maximum average production and profit was realized in June.

Palampur

One hectare integrated farming system (IFS) model started in 2010 at CSK HPKV, Palampur developed for mid hills zone in western Himalayas comprise of cropping systems *viz*. Rice-Wheat, Soybean-Pea, Maize + Soybean - Potato in 0.65 ha + horticulture cum vegetable unit viz .Peach, Pecanut, Pomegranate and Litchi as main fruit crops and Frenchbean, Okra, Maize Fodder-Gobhisarson as intercrops (0.175) + Fodder unit *viz*. Sorghum + Bajra –Oats in Forage block (0.10 ha), Dairy crop unit (3 cows+ 4 female calves) +Mushroom cultivation and Vermicompost Unit (0.075) provides round the year production (17.63 tonnes of REY year^{-1}).

Results of last five years of the study revealed that a net profit of Rs. 75007/- with maximum net returns from crop unit i.e. Rs. 42305/- followed by livestock unit with net returns of Rs. 22016/- followed by fodder unit with net returns of Rs. 5608/- followed by other enterprises *viz*. Mushroom cultivation with net returns of Rs. 5500/- followed by horticulture unit with net returns of Rs. 2876/- (Mean of five years 2010-11 to 2015-16) can be obtained from one hectare area. The profit percentage of different component are illustrated as follow Cropping system (54%), Livestock unit (28.03%), Fodder unit (7.41%), mushroom unit (7%) and Horticulture cum vegetable unit (3.66%)(Mean of five years 2010-11 to 2015-16). In 2015-16 the net returns of Rs.99087/- were

Table 7.1.1/3: Total Inputs' cost and percent share of the inputs purchased/generated and recycled within the system:

Year	Total Input Cost (Rs.) (TIC)	Value of inputs purchased from market (Rs.) and its percent share in TIC	Value of Inputs (Rs.) generated and recycled within farm and its percent share in TIC	Number of Labour engaged, annual expenditure on it and its percent share in TIC
2011-12	-	-	-	-
2012-13	230095	117189 (50.93)	25806 (11.21)	87100 (37.85)
2013-14	62774	42341(27.60)	48620 (31.63)	153735 (24.40)
2014-15	230324	141298 (67.22)	15769 (7.50)	53125 (25.27)
2015-16	227711	117627(51.66)	61209 (26.88)	48875 (21.46)

Data given in table above indicate that share of recycled inputs increased in successive years which lowered the cultivation cost and increased profits.

Poultry unit

Director Dr. A.S.Panwar visiting IFS Model

realized from one ha IFS Model where highest net returns of Rs. 66882/- were realized from crop unit followed by Dairy unit (Rs. 8624/-), Fodder unit (Rs. 10976/-), Mushroom unit (Rs. 7638/-) followed by Horticulture cum vegetable unit (Rs. 4964/-) respectively with employment generation of 287 days/year. The maximum production and profit was realized in May while employment was in October month signifying the work even during lean period.

The model meets around 46% of inputs required for different enterprises within the farm besides providing all the commodities (cereals, pulses, oilseeds, vegetables, fruit, mushroom and milk) required for the farm family. Recycling within the farm generated 80.2 kg N, 40.1 kg P_2O_5 and 80.2 kg K_2O $year^{-1}$.

Pantnagar

The integrated farming systems (IFS) Model at GBPUAT, Pantnagar for *Tarai* region of Uttrakhand was started during April, 2011-12 at Norman E. Borlaugh Crop Research Centre, Pantnagar on one hectare land comprises of crops, dairy, biogas, vermicomposting, fishery, horticulture, agroforestry and boundary plantation. Details of the components and area allocated under each enterprise are given in Table 1.

Table 7.1.1/4: Integrated farming system model (1.0 hectare model)

Particulars	Area (m^2)
Field crops	4700
Agroforestry/horticultural crops	4200
Dairy (3 cows) +vermicompost + kitchen garden	500
Fishries	600
Grand total	10000

The average farm production evaluated in terms of REY (t ha^{-1}) exhibits that total 30.49 t REY

ha^{-1} annum was produced in the model. The individual units such as, crop, horticulture, livestock, fishery and other units produced8.85, 6.72, 13.54, 0.31 and 1.24 t REY ha^{-1} annum on an average correspondingly. The average total gross return from the IFS-model was Rs. 396612 annum^{-1} in which the % share of crop, horticulture, livestock, fishery and other units were 28.94, 22.18, 43.16, 0.60 and 4.50 % respectively. Whereas, the average annual net returns from the model was Rs. 221420.10 and the crop, horticulture, livestock, fishery and other units were sharing about 27.33, 25.03, 40.79, 0.09 and 7.01% to the net returns. Benefit: cost ratio in terms of economic point of view was 2.77 annum^{-1} during last 5 years. The

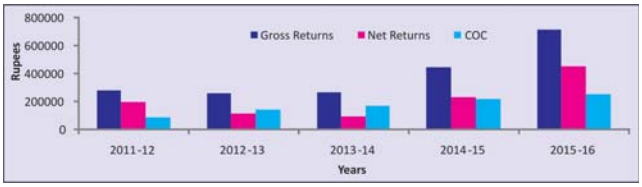


Fig. 1. Year wise gross return, net returns and cost of cultivation in IFS model

monetary value of gross and cost of production during 2015-16 was Rs. 690629.50 and 256974.

The quantity of farm products (kg lit^{-1} nos.$^{-1}$) recycled in the varied units under the IFS-model *viz*. crop, horticulture, dairy, vermicompost FYM^{-1}-pit and bio-gas unit were 9832, 4460, 35070, 12382

Table 7.1.1/5: Total Inputs' cost and percent share of the inputs purchased/generated and recycled within the system:

Year	Total Input Cost (Rs.) (TIC)	Value of inputs purchased from market (Rs.) and its percent share in TIC	Value of Inputs (Rs.) generated and recycled within farm and its percent share in TIC	Number of Labour engaged, annual expenditure on it and its percent share in TIC
2012-13	181623.0	62668.5 (34.5%)	38734.5 (21.3%)	80220.0 (44.1%)
2013-14	170634.9	57934.9 (33.9%)	31500.0 (18.5%)	81200.0 (47.6%)
2014-15	217485.9	61742.9 (28.4%)	72343.0 (33.2%)	83400.0 (38.3%)
2015-16	254866.0	106859.0 (41.9%)	66207.0 (26.0%)	81800.0 (32.1%)
Average	206152.5	72301.0 (35.1%)	52196.1 (25.3%)	81655.0 (39.6%)

Table 7.1.1/6: Livelihood analysis of an IFS Model

Farm Enterprises	Value of all farm commodities produced (A) (Rs.)	Value of farm commodities consumed in family (B) (Rs.)	Value of all farm commodities recycled within the system (C) (Rs.)	Marketable Surplus (A-B-C)=D (Rs.)	Family savings (If any) (D-Cost of Production) (Rs.)
Crops/Cropping Systems (Including vegetables/flowers)	133581	26793	64636	42152	-14171
Dairy (Milch Animals)	422760	29200	38360	355200	201103
Horticulture (Fruit crops)	116455	7000	19864	89591	58141
Agroforestry					
Fishery	4250	600	100	3550	-286
Others: Poultry/piggery/duckery/ goatary (Supplementary/complementary)	37244	3500	31244	2500	-8768
Boundary plantations	-	-	-	-	-
Value addition	-	-	-	-	-
Total of all the farm produces (GR)	714290	67093	154204	492993	236019

Animal unit

Fish pond

Vermicompost unit

Poultry unit

and 897 respectively. The calculated market value of the entire recycled farm products was Rs. 82101 during 2015-16. The annual average total input cost wasRs. 206152, whereas, the % share of purchased input cost, generated as well as recycled input cost and the engagement of labour to the input cost were 35, 25 and 39 correspondingly.

Overall analysis of the IFS model and its impact on livelihood is given in the table below. This shows that even after meeting family consumption and cost on production a family saving of Rs. 2,36,019 can be achieved to meet other family daily miscellaneous needs.

2. EASTERN HIMALAYAN REGION

In this Agro Climatic Region two AICRP-IFS centers Umaim (Meghalaya) and Jorhat (Assam) are located and have initiated IFS studies during 2011-12.

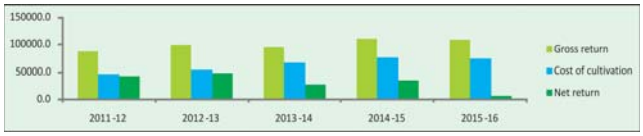
Umaim

The integrated farming systems (IFS) unit at ICAR Research Complex for NEH Region started during 9th March, 2009. All the components of IFS *viz*. crops, livestock, fruit trees, fishery were developed and incorporated during 2010-11 in one hectare area.

Table 7.1.1/7: Composition of IFS Model/Models being developed at respective centres

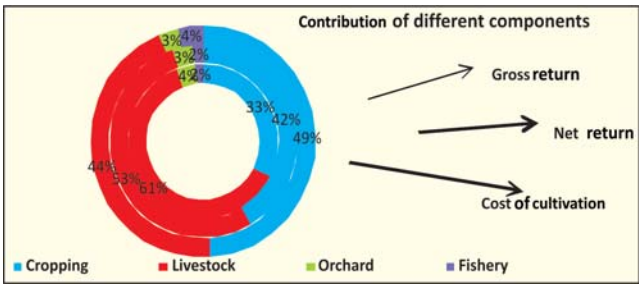
Area of IFS Model (ha)	Major components (Area/Species/number/capacity)			Supplementary/Complementary
	Crops (ha)	Horticulture/Plantation Crops (ha)	Fish Pond (ha)	Poultry/duckery/piggery (Nos)
1.0	0.7	0.2	0.05	Pigs- 3 , Broiler -630 Layer – 100

The slopes were converted into terraces and planted with guinea and broom grasses on the terrace raises and shoulders with an objective for not only providing stability but also for providing green fodder. The economics of various components of IFS was worked out for the last 5 years separately by calculating cost of cultivation, gross and net return. The detail economics of the IFS model since its start in 2011-12 is presented in Fig.below. The gross returns were Rs. 87,340.25, Rs. 99,154.38, Rs. 94,410.74, Rs. 1,10,396.38, Rs. 1,08,196.00 during 2011-12, 2012-13, 2013-14, 2014-15, 2015-16 respectively. The respective net returns were Rs. 41,709.00, Rs. 47,558.95, Rs. 27,230.56, Rs. 34,833.39 and Rs. 5730.00 during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively .



The livestock and cropping system were the most remunerative. The gross return from livestock component was high followed by cropping system however net return from cropping was more compared to livestock. The economics of different component like Cropping, livestock, orchard and fishery are presented in Fig. below. Rice equivalent yield (REY) and profitability are the two important factors of cropping system in IFS. Rice equivalent yield (REY) and profitability was more in case of spice based farming system followed by vegetable based farming system. Minimum REY and profitability was seen in groundnut based farming system.

Total employment generation in IFS Model was 298 and value of recycled products within the system was reported to Rs.7949 year^{-1}.



Jorhat

Integrated Farming System model was established at Instructional and Research Farm of Assam Agricultural University, Jorhat during the year 2010-11 with a land area of 1.0 ha. The land was allocated under different components of Integrated farming system *viz.* Field crops, Horticultural crops, Cattle, Fishery, Poultry and Apiary with the objective to meet up different family requirement (of five members family. IFS model comprising of cropping systems - Rice (w) -Toria-Cowpea(F), Rice (w) – Toria - Green gram, Rice (W) - Oat(F) - Blackgram, Rice (W) – Potato - Lady's finger, Rice (W) – Cabbage - Cowpea(V); some other fodder crops *viz*. Setaria and Hybrid Napier were grown on bunds in 0.65 ha, horticulture [guava, lemon, pine apple, banana, arecanut and vegetables such as cabbage, potato, tomato, french bean, cow pea(V), okra & pea in 0.30 ha + dairy including animal shed with store house and threshing floor including biogas plant, vermin-compost & liquid manure unit in 0.11 ha and fishery 0.092 ha developed for the Marginal and Small farmers of Assam of North-east India. The Raised and Sunken bed module was also developed within the model to utilize the marshy land for production of rice and as well as vegetables. During the year 2015-16, the poultry unit is also incorporated to the IFS model for which a poultry house of 12.5 m^2 is constructed over the pond water.

Raised and sunken bed system

Pineapple on pond bank

Hort.- Vegetable crops

Rice crops

The results of last five years i. e. from 2011-12 to 2015-16 revealed that the average System Equivalent Yield (SEY) of the IFS model was 22.62 t ha^{-1} with a Gross return of Rs. 337485.00, Net return of 170677.00 and B:C ratio of 1.90. The highest SEY of 39.11 t ha^{-1}, Gross return of Rs 586637.00 and Net return of Rs 3140555.00 was recorded during the year 2015-16, however the highest B:C ratio of 2.35 was estimated during the year 2014-15 where as it was 2.15 during the year 2015-16.

The highest amount of bio-waste was recycled during the 2015-16 with total value of Rs.94706.00 and thereby the saving with recycled farm products was 34.74% of the total input cost. The average value of the bio-waste recycled within the system during the period from 2011-12 to 2015-16 was Rs 47693.00 with a saving of 25.84% of the total input cost.

The highest employment generation of 479 man days was recorded during the year 2015-16 with a value of Rs 64170.00 (@Rs.134 Man day^{-1}) within the system and the saving from family labour engaged was 23.54% of the total input cost whereas the average employment generate during the period from the IFS model was 418 mandays with a value of Rs 55050.40 @ Rs. 131.60 Man day^{-1} and the saving from family labour engaged was 33.73% of the total input cost. IFS approach adopted at the center suggested that Integrated Farming system plays a vital role in securing sustainable production of high quality food and other production fulfilling the basic needs of household like food (cereal, pulse, oilseed, milk, honey, fish, meat etc), fodder, fuel etc. This system helps in sustaining farm income by reducing the cost of production; as agricultural waste (bio-waste) are efficiently recycled in the system so it helps in reducing environmental pollution by low

release of Green House Gases, maintain soil fertility and agricultural sustainability. After almost fulfilling the family requirement a good amount i.e. Rs.1,50,787.00 remains in the hand of Farm family as savings which may be used to meet up other requirement and also as future savings. Hence, the IFS model developed by AICRP on IFS may be recommended for the small and marginal farmers of the region under rainfed situation.

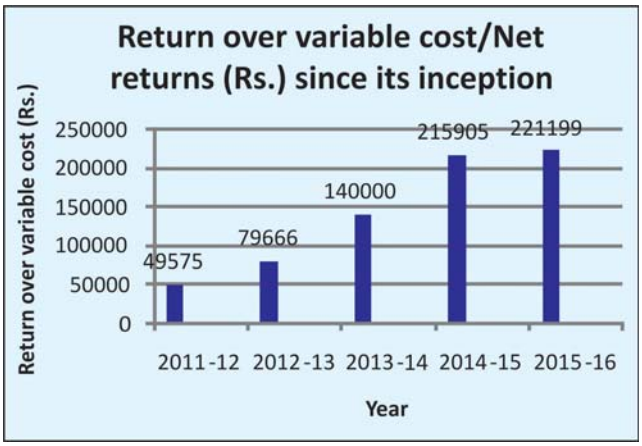
3. TRANS GANGETIC PLAINS REGION

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 "Region specific IFS models" at respective centers. Composition of IFS models developed and performance of the IFS approach in last five years of its establishment is given here under;

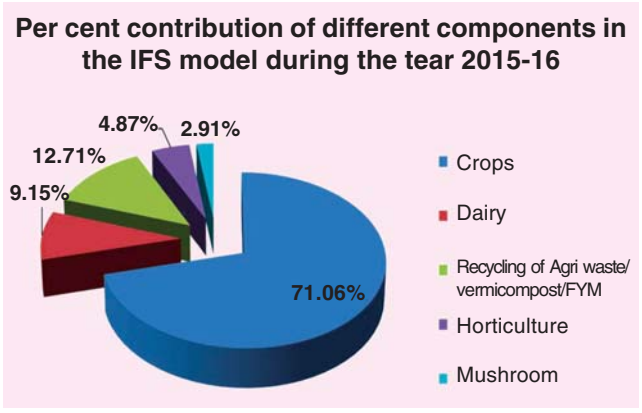
Hisar

The IFS Model developed at Hisar was started in the year 2011-12 in one hectare area comprises of field crops (Cereals, pulses, oilseeds, fodder, and fibre), horticultural crops (fruits, vegetables and flower), animal unit (2 buffalos), mushroom unit, vermicompost unit/ recycling of farm waste and boundary plantation. The model has been designed for 7 member family. In order to enhance, the income and resource recycling, complementary enterprises such as vermicompost (75 m^2) and quality FYM production (75 m^2) and karonda and bael as boundary plantation were incorporated. Under horticultural crops, lemon + guava + marigold/vegetable (0.06 ha) and mushroom (75 m^2) was added as income supplementing activities in the model.

During the initial two years only different cropping system were tried in the model, which gave a return over variable cost/net return of Rs. 49575 and Rs. 79666 during 2011-12 and 2012-13, respectively. During third year, dairy (Two buffalos) and vermicompost were added to the model and thus the net income was enhanced to Rs. 140000. During the year 2014-15, mushroom and floriculture were added to the model, which further raised the net income to the tune of 2,15,905. In the recent year *i.e.* 2015-16 a net income of Rs. 2,21,199 was achieved from the model.



Percent contribution of different IFS components during 2015-16 is predicted in Fig. Highest contribution was from crops (71.06%) followed by recycled products (12.71%) and dairy (9.15%). Recycling of farm wastes/by - products within the model is another aspect contributing to the net income by 8.47 and 12.71% contributed to the net income during 2014-15 and 2015-16, respectively from recycling of the farm byproducts/ vermicompost/FYM/crop residues and other agricultural wastes.



Employment generation

One of the important objectives of the Integrated Farming system is to provide employment to the

farming family round the year. Highest employment was generated in the year 2015-16 (340 man days). Further it has been seen that dairy component generate maximum employment round the year during both the years.

Ludhiana

IFS study at PAU, Ludhiana was initiated during kharif 2010 on 1.0 ha farm area and comprise of 6400: sq.m for field crops i.e. Cereals/pulses/ oilseeds/ green fodders etc., 1900 sq.m for horticultural crops and vegetable intercropping, 300 sq.m for agro-forestry, 200 sq. m for dairy enterprise, 1000 sq.m for aquaculture (Fresh water fish production), 200 sq.m for kitchen gardening. In addition to this boundary plantations are also done in which cranberry (Karonda) and galgal are grown.

An Overview of IFS Model at PAU, Ludhiana

As per ICMR norms, annual demand of an average family of 5 member was 1292 Kg cereals, 167 Kg Pulses, 108 Kg oilseeds, 733 litres milk, 167 Kg fruits, 950 Kg vegetables and 3600 Kg of dry fodder. The IFS model (1.0 ha) in response to this produced 3650 kg cereals, 140 Kg pulses, 151 kg oilseeds, 17334.6 litres of milk, 620 kg fruits, 5783 kg vegetables and 20343 kg of dry fodder along with 22 kg seed during the year 2015-16. The study showed that IFS model constituted in 1.0 ha area can be enough to fulfill daily need requirements of a 5 member family and will also fetch additional income to the family of a farmer.

The average Gross returns of the IFS model was Rs 541820 ha^{-1} with average input cost of Rs. 248395 ha^{-1} and average net returns of Rs. 293425 ha^{-1} obtaining an average benefit cost ratio of 2.18. The IFS model along with better economics in comparison to the prevailing monoculture rice wheat system has also generated 2426 days of employment. The maximum contribution of Rs 141445 on an average has been provided by dairy sector and has contributed about 48.20 % of total IFS farm net returns to the system. The IFS model not only fulfill the farmer family demands but is also helpful in generating output which can be used as an input for other components of the IFS model and make farming more economic.

The results clearly revealed that Integrated Farming system plays a vital role in securing sustainable production of high quality food and other production fulfilling the basic needs of household (cereals, pulses, oilseeds, milk, fish, fodder, fuel etc).

4. UPPER GANGETIC PLAINS REGION

In this Agro Climatic Region two AICRP-IFS centers namely PDFSR, Modipuram, Meerut (U.P.) a voluntary ICAR institute and ii) CSAUA&T, Kanpur (U.P.) both in Uttar Pradesh are working on the aspect of “Development of Region Specific IFS Models”. The findings of first two years of establishment of IFS models at individual centers are described below;

Table 7.1.1/8: Total Inputs’ cost and percent share of the inputs purchased/generated and recycled within the system:

Year	Total Input Cost (Rs.) (TIC)	Value of inputs purchased from market (Rs.) and its percent share in TIC	Value of Inputs (Rs.) generated and recycled within farm and its percent share in TIC	Number of Labour engaged, annual expenditure on it and its percent share in TIC
2015-16	320250	259863 (81.14 %)	60387 (18.86)	1917,76680 and 23.94%
Average	235124	166409.6 (70.77 %)	53601.6 (22.80)	2427,76068 and 32.35 %

Dairy unit

Overview of crops & hort. fields

Fish production

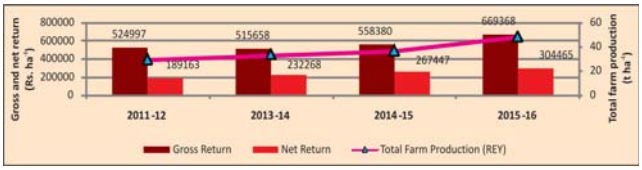
Vegetable crops

Mushroom unit

Modipuram

To demonstrate the diversified system of farming under irrigated conditions of western U.P., a cultivated area of 0.70 hectare was undertaken for diversifying prevailing farming system *crop + dairy* (opted by more than 84% of the total farm families) with integration of i) fruit crops (0.30ha) having Mandarin var. kinnow and Banana var.G-9 under Agro – horti system, ii) round the year production of mushroom , value addition in cowdung by scientific composting and vermicomposting (0.01ha), biogas unit of one cubic meter and backyard poultry with 15 birds alongwith boundary plantations of guava & karonda. Initial five years results (2011-12 to 2015-16) revealed that a small area of 3800 sq.m. kept under crop production with two to three hundred cropping intensity under irrigated condition is sufficient enough to meet the household annual food, fuel and fodders demand of a seven member family and their animals and rest of the farm area can be utilized for raising high value crops (vegetables/ fruits/flowers) and integrating low cost & cost effective farm enterprises such as fruits, mushroom, poultry, vermicomposting, biogas and boundary plantations.

In fifth year (2015-16) of the study total farm production (REY) was 47.81 t ha^{-1} with gross and net returns of Rs.6,69,368 ha^{-1} $year^{-1}$ and Rs.3,04,465 ha^{-1} $year^{-1}$, respectively. As the farmer is more interested in higher production and profits, the net returns was four times higher than prevailing system (Rs.68,000). The percent contribution in gross and net returns of different farm enterprises crops, dairy, horticulture and others was 20.88, 41.93%, 27.1%, 10% and 27%, 18.73%, 41.91%, 12.30% respectively. Comparatively higher net profits in horticulture was because of significantly higher fruit yields & intercrops (Rice-wheat) and less cost of production as compared to dairy and crop production.



Total farm production (RYE –t/ha/year), gross and net returns during last 5 years –IFS Model

Intermittent use of farm products/by-products and recyclable residues could contribute Rs.97,376 (Table-2) in total cost of production (Rs. 2,55, 432). Another major farm resource i.e., farm labour (365 Man days @ Rs.170 day^{-1}) also contribute Rs.62, 218 (24.28%). This all saved Rs.1,59,394 (more than 62%) of the total cost, thus economizing the production cost to a great extent . In total 1133 kg of plant nutrient NPK (considering 33% of this as realizable) was added in to the soil through recycling of crop residues, cowdung and green manuring etc. valuing about Rs.13,000 as saving which otherwise to be spent on chemical fertilizers. Diversification also provided more employment opportunity 356 man days as compared to 215 Man Days in prevailing system of farming.

Table 7.1.1/9: Demand and Production of essential farm commodities of a 7 member family: Demand as per ICMR standard

IFS Model Area (ha)	Demand and Production of Different Farm Commodities (Kg $Litre^{-1}$ $No.^{-1}$ etc.)										
	Cereals (Kg)	Pulses (Kg)	Oilseeds (Kg)	Milk (Litre)	Fruits (Kg)	Vegetables (Kg)	Eggs (nos.)	Green Fodder (Kg)	Dry Fodder (Kg)	Mushroom (Kg)	Fuel Wood (Kg)
Annual Demand of essential food and fodder commodities for a farm family with 7 family members (On an average)											
	1550	200	130	1120	200	900	-	21900	4050	-	-
Actual annual production of different farm commodities at farm											
0.70	3040	282	363	4228	5560	2960	—	20940	4095	457	1194

Kanpur

Crop + Dairy is the most dominate farming system with area coverage of 89% followed by Crop + Dairy + Horticultural crops (9%). On Station IFS Model on One hectare area for small and marginal farmers of Central Plain Zone of U.P. was started at C.S.A. University of Agriculture & Technology, Kanpur during Kharif 2011 to achieve profitability, sustainability and livelihood security. This model consist three farming component i.e. (i) Crop (ii) Dairy and (iii)Horticulture. In crop component, Six cropping systems were adopted viz; (i) Rice-wheat–GG(G+R) (ii) Maize-Mustard–Sourghum (iii) Maize-Chickpea (iv) Maize-Potato-GG(G+R) (v) Maize-Garlic-GG(G+R) (vi) Sorghum (GF)-Barseem (GF) on an area of 7200 m^2. Dairy unit consisting of 4 animals i.e. One Buffalo, One Cow and two Calves along with Nadep and vermicomposting was also established on an area of 210 m^2 (60+150sqm). Horticulture unit is maintained on an area of 1920 m^2 which includes plantation of Guawa (24), Aonla (09),Lemon (08), Mango(03), Jaick fruit(01) and Banana plantation. Vegetable and flower are also being grown as intercrop in horticulture unit besides five boxes apiary.

In IFS Model, highest Rice equivalent yield (REY) and gross return was recorded with crop production unit followed by Dairy unit and Horticulture unit while maximum net return was recorded with dairy unit followed by crop production and horticulture unit during each year's (2012-13 to 2015-16). Maximum rice equivalent yield (REY), Gross return and Net return in all components were recorded during 2015-16 in comparison to initial year. During the year 2015-16 highest rice-equivalent yield 24.97 t ha^{-1}, Gross return Rs. 230566 ha^{-1} and net return Rs. 130341 ha^{-1}, was obtained in IFS Model.

During the year highest value of recycled product was Rs. 110675 and generated employment of 304 Man days.

Highest B:C ratio 2.30 was also recorded during 2015-16 in comparison to initial year. Soil fertility status after five years showed slight improvement in crop production unit and horticulture unit in comparison to its initial years.

Table 7.1.1/10: Prevailing farming system/systems and respective estimated annual returns/year.

First Ranking				Second Ranking			
Farming System	Area coverage (%)	Estimated returns (Rs. ha^{-1})		Farming System	Area coverage (%)	Estimated returns (Rs. ha^{-1})	
		Gross	Net			Gross	Netl
Crop + Dairy	89	94532	67754	Crop + Dairy + Hort. (Mainly fruits)	9	1,05,500	71,150

Table 7.1.1/11: Component - wise Net Returns during study period (2012-16)

Year	Total Net returns	Net returns From Crops	Net returns from Horticulture	Net returns from Livestock unit
2012-13	97405	44481	4246	47438
2013-14	92633	43453	688	48492
2014-15	67307	32494	2908	31905
2015-16	130341	56641.5	929.75	72770
Average	96922	44268	2193	50151

Table 7.1.1/12: Contribution of different farm enterprises in Resource Recycling

Year	Value of recycled products				Man Days
	Total Cost	Crops	Dairy	Total value of recycled product	
2012-13	131933	28438	6000	34438	422
2013-14	150148	46700	9200	55900	360
2014-15	156619	44962	15250	60212	334
2015-16	210900	65050	45625	110675	304
Average	162400	46288	19019	65306	355

5. MIDDLE GANGETIC PLAINS REGION

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 Region Specific IFS Models for respective states since 2010-11. Significance of IFS approach towards production, profitability and livelihood of small land holders in the regions as reflected form the results of last 4-5 years of the programme is summarized hereunder;

Varanasi

Varanasi lies at 25°18' north latitude and 83°03' east longitude and at an altitude of 128.93 m above mean sea level. It falls under sub-humid climate with average rainfall of 1100 mm and belongs to Eastern Plain and *Vindhyan* region and NARP zone of Eastern Plain Zone: U.P.-4 , Major farming system of the region is Crop +Dairy with area coverage of more than 70% followed by Crop + vegetables (20%).

Area and composition of 1.0 ha IFS model being developed for Varanasi region comprise 0.81 ha is assigned to crop component with six cropping sequence , Dairy component includes 4 cross bred cows, the area assigned to fish pond and horticulture is 0.1 ha and 0.06 ha, respectively. Regulated drain of the cattle shed goes to the fish pond and the urine is collected in separate tank for various uses. The harvested water of the farm building goes directly to the fish pond where high density poly culture consisting of grass carp, rohu, catala and mrigal is practiced. Horticulture includes 14 permanent trees *viz*. guava, mango, citrus, *aonla*, jack fruit along with intercrops of banana and vegetables. Cucurbits are taken on the fence of orchard during *kharif*. Boundary plantation includes *karonda*, banana and papaya. Supplementary enterprises include poultry and mushroom cultivation. In poultry 200 chicks of Kuroiler are reared and six cycles are completed in one year. White button mushroom is cultivated on compost prepared using 5.0 q wheat straw during winter. Value additions include processing of rice, pulses, and oilseeds as well as NADEP and Vermicompost. Boundary plantation of *karonda*, banana and papaya is being practiced in about 200 m periphery.

Table 7.1.1/13: Prevailing farming system/systems and respective estimated annual returns year^{-1}.

Prevailing Major Farming Systems with Percent Area Coverage and estimated annual income per hectare								
First Ranking				Second Ranking				Others
Farming System	Area coverage (%)	Estimated returns (Rs. ha^{-1})		Farming System	Area coverage (%)	Estimated returns (Rs. ha^{-1})		(%)
		Gross	Net			Gross	Netl	
Crop + Dairy	70	113392	69170	Crop+ Vegetables	20	141472	82054	Dairy + Crop 5

The overall farm production remained consistent over the years. In first year (2011-12), the contribution of crop component was higher as compared to subsequent years probably due to better weather condition and meeting nutrient requirement mainly through fertilizer. In 2012-13 and 2013-14 livestock unit contributed more to the total farm production in terms of REY because of the higher number of cows. However, the share of livestock to the total farm production was maximum in all the years. After livestock and crop, the third major component was poultry in all the years.

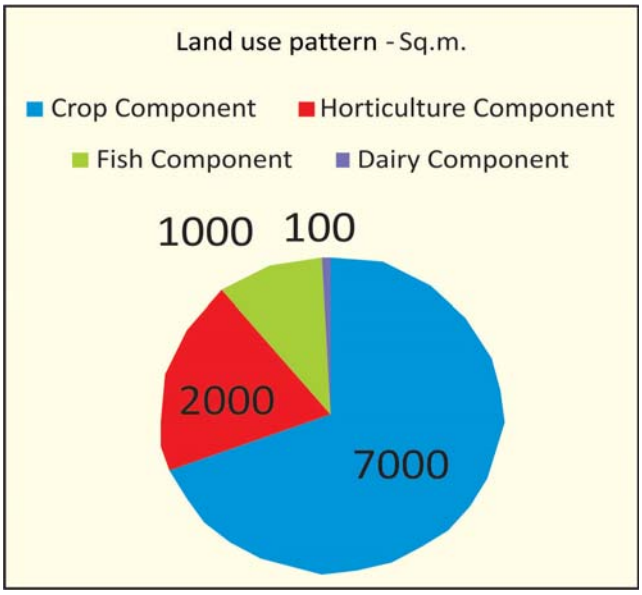
Value addition of farm produce assessed separately in 2015-16 with respect to crop and livestock units showed marked contribution to the farm income both in terms of gross and net returns. The total gross return was recorded maximum in 2nd year (2011-12) mainly due to livestock unit with 6 milch cows but in subsequent years, it slightly increased even with less number of cows (4). However, the net return was increased with time and recorded highest (Rs. 3,80,231) in 2015-16. Like farm production, the contribution of dairy to the net return was maximum followed by crop, poultry, fishery and horticulture units, respectively. The average values of gross and net return over the period were recorded as Rs. 8,81,078 and Rs. 3,64,801, respectively. This resulted in benefit cost ratio of 1.71 and 0.71 from the economic and agronomic point of view, respectively.

The recycling of products in cropping system was maximum (Rs. 69486) in 2015-16 and the major crop produce was recycled in dairy unit followed by poultry . Cow dung obtained from dairy was recycled in fish pond as well in the preparation of vermicompost and NADEP compost that were recycled in crop, horticulture and fishery. The overall recycling of dairy produce was to the extent Rs. 39,045. This was followed by poultry Rs. 4328 and mushroom. However, the total value of recycled farm produce was Rs. 1,17,804. Based on the 5 years average, the total number of man days engaged was 821 equivalent to Rs.164144/. The engagement of labour was maximum in dairy (429) followed by crop (229), poultry (72), mushroom + value addition (45), fishery (24) and horticulture (23).

Livelihood analysis revealed that after meeting family demand and deducting cost of production, a saving of Rs.1,35,516 was reported for meeting other family liabilities. This shows the economic viability of the IFS approach adopted at the center.

Kumarganj

A model on integrated farming system (IFS) was initiated in July 2011 on a partially reclaimed salt affected soil at the Agronomy Research Farm, N.D. University of Agriculture and Technology, Kumarganj, Faizabad, Uttar Pradesh. The On-station integrated farming system model consisted of various components on 1.01 ha area, *viz*. crop(0.70 ha), horticulture (0.20 ha aonla and guava orchard), dairy (two milking cows), fishery (in 0.10 ha farm pond area fingerlings of composite culture of catla, rohu common carp, silver carp and grass carp), cowshed on an area of 0.01 ha.



The area wise crops grown as cereal crops (8000 sq m), pulses (4800sq m), oilseeds (1200 sq m) vegetables(1200 sq m) and fodders (5800sq m). Results revealed that on an average, system productivity of crop unit (11.21 t), dairy unit (9.94 t) and horticulture unit (1.53 t) was recorded in terms

of rice equivalent yield, respectively. Among the various cropping sequences, rice-potato-greengram sequence recorded the maximum RGEY (3.85 t) followed by rice-lentil-maize+ sudanchari (2.49 t) and minimum (2.29 t) with rice-berseem-greengram sequence in 1200 sqm net area.

Five years mean yield data of crop component showed that 3.68 t cereals, 25.8 t potato, 2.2 t oilseed, 0.53 t pulses, 28.78 t green fodders and 4.89 t dry fodders were obtained from 0.7 ha area annually. The five years average milk production of both the cows was 10.01 lit/day. The income from average milk production (3654 lit) of last five years was Rs. 123812. While the compost prepared from the dung and animal shed wastes were recycled in the crops. The results of 5 years showed that after fulfilling the family requirement of farmers having 5-6 members as per ICMR standards about 2.0 t cereals, 0.38 t pulses, 1.0 t oilseeds, 14.0 t green fodder, 0.70 t dry fodder and 2800 litre milk could be sold in the market to meet out other daily needs and purchase of inputs from market for the production. On considering the net return it is clear that maximum net return (53.4%) was obtained from crop component followed by dairy (23.0%). The fish and horticulture components gave 12.1 and 9.5% of total net return. The maximum benefit cost ratio (4.07) was obtained from horticulture component followed by crop unit (3.07), while minimum B:C ratio (1.43) was recorded from dairy enterprises.

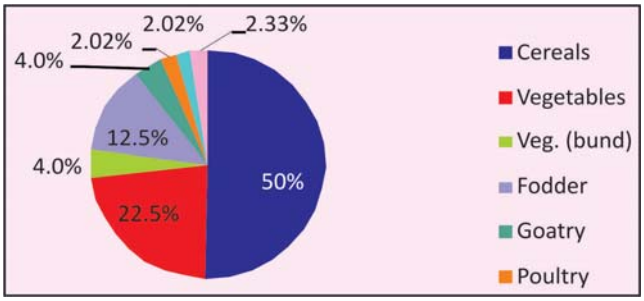
Employment generated round the year was 501 man days and maximum was in month of July (83 man days) and minimum in the month of September (28 man days). Maximum labour was engaged in dairy component (230 man days) followed by crop component (209 man days). Horticulture and fish components engaged only 30 and 21 man days annually.

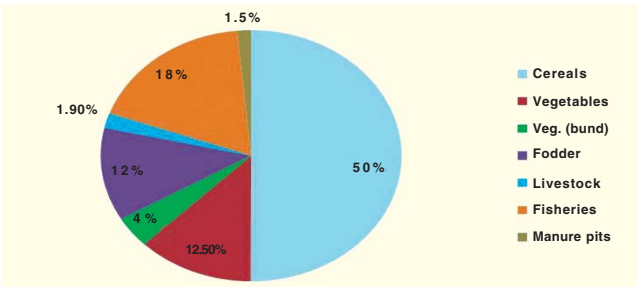
Among the different farm commodities, the maximum marketable surplus of Rs. 123088 was obtained from crop unit followed by dairy unit (Rs 109715), annually. Over all the farming system module of one hectare area provided net return of Rs. 259870 from crop + dairy + horticulture + fishery enterprises by the incurred cost of Rs. 229287 per annum during 5th year.

On the basis of 5th year data, the value of all the produced farm commodities is Rs. 489157 out of which the farm commodities amounting Rs. 108705 was consumed by family and commodities of Rs. 66981 was recycled within the system. Remaining farm commodities of Rs. 313471 was available to be sold in the market to purchase the inputs from outside for production (Rs. 92236) and expenditure on labour (Rs. 70070). The balance amount of Rs. 151165 was available to meet out their family needs.

Patna

Two IFS models were developed at ICAR Research Complex for Eastern Region, Patna Research Farm comprising of Crop + Goat + poultry (one acre model: 4000m^2) and Crop + Livestock (2 Cows) + Fishery cum duckery (two acre model: 8000m^2)for upland and lowland situation which represents more than 75 percent of eastern region. Total establishment cost of one acre IFS model was Rs. 1.2 lakhs and for two acre IFS model was Rs. 2.05 lakhs which includes construction of sheds for animals and birds, mushroom, pond, vermi-pits, biogas, boundary plantation and fruit crop unit. One acre and two acre IFS model generates a total yearly employment by 351 and 619 man-days while yearly net returns are Rs. 86,521 and Rs. 1,37,209, respectively which is about three times higher over rice-wheat cropping system. Upon recycling of wastes obtained from different components under two acre IFS, N=56.5 kg, P=39.6kg and K=42.7kg were added into the soil which is equivalent to 118 kg urea, 247kg SSP and 42.7 kg of MOP. Upon recycling of wastes of different components under one acre IFS, N- 44.0 kg, P- 29.5kg and K- 31.2kg was added into the soil Allocation of area under 2. 0 Acre (Above) & 1.0 acre model (below) which is equivalent to 93.0kg urea, 184.0 kg SSP and 52.0 kg of MOP. The bio- gas unit of 2m^3 capacity generates biogas equivalent to 16.2 LPG cylinder of 14,5kg capacity from which lightening and cooking is practised.





Allocation of area under 2. 0 Acre (left) & 1.0 acre model (right)

Duck-fish integration is one of the promising integration for low lying areas where water is stagnated upto a period of 4-5 months in a year. For a pond area of 1000m^2 a total no. of 40-50 ducks can be incorporated and duck droppings may be used as feed source for the fishes (mix carp culture, 1000 fingerlings). From 40 ducks one can get about 6000 nos. of eggs year^{-1} and from a water area of 1000m^2 about 300-350 kg of carps can be harvested in a year which is highly profitable for a small farmer.

It was observed that under one acre IFS model (Crop + Goat + poultry + mushroom), total input and output energy was calculated as 68, 491 MJ and 2,17,548 MJ respectively (Input/output ratio:: 1: 3.2) while under two acre IFS model (crop + fish/duck + livestock) was reported as 296709 MJ and 7,52,415 MJ, respectively (Input/output ratio:: 1: 2.5), means crop + goat + poultry + mushroom integration is more energy efficient over crop + fish duck^{-1}+ livestock integration .

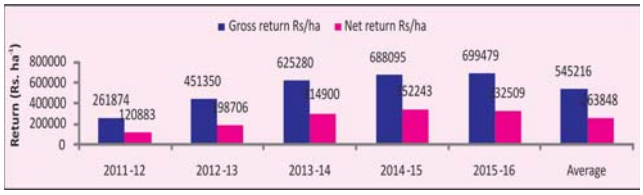
It is assumed that for better sustainability of the IFS model sustainability index should be more than 0.5. A suitable and viable IFS model could be identified for their existence based on net return, sustainability index, employment generation and improvement in soil fertility attained over a period of time. Here, among different IFS model evaluated, Crop +goat +poultry + mushroom integration provided highest ISI (79. 2) and was followed by Crop + goat + fish + duck (77.2) which was again followed by Crop = goat + poultry (75.7) and vegetable + goat integration (75.1) whereas, income sustainability index (ISI) from rice- wheat system was in negative.

Sabour

The IFS model was developed at Sabour centre of Bihar Agricultural University during *kharif*, 2010. The Integrated Farming System model was synthesized using the scientific inputs from the on-station research experiments conducted at Bihar Agricultural University, Sabour for improving the productivity, profitability and sustainability of the whole farm as well as livelihood security of farmer's family. The cropping systems were modified by including cereals, pulses, oilseeds, vegetables, fruits, milk, eggs etc. to meet the family needs. The area allocated under different components of one hectare integrated farming system (IFS) model were 5916 m^2 under three cropping systems *viz.*, rice - wheat- green gram (grain + residue incorporation), rice - winter maize + potato - cowpea (F), rice - mustard - maize (G) + cowpea (F); 1098 m^2 under fodder system, i.e. sorghum + rice bean - berseem - maize + cowpea (F), 792 m^2 under seasonal vegetables; Area under Fish production (800 m^2) and fruits (Guava and Papaya) on embankment of fish pond (620 m^2) totaling it to 1420 m^2 . Besides, 125 numbers of subabool (*Leucaenaleucocephala*) plants and 50 numbers of Moringa plants were also planted along the boundary of field in 200 m^2 areas. Vermicompost pits (3 nos.) were constructed near dairy shed for recycling of farm and animal wastes in 100 m^2 area+dairy (2 cross breed milch cows) in 70 m^2 area, Goatry (10 + 1 Black Bengal breed) for meat

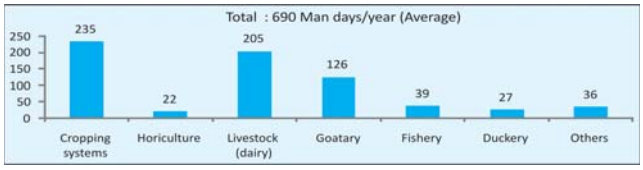
purpose in 80 m^2 area, ducks for eggs and meat have been included in the system. All the farm and animal wastes were properly recycled into system so that nothing goes waste and output of one enterprise worked as input for other enterprises.

The gross returns were Rs. 261874, 451350, 625280, 688095 and 699479 per hectareduring 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16, respectively. The respective net returns were 120883, 198706, 314900, 352243 and 332509 ha^{-1}. The benefit : cost ratio computed were 1.84, 1.79,1.01,2.05 and 1.91during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16, respectively. However, the average B:C ratio was 1.72, net return Rs 263848 ha^{-1} and gross return Rs. 545216 ha^{-1} for developed IFS model.



Gross and net returns during study period

The average man days required for production of crops alone was 235 man days whereas, allied enterprises enhanced employment to the tune of 455 man days.



It clearly indicates that combining cropping with other enterprises increased labour requirement and thus provide scope to employ more labour and that too round the year.

6. LOWER GANGETIC PLAINS REGION

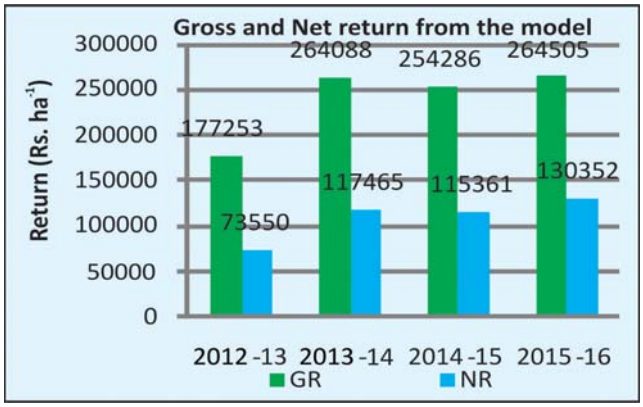
AICRP-IFS Center at Kalyani (WB)

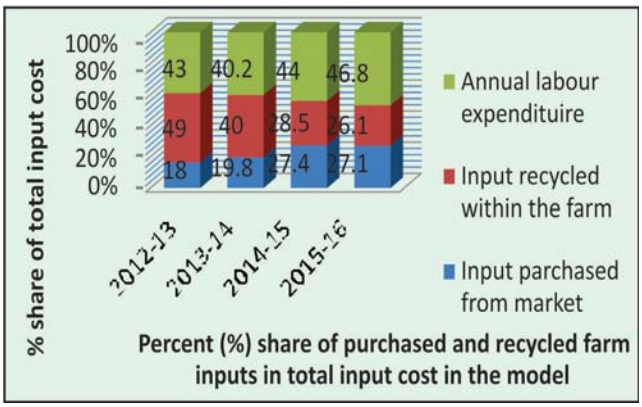
To demonstrate the benefits of diversified farming an IFS Model was established in 2012 in order cater to the needs of six-member farm family so as to sustain their livelihood under irrigated ecosystem of New Alluvial zone of West Bengal. In order to meet the requirements of the farm families and livestock, 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 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 m^2 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.

During the study period of last four years , mean production in terms of REY was recorded to the tune of 14.46 t ha^{-1} $year^{-1}$. Livestock unit (7.54 t ha^{-1} $year^{-1}$) accounted for 52.14% of the total production followed by crop unit (3.89 t ha^{-1} $year^{-1}$) which shared 26.90% of the total production. The highest net return of Rs.65,299/- was realised from Livestock unit followed by crop unit (Rs. 20,081/-), horticulture unit (Rs. 13,820/-) and fishery unit (Rs. 9,981/-). During the last four years, mean revenue generated from all these components amounted to Rs. 1,09,182/-. The Model recorded 42.6, 47.4 and 49% higher net return as compared to the existing farming system of the New Alluvial Zone during 2013-14, 2014-15 and 2014-15, respectively.

About 72% of the input cost of the model was realized from different farm enterprises besides providing almost all the commodities required for the farm family. The maximum net return was realized in the month of June followed by March and highest employment was generated in the months of March and August (11%).

The model generated 75 kg N, 33 kg P_2O_5 and 63 kg K_2O $year^{-1}$ through recycling and





vermicomposting. The biogas unit of 2 cubic meter capacity generated biogas equivalent to 250 kg LPG year^{-1}.

On an average the Model generated employment of 340 man days.

The system may further be improved by incorporating other components (like goatery, piggery, mushroom cultivation etc.) considering their suitability.

Fish culture in sunken bed system

Vegetable on raised beds

Livestock unit

7. EASTERN PLATEAU AND HILLS

IGKV, Raipur (Chhatisgarh) and BAU, Kanke Ranchi (Jharkhand), the two AICRP-IFS centers representing Eastern Plateau and Hills Region are given responsibilities to develop IFS models for livelihood improvement of small and marginal farmers of the region.

Raipur

Integrated farming system research model of 1.0 hectare has been started from the year 2010-11 with cropping system, horticultural system, fishery and poultry enterprises. From the year 2012-13, dairy component, vermicompost, biogas units have also been taken under operation in addition to the aforesaid components goatry unit was also included. A gross income of Rs. 3,11,705 ha^{-1} was generated from the entire IFS Research model area which is Rs 1,55,124/- more in terms of gross return after four years from different component/enterprises. The gross income has been increased with years due to integration of more enterprises or components like dairy component, vermi-compost, biogas and goatry units. Higher net income of Rs 1,77,097/- was achieved during 2014-15 .

Under crop production, among 5 cropping systems tested, highest total productivity (1639 kg) in terms of rice equivalent yield was recorded under rice-sweet corn-greengram sequence. This system also produced considerable net return of Rs 18199/-, followed by Sorghum - berseem+ Mustard -maize (fodder) generated the total net return of Rs 9343/- and appreciable total productivity (916 kg).

Further, Brinjal-sweetcorn -green gram cropping system produced highest total productivity of 1731 kg and also generated highest total net return of Rs 18872/- followed by Okra-Tomato-Clusterbean system which produced 1498 kg and obtained total net return of Rs 18748/-. Minimum total productivity and net return was obtained in Sweetcorn-Onion+Coriander-Green gram cropping system due to sweetcorn crop was failed because of heavy rainfall incidence during kharif season.

Dairy unit produced 733 liters of milk and generated and handsome amount of Rs. 26388/-. Poultry unit also generated Rs. 35233/-. Goat rearing also started in the IFS model in 2015-16.

The average of four years employment generation increased to 314 man days ha^{-1} $year^{-1}$

Table 7.1.1/14: Livelihood analysis of an IFS Model

Farm Enterprises	Value of all the farm commodities produced (A) (Rs.)	Value of commodities Consumed in family (B) (Rs.)	Value of commodities Recycled (C) (Rs.)	Marketable Surplus (A-B-C)= D (Rs.)	Family savings (If any) (D-Cost of Production) (Rs.)
Cropping Systems (Including vegetables)	181709	22620	13251	145838	85526
Dairy (Milch Animals)	40696	6552	10950	23194	-71555
Horticulture/Boundary plantation	9405	3079	140	6186	2771
Fishery	10340	3610	1023	5707	3074
Others (Poultry/piggery/duckery/goatary)	35233	2400	761	32072	6312
Mushroom	3600	960	500	2140	440
Azolla	722	0	0	722	410
Value addition (Vermicomposting/biogas)	30000	0	3000	27000	23000
Total of all the farm produces (GR)	311709	39221	29625.00	245193	49978

by integrating various component as compare to cropping alone (88 man days ha^{-1} $year^{-1}$). Integration of other components with cropping increases the labour requirement and thus provides scope to employ family labour round the year without much lean and peak demand for labour.

Efficient utilization of costly input is the need of the time. Integration of different system components and recycling of by-products and farm wastes has been practiced in farming system. Total 74139 kg farm waste and 14600 litre cow urine of Rs. 69156 value was recycled from 1.0 ha IFS model, IGKV, Raipur during 2014-15.

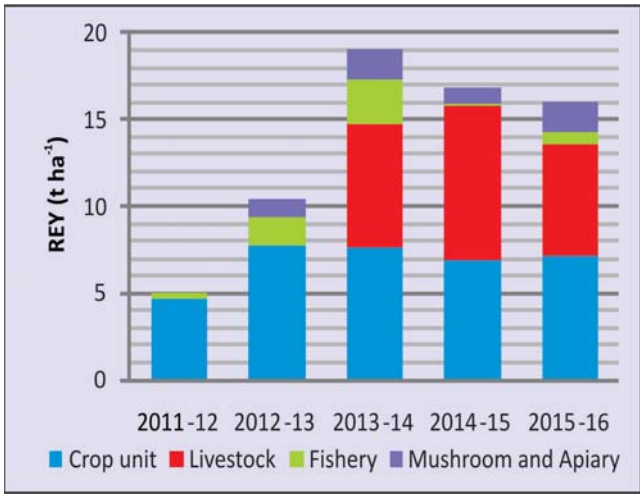
Livelihood analysis (Table) show that even after meeting all family requirements and deducting variable cost farmers can save Rs. 49,978 $year^{-1}$ to meet other miscellaneous expenditures.

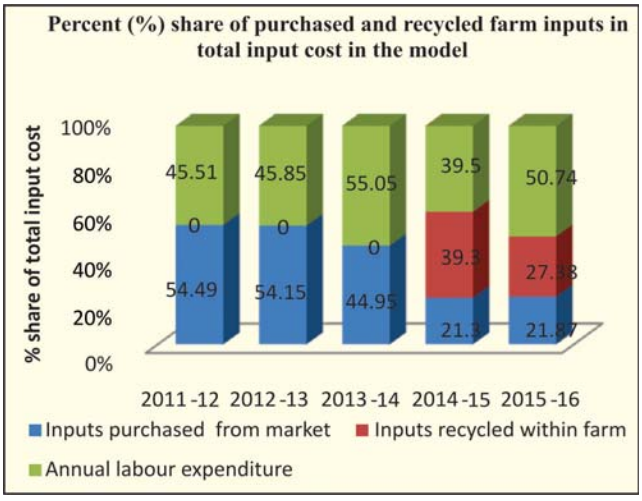
Ranchi

Based on the base line data of the region, an integrated farming system model of 1 ha comprising of components like cropping, milch cows, fishery, apiary, mushroom production, nutritional garden and vermicompost was undertaken at Agronomy Research Farm of Birsa Agricultural University during 2011-12 to 2015-16, to study the productivity, profitability, employment generation and resource recycling of integrated farming system.

Integrated farming system provided an opportunity to increase the economic yield per unit time by intensification of cropping and integration of allied enterprises. Among the components, the highest net return was obtained from crop (Rs. 64573) followed by livestock (Rs. 51531), fishery (Rs. 7085) and other agricultural enterprises i.e. apiary, mushroom and vermicompost (Rs. 7897). On an average of last five years, production (REY), gross returns and net returns were reported 13.45 t ha^{-1} $year^{-1}$, Rs. 2,04694 and Rs. 1,08,894 ha^{-1} $year^{-1}$, respectively.

With overall adoption of integrated farming system lower down the production cost due to better recycling of resources produced within the farm (27.38 to 39.3%) which enhanced the net return (Rs. 108894 ha^{-1} $year^{-1}$) and employment generation (379 mandays/ha/year) of integrated farming system.Thus, to improve the productivity, economic returns and employment generation for family labour, integrated farming system could be adopted instead of cultivating the crops alone by the farmers of Jharkhand state.





Dairy Unit in IFS

Paddy in Rice- wheat system

***Tephrosia spp.* on dyke**

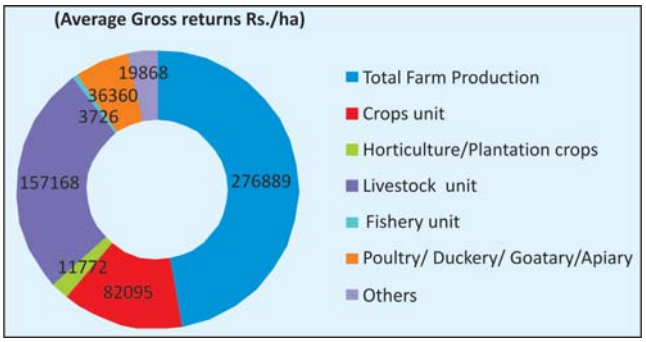
Mushroom Unit

8. CENTRAL PLATEAU AND HILLS

AICRP-IFS Centre Jabalpur (MP), represents ACR Central Plateau and hill Region of the country. The predominant farming system of the Jabalpur is crop + dairy which rank 1st with the contribution of 80% area coverage. The 2nd ranking crop + dairy + horticulture (vegetables) contributes about 15% coverage area and other farming system is crop + dairy + fishery contributes 5% coverage area. 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 during kharif season of 2012. In the IFS model cropping component covers 0.64 ha, dairy component covers 0.007 ha with 3 cow + 1 calf, fisheries component 0.06 ha (1800 m^3), poultry component 300 birds, vermicompost 0.0039 ha and mandatory other enterprises like kitchen garden, boundary plantation etc.

The demand and production of different farm commodities required for the 5 members family for their livelihood is cereals 1050 kg, pulses 50 kg, oilseeds 108 kg, milk 720 liter, vegetables 360 kg, green fodder for 3 cow + 1 calf 22500 kg and dry fodder 4583 kg per annum. The actual annual average production of different farm commodities for whole family and animals were cereals 2665 kg, pulses 85 kg, oilseeds 67 kg, maize cobs 2017 no., milk 4193 liter, vegetables 842 kg, live fencing with Karonda 70 kg, green fodder for 3 cow + 1 calf 10129 kg and dry fodder 3932 kg, fisheries + poultry 192 kg and others (vermicompost) 3156 kg per annum. The average total farm productivity in terms of Rice Equivalent Yield (REY) is 24.32 t ha^{-1} $year^{-1}$, out of which the cropping component

yields 6.48 t ha^{-1} year^{-1}, horticultural crops 2.94 t ha^{-1} year^{-1}, livestock unit (dairy) 12.94 t ha^{-1} year^{-1}, fisheries 0.26 t ha^{-1} year^{-1}, poultry 2.51 t ha^{-1} year^{-1} and others, which includes mushroom, vermicompost, border planting and kitchen gardening 1.61 t ha^{-1} year^{-1}. The total average gross and net monitory returns of the IFS model fetched Rs 276889 and 108312 ha^{-1} year^{-1}, respectively. Component wise average total returns during study period (Year 2012-13 to 2015-16) is predicted in fig.



The crop+ dairy enterprises produces a number of by product which were recycled and is used as intermittent for both the components which save the money of rupees 35932 annum^{-1}. The average total input cost and percentage share of input purchased and recycled within the system were Rs 170268 and with the value of input purchased from the market Rs 54006 and value of input generated and recycled within the farm were Rs 21945 annum^{-1}. Further, the success of any IFS model is depends upon the employment generation for the farmers and their year round work for checking the migration of farmers from rural to urban areas. The different components generated the employment 516 man day of worth Rs 96649 (Rs 198 day^{-1}) out of this the cropping component 131, dairy 184.5, horticulture 114.5, fisheries and others includes vermicompost, mushroom, boundary plantation and poultry was 100 man days. The all farm commodities produced a farm of worth Rs 241066 ha^{-1} year^{-1}, out of which Rs 26645 were recycled within the system and rest of the amount of Rs 214421 were marketable surplus.

9. WESTERN PLATEAU AND HILLS

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. Region specific on station IFS models are being developed at all the three respective centers. Composition of IFS models and production & economic trends under scientific management and prevailing farming practices are summarized below;

Akola

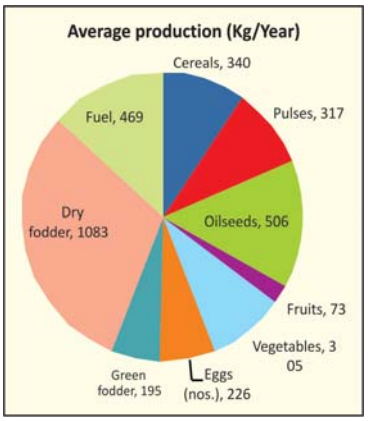
To increase the productivity, profitability and bring sustainability under small and marginal farmers of Vidarbha Region of Maharashtra state, an IFS model was established at main center of Dr. PDKV, Akola during 2012-13 on an one hectare irrigated land to meet out the needs of an average family of 5-6 members. This model includes crops and cropping systems (0.70 ha), horticulture (0.25 ha), goatary, poultry, kitchen gardening, boundary plantation and composting (0.05 ha) etc.

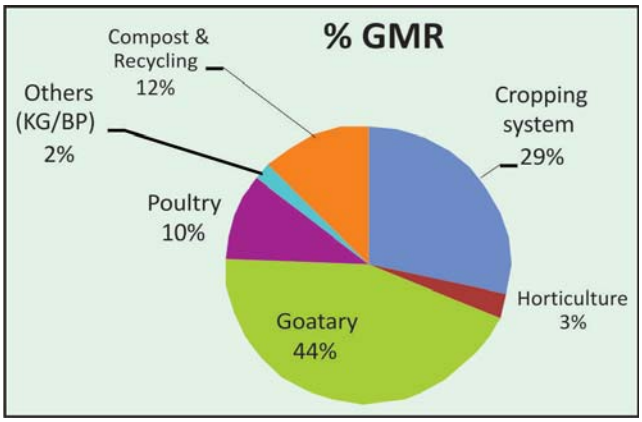
Last 4 years results confirmed that the adoption of IFS by inclusion of crop based enterprises, horticulture, goatary, poultry and related subsidiary unit have recorded overall average production of 35.14 q ha^{-1} and net profit of Rs. 61,066 ha^{-1} year^{-1}. The highest profit received from goatary (Rs. 18689/-) followed by crop (Rs. 12913), poultry (Rs. 9208), compost and recycling (Rs.22921), horticulture (Rs.986) and kitchen gardening (Rs.3651). Similarly, component wise overall average productivity in term of Soybean Equivalent Yield (SEY) was (52.20 q ha^{-1} of SEY) out of which goatary alone had contributing highest profit (25.60 q ha^{-1}) followed by crop (15.80 q ha^{-1}), poultry (5.70 q ha^{-1}), kitchen gardening (3.30 q ha^{-1}), horticulture (1.80 q ha^{-1}) and compost and recycling.

Farm compost and recycling of farm wastes and crop residues etc. contributed worth Rs. 22921. In term of plant nutrient 206 kg of NPK

Table 7.1.1/15: Profit through value addition of pigeon pea (2014)

Items	Without value addition			With value addition (VA)			Processing charges (Rs)	Income (Rs)	Net income through V.A (Rs)
	Prodn. (q)	Rate (Rs q^{-1})	Amount (Rs)	Processed Dal (q)	Rate (Rs q^{-1})	Total income (Rs)			
Pigeonpea whole grain	1.00	4300	4300	0.65 (Full)	7500	4875	500	—	—
—	—	—	—	0.30 (Broken)	3500	1050	—	—	—
—	—	—	—	0.05 (seed coat)	1000	50	—	—	—
Total	**1.00**	**4300**	**4300**	**1.00**	**—**	**5975**	**500**	**5475**	**1175**





year^{-1} added to the soil (74 kg N + 21 kg P_2O_5 + 111 kg K_2O) saving an amount of Rs. 4495/- and improves the soil health. Total annual man-days generated was 469 days.

Value addition of pigeon pea dal also contributed to 27.33 % in income. The system average gross returns from 1.0 hectare irrigated model was Rs. 188333 with net profit realization of Rs. 61066 ha^{-1} year^{-1}.

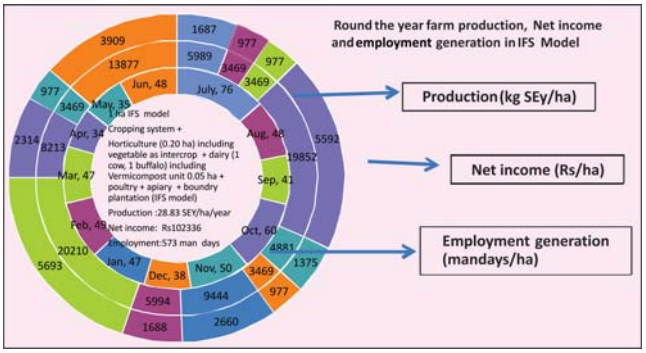
Parbhani

An Integrated Farming System model was established at VNMKV, Parbhani during the year 2010-11 with a land area of 1.0 ha. The land was allocated under different components of Integrated farming system *viz.* Field crops, Horticultural crops, Livestock, Poultry and Apiary with the objective to meet up different family requirement (of five members family. IFS model comprising of cropping systems - Soybean-Wheat (0.1 ha), Soybean-Rabi Sorghum (0.1 ha), Soybean-Onion (0.1 ha), Green gram-Brinjal (0.16 ha); Fodder crops *viz*. Hybrid Napier (0.075 ha) and Lucerne (0.075 ha) were grown, horticulture [*Kagzi lime* (0.20 ha) intercrop –*Kharif* Soybean and *Rabi* Cabbage, spices- Turmeric (0.1 ha), Boundary plantation such as Anjan and Drumstick on 0.04 ha + dairy including animal shed (1 Cow-Holdev and 1 Buffallo- Murrah), vermicompost (0.05 ha) developed for the Marginal and Small farmers of Central Maharashtra Plateau Zone (MH-7) .

The average Soybean equivalent yield recorded from 2010-11 to 2015-16 was 6.69 tonnes ha^{-1} with average Gross return of Rs. 235025/- and Net return of Rs. 101373/- . The Gross return of Rs. 251266/-, Rs. 220168/-, Rs. 214740/-, Rs. 274499/- and Rs. 214451/- during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively. The Net return of Rs. 116311/-, Rs. 95744/-, Rs. 100718/-,

Rs. 106536/- and Rs. 87554/- during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 respectively (Fig. 5). The Benefit cost ratio recorded from 2010-11 to 2015-16 was 1.72. The average gross and net return recorded from cropping system of Rs. 68982/-, (Rs. 39796/-), horticulture Rs. 38171/- (Rs. 17223/-), Livestock Rs. 56474/- (Rs. 29025/-), Poultry, Apiary of Rs. 43319/- (Rs. 10574/-) and Vermicompost of Rs. 16956/- (Rs. 9735/-), respectively.

The total value of recycled farm product within the IFS model of Rs. 15586/-. The total average 416 man days generated from IFS model during 2010-11 to 2015-16. The average saving from the recycled farm product of Rs. 36527/- (29.0%).



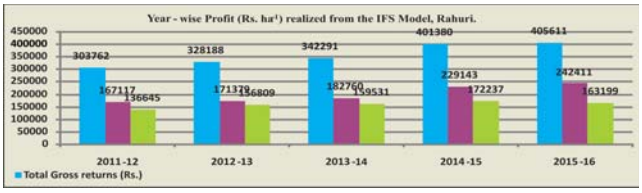
This system helps in sustaining farm income by reducing the cost of production; as agricultural waste (bio-waste) are efficiently recycled in the system so it helps in reducing environmental pollution, maintain soil fertility and agricultural sustainability. The net amount i.e. Rs. 101373/- remains in the hand of Farm family as savings which may be used to meet up other requirement and also as future savings. Hence, the IFS model developed by AICRP on IFS may be recommended for the small and marginal farmers of the region under irrigated situation.

Rahuri

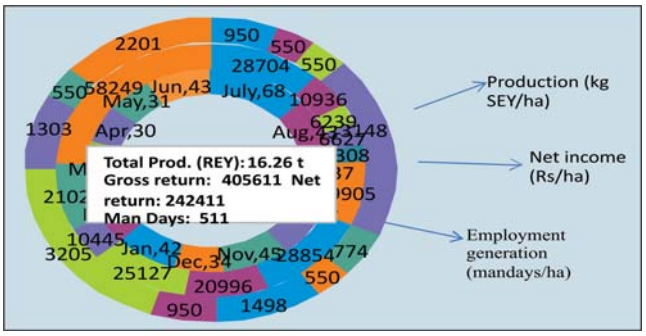
The integrated farming systems (IFS) unit at MPKV, Rahuri was started during 2010-11. The model is developed for small farming household with 1.00 ha area under irrigated ecosystem. The present system consists of cropping system, horticultural plantation, dairy, poultry, vermi-compost unit and boundary plantation.

The gross returns were Rs. 3,03,762/-, 3,28,188/-, 3,42,291/-, 4,01,380/- and 4,05,611/- during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16, respectively. The respective net returns were Rs. 1,67,117/-, 1,71,379/-, 1,82,760/-, 2,29,143/- and 2,42,411/-. However, the net return increased to Rs. 2, 42,411/- with benefit cost ratio 2.48 during 2015-16. Among different components of IFS, poultry and horticultural components were the most remunerative. The productivity of dairy component was the most inconsistent. The relative contribution of gross return from dairy component to gross return from the whole system was quite high however, relative contribution of net return from this component in the whole system was low. This indicates that the cost involved in dairy is comparatively high.

The IFS system generated total employment of 311, 309, 391,309 and 511 man days during 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16, respectively.



Recycling of farm products and by-products and creation of labour days are the two major objectives of the IFS. Inputs purchased from outside, inputs recycled within the system and cost on labour contributed 50, 25 and 25% to the total cost of production of the system during the year 2014-15. The respective contributions were 34, 33 and 33 % in 2015-16. Hence, it reveals that though the cost on inputs purchased from outside has decreased in 2015-16, however the cost on recycled inputs and labour has increased subsequently. Further, The month-wise production, returns, employment generation (2015-16) is presented below ;



10. SOUTHERN PLATEAU AND HILLS

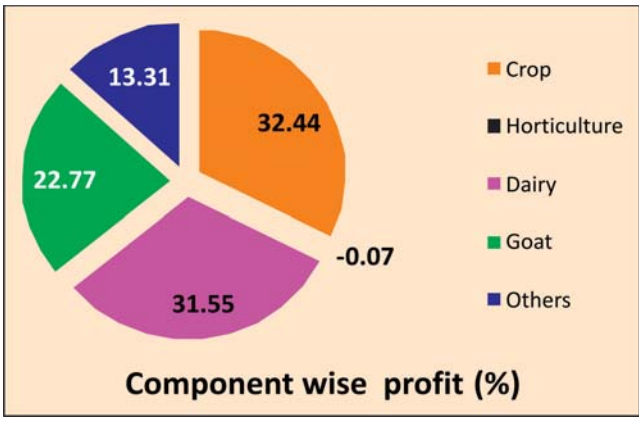
Four AICRP-IFS centers namely, ANGRAU, Rajendra Nagar, Hyderabad (A.P.), TNAU, Coimbatore (Tamilnadu), ARS, Kathalgarh (Karnataka) and ARS, Sirriguppa (Karnataka) are located in different NARP zones of Southern Plateau and Hill Agro Climatic Zone of the country. All the centers have developed region specific IFS models at their respective centers since 2010-11. The composition and significant achievements of last 4-5 years of respective centers are given below

Coimbatore

IFS study on development of integrated farming system model for small farmers of irrigated dryland in western zone of Tamil Nadu was initiated in research farm of TNAU, Coimbatore during June 2010, with an objective to develop and validate Integrated Farming System model for enhanced system productivity, profitability and sustainability in irrigated dryland, to assess relative efficiencies of the IFS model in terms of economics, resource use and energy and to optimize individual components of IFS in regional perspective. The predominant farming systems followed is crop + dairy in 70 % area and crop + dairy + goat in 30 % area. The average size of a farm family is five members (3 male and 2 females).

The model was designed for 1.2 ha land holding, to support a family of five to six members. The IFS model comprised of crop unit, horticulture (aonla, sapota, guava and pomegranate), dairy unit (2+1), goat unit (10+1), biogas unit (2 m^3), vermicompost unit, border plants (annual moringa, curry leaf and agathi) and area under supporting activities.

The average total farm production per year in terms of Maize equivalent yield from main product was 38.2 t ha^{-1} and from by product was 7.7 t ha^{-1} summing to a total of 46 t. From an average of five years study (2011-2016), it can be concluded that cropping component recorded the net return of ₹ 94,586. Dairy and goat unit registered net returns of 91,588 and 66,389 respectively. The net returns from other enterprises like vermicompost unit, biogas unit, Compost yard, Border plants and kitchen garden was 39,955. Considering horticulture, since the income from the tree component will be realized from 4th year onwards the net returns were not appreciable. By adopting the IFS approach developed at the center, a net return of 2,92,702 $year^{-1}$ could be realized from 1.20 ha farm unit.

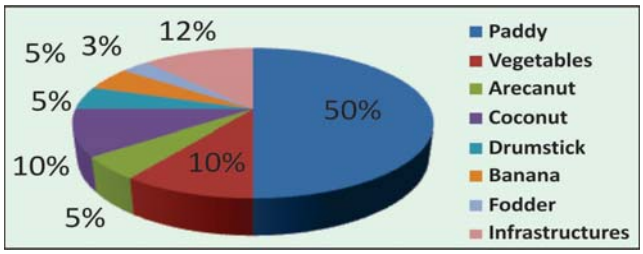


Saving of production cost, with recycled farm products was 27.6 % (Rs. 1,12,573) and farm labour engaged was 35.9 % (Rs. 1,46,531). The nutrient addition through vermicompost and FYM was 191 kg N, 86 kg P and 112 kg K per year. The IFS approach generated an employment of 778 man days round the year with a benefit cost ratio of 1.96.

Kathalgere

The IFS study has been conducted on irrigated based integrated farming system for marginal and

small farm holders with an area of 1.0 ha at Agricultural and Horticultural Research Station, Kathalagere, Davangere district of Karnataka state under Bhadra command area during 2011-12 to 2015-16. The allocation of land resource for accommodating different enterprises was done as per the family needs (calculated for a family of 5 members) and size/numbers of individual components of the system. Out of one hectare area, 0.50 hectare was allotted for crop component (Cereals, pulses and millets), 0.35 hectare was taken up with Horticulture crops (Arecanut, Coconut, Banana, Drumstick and Vegetables). Diary and Sheep components were also introduced as additional components with buffalo (one) + HF cow (two) and sheep (10+1). Green fodder block was fixed in an area of 0.03 hectare. Additional components like compost (2 units), vermicompost (3 units) and Azolla (2 units) were included subsequently in the system. Cow dung, urine, sheep excreta, farm wastes and crop residues were properly recycled by composting (FYM and vermicompost) and incorporated in to the soil. Similarly, Azolla was released in to paddy field as source of nitrogen fixer and also used as animal feed in limited quantity (1:10 ratio of azolla and feed).



Component wise area allocation (%)

The data after 5th year of study indicated that adoption of integrated farming system by inclusion of crop based enterprises, Horticulture, Dairy, Sheep and other subsidiary units have recorded overall average net returns of Rs. 186571 and highest was contributed by crop component alone (Rs.80795) followed by dairy (Rs. 47378), horticulture (Rs. 38526) and sheep (Rs. 17876). Similarly, component wise overall average farm production is (43.52 Rice equivalent yield t ha^{-1}). Out of this crop component alone is contributing highest production (16.04 REY t ha^{-1}), followed by Horticulture (11.80 REY t ha^{-1}), vermi compost (1.88 REY t ha^{-1}) and Dairy (1.75 REY t ha^{-1}). Apart from growing crop component alone other subsidiary enterprises are significantly contributing in improvement of net profit of farmer.

The total quantity of produce recycled was (26,316 kg l^{-1} nos^{-1}) worth of Rs.43, 846 (three years average) was obtained. Effective recycling of farm waste in terms of vermicompost/compost can save Rs.12634 by addition of 1256 kg of nutrients in-terms of N, P & K.

Integrated farming system has created more number of working hours in the system due to involvement of more enterprises than cropping system alone. 1.0 ha model has generated 515 mandays, 760 mandays, 1070 mandays and 932 mandays per hectare per year during 2012-13, 2013-14, 2014-15 and 2015-16 respectively

Rajendernagar

Integrated Farming Systems research was initiated at Rajendranagar, PJTSAU in 1.0 ha land under irrigated dry situation during 2010-11. The

Table 7.1.1/16: Total amount of nutrient added through recycling and its market value during 2015-16

Recyclable Farm waste	Quantity (kg)	Nutrient content (%) and total recyclable nutrients (kg) N (kg)	P (kg)	K (kg)	Quantity of fertilizers (kg)	Value in rupees (Rs.)
Vermicompost	3217	32.17	11.91	17.05	540.5 (Urea)	3784
Cow dung	7754	85.29	33.34	36.44	489.2 (SSP)	4256
Sheep litter	4462	131.63	33.02	81.65	229.7 (MOP)	4594
Total	15433	249.09	78.27	135.14	-	12634

land was earmarked for developing 1 hectare Model for marginal / small farmers by integrating crops with horticulture and animal components. The crop component includes arable cropping systems viz., rice-maize, rice-sunflower, maize-castor, maize + pigeonpea-cowpea and pigeonpea + greengram-groundnut. The horticulture component includes a fruit crop guava and seasonal vegetable intercrops like tomato, green chillies, bhendi during rainy season and carrot, beetroot, cluster bean in rabi season. Horticulture, fodder block and boundary plantation was established and initiated during 2010. The Livestock component with 2 dairy buffaloes (Murrah Breed), 6 goats (Osmanabadi) and a unit of 20 backyard poultry birds (Vanaraja) was started during kharif season 2011 and the full pledged Integrated Farming Systems research is being conducted since then. Complementary units like Vermicomposting and composting were included for residue recycling in the system. During 2015-16, new cropping systems were included in the unit *viz*., Bt cotton+Greengram –Fodder Sorghum, Pigeonpea + Sweet corn – Bajra, Maize-Groundnut and Sunhemp in the Maize+Pigeonpea – Cowpea system.

An overview of Crop + horticulture + livestock farming system in 1 ha area for ID situations of Telangana

During fifth year (2015-16) of the study, total productivity of 37.21 t REY ha^{-1} and the net returns of Rs.1, 59, 020/- with a benefit cost ratio of 1.43 were recorded from 1 ha of IFS with a variable cost of production of Rs.3,65,633/-. Out of the total net income, crops including fodder contributed to an extent of 61.00% returns, followed by livestock unit with 28.34% share and 7.71% from complementary units like FYM & Vermicomposting. Least contribution was observed from horticulture unit with 2.95% share in net returns. On an average, productivity of 29.39 t REY ha^{-1} was recorded in IFS unit with an annual operational cost of Rs. 3,04,759/- and net returns of Rs. 1,00,947 ha^{-1} yr^{-1}. On an average 2591 kg of cereals 160 kg pulses, 405 kg oil seeds, 2436 litres of milk 1140 kg of vegetables were produced in the system as against annual demand of 730 kg of cereals, 125 kg pulses, 120 oil seeds, 400 litres of milk 300 kg of vegetables for five member farm family. Component wise share of inputs and labour in total cost of cultivation indicated that 27.00% of total COC was on inputs purchased from outside and 23.80% of COC could be met through input recycling, 31.10% of expenses on labour could be met through family labour and only 18.1% of total COC was on hiring of labour (Table 12). The average contribution of different farm enterprises to net income were highest with cropping unit (82.86%) followed by livestock unit comprising of buffaloes, goats and poultry (12.49%) and complementary enterprises contributed to a tune of 3.82%. The lowest share in net returns (0.84%) was recorded by the guava orchard with under storey vegetables horticulture unit as the orchard has not yet attained the full bearing stage.

Livelihood analysis of the year 2015-16 indicated that the current Crop + Livestock + Horticulture integrated farming system results in a total family saving of Rs. 2,17,707/-. The system resulted in production of Rs. 3,67,716/- worth of marketable surplus after meeting the requirement of family (worth of Rs. 55,525/- with an assumed family size of 2+3) (Table 18). Out of all the farm enterprises, goatery unit recorded maximum marketable surplus of Rs.1,54,832/- followed by dairy unit with Rs.1,47,230/- and value addition with FYM and vermicomposting with Rs.13,795/-.

From all the farm enterprises in the system, material worth of Rs. 1,01,407/- was recycled.

Maximum amount of recycled material worth of Rs. 85,187/- was recorded from cropping unit followed by Livestock & complementary units (FYM & Vermicomposting) accounting Rs.16,219/-. Family savings worth of Rs. 1,08,207/- was recorded from goatery unit and value addition.

An amount of Rs. 1,09,500/- (547.5 man days @ Rs. 200/day) can be saved by providing employment to the family members.

Siruguppa

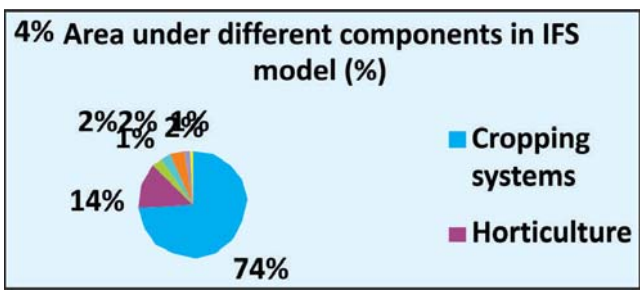
An Integrated Farming System model of 1 ha was established at Agricultural Research Station, Siruguppa, Karnataka, under AICRP on Integrated Farming System for livelihood security of small farmers in Tungabhadra Project area during the year 2010-11. The soil was low in available nitrogen (280 kg ha^{-1}), medium in organic carbon content (0.67 %) and available P (10.8) and rich in K (364 kg ha^{-1}) status. The land was allocated under different components mainly on agriculture components including crop (Cereals and pulses components in 0.74 ha), horticultural in 0.18 ha (Sapota, curryleaf, papaya, vegetables and floriculture) and fodder component in area of 0.02 ha. The remaining land of 0.06 ha was allotted for agriculture allied activities such as live stock unit including 2 cows, one buffalo and goatary (14 nos.), Fish pond, Vermicomposting unit (4), compost unit (1) and Azolla unit (1). The boundary plantation with teak and glyricidia was established to protect the unit and to generate the biomass for further utilization. The internal bunds were also planted with pigeon pea, fig and banana to meet out nutritional security of a small family (of six member's family).

Results revels that higher system equivalent yield (SEY) in terms of rice equivalent yield of 29.05 t ha^{-1} was recorded during 2014-15 as compared to initial year of 2011-12 (10.75 kg ha^{-1}) and it was increase with the years except during 2015-16. Among the different components, livestock unit contributed more towards SEY than the others. The higher grass returns of Rs. 375484 and net returns of Rs. 208779 was noticed during 2015-16 and were relatively increases with year's. However, IFS model recorded the average of five years gross and net return of Rs. 117734 and Rs. 70376 from crop component, Rs. 36241 and Rs. 19320 from horticulture, Rs 102810 and 43950 from dairy and Rs. 18,984 and Rs. 9800 from goatary unit, respectively.

The IFS model generate employment throughout the year, however, the higher average employment generated (man days/year) was recorded in dairy component (225) followed by crop component (155) and lowest being in horticulture system (67).

The system also generated farm waste (12 t), crop residue (4.18 t) and animal (5t) and goat manures (2t) were used to generate the vermicompost of 5.78 ton and compost of 15 tons. The existing IFS models not only profitable but also achieve the sustainable yields and on the other hand conserve the natural resource by recycling the farm waste and generate the employment throughout the year and finally assures the nutritional security of small farmers.

The farm production data given in table below reveal that diversified system is sufficient enough to meet all family demands of food, fodder and fuel



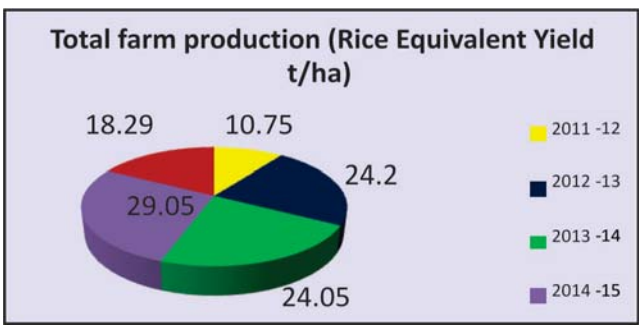


Table 7.1.1/17: Demand and production of essential farm commodities (kg/litre)to meet household food, feed and other daily meal requirements

Year	Demand and Production of Different Farm Commodities (Kg Litre^{-1} No.$^{-1}$ etc.)										
	Cereals	Pulses	Oilseeds	Milk	Fruits	Vegetables	G.F.	D.F.	Azolla	Fuel Wood	VC
Annual Demand of essential food and fodder commodities for a farm family with 5/6/7 family members (On an average)											
	1808	233	152	1307	233	1050	30375	6188	0	1500	0
Actual annual production of different farm commodities at farm											
2011-12	4368	273	73	2000	0	828.5	525	5510	0	0	0
2012-13	5519	248	81.4	1213	100	1965	5400	7838	90	571	0
2013-14	4775	428	70	1170	62	2575	6013	6250	0	0	5110
2014-15	5736	109.5	0	1515	245	2505	5000	7456	0	0	4670
2015-16	4399	391	0	1117	122	827	10175	9353	0	0	5710
Average	**4959**	**289.9**	**44.88**	**1403**	**105.8**	**1740.1**	**5422.6**	**7281.4**	**18**	**114.2**	**3098**

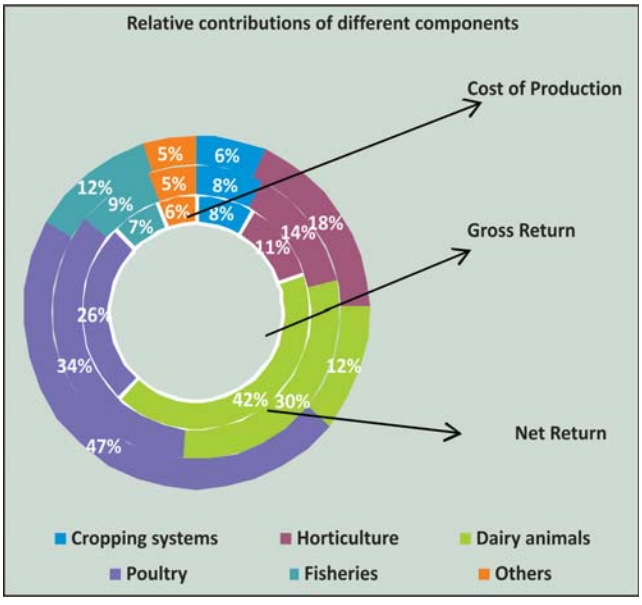
etc. and help in improving nutritional status of human daily meal and fodder of animals.

11. EAST COAST PLAIN & HILLS

AICRP-IFS Center at Bhubaneswar (Odisha)

AICRP-IFS center at Bhubneshwar (Odisha) representing East Coast Plain & Hill region is in process of developing an IFS Model for small land holders of the region since 2010-11. However, integrated farming systems at OUAT, Bhubaneswar could start during April, 2012 with existing infrastructures like office building, coconut plantation, dairy and poultry buildings, pond and some silvicultural plants. The IFS model 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 gross and net returns were Rs. 2,34, 827, Rs. 1,81, 774, Rs. 2,96, 199, Rs. 3,95, 161 and Rs.68,788, Rs.48,256,Rs.1,14,686, Rs.1,57,802 during 2012-13, 2013-14, 2014-15 and 2015-16, respectively.

Relative contributions of different components to the whole system with respect to gross return, net return and cost of production is presented in Fig. 1. The poultry and horticultural components were the most remunerative. The productivity of dairy component was the most inconsistent. The relative contribution of gross return from dairy component to gross return from the whole system was quite high; however, relative contribution of net return from this component to the net return from the whole system was low. This indicates that the cost involved in dairy is comparatively high.



Recycling of farm products and by-products, and creation of labour days are the two major objectives of the IFS. For the unit of 1.25 ha area at Bhubaneswar during 2015-16, inputs purchased from outside, inputs recycled within the system and cost on labour contributed 49, 19 and 32% to the total cost of production of the system during the year 2014-15. The respective contributions were 48, 11 and 41% in 2015-16. Employment generation during the period was 452, 390, 459 and 493 man days, respectively.

12. WESTERN COAST PLAINS & HILLS

In this particular Agro Climatic Region three AICRP-IFS centers one each in the states of Goa (ICAR Research Complex, Goa), Maharashtra (Karjat) and Kerala (Karmana) are in process of developing of Region Specific IFS Models for respective states . The composition of IFS models and performances of production and productivity in respective regions are summarized below;

Goa

Goa is a small State in the West coast of India. The average holding size of farmers is below 0.5 ha. These small land holdings are further characterized by undulating terrain with diverse soil conditions. The marginal uplands with shallow soils are dominated by cashew crop. However, the local food habits of rice-fish curry, use of coconut in most of the culinary preparations and cashew for beverage and food needs to be met continuously by the agricultural sector. Further, the local milk production is only one third of the present demand to meet the daily minimum basic requirement (0.25 litres head^{-1}).

a) Integrated farming system models for typical lowland (rice based) situations

Integrated farming system models involving rice, pulses, oilseeds etc. in different possible crop combinations integrated with livestock and fish species for a family size of 6 members in an area of 0.5 ha under lateritic soil condition was initiated in 2012-13. The components and area allocation is as follows,

Results of last four years study revealed that average gross and net returns were Rs. 2,73,020 and Rs.1,67,920 respectively, and constantly increased in successive years of the study which shows the stability of the IFS approach. Higher net return was recorded in the rice-sweet corn system followed by rice - brinjal system during all the year of study. This indicates better economic efficiency of the rice-sweet corn-dairy system and rice – brinjal - dairy system. Benefit-cost ratio directly compares benefits and costs. This criterion indicates the rate of return per rupee invested in a farm enterprise. The higher benefit cost ratio was recorded with the rice-sweet corn-dairy system followed by rice-brinjal-dairy system due to higher market demand and higher market price.

In addition to above, diversified nature of IFS approach could made available almost all the food/ fodder/fuel need alongwith improved nutritional feed components.

Table 7.1.1/18: Different components of lowland IFS model

Cropping System	Area (ha)	*Kharif*	*Rabi*
Cropping system 1	0.1	Rice (Jyoti)	Sweet Corn (S-75)
Cropping system 2	0.1	Rice	Brinjal (Agassim selection)
Cropping system 3	0.1	Rice	Ground nut (TAG 24)
Cropping system 4	0.1	Rice	Cowpea ((DU-3)
Livestock	Cow cross breed [Jersey × Sindhi] (1 cow + 1 Heifer and 1 calf), Poultry (3 birds- Gramapriya)		
Supplementary	Vermicompost and mushroom (0.02 ha), Kitchen garden (80m^2)		

Table 7.1.1/19: Economics of IFS lowland (rice based) system

Years	Gross Returns (Rs.) (Value of all the farm commodities produced at farm)	Net Return (Rs.) (Gross returns – cost of production)	B:C Economics point of view Gross returns dividedby cost of production
2010-11	212500	107400	2.02
2011-12	234600	129500	2.23
2012-13	278800	173700	2.65
2013-14	292400	187300	2.78
2014-15	346800	241700	3.30
Average	273020	167920	2.60

b) Plantation crop (Upland) based integrated farming system model

A upland model of area 0.8 ha comprising of enterprises such as Plantation crops: Cashew (variety Bhaskara) + Pineapple (Variety Giant Kew), Coconut (benaulim)+ Pineapple (Giant Kew) + Noni + Tapioca, Areca nut (Mangala) + Banana (G-9), piggery, poultry, vermicompost unit, compost unit was evaluated for upland situations of Goa. After fifth of year of start of the IFS model, the gross return of the system was around Rs. 1,60,550 Lakhs and the net profit was Rs. 89,510. The highest contribution to net profit was from the piggery unit (38%) followed by cashew-pineapple system (20%) as both the crops started yielding. As the orchard is young the gross return and net return was found less, over the year the contribution from individual system will increase significantly. The benefit cost ratio of the system was 1.25.

Karjat

The prevailing farming system in Konkan region consists Field crops + Horticulture + Livestock + Composting, comprising an area of 73 % whereas, second ranking farming system adopted by farmers is Field crops + Dairy/Draught animals on an area of 18 %. The land holding of small and marginal farmers is 1.44 and 0.36 ha, respectively. The Integrated Farming System Model of 1.00 ha area has been developed under AICRP on IFS at RARS, Karjat for family having 3 males and 3 females (6 persons). The IFS model comprised different enterprises *viz.,* crops and cropping systems on an area of 0.50 ha, horticulture component (fruit crops + nursery) 0.40 ha, livestock components namely, dairy, goatary and poultry on area of 35.75 m^2 each (107.25 m^2), vermicompost unit on 18.00 m^2 and rest of the land (874.75 m^2) used for operational and other purposes.This region is dominated by rice based cropping systems due to high rainfall. Therefore, the total production of the model is converted in terms of rice grain equivalent yield (REY).

The average of three years data showed total production of 38.38 t REY obtained from 1.00 ha area. In terms of economic returns, the gross and net returns were Rs. 5,28,161.28/- and Rs. 1,23,479.50/-, respectively with B: C ratio 1.31. Under crops and cropping systems, Rice – Brinjal, Rice – Watermelon, Finger millet – Cowpea, Cucumber – Sweet corn, Groundnut - Field bean and Fodder crop, Napier Bajra (perennial) systems were grown on 0.50 ha area. This component produced 10.99 t REY (28.63 %) with gross and

Cost of production	Cashew-pineapple	Coconut- Pineapple-noni	Areca nut-Banana	Piggery	Poultry	Total
Gross income	36000	28450	26500	57500	12100	160550
Net income	18110	14770	17300	34050	5280	89510

net returns for Rs. 1,50,951 (28.58 %) and 50,362 (40.79 %), respectively. The horticulture component included fruit crops namely, mango, anola, sapota and coconut grown on area of 0.35 ha apart from nursery (0.05 ha). In nursery, mango and sapota grafts were prepared and sold. The contribution of horticulture component in terms of REY was 6.14 tonnes (16.00 % of total production). This component contributed Rs. 85,002/- (16.09 %) and Rs. 13,602 (11.02 %) gross and net monetary returns, respectively. Livestock component comprised dairy, poultry and goatary. Initially in the year 2012-13, two cross bred jursey and 1 local cow were purchased. Dairy component contributed 8.19 tonnes REY which was 21.34 % of the total REY. Dairy component gave average gross and net returns of Rs. 1,12,373/- and Rs. 26,569/-, respectively. The per cent share of gross and net returns to total was 21.28 and 21.52, respectively. At the initiation of model, goat unit of 6 females and 1 male was purchased. Every year the sellable male and female goats were sold. Average of 3 years showed that the goat unit contributed 4.67 tonnes REY and its per cent share was 12.17. This component realized Rs. 64,277 (12.17 %) gross and Rs. 13,041 (10.56 %) net returns.The average production of 5.01 tonnes REY was obtained from poultry component which was 13.05 per cent in total IFS model production. This realized Rs. 69,240/- and Rs. 16,846/- gross and net returns, respectively. In terms of percentage it was of 13.11 % and 13.64 % of total gross and net returns, respectively.The edible by-produce of crops and cropping systems and main produce of forage crop were fed as a green and dry fodder to dairy animals. Total cost of production of the IFS model during 2015-16 was Rs. 4,76,605/- ha^{-1}, which included outside purchase for Rs. 1,70,925/- ha^{-1} (35.86%), value of recycled material within the system of Rs. 1,01,469/- ha^{-1}(21.29%) and for farm labours costing Rs. 2,04,210/- ha^{-1} (42.85%). Economic indices showed the gross and net profit of Rs. 6,21,502/- and Rs. 1,44,896/- ha^{-1}, respectively with B: C ratio 1.30 during 2015-16.

Crop residues, livestock manures/ droppings and shed wastes were used for preparation of vermicompost. The vermicompost unit produced 3.38 t REY (8.81 %) giving Rs. 46,316/- (8.77 %) and Rs. 3,057 (2.48 %) average gross and net returns, respectively. The component wise production of recycled material and their intermittent use with their market values were also estimated. Total quantity of 41,741 kg lit^{-1} $No.^{-1}$ of farm produce and by produce for worth of Rs. 1,01,469/- (21.29 %) to be purchased from the market were utilized and recycled within different components of the model during 2015-16.

The average employment generation through present IFS model was found to be 964 man days and its value was Rs. 1,68,504/- which contributed 41.64 % in the total cost of production. Farmers

Table 7.1.1/20: Livelihood analysis of an IFS Model – Value of farm commodities in term of Rupees.

Farm Enterprises	Value - All farm commodities (A)	Value - Farm commodities consumed (B)	Farm commodities Recycled (C)	Surplus (A-B-C)=D	Family savings (D- Cost)
Crops/Cropping Systems(Including vegetables/flowers)	157663	44096	11875	101691.75	-
Dairy (Milch Animals)	109834	18240	20578	71016	-
Horticulture (Fruit crop)	137766	8640	36326	92800	-
Goatary	76255	-	-	76255	22155
Poultry	98659	14400	-	84259	14404
Value addition	41325	-	32690	8634.25	-
Total (GR)	621502	85376	101469	434656	36559

can increase their net returns by saving the expenditure on farm labours through employment of family labours. The livelihood analysis of the IFS model is presented in Table 12. From the data it is seen that family can save Rs. 36,559/- from one hectare area after meeting almost all requirements of the family.

Karmana

AICRP-IFS center at Karmana has developed four IFS models *viz*; Banana based, Coconut based, Homestead based and Rice based farming systems for different situations. The progress of all the models in brief is summarized below;

a) Banana based Integrated Farming System (IFS)

A banana based integrated farming system model was developed and validated under the AICRP on IFS being implemented at the Cropping Systems Research Centre, Karamana, Kerala Agricultural University. The model was developed to suit to the soil and the tropical climatic features of Kerala. The main objectives were to examine critically the productivity, viability and constraints associated to each of these systems, assess the relative efficiencies and optimize the individual components of IFS in a regional perspective. Studies on this IFS models were initiated during the Kharif season of year 2011. The systems were established in a full fledged manner by 2013-14. The model is designed for an area of 0.2 ha, matching to the average size of holdings in Kerala, sufficient enough for a four member average family.

Banana was grown in the reclaimed wetlands in early years. The yields were not quite promising and hence, the crop was grown on raised bunds representing an upland condition. Thereafter, the banana based model is profitable. The system generated nutrients to the tune of 153 kg nitrogen, 76 kg phosphorus and 83 kg potassium, equivalent to that of 333 kg Urea, 379 kg Rock phosphate and 139 kg Muriate of Potash**.** The price equivalent of the nutrients generated is estimated as Rs. 8481/- and can be considered as a saving on fertilizers nutrient purchase.The nutrient generation of the system estimated in energy equivalents was as high as 10, 694 MJ.

Employment generation was more in initial year owing to the work involved in laying out the unit and designing the needed infrastructure. Subsequently, the man day requirement for

An overview of Banana based IFS Model at Karmana

Table 7.1.1/21: Area allocation for different components (0.2ha)

Component	Net area (m^2)	Gross area (m^2)
Crops : (Banana + intercrops) - (Banana + intercrops) - Daincha Tuber crop cassava as intercrop) , Fringe crop of fodder (on the outer bunds of banana area)	1880	1880
Livestock : Cow (1+1) unit	80	80
Vermicompost unit	75	75
	2035	**2035**

maintaining the model came down. Employment generation varied from 157 in 2013 to 91 in 2015-16.

Cost of cultivation and returns from IFS model during the study period given in table below revealed that gross returns increased from Rs.1,29,664 in 2013-14 to Rs. 1,66,534 in 2015-16.

Table 7.1.1/22: Economics of cultivation under Banana based IFS model during the years after establishment

Parameter	2013-14	2014-15	2015-16
Gross returns (Rs)	129664	142519	166534
Cost of production (Rs)	133105	122157	154488
Net returns (Rs)	- 3441	20,362	12046

b) Coconut based Integrated Farming System (IFS)

The model is suited to the soil and the tropical climatic features of Kerala. Studies on this IFS model was initiated during the Kharif season of year 2011. The system was established in a full fledged manner by 2013-14. The model is designed for an area of 0.2 ha, matching to the average size of holdings in Kerala, sufficient enough for a four member average family.

Coconut trees planted on raised bunds and fish grown in trenches dug between bunds form the unique feature of this IFS model. Genetically Improved Farm Tilapia (GIFT) is the fish reared in the fresh water trenches. In the interspaces between coconut and in the available additional area, fruit crops *viz*. papaya, bread fruit and mango are grown. Pepper, the most important of spice crops, is trailed on to coconut palms and is in the initial years of growth. Azolla is raised in a shallow trench within the interspaces. Regarding animal components, one cow unit (1 +1) is maintained in this model. Fodder crops mainly Hybrid Napier, raised in the interspaces of coconut palms caters to the fodder needs of the cattle maintained in the system. Border planting with timber tree species - teak is attempted in the model for well utilizing the available land area.

Cultivation cost and returns under coconut based farming system is given in table below indicate that Coconut based IFS model could register continued increase in net returns over the years. The system could generate quality fodder for supplementing livestock production also. The fish component was remunerative and added much to revenue generation.

More people were employed in the initial year for laying out the experimental unit and establishing the necessary infrastructure facilities. Thereafter, works were restricted to maintenance of the established unit and hence, a reduction in employment generation in subsequent years.

The system generated nutrients to the tune of 127 kg nitrogen, 69 kg phosphorus and 76 kg potassium equivalent to that of 275 kg urea, 345 kg rock phosphate and 127 kg Muriate of potash**.** The price equivalent of the nutrients generated is estimated as Rs.7539/-. Hence, an amount of Rs.7539 could be saved on purchase of fertilizers. The energy equivalent of the nutrients generated by the system is estimated as 8966 MJ.

Table 7.1.1/23: Coconut based IFS at a glance (Area allocation-0.2 ha)

Component	Net area (m^2)	Gross area (m^2)
1. Coconut on bunds and adjoining areas (30 nos)	1480	1480
2. Border trees: Teak (15 nos)	400	400
Multi-tier cropping : (In coconut interspaces + additional area): Papaya (6 nos), Jack (1 no), Mango (1 no), Bread fruit (1 no), Fodder crops		
3. Azolla - in a shallow pit of 2 x1x 0.2 m^3 size, lined with silpaulin.	20	620
Livetsock components: 1. Cow unit (1 + 1)	100	100

Table 7.1.1/24: Economics of cultivation under Coconut based IFS model during the years after establishment

Parameter	2013-14	2014-15	2015-16
Gross returns (Rs)	1,34,381	1,83,201	1,83,191
Cost of production (Rs)	1,02,610	1,30,421	1,26,589
Net returns (Rs)	31,771	52,780	56,602

Table 7.1.1/25: Employment generation under Coconut based IFS model during the years after establishment

Item	2013-14	2014-15	2015-16
Man days per year	133*	79.5	68.75

c) Rice based Integrated Farming System Model for Marginal Farmers

Studies on this IFS models were initiated during the Kharif season of 2011. The systems were established in a full fledged manner by 2013-14. The model is designed for an area of 0.2 ha, matching the average size of holdings in Kerala, sufficient enough for a four member average family.

Rice, the staple food of the people of Kerala, forms the major crop in this particular IFS model. After rice crop both in the first and second cropping seasons, the land is utilized mainly for raising vegetables (bhindi, brinjal, ash gourd) and green manure daincha. A pond is maintained, adjoining to the rice field, in which fish mainly Catla, Rohu, Mrigal, and Grass carp are reared. A duck house has been erected over the pond for accommodating the *Chaara* and *Chempalli* indigenous breeds of duck. The droppings from the duck house fall directly into the pond and supply the essential nutrients needed to increase the biomass of the natural food organisms of fish. The left over food waste within the duck house also go to the fish pond and serves as fish feed. Hence, optimum utilization of feed resources is attempted in the model. One cow unit (1+1) is maintained in the system. As part of utilizing the land area to the fullest, vegetables mainly ash gourd is planted in the dike area and trailed on to the net provided over the fish pond.

The system generated profit during 2013-14 and 2014-15. However, it faced a net loss during 2015-16, mainly due to the reduced egg production from duck unit (several birds had stopped laying eggs and has become ready for culling). Culling of unproductive birds and the new productive lot of birds introduced will improve the situation. Moreover, the cow unit had entered dry period during fag end of the year. Also the high cost of production of rice mainly attributed to greater labour requirement could be related to the reduction in profits from the system.

Being a labour intensive crop, more man days (124-252) were needed for raising the rice crop in the Rice based IFS model, resulting in high labour cost. In Kerala, labour charges are high (Rs.650 per man day) and accounts for almost 70 per cent of the total cost of rice production.

Table 7.1.1/26: Area allocation under Rice based IFS (0.2 ha)

Components	Net Area (m^2)	Gross area (m^2)
First crop rice (medium duration var.Uma)	1500	1500
Second crop rice (medium duration var.Uma)	-	1500
Third season (summer) crops Bhindi var.Varsha Upahaar Brinjal var. Haritha Green Manure crop (Daincha)	-	1500
Fish : (Inclusive of pond and dyke area planted with crops)	450	450
Duck house	Over pond	0
Cow (1+1)	50	50
Total	**2000**	**5000**

* The duck house being erected over the pond utilizes the vertical space and hence, no additional land area

The system generated nutrients to the tune of 110 kg nitrogen, 43 kg phosphorus and 52 kg potassium equivalent to that of 240 kg Urea, 213 kg Rock phosphate and 87 kg Muriate of potash. The price equivalent of the nutrients recycled is estimated as Rs.5287/-. Hence, an amount of Rs.5287/- could be saved on inorganic fertilizer purchase. The nutrient generation of the system estimated in energy equivalents is as high as 7504 MJ.

Table 7.1.1/27: Economics of cultivation under Rice based IFS model

Parameter	2013-14	2014-15	2015-16
Gross returns (Rs)	250829	297999	255253
Cost of production (Rs)	262603	237444	276658
Net returns (Rs)	11774	60555	-21405

d) Homestead based Integrated Farming System Model for Marginal Farmers

Homestead farming is a system of crop production followed mostly in the tropics, wherein the home and the adjoining land is utilized for cultivation of mixed crop species especially to satisfy the household needs of farmers. Homestead farming is much relevant to Kerala, where the population density is high and the average holdings (0.2 ha) is much less than the National average (1.33 ha).

Homestead IFS model is designed for a 0.2 ha land holding with the predominant crop of Kerala *viz*. coconut, as the main/base crop. Timber /fruit / multipurpose trees including teak, mango, jack, neem, gooseberry, glyricidia, Caesalpinia etc are grown along boundaries and in the interspaces between coconut palms. A kitchen garden growing almost all the tropical vegetables (brinjal, tomato, chilli, bhindi, cowpea, amaranth, drumstick, curry leaf, etc) is maintained in this system by utilizing the available interspaces as well as the 120 square metre roof area of the building (assumed to be the dwelling). Tropical fruits like papaya, passion fruit, sapota, guava, West Indian cherry, spices like turmeric etc also are accommodated in the system.

Regarding livestock components, a cow unit (1+1) and a poultry unit of 30 birds (Gramalakshmi, Gramapriya and Athulya breeds suitable to homesteads) are part of the system which generates employment opportunities and valuable

Table 7.1.1/28: Area allocation under Homestead based IFS model (0.20 ha)

Components	Location	Area* (m^2)
A. Tree crops		
Coconut (17 Nos)	Main crop	980
Fruit crops *viz*. Mango and Jack	Boundary planting and in the interspaces between coconut and other trees	250
B. Teak (20), Neem (2), Gooseberry (1), Caesalpinia (1) , Glyricidia (2) etc.	Interspaces between coconut + additional area	160
C. Kitchen garden		
Medicinal plants- 15 nos , Papaya - 5 nos. Sapota - 2 nos. Guava- 2 nos. West Indian Cherry - 1 Curry leaf - 10 Turmeric (grow bags) – 50 + Vegetables	Separate area	200
D. Poultry unit (30 birds)	Separate area	100
E. Vermicompost unit	Separate area	60
F. Cow unit (1+1)	Separate area	100
G. Terrace garden + water harvesting	Separate area	150
Total		**2000**

manure apart from milk and egg production. Roof water harvesting and biogas component (1 m^3 biogas unit) also form part of the system. The tree litter fall is accounted in contributing to soil organic matter. Small scale vermicomposting is attempted in boxes maintained on the roof top terrace garden.

Gross and net returns were however, more in successive years after establishment of the IFS model but comparatively high in 2014-15.

Table 7.1.1/29: Economics of cultivation of the Homestead based IFS model during the years after establishment

Parameter	2013-14	2014-15	2015-16
Gross returns (Rs)	1,40,444	2,01,996	178472
Cost of production (Rs)	1,51,624	1,44,686	151577
Net returns (Rs)	- 11,180	57,310	26895

The system generated nutrients to the tune of 72 kg nitrogen, 42 kg phosphorus and 43 kg potassium equivalent to that of 156 kg urea, 208 kg rock phosphate and 72 kg Muriate of potash**.** An amount of Rs.4403 could be saved on purchase of these nutrients**.** The nutrient generation of the system estimated in energy equivalents was 5117MJ. Among all the components, the dairy unit generated maximum quantity of nutrients. Among all the components of the system, the dairy unit generated the maximum quantity of nutrients.

13. GUJARAT PLAINS & HILLS

AICRP-IFS Center at S. K. Nagar (Gujarat)

The economy of the region is based on animals and mainly dairy based farming system with crops as necessary components representing more than 95% farm families with an annual net returns of Rs.68758/ha/year. Average holding size of the region ranges from 0.53 ha (marginal farmers) to 1.46 ha (Small farmers) with 6 member family.The IFS study on Integrated farming Systems at SDAU, Sardarkrushinagar of Gujarat State going on since 2010-11 with different components *viz*., 1. Crops (0.70 ha), 2. Multistoried horticultural crops (0.25 ha), 3. Boundary plantation, 4. Dairy unit with two Mahesani breed buffaloes (0.025 ha), 5. Vermicompost and Nursery unit (0.01 ha) and 6. Water recharging unit (0.015 ha). The system is based on in vogue cropping system on 0.70 ha of 1.00 ha farm *viz*; (i) green gram –mustard-summer pearl millet (0.24 ha), (ii) groundnut-wheat- fodder pearl millet (0.08 ha), (iii) green gram- castor relay (0.32 ha) and (iv) fodder cowpea - lucerne + chicory (0.06 ha) to ensure annual calorie and nutritional requirement of the family. Both income and health were made more sustainable by growing fruits and vegetable in two tiers on 0.25 ha.

The soil health was taken care of by including pulses in cropping system, making microbes enriched vermin-compost from the waste and dung of the two buffaloes reared on 0.04 ha. Farm wastes were recycled within the system which obliterated the need to purchase off-farm inputs.

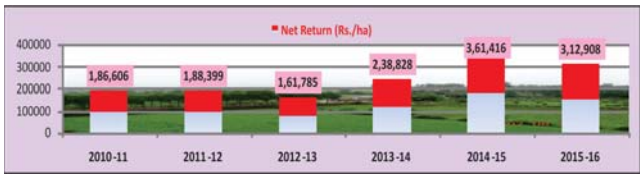
The internal bunds were used for growing fodder while on boundaries quick growing timber tree like *Alianthus* were planted to brace up income. The model had a provision of farm pond (0.01 ha) for water harvesting and well recharging on low lying depression of the farm. The model also entailed trees like *glaceredia* at regular interval whose nutritious leaves were lopped and added to soil to enhance soil fertility. The system has been functional for the last five years and the cursory

Table 7.1.1/30: Total Inputs' cost and percent share of the inputs purchased/generated and recycled within the system (2015-16)

Area of IFS Model (ha)	Components of IFS Model	Value of inputs purchased from market and % share(Rs.)	Value of Inputs generated and recycled within farm and % share (Rs.)	Value of farm labour engaged and % share (Rs.)	Total Input Cost (Rs)
1.0	Crops+Dairy + Hort. +Vermi-compost + Boundary Plantations	22,847 (12 %)	1,08,151 (57.0 %)	58,884 (31.0%)	**1,89,882**

analysis of the investment indicated that system is good enough to provide daily average income of Rs. 692/day with engagement of 1.03 unit of labour^{-1} day.

The continuous sustainable income and livelihood security throughout the year can be fruitful to check urban migration. As the farmers are more concerned with net profit, the diversification has ensured significantly higher and consistently more returns in successive years of the study as predicted in figure below;



In boundary plantation unit, growing grasses and hybrid napier, ardusa, drumstick and subabul on bund. Boundary plantation total average net return received Rs. 65883 which was 19.8 % of total net returns.

As per the IFS model, dairy unit and vermicompost which has two Mehsani breed buffaloes which indicated that average gross return of Rs.155332. Total average net profit from dairy and vermicompost unit was obtained Rs. 47197 0.035 hectare area which contributed 17.8 % to total net return of the whole IFS model.

Integrated farming system has created more number of working hours in the system due to involvement of more enterprises than cropping system alone. 1.0 ha model has generated 423 mandays, 307 mandays and 398 mandays per hectare per year during 2013-14, 2014-15 and 2015-16 respectively. On farm recycling of farm wastes, crop residues etc. saved market input by 57% and only 12% was from market (Table). This shows the economic viability of the system.

14. WESTERN DRY REGION

AICRP-IFS Center at Durgapura (Rajasthan)

Crop+ Dairy with annual net returns of Rs.118998 ha^{-1} year^{-1} is the most 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 (MF) to 1.44 ha (SF) with a family size of 7 members.

The IFS model of Durgapura, developed on an area of 1.45 ha, consists of 1.0 ha area under crops, livestock with two cross bred Holstein Frisian (HF) cows and a herd of 6 (5 Female +1 Male) *sirohi* breed goats, a unit of 20 birds poultry belonging to Pratap Dhan breed, horticulture (0.25 ha) under drip irrigation system, out of which 0.13 has mixed orchard and in remaining part seasonal vegetables are raised. A unit of vermi-compost and compost are also established to utilize the available organic waste and excreta in to valuable manure. A small unit of mushroom was also established but its production could not be taken regularly. Production of different components of IFS Durgapura model were converted in to Pearl Millet Equivalent Yield (PEY) for comparing production potential of various components. On the basis of 5 years average of production of different components the model gave 27.8 t PEY annually in which major share was contribute from dairy livestock (10.3 t) followed by crop component (6.7) and goatry (6.6).

This is quite evident that crop or crop + live stock combination is not as efficient as the IFS model in terms of production potential. The horticultural component occupied just one fourth of the area in compared to crops yet it gave 50 per cent PEY than that of crop component. Production of various commodities produced under different enterprises were in excess than the requirements of farm family and that can be termed as

Table 7.1.1/31: Farm Production details from IFS Model

Year	Farm Prod. (PEY) t ha^{-1}	Prod.(PEY) t ha^{-1} from Crops unit	Prod. (PEY) t ha^{-1} from Horticulture unit	Prod. (PEY) t ha^{-1} from Livestock unit	Prod. (PEY) t ha^{-1} from Fishery unit	Prod.(PEY) t ha^{-1} Poultry/ Goat/Apiary	Mushroom/ V.compost/ BP/KG etc.
2011-12	13.68	1.23	2.48	6.02	0.30	3.65	-
2012-13	17.54	2.35	3.28	7.35	-	4.56	
2013-14	30.54	9.09	3.77	12.42	-	4.86	-
2014-15	31.07	8.99	0.43	13.03	-	8.38	-
2015-16	46.50	11.86	6.25	12.72	-	11.67	4.0
Average	27.87	6.70	3.24	10.31	0.30	6.62	4.0

marketable surplus. On an average marketable surplus produce could fetch net returns of Rs 66757 annually. Highest amount of gross returns was obtained from the dairy livestock accounting for about 41.5 percent gross returns followed by goatary (27 per cent and crops (23.6 per cent). The dairy live stock component accrued about 34.1 per cent net returns of total IFS model net returns on 5 years average basis followed by goatary (31.3 per cent) crops (23.3 per cent) and horticulture (10.9 per cent). Further, the highest gross as well net returns were obtained by dairy livestock followed by goatry and crop component. However, horticulture component were more cost effective in accruing net returns that was giving comparatively more returns against lower production cost.

The substitution / replacement of purchased items with those produced within the IFS system is also an important indicator of internal flow of resources. On the mean basis it can be observed that out of total cost of IFS model 36.45 per cent was labour component and 25.5 per cent inputs are being produced internally whereas, dependence upon external sources was only up to 38 per cent that can further be reduced with experience . Total savings from recycled farm produce was up to 27.7 per cent whereas the labour saving was to the tune of 37%.

15. ISLAND

AICRP-IFS Center at Port Blair (AN)

The Andaman and Nicobar group of Islands lie in the Bay of Bengal 1200 km east of main land India between 6-14^0 N latitude and 92-94^0 E longitude. Plantation crops + Pig (50 %) followed by Crop + Dairy animal cows + Fish (45 %) are

Table 7.1.1/32: Contribution of farm enterprises in Resource Recycling and overall saving (%) in production cost:

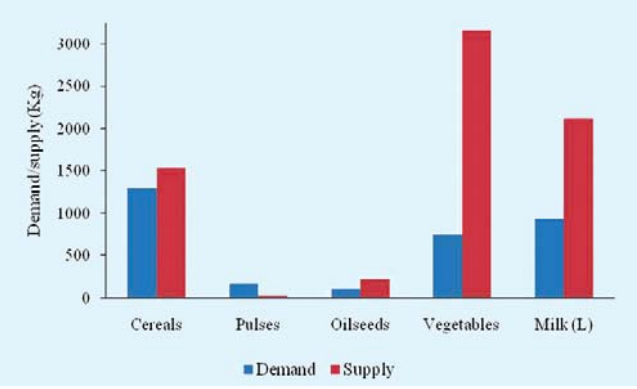
Year	Cost of prod. (Rs.)	Enterprise Wise Value of Recycled Products and By-products (Rs)					Total Value of Recycled Farm Products	Farm Labour Engaged		Saving (Recycled Farm Products) (%)	Saving from Farm labour Engaged (%)
		Crops	Dairy	Horti.	Fishery	Others (Biogas/ Mushroom		Man days	Value		
2013-14	292643	19800	53200	-	6405	14305	93710	529	87814	32	30
2014-15	227420	11460	41664	460	0	0	53584	292	58108	24	25
2015-16	388206	78400	24145	2970	0	0	105515	1084	215716	27.18	56.08
Average	302756	36553	39670	1715	2135	4768	84270	635	120546	27.73	37.03

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 0.39 ha (MF) to 1.38 (S.F.) with an average of 7 members in a family. An IFS model involving crops, dairy and fisheries was developed in 2011 in an area of 0.75ha for lowland or valley areas of Andamans. The area allocation for different components is given in Table.

Table 7.1.1/33: Area allocation for different components of IFS

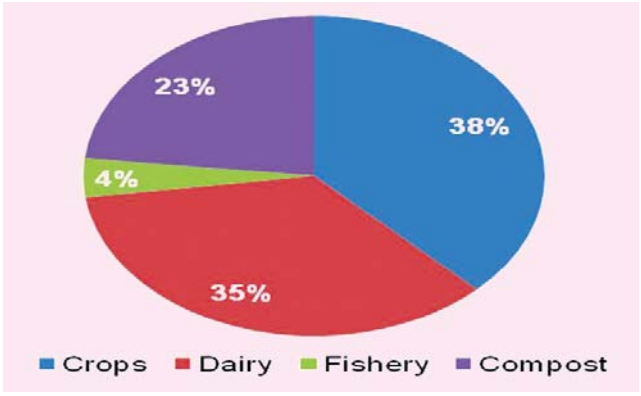
Components	Area allocation (m^2)
Crop Components	6500
Rice based cropping system (Rice- Maize/pulses /oilseeds/ vegetables/fodder)	3500
Broad Bed & Furrow system (Vegetables/Flowers, Rice + Fish)	3000
Dairy, Vermicompost unit & common uses	1000
Total area	7500

The diversified system of farming could able to meet the basic food requirement of family (Fig) below.



Demand and Supply of essential food items from IFS model

The average annual production from the IFS system in an area of 0.75 ha is 29.5 t in terms of Rice Equivalent Yield (REY) with major contribution from dairy (52%) followed by crops (46%).The



Share (%) of different farm enterprises in recycled material

average gross returns from the system (0.75ha) were Rs.393711 with maximum contribution from dairy unit (47%) followed by crops (44.8%). The composting unit yielded an amount of Rs.28297/- contributing 7.2% to total farm income as against Rs.3900/- from fisheries. However, the total net returns from the system is only Rs. 160612/- with 55% contribution from crop component and dairy unit contributed only 37% of the total net returns of the farm.The average input cost used in the system was Rs.234548/-. Of the total input cost, 36% was accounted by labour cost, while recycled items accounted 32.3% and 31.0% by outside purchase. The total labour cost was Rs.85625/- with majority of labour engaged in dairy (192 man days) followed by crop components (140 man days). The value of recycled products was Rs.76474/- and of this crop components accounted 38%followed by dairy (35%) and composting unit (23%). Rice and dairy based farming in an area of 0.75ha could meet major food requirement of the family of 5 members, besides there is a surplus production of milk and vegetables to a value of Rs.1.68 lakhs.

Subsidiary units : vermicompost – 3% , 4 man days

7.2 CROPPING SYSTEMS MANAGEMENT

7.2.1 CROPPING SYSTEM DIVERSIFICATION/INTENSIFICATION

Title of the Experiment: Identification of need based cropping systems for different agro-ecosystems (**Expt**. No. 1a).

Objectives: To identify suitable cropping systems with high productivity and profitability for different agro- ecosystems.

Year of start:1990-91

Treatments: No common treatments are for all the centers; they vary from location to location. The number of cropping systems tested at each location also varies from 6 to 15. The treatments are modified after every 3-4 year. The details of treatments are given in table-7.2/1 along with experimental results.

Locations:

Ecosystem	Centre(State)
Arid	Hisar (Haryana), S.K.Nagar (Gujarat) and Siruguppa (Karnataka)
Semi-arid	Bichpuri (U.P.), Junagarh (Gujarat), Durgapura (Rajasthan), Rajendranagar (A.P.), Rudrur (A.P.), Indore (M.P.),Parbhani (Maharashtra), Coimbatore (T.N.), Ludhiana (Punjab).Kanpur (U.P.), Kota (Rajasthan), Akola (Maharashtra)
Sub-humid	Faizabad (U.P.), Pantnagar (Uttarakhand), Sabour (Bihar), Ranchi (Jharkhand), Jabalpur (M.P.), Rewa (M.P.),Powarkheda (M.P.), Chiplima (Orissa), Kathalgere (Karnataka), Raipur (M.P.), and Varanasi (U.P.)
Humid	R.S. Pura (J & K), Jorhat(Assam),Kalyani(W.B.) and Palampur (HP)
Coastal	Bhubaneshwar (Odisha), Maruteru (A.P.), Navsari(Gujarat), Karamana (Kerala),Thanjavur (T.N.), and Karjat (Maharashtra)

Results:

Data were recorded on yields, annual net returns and annual energy output at all the centers which have been presented in table 7.2/1. A brief description of Centre-wise results is given below.

Arid Ecosystem

Hisar: Seven cropping systems were evaluated at Hisar. Out of those, cotton-wheat-fallow system was found better than others and recorded the highest net return of Rs. 90,050 ha^{-1} $year^{-1}$ followed by pearl millet-wheat-fallow system with returns of Rs.70,520 ha^{-1} $year^{-1}$. In terms of energy production, existing pearl millet-wheat-fallow system was better which gave highest energy production of 30.16 $K*10^6$ ha^{-1} $year^{-1}$ followed by pearl millet+greengram-wheat+mustard-fallow (28.12 $K*10^6$ ha^{-1} $year^{-1}$) cropping system.

S.K. Nagar: Out of eight cropping systems evaluated, the cropping system involving green gram-fennel+cauliflowerrecorded the highest net returns of Rs.38,802 ha^{-1} $year^{-1}$ followed by green gram-mustard+lucerne-lucerne(cont.)(Rs. 22,200 ha^{-1} $year^{-1}$). In terms of energy production, pearl millet-mustard-fallow sequence was better with highest energy production of 16.15 $K*10^6$ ha^{-1} $year^{-1}$.

Siruguppa: Ten cropping systems were evaluated at Siruguppa. Among those, rice+sesbania-fallow-ridgegourd was identified to be the most profitable with net returns of Rs. 2,24,868 ha^{-1} $year^{-1}$, and energy production was recorded highest (31.45 $K*10^6$ ha^{-1} $year^{-1}$) in the rice-fallow-rice cropping sequence.

Crop diversification in *kharif* at S.K. Nagar

Crop intensification in *rabi* at S.K. Nagar

Semi-Arid Ecosystem

Bichpuri: Ten cropping systems were evaluated at Bichpuri centre, out of which pearlmillet-potato-clusterbean recorded the highest gross return of Rs. 2,41,461 ha^{-1} year^{-1} closely followed by dhaincha-potato-okra (Rs. 2,24,733 ha^{-1} year^{-1}). The highest energy value of 40.33 K*10^{6} ha^{-1} year^{-1} was also recorded under which pearlmillet-potato-clusterbeancropping system followed by dhaincha-potato-okra 32.28 K*10^{6} ha^{-1} year^{-1}.

Durgapura: Among ten cropping systems evaluated green gram-mustard cropping system recorded the highest net returns of Rs. 1,05,526 ha^{-1} year^{-1} followed by cluster been-mustard cropping system (Rs. 1,01,822 ha^{-1} year^{-1}). The highest energy value of 21.19K*10^{6} ha^{-1} year^{-1} was also recorded from cluster been-mustard system.

Rajendranagar: Out of twelve cropping systems evaluated at Rajendranagar, maize-groundnut cropping system recorded the highest net returns of Rs. 93,762 ha^{-1} year^{-1} closely followed by Bt. Cotton+soybean-sesame (77,316 ha^{-1} year^{-1}). As regard the energy production, Bt. Cotton+ greengram-maize (cob) was found to be the best (71.19 K 10^{6} ha^{-1} year^{-1}).

Rudrur: Among twelve cropping systems evaluated at Rudrur, Bt. Cotton+soybean-sesame-fallow cropping system was found better in terms of net returns (Rs. 2,31,215 ha^{-1} year^{-1}) followed by Bt. Cotton-sesame-fallow (Rs. 2,10,226 ha^{-1} year^{-1}). From energy production point of view maize+ soyabean-rice recorded the maximum value of 43.6 K*10^{6} ha^{-1} year^{-1}.

Indore: Out of nine cropping systems evaluated at Rahuri (Indore), soybean+maize-wheat+french bean-greengram recorded the highest net return of Rs. 1,64,162 ha^{-1} year^{-1} followed by soybean+ maize-wheat-fallow (Rs. 1,47,766 ha^{-1} year^{-1}). However in terms of energy production soybean+ maize-wheat+french bean-greengram and soybean+maize-wheat-fallow proved better and produced 39.52 K*10^{6} and 33.94 K*10^{6} energy ha^{-1} year^{-1}, respectively.

Parbhani: Among nine cropping systems evaluated maize+soybean+sesbania-wheat+ chickpea-okra+cow pea found bestin net returns (Rs. 2,05,378 ha^{-1} year^{-1}) and from point of view of energy production cropping system maize+ soybean-chickpea+sorghum-cowpea+okra (30.90 K*10^{6} ha^{-1} year^{-1}) found best.

Coimbatore: Nine cropping systems were evaluated at Coimbatore, out of which onion(RF)-cotton(RF)-maize(RF) recorded highest net return of Rs. 2,58,163 ha^{-1} year^{-1} followed by gram-cotton+sunnhemp(F) (Rs. 2,54,693 ha^{-1} year^{-1}).

Ludhiana: Among the twelve cropping sequences evaluated at Ludhiana, maize+cowpea–greengram+mustard-fallow sequence was identified most suitable with highest net returns of Rs. 2,85,399 ha^{-1} year^{-1}. Sorghum+cowpea-heat+

mustard-fallow (191.22 K*10^6 ha^{-1} $year^{-1}$) sequence foundbest in energy production.

Kanpur: Out of ten cropping systems, maize-garlic-fallow system recordedhighest net returns of Rs. 2,28,349 ha^{-1} $year^{-1}$ followed bymaize+black gram–potato (Rs. 82,645 ha^{-1} $year^{-1}$). However, in terms of energy production, hybrid rice-wheat (38 K*10^6 ha^{-1} $year^{-1}$) system proved better than others.

Kota: Eight cropping systems were evaluated at Kota out of which maize-garlic-fallow recorded the highest net returns of Rs. 3,22,390 ha^{-1} $year^{-1}$ followed by soybean(BB)+maize(F)-garlic+ wheat (Rs. 2,60,142 ha^{-1} $year^{-1}$). From energy production point of view soybean-wheat-fallow (27.0 K*10^6 ha^{-1} $year^{-1}$) followed by maize-garlic-fallow (25.3 K*10^6 ha^{-1} $year^{-1}$) cropping systems were found better than others.

Akola: Out of eight cropping systemsevaluated at Akola, groundnut+niger(F)-wheat+carrot-green gram+spinach(F) recorded highest both net return (Rs. 58,398 ha^{-1} $year^{-1}$) as well as energy value (21.28 K10^6 ha^{-1} $year^{-1}$) followed by groundnut+niger (F)-lentil+carrot-greengram+spinach(F)(Rs. 48,634 ha^{-1} $year^{-1}$).

Sub-Humid Ecosystem

Faizabad: Eight cropping systems were evaluated at Kumarganj, out of which rice-cauliflower-cowpea recorded highest net return of Rs. 1,65,546 ha^{-1} $year^{-1}$ followed by rice-frenchbean-okra (Rs. 1,14,623 ha^{-1} $year^{-1}$). However from energy production point of view rice-potato-green gram (41.01K*10^6 ha^{-1} $year^{-1}$) found to be the best.

Pantnagar: Among eight cropping systems evaluated at pantnagar, rice-potato-cowpea recorded the highest net return of Rs. 3,67,846 ha^{-1} $year^{-1}$ closely followed by maize+cowpea-vegpea+toria-groundnut+mentha (2,62,494 ha^{-1} $year^{-1}$). However from energy production point of view, rice-pea (veg)-maize found to be the best (57K*10^6 ha^{-1} $year^{-1}$) closely followed by maize+ cowpea-vegpea+toria-groundnut+mentha (56.7 K*10^6 ha^{-1} $year^{-1}$).

Sabour: Twelve cropping systems were evaluated at Sabour. Out of those rice-cabbage+radish-okra+mungbean found the best in terms of net returns (3,54,611 ha^{-1} $year^{-1}$) followed by rice-garlic+coriander-maize+cowpea (Rs. 2,63,860 ha^{-1} $year^{-1}$). Whereas with regard energy value, rice-potato+radish-onion+maize (fodder) proved to be the best (62.61 K*10^6 ha^{-1} $year^{-1}$) followed by rice-maize+potato-sorghum+cowpea (61.26 K*10^6 ha^{-1} $year^{-1}$).

Ranchi: Out of seven cropping systems evaluated at Ranchi, rice-potato+wheat-green gram found the best in terms of both, net returns (Rs. 94,527 ha^{-1} $year^{-1}$) and energy production (54.82 K*10^6 ha^{-1} $year^{-1}$) followed by rice-potato-green gram in terms of energy production(29.94 K*10^6 ha^{-1} $year^{-1}$).

Jabalpur: Out of twelve cropping system evaluated, rice (basmati)-merigold-sorghum (fodder) recorded the highest net returns of Rs. 8,12,990 ha^{-1} $year^{-1}$ followed by rice-veg. pea-sorghum (Rs. 7,80,864 ha^{-1} $year^{-1}$). Regarding energy production point of view rice-potato-sorghum (fodder) recorded the highest calorific value (18.5 K*10^6 ha^{-1} $year^{-1}$).

Powerkheda: Out of ten cropping systems evaluated at Powerkheda, rice-mustard-black gram provided the highest net returns of Rs. 2,05,057 ha^{-1} $year^{-1}$ followed by soybean-pigeanpea-okra (Rs. 1,74,435 ha^{-1} $year^{-1}$). Whereas, energy production was maximum with rice-mustard-blackgram cropping system (46.6K*10^6 ha^{-1} $year^{-1}$) followed by soybean-potato-sesame (37.7K*10^6 ha^{-1} $year^{-1}$).

Chiplima: Among ten cropping system evaluated at Chiplima,rice-maize+coriander-cowpea+ amarantusrecorded the maximum net returns (Rs. 7,39,677 ha^{-1} $year^{-1}$) with highest energy production (207.60 K*10^6 ha^{-1} $year^{-1}$) followed by rice-maize+ radish-okra+amaranthus (Rs. 4,87,167 ha^{-1} $year^{-1}$) with energy value of 138,28 K*10^6 ha^{-1} $year^{-1}$.

Kathalgere: Out of eight cropping system evaluated at Kathalgere,rice-spinach found the

Crops diversification at Kathalgera

best with net returns of Rs. 1,66,767 ha^{-1} year^{-1} followed by rice-groundnut (Rs. 92,818 ha^{-1} year^{-1}). With regard to energy production rice-maize (39.8 K*10^{6} ha^{-1} year^{-1}) proved better than others.

Varanasi: Out of ten cropping systems evaluated, paddy-pea (veg)-okra was found best both in terms ofnet returns (Rs. 44,328 ha^{-1} year^{-1}) and highest energy value of 30.56 K*10^{6} ha^{-1} year^{-1} followed by paddy-mustard-green gram (20.2K*10^{6} ha^{-1} year^{-1}).

Humid Ecosystem

R.S.Pura: Out of ten cropping systems evaluated rice-potato-maize recorded the highest net returns of Rs. 5,45,222 ha^{-1} year^{-1} followed by rice-broccoli-mash (Rs. 2,57,422 ha^{-1} year^{-1}). From energy view point, rice-potato-maizerecorded the highest calories of 170.2K*10^{6} ha^{-1} year^{-1} followed by rice-potato-onion (35.6K*10^{6} ha^{-1} year^{-1}).

Jorhat: Eight cropping system were evaluated at Jorhat. Out of those, rice-cabbage-green gram recorded the highest net returns of Rs. 1,45,100 ha^{-1} year^{-1} followed by rice-green chillies-black gram (Rs. 1,11,400 ha^{-1} year^{-1}). Rice-fallow rice, however recorded the highest energy value 17.64K*10^{6} ha^{-1} year^{-1}.

Kalyani: Out of eleven cropping systems evaluated at Kalyani, pointed gourd+elephant foot yam-pointed gourd+garlic-pointedgourd+elephant foot yam recorded the highest net return of Rs. 3,72,397 ha^{-1} year^{-1} followed by cauliflower+ amaranthus-raddish+frennchbean-okra+cowpea (Rs 2,39,933 ha^{-1} year^{-1}).

Palampur: Among eight cropping systems evaluated at Palampur, rice-spinach-cucumber recorded the highest net returns of Rs 44,799 ha^{-1} year^{-1} followed by rice-pea-summer squash (Rs 42,178 ha^{-1} year^{-1}). With regard to energy production rice-wheat-fallow recorded the highest calorific value of 20.5 K*10^{6} ha^{-1} year^{-1}.

Coastal Ecosystem

Bhubaneswar: Ten cropping system were evaluated at Bhubaneshwar. Out of those rice-maize+kosala-cowpea+amaranthus recorded the highest net returns of Rs. 5,58,985 ha^{-1} year^{-1} closely followed by rice-maize+radish-okra+ amaranthus (Rs.5,26,679 ha^{-1} year^{-1}). With regard to energy production, rice-maize+kosala-cowpea+ amaranthus found the best with calorific value of 159.48 K*10^{6} ha^{-1} year^{-1}.

Maruteru: Out of nine cropping systems evaluated, rice-black gram recorded the highest net returns

of Rs. 41,869 ha^{-1} year^{-1}. Rice-rice followed by rice-maize produced maximum energy values of 30.6 and 24.9 K*10^{6} ha^{-1} year^{-1}, respectively.

Navsari: Ten cropping systems were evaluated at Navsari. Rice-lurcen provided the maximum net returns of Rs. 44,30,140 ha^{-1} year^{-1} followed by rice-fenugreek-clusterbean (Rs. 2,40,261 ha^{-1} year^{-1}). rice-fenugreek-clusterbeanrecorded the highest calorific value of 31.52 K*10^{6} ha^{-1} year^{-1}.

Karamana: Among seven cropping systems evaluated, rice+fish-rice+fish-culinary melon recorded the maximum net returns (Rs 2,34,863 ha^{-1} year^{-1}) as well as calorific value (38.0K*10^{6} ha^{-1} year^{-1}) followed by rice+fish-rice+fish-amaranthus in terms of returns (Rs 66,971 ha^{-1} year^{-1}) and energy (33.6 K*10^{6} ha^{-1} year^{-1}).

Thanjavur: Out of nine cropping system evaluated, maize+black gram (FIRB)-rice-blackgram+redgram (FB)recorded the highest net returns (Rs. 98,975 ha^{-1} year^{-1}). Rice+dhaincha (GM)-rice-maize+blackgram (FIRB) recorded the second best cropping system from net return (Rs 98,970 ha^{-1} year^{-1}) and best in energy production (57.53 K*10^{6} ha^{-1} year^{-1}) point of view.

Karjat: Among the eleven cropping systems evaluated at Karjat, rice-brinjal-fallow recorded the highest net returns of Rs. 2,21,493 ha^{-1} year^{-1} followed by rice-groundnut (Rs.53,108 ha^{-1} year^{-1}). With regard to energy production rice-groundnut (34.0 K*10^{6} ha^{-1} year^{-1}) followed by rice-rice (33.2 K*10^{6} ha^{-1} year^{-1}) proved better than other cropping systems.

Experimental view of need based cropping system at Pantnagar

Table 7.2.1/1: Evaluation of alternate efficient cropping system in various ecosystems

Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10⁶)
	Kharif	*Rabi*	Summer					
A. ARID ECOSYSTEM								
Hisar (Haryana)								
Pearl millet - Wheat - Fallow	2989	5600	0	118554	48034	70520	2.47	30.2
Cotton - Wheat - Fallow	2505	4064	0	156605	66555	90050	2.35	22.4
Pearl millet – Barley - Mungbean	3227	3101	1157	78317	54567	23750	1.44	22.1
Cluster bean - Broccoli - Onion	987	2952	0	94822	68080	26742	1.39	16.7
Mungben – Mustard + Kasni - Fallow	1044	2275 + 124	124	79208	35394	43814	2.24	12.3
Pearl millet – Wheat - Cowpea	3403	2974	0	85652	60462	25190	1.42	22.6
Pearl millet +Mungbean -Wheat + Mustard - Fallow	2629	5085 + 192	192	113039	49608	63431	2.28	28.1
Standard Error				**14615**				**3.7**
Critical Difference (5%)				**31846**				**8.1**
S.K. Nagar (Gujarat)								
Pearl millet – mustard - fallow	1615	1907	0	84065	63049	21016	1.33	16.1
Green gram – fallow - green gram	406	0	758	56470	104567	-48097	0.54	3.9
Green gram + cowpea + castor - fallow + sorghum + cowpea	375 + 0 + 0	0	0 + 0	18171	96652	-78481	0.19	1.2
Green gram - fallow - bottle gourd	402	0	0	19481	93726	-74245	0.21	1.3
Bt cotton - fallow - fallow	2215	0	0	93044	106587	-13543	0.87	7.3
Green gram – fallow + cauliflower - fannel	584	1539 + 0	0	119109	80307	38802	1.48	2.4
Green gram - mustard + lucerne - lucerne	640	1769 + 0	0 + 0	90329	68129	22200	1.33	11.7
Bt cotton + green gram +castor – castor - fallow	2433 + 0	0	0	102186	100721	1465	1.01	8.1
Standard Error				**8855**				**0.4**
Critical Difference (5%)				**18994**				**0.9**
Siruguppa (Karnataka)								
Rice - Rice - fallow	6526	0	3762	88760	66988	21772	1.33	22.6
Rice + sesbania - fallow - ridge gourd	6566 + 0	0	5787	283166	58298	224868	4.86	23.7
Rice - fallow - mustard	6614	0	209	96950	54517	42433	1.78	24.0
Rice - fallow - beans	6638	0	1466	90281	55333	34948	1.63	23.0

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10⁶)
	Kharif	*Rabi*	Summer					
Rice - fallow - siyazeer	6878	0	495	93534	53653	39881	1.74	23.8
Rice - fallow - coriander	6861	0	717	102376	54853	47523	1.87	25.8
Rice - spinach - black gram	5346	0	1266	131272	49428	81844	2.66	22.9
Rice - fenugreek leaves - green gram	5320	0	1295	135162	50653	84509	2.67	22.7
Rice – fallow - rice	4932	0	4160	123652	66768	56884	1.85	31.5
Rice – susbenia (incorporation) - rice	4668	0	4022	118186	65698	52488	1.8	30.1
Standard Error				**5717**				**0.7**
Critical Difference (5%)				**12012**				**1.5**
B. SEMIARID ECOSYSTEM								
Bichpuri, Agra (UP)								
Pearl millet - wheat - fallow	2691	4511	0	99035	NR	NR	NR	25.3
Pearl millet - wheat - green gram	2420	4480	1640	174757				29.7
Pearl millet - lentil - fallow	2891	1640	0	86566				16.1
Soyabean - wheat + mustard -fallow	1351	3905 + 510	0	108298				22.1
Pigeon pea - wheat - fallow	1865	4210	0	142159				20.8
Green gram - mustard - fallow	1705	2391	0	162791				18.6
Daincha -potato - okra	0	30802	6890	224734				32.3
Pearl millet - potato - cluster bean	2610	29701	6014	241461				40.3
Sesamum - barley - green gram	980	4011	1411	162628				23.7
Jowar fodder - oat fodder - cowpea fodder	25640	23141	16713	108598				10.5
Standard Error				**2741**				0.4
Critical Difference (5%)				**5624**				0.8
Durgapura, Jaipur (Rajasthan)								
Pearl millet - wheat - fallow	1649	3727	—	74644	47100	27544	1.58	18.8
Cluster bean - mustard - fallow	1709	3808	—	148922	47100	101822	3.16	21.2
Green gram - mustard - fallow	1331	2179	—	137526	32000	105526	4.3	16.2
Groundnut - wheat - fallow	2133	2084	—	115518	31500	84018	3.67	19.3
Pearl millet - pea - fallow	1576	4054	—	116990	65100	51890	1.8	18.5
Pearl millet - fenugreek leaves - fallow	1799	1172	—	35969	35000	969	1.03	7.1
Groundnut - chandrasur - fallow	1717	748	—	84079	39000	45079	2.16	12.0
Cluster bean - pea - fallow	1710	1124	—	48339	52000	-3661	0.93	4.1
Pearl millet - wheat - fallow	1291	1214	—	33740	36000	-2260	0.94	8.9

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10⁶)
	Kharif	*Rabi*	Summer					
Standard Error				**28821**				4.1
Critical Difference (5%)				**59487**				8.4
			Rajendranagar (Telanangana)					
Maize - sunflower - fallow	5560	880	—	106683	58665	48018	1.82	24.5
Pearl millet + soyabean - potato - fallow	710 + 365	12025	—	72332	76260	-3929	0.95	15.8
Maize – groundnut – fallow	5396	2252	—	161577	67815	93762	2.38	31.2
Pearl millet + soyabean - sunflower + groundnut – fallow	750 + 348	324 + 17507	—	100421	49245	51176	2.04	16.1
Maize + soyabean - potato – fallow	4215 + 3907	12250	—	120949	96300	24649	1.26	28.0
Bt cotton + soyabean - sesamum + groundnut – fallow	1150 + 410	395 + 1845	—	150766	73450	77316	2.05	18.3
Maize (fodder) + soyabean - castor + green gram – fallow	4412 + 465.0	965 + 425.33	—	69491	61160	8331	1.14	8.4
Bt cotton + green gram - sunflower + pearl millet - fallow	1205 + 320	1380 + 0	—	117880	61050	56830	1.93	13.6
Soyabean - potato - fallow	1075	12400	—	83322	85240	-1919	0.98	16.7
Bt cotton + green gram - sesamum – fallow	1309 + 290	535	—	93653	71350	22303	1.31	8.3
Pearl millet - groundnut – fallow	1120	2361	—	108453	46495	61958	2.33	17.4
Bt cotton + green gram - maize (green cob) - fallow	1295 + 285	52750	—	110413	78240	32173	1.41	72.0
Standard Error				**9172**				**3.6**
Critical Difference (5%)				**19024**				**7.4**
			Rudrur (Telangana)					
Rice - rice – f allow	4000	6250	0	139400	93000	46400	1.5	35.5
Maize - sunflower - fallow	5250	1975	0	143625	61000	82625	2.35	30.2
Maize + soyabean - rice - fallow	4628 + 833	7000	0	177846	83500	94346	2.13	43.6
Bt cotton - sesamum - fallow	5328	1200	0	278976	68750	210226	4.06	24.4
Soyabean - sunflower - fallow	1450	2000	0	112108	58500	53608	1.92	18.7
Bt cotton + soyabean - sesamum - fallow	5053 + 790	1625	0	307215	76000	231215	4.04	29.3
Soyabean - wheat - fallow	1400	1775	0	61578	50050	11528	1.23	12.2
Turmeric - sesamum - fallow	4810	950	0	168760	143750	25010	1.17	22.1
Maize - bengal gram - fallow	5130	1450	0	117635	52550	65085	2.24	22.8

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Turmeric + soybean - pearl millet - fallow	3308 + 850	2565	0	139831	147000	-7170	0.95	24.5
Maize + soyabean - tomato - fallow	4755 + 845	1875	0	101511	65500	36011	1.55	20.3
Turmeric + soyabean - sesamum - fallow	4700 + 1665	1051	0	213185	155550	57635	1.37	29.5
Standard Error				**12066**				**1.9**
Critical Difference (5%)				**25027**				**3.9**
			Indore (M.P.)					
Soyabean - wheat - fallow	1157	5458	0	108760	54562	106445	2.95	23.9
Soyabean - chick pea - fallow	1359	219	0	42300	47470	17266	1.36	6.7
Soyabean + maize - wheat - fallow	617 + 4075	5011	0	142449	60883	147766	3.43	33.9
Soyabean + maize - chick pea + wheat - green gram	747 + 4599	66 + 2683	259	133781	71701	121029	2.69	29.3
Soyabean + sorghum - chick pea + mustard - cowpea + okra	610 + 339	189 + 330	385 + 39	43444	71175	6426	1.09	6.5
Soyabean - cauliflower + wheat - cowpea + maize(cob)	1237	7549 + 3429	285 + 21	144097	80967	146222	2.81	22.4
Soyabean + maize - pea veg - green gram	533 + 4109	3061	200	117573	81767	60770	1.74	19.9
Soyabean + maize(cob) - wheat + chick pea - green gram	528 + 4549	4707 + 7	201	95401	81598	141454	2.73	24.9
Soyabean + maize - wheat + french bean - green gram	525 + 53243	5352 + 27	159	169897	82698	164162	2.99	39.5
Standard Error				**8668**				**1.6**
Critical Difference (5%)				**18376**				**3.5**
			Parbhani (Maharastra)					
Soyabean - sorghum - fallow -	2099	3095	0	101097	56865	44232	1.78	19.9
Cotton - fallow - groundnut	2397	0	1995	173265	68570	104695	2.53	19.2
Soyabean - wheat - cowpea	2105	3267	6348	177424	61160	116264	2.9	23.4
Cotton + soyabean - cotton - green gram + amaranthus	2167 + 1052	0	720	146352	64000 + 0.0	82352	2.29	14.1
Pigeon pea + soyabean - pigeon pea - green gram + cluster bean	1802 + 661	0	605	146745	74135 + 1768	72610	1.98	11.5
Maize + soyabean - chick pea - cowpea + okra	4442 + 699	1497	6795	281028	75650 + 5717	205378	3.71	28.9

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Pearl millet + soyabean - chick pea + mustard - cowpea	1919 + 1055	1036	6274 + 898	191852	69500	122352	2.76	23.1
Maize + soyabean - chick pea + sorghum - cowpea + okra	4286 + 646	1057	6505 + 1872	216201	80225 + 0	135976	2.69	30.9
Standard Error				**13804**				**0.9**
Critical Difference (5%)				**29609**				**2.0**
Rahuri (Maharashtra)								
Maize - potato - fallow	4445	21280	—	154653	80125	74528	1.93	35.8
Maize + soyabean - wheat - fallow	1482 + 1599	3582	—	112538	56277	56261	2	24.4
Maize - garlic - fallow	4600	6300	—	306646	66780	239866	4.59	24.9
Maize + soyabean - onion + cabbage - fallow	1190 + 1913	21168 + 6038.0	—	326251	83460	242791	3.91	24.5
Maize - onion - fallow	4758	30890	—	387389	79586	307803	4.87	31.7
Maize + soyabean - potato - fallow	1566 + 1661	22890	—	166289	81236	85053	2.05	34.7
Soyabean - potato - fallow	2236	22903	—	160304	88989	71315	1.8	31.8
Maize + soyabean - chick pea + mustard - fallow	1520 + 1623	8119 + 7091	—	577293	53430	523863	10.8	79.8
Soyabean - garlic - fallow	2355	12081	—	531434	79546	451888	6.68	27.7
Maize + soyabean - garlic - fallow	1586 + 1723	11555	—	515755	82956	432799	6.22	29.6
Soyabean - onion - fallow	2550	28601	—	365579	85158	280421	4.29	25.3
Fallow - soyabean - onion + chick pea - fallow	1138 + 1698	12275 + 8281	—	455985	83158	372827	5.48	43.3
Standard Error				**216120**				**25.9**
Critical Difference (5%)				**448232**				**53.7**
Ludhiana (Punjab)								
Rice - wheat - fallow	6116	5126	0	157505	53342	104163	1.51	38.9
Basmati rice - hayola - green gram	3971	1849	831	179474	20571	158903	1.13	26.5
Basmati rice - radish - fallow	3869	22281	4655	176641	21196	155445	1.14	17.2
Maize - potato kufri - fallow	4911	22256	4580	165215	29772	135443	1.22	38.4
Maize + turmeric - barley - fallow	3804 + 16159	3415	0	512371	305578	206793	1.22	80.9
Maize + turmeric - wheat - fallow	3816 + 16470	3790	0	533736	329250	204486	1.22	83.6

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Maize + radish - wheat - fallow	3816 + 7573	3712	862	130885	-10795	141680	1.22	27.2
Groundnut + arhar - wheat - fallow	1523 + 4498	4838	0	131081	20422	110659	1.22	26.9
Maize - pea - fallow	3293	9506	0	271779	132140	139639	1.95	41.2
Maize + arhar - green gram - fallow	3136 + 906	1646	0	121398	16656.4	104742	1.22	19.3
Maize + cowpea - green gram+ mustard - fallow	20525 + 2808	330 + 1467	1055	370779	85380	285399	1.22	80.6
Sorghum + cowpea - wheat + mustard - fallow	47460 + 15273	4858 + 268	4065	98843	85152	13731	1.22	191.2
Standard Error				**15208**				**9.7**
Critical Difference (5%)				**30964**				**31.0**
			Kanpur (UP)					
Rice - wheat – fallow	4929	2554	—	104053	65620	38433	1.59	25.9
Rice - wheat – fallow	8048	2685	—	148371	70050	78321	2.12	37.1
Rice - wheat – fallow	8238	2738	—	151738	70050	81688	2.17	38.0
Maize - wheat – fallow	4079	2792	—	94527	56700	37827	1.67	23.6
Maize - mustard – fallow	2905	822	—	66008	44550	21458	1.48	14.4
Maize - mustard - fallow	3000	887	—	69465	44550	24915	1.56	15.1
Maize + green gram - potato - fallow	2952 + 381	20155	—	148293	130550	17743	1.14	30.9
Maize + black gram - potato - fallow	2976 + 999	21250	—	181295	98650	82645	1.84	34.3
Maize - garlic - fallow	3071	7185	—	320899	92550	228349	3.47	20.9
Rice - wheat - fallow	4738	2583	—	101897	65620	36277	1.55	25.3
Standard Error				**15978**				**2.6**
Critical Difference (5%)				**32784**				**5.3**
			Kota (Rajasthan)					
Soyabean - wheat - fallow	1950	5360		127640	42000	85640	3.04	27.0
Soyabean + maize - garlic + wheat - fallow	1620 380	7530 750		335142	75000	260142	4.47	17.9
Maize - mustard - green gram	2980	1640	150	101700	53000	48700	1.92	19.6
Maize + blackgram - chick pea + mustard - green gram	2100 350	1550 470	433	101929	56000	45929.2	1.82	14.2
Maize + blackgram - chick pea + linseed - cowpea	3080 605	1400 350	4060	91600	54000	37600	1.7	15.7

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Maize - garlic - fallow	3320	9600	0	418390	96000	322390	4.36	25.3
Cotton + blackgram - fallow - green gram	1820 812	0	1130	70980	46000	24980	1.54	6.0
Cotton + clusterbean - fallow - green gram	1900 1210	0	1050	74100	46000	28100	1.61	6.3
Standard Error				**5242**				**0.3**
Critical Difference (5%)				**11244**				**0.7**
			Akola (Maharashtra)					
Groundnut - linseed + carrot - green gram	1468	784 + 455	78	91736	50327	41409	1.82	13.0
Groundnut - lentil + carrot - green gram	1634	668 + 808	99	95941	47307	48634	2.03	12.3
Groundnut - pea + carrot - green gram	1361	1150 + 379	95	89119	51347	37772	1.74	11.8
Groundnut - rajma + carrot - green gram	1684	571 + 354.0	89	89668	60108	29560	1.49	12.0
Groundnut – rajma + carrot - green gram	1446	129 + 556	101	69875	46782	23093	1.49	9.2
Groundnut - green gram + carrot - green gram	1580	303 + 580	100	86507	48112	38395	1.8	10.6
Groundnut - black gram + carrot - green gram	1475	296 + 480	91	80205	49012	31193	1.64	9.9
Groundnut - wheat + carrot - green gram	1641	3308 + 505	87	121099	62701	58398	1.93	21.3
Standard Error				**12053**				**1.7**
Critical Difference (5%)				**25854**				**3.6**
			C. SUBMID ECOSYSTEM					
			Faizabad (UP)					
Rice - wheat - fallow	4825	4185	0	126303	67127	59176	1.88	31.2
Rice - potato - green gram	5043	20478	1107	214427	123402	91025	1.74	41.0
Rice - french bean - okra	4809	2230	7966	214037	99414	114623	2.15	20.0
Rice - mustard - black gram	5064	1705	982	171405	76486	94919	2.24	30.1
Rice - berseem - berseem	4951	0	177	87126	59376	27750	1.47	17.7
Rice - chick pea – maize	4844	1813	52652	127978	75554	52420	1.69	24.0
Rice - lentil - fallow	4852	1658	0	116971	72516	44455	1.61	22.5
Rice - cauliflower - cowpea	4922	11060	8232	252544	86998	165546	2.9	28.3
Standard Error				**10070**				**1.1**
Critical Difference (5%)				**21600**				**2.3**

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield ($K*10^6$)
	Kharif	*Rabi*	Summer					
Pantnagar (Uttrakhand)								
Rice - wheat - fallow	4250	5087	0	138267	50100	88167	2.76	32.3
Rice - pea veg - rice	4400	11133	7190	280602	92000	188602	3.05	50.5
Rice - pea veg - fallow	4373	9577	0	221097	66276	154821	3.34	24.0
Rice - potato - cowpea	4267	28100	8140	463153	95307	367846	4.86	46.0
Rice - pea veg - maize	4500	9867	9423	283193	69958	213235	4.05	57.0
Rice - mustard - cowpea	4187	1500	8070	267560	63026	204534	4.25	26.5
Rice + sesbania - pea veg + toria - maize + mentha	3333	9167 660	5130 21383	309959	75953	234006	4.08	56.1
Soyabean + rice - wheat + menthe - mentha	2040 2310	4400 15977	2992	206243	56946	149297	3.62	43.2
Maize + cowpea - pea veg + toria - groundnut + mentha	8553 1933	8517	1043 13567	339117	76622	262495	4.43	56.6
Standard Error				**4001**	**-**	**4000**	**0.05**	**0.8**
Critical Difference (5%)				**11994**	**-**	**11992**	**0.17**	**1.7**
Ranchi (Jharkhand)								
Rice - wheat - fallow	2310	3275	0	78900	50898	28002	1.55	19.3
Rice - mustard - green gram	2718	813	0	64205	55719	8486	1.15	13.8
Rice - linseed - green gram	2835	697	0	61906	49938	11967	1.24	13.5
Rice - potato - green gram	3302	19091	0	130812	133978	-3166	0.98	29.9
Rice – wheat + mustard - green gram	2998	2357 + 148	0	79928	64176	15751	1.25	19.3
Rice - wheat + linseed - green gram	3092	2470 + 106	0	81420	64211	17209	1.27	19.8
Rice - potato + wheat - green gram	3442	19394 + 6968	0	235115	140587	94527	1.67	54.8
Standard Error				**38951**				**9.7**
Critical Difference (5%)				**84874**				**20.4**
*Green gram in all the treatments failed due to hailstorm on 27.05.15								
Jabalpur (M.P.)								
Rice - wheat - fallow	3706	3667	0	103573	41830	61743	2.48	25.5
Rice - chick pea - fallow	3867	-961	0	19691	35980	-16289	0.55	9.9
Rice - onion - green gram	3928	5882	0	115174	48295	66879	2.38	16.5
Rice– berseem- fallow	3273	5	0	44521	48530	-4009	0.92	11.3
Rice - potato - sorghum	3503	2665	48864	807253	52235	755018	15.45	185.2
Rice - gobisarson - black gram	3444	947	677	97571	46100	51471	2.12	19.4

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield ($K*10^6$)
	Kharif	*Rabi*	Summer					
Rice - pea veg - sorghum	3496	3541	47771	824472	43608	780864	18.91	182.1
Rice - potato - groundnut	3360	2525	1763	127569	54325	73244	2.35	24.1
Rice - gobisarson - sorghum	3374	884	46633	777485	41595	735890	18.69	179.2
Rice - gobisarson - okra	3391	901	3699	110816	43850	66966	2.53	17.9
Rice - french bean - sorghum	3883	0	27009	466045	45748	420297	10.19	107.7
Rice - marigold - sorghum	3452	4338	47229	858470	45480	812990	18.88	177.0
Standard Error				**20143**				**3.4**
Critical Difference (5%)				**41011**				**11.0**
			Rewa (M.P.)					
Fallow - wheat - fallow	0	50	0	725	NR	NR	NR	173.0
Fallow - green gram - fallow	0	10	0	486				33.4
Fallow - berseem - berseem	0	268	0	661				42.8
Fallow - fallow - wheat	0	0	40	586				139.7
Fallow - garlic - fallow	0	69	0	2682				99.7
Fallow - fallow - onion	0	0	160	1680				80.0
Fallow - lentil - sunhemp fodder	0	83	0	2558				285.4
Fallow - fallow - wheat	0	0	40	586				139.7
Fallow - chick pea + linseed - fallow	0	5 + 4	0	284				36.3
Fallow - mustard - sunhemp fodder	0	16	0	534				86.2
Standard Error				**660.626**				**71.4**
Critical Difference (5%)				**1355.6**				**146.5**
			Powerkheda (M.P.)					
Soyabean - wheat - fallow	917	4486	0	88506	47211	41295	1.87	19.5
Soyabean - chick pea - fallow	958	1569	0	78279	36232	42047	2.16	9.8
Soyabean - mustard - green gram	986	1555	799	116077	55198	60879	2.1	15.3
Soyabean - pea - onion	986	7152	5354	253105	90612	162493	2.79	29.5
Paddy - wheat - green gram	3868	4680	778	158180	80578	77602	1.96	32.2
Soyabean - potato - fodder	944	31247	38885	218448	121584	96864	1.8	35.9
Soyabean - pigeon pea - okra	979	1916	12638	266401	91966	174435	2.9	15.1
Paddy - mustard - black gram	3795	5636	847	279600	74543	205057	3.75	46.6
Paddy - linseed - fallow	3944	1347	0	98767	51667	47100	1.91	20.8
Soyabean - potato - sesamum	944	30833	660	193267	119628	73639	1.62	37.7
Standard Error				**62565**				**10.1**
Critical Difference (5%)				**128383**				**20.8**

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Chiplima (Orissa)								
Rice - groundnut - fallow	3500	1916	0	124231	75000	49231	1.66	23.0
Rice - groundnut + sunflower - bottle gourd + amaranthus	3663	1411 + 313	9346 + 742	192041	108600	83441	1.77	24.1
Rice - groundnut + kosala - cowpea + amaranthus	4153	1864 + 1909	3110 + 888	197996	123323	74673	1.61	27.7
Rice - maize + radish - okra + amaranthus	3692	35692 + 11607	3146 + 760	612107	124940	487167	4.9	138.3
Rice - maize + coriander - cowpea + amaranthus	17691	41909 + 377	3310 + 805	849940	110263	739677	7.71	207.6
Rice - omato + kosala - water melon + amaranthus	3570	9091 + 1475	8982 + 758	261919	129200	132719	2.03	19.6
Rice – tomato + febugreek – cowpea + amaranthus	4068	9689 + 153	2992 + 874	190572	134763	55809	1.41	18.2
Rice - potato + radish - pumpkin + amaranthus	3673	7468 + 9705	10027 + 925	208726	139420	69306	1.5	24.6
Rice - potato + kosala - green gram + amaranthus	4281	8481 + 1100	744 + 1012	155501	141323	14178	1.1	26.5
Rice - knolkhol + spinach - ridge gourd + amaranthus	3624	6002 + 843	2853 + 880	204022	95940	108082	2.13	16.4
Standard Error				**84094**				**21.4**
Critical Difference (5%)				**176682**				**45.0**
Kathalagere (Karnataka)								
Rice – fallow - rice	5555	-	5479	150062	75634	74428	1.98	38.2
Rice – fallow - rice	5586	-	5584	151912	74476	77436	2.04	38.6
Rice – fallow - groundnut	5456	-	2248	164122	71304	92818	2.3	31.6
Rice – fallow - maize	5589	-	5696.67	151491	63494	87997	2.39	38.8
Rice – fallow - soyabean	5612	-	2334	136074	66808	69266	2.04	29.5
Rice – fallow- spinach	5468	-	14792	244473	77706	166767	3.15	26.2
Rice – fallow - finger millet	5662	-	3348.33	128902	60217	68685	2.14	30.6
Rice – fallow - maize	5564	-	5999	155157	63320	91837	2.45	39.8
Standard Error				**4326**				**1.1**
Critical Difference (5%)				**9279**				**2.3**
BHU (Varanasi)								
Rice - wheat - fallow	2075	1968	0	56756	51094	5662	1.11	13988.8
Rice - wheat - green gram	2393	2141	0	63594	51094	12500	1.24	15688.8
Rice - wheat - sesbania	2552	2164	0	66095	51094	15001	1.29	16319.7

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Rice - wheat + mustard - black gram	2279	2095 + 0	0	61372	90106	-28734	0.68	15134
Rice - wheat + mustard - cowpea	2503	2153 + 0	0	65259	89108	-23849	0.73	16109.8
Rice - mustard - green gram	2419	2187	0	106179	88718	17461	1.2	20204.4
Rice - rapeseed - lady finger	2304	2014	0	98808	94369	4439	1.05	18868.7
Rice - pea veg - lady finger	8277	2072	0	139494	95166	44328	1.47	30563.9
Rice - maize + pea veg - cowpea	2113	2199 + 0	0	57878	101061	-43183	0.57	14832.7
Rice - potato - green gram	2483	2164	0	43504	117634	-74130	0.37	10689.4
Standard Error				**38759**				**9697.3**
Critical Difference (5%)				**81433**				**20373.9**
D. **HUMID ECOSYSTEM**								
R.S. Pura (Chatta J&K)								
Rice - wheat - fallow	5042	2483	0	104575	65055	39520	1.61	26.0
Rice – berseem - fallow	3708	57917	0	193488	65162	128326	2.97	22.1
Rice - potato - onion	3396	17917	12896	262215	139423	122792	1.88	35.6
Rice - knolkhol - tomato	3646	17708	5104	210625	107559	103066	1.96	21.4
Rice - garlic - cowpea	3562	7917	2292	384696	157761	226935	2.44	24.9
Rice - merigold - french bean	3437	8125	4708	316897	109070	207827	2.91	13.4
Rice - spinach - okra	3708	16458	4937	301421	99799	201623	3.02	22.6
Rice - broccoli - black gram	3500	9167	1021	350923	93501	257422	3.75	19.8
Rice - cabbage - onion	3417	19375	12625	304966	112769	192197	2.7	23.4
Rice - potato - maize	3458	17667	41250	673098	127876	545222	5.26	170.2
Standard Error				**28319**				**2.3**
Critical Difference (5%)				**58111**				**4.6**
Jorhat (Assam)								
Rice - Fallow - rice	3300		6720	53500	39800	13700	1.34	17.6
Rice - Toria - Fallow	3630	1490		65900	29700	36200	2.22	16.4
Rice - Cabbage - Green gram	3470	23900	960	210800	65700	145100	3.21	12.3
Rice - Cauliflower - Black gram	2800	7520	1130	123900	56500	67400	2.19	13.2
Rice - KnolKhol - Cowpea	3570	5480-7280	9930	153300	70200	83100	2.18	11.6
Rice - Capsicum - Cowpea	3170	2190	12800	142400	65600	76800	2.17	9.4
Rice - chilli - Black gram	3130	2800	1220	170700	59300	111400	2.88	12.7

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield ($K*10^6$)
	Kharif	*Rabi*	Summer					
Rice - Radish - Green gram	3130	21060-5060	810	168000	65600	102400	2.56	13.3
Standard Error						**5.05**	**0.05**	**0.8**
Critical Difference (5%)						**13**	**1**	**1.2**
			Kalyani (WB)					
Rice – rice – fallow	3877	3109		109609	96692	12917	1.13	
Rice – potato – jute	3630	8234	2148	194051	159000	35051	1.22	
Rice - fallow - maize + black gram	3868		675 +726	126747	92363	34384	1.37	
Elephant f.yam + ginger + termeric dolichos bean - elephant f.yam + ginger + termeric		+3403	15899	372396	287769	84627	1.29	
Rice – potato + cabage - maize + green gram	3569	4297 +5454	687 +707	238420	162180	76240	1.47	
Cauliflower + amaranths - raddish + frennch bean – okra +cowpea	10161 4233	8931 1143	1097 921	403779	163846	239933	2.46	
Maize – mustard + greenpea - swamp taro	2245	654 +3325	784	131184	102224	28960	1.28	
Rice + redgram –- carrot + coriander - ridge gourd	3403 +1055	5176 +1638	1943	379117	168761	210356	2.25	
Maize - onion + blackcumin - bitter gourd	1860	1711 632	1713	112459	92088	20371	1.22	
Onion – brinjal + sweet potato – chilli - cabbage	2917	5323 +3835	694 +9708	361255	153923	207332	2.35	
Pointed gourd + elephant f.yam - pointed gourd + garlic - pointed gourd + elephant f.yam	7055	8462	7254 +7290	665921	293524	372397	2.27	
Standard Error								
Critical Difference (5%)								
			Palampur (HP)					
Rice – wheat - fallow	4451	1468		102841	93629	9212	1.1	20.5
Rice – pea - summer squash	4072	3409	5208	187917	145739	42178	1.29	18.1
Okra – radish - onion	1705	2841	8617	193390	163347	30043	1.18	5.4
Turmeric – pea - summer squash	2367	3977	4735	198788	210244	-11456	0.95	12.7
Rice – lettuce - potato	4451	947	4640	120881	190671	-69790	0.63	20.1
Rice – palak - cucumber	3883	1136	11364	184716	138917	45799	1.33	15.2
Rice – broccoli - radish	3504	2580	2178	128097	136753	-8656	0.94	13.4
Colocasia – pea + coriander- fallow	4261	2334		145985	157716	-11731	0.93	6.6
Standard Error								
Critical Difference (5%)								

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield ($K*10^6$)
	Kharif	*Rabi*	Summer					
E. COASTAL ECOSYSTEM								
Bhubaneswar(Orissa)								
Rice - groundnut -fallow	3468	1765	-	117747	75000	42747	1.57	22.0
Rice - groundnut + toria - bottle gourd - + amaranthus	3386	905 + 3507	6393 + 742	147386	105850	41536	1.39	19.9
Rice – groundnut + kosala - cowpea + amaranthus	3785	1443 + 1354	3463 + 888	174849	123323	51526	1.42	24.0
Rice - maize + radish - okra + amaranthus	3235	38961 + 6494	4771 + 760	651619	124940	526679	5.22	147.6
Rice- maize + kosala - cowpea + amaranthus	3563	42291 + 1676	2930 + 805	670308	111323	558985	6.02	159.5
Rice - tomato + radish - bitter + amaranthus	3408	8980 + 6228	3472 + 758	210054	142940	67114	1.47	16.2
Rice - tomato + kosala - cowpea + amaranthus	4232	12421 + 1410	3510 + 874	235952	135323	100629	1.74	20.2
Rice - broccoli + radish - pumpkin + amaranthus	3098	3908 + 4995	6605 + 817	231339	120940	110399	1.91	15.4
Rice - broccoli + kosala - cowpea + amaranthus	3977	4773 + 1354	3619 + 903	255148	118063	137085	2.16	18.7
Rice - knolkhol + spinach - cowpea + amaranthus	3420	6027 + 788	3763 + 880	150350	97940	52410	1.54	17.0
Standard Error				**20320**				**4.2**
Critical Difference (5%)				**42693**				**8.8**
Maruteru (AP)								
Rice - maize - fallow	5810	1405	—	97637	88750	8884	1.1	24.9
Rice - sorghum - fallow	6427	993	—	102605	73750	28855	1.39	25.7
Rice - soyabean - fallow	5882	229	—	85870	68250	17620	1.26	21.3
Rice - black gram - fallow	6064	501	—	105619	63750	41869	1.66	22.7
Rice - maize - fallow	5737	817	—	88849	88750	99	1	22.6
Rice - sorghum - fallow	5628	736	—	87804	73750	14054	1.19	22.0
Rice - soyabean - fallow	5919	254	—	86997	68250	18747	1.27	21.6
Rice - black gram - fallow	5701	365	—	94427	63750	30677	1.48	21.0
Rice - paddy - fallow	6245	2584	—	120084	97750	22334	1.23	30.5
Standard Error				**4061**				**0.8**
Critical Difference (5%)				**8610**				**1.7**

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield ($K*10^6$)
	Kharif	*Rabi*	Summer					
Navsari (Gujarat)								
Rice - chick pea - fallow	4310	497	0	75641	46673	28968	1.62	16.7
Rice - sorghum - sorghum	3715	1749	1235	96174	62465	33709	1.54	23.3
Rice - maize sweet corn + green gram - green gram	4390	3852 + 152	692	151655	56433	95222	2.69	22.8
Rice - fenugreek(s) - cluster bean	4241	4561	4744	295997	55736	240261	5.31	31.5
Rice - castor - castor	4172	1586	0	107481	45383	62097	2.37	21.4
Rice - brinjal + radish - brinjal	4138	6973 + 4698	0	150541	54787	95754	2.75	23.3
Rice - sunhemp fodder - groundnut	4515	0	1337	114906	69649	45257	1.65	23.2
Rice - cabbage - green gram	4275	10002	1223	182480	66772	115708	2.73	21.6
Rice - maize sweet corn - groundnut	4024	4424	1189	160893	71073	89820	2.26	26.2
Rice - lucerne - lucerne	4241	24406	155	4478664	48525	4430140	92.3	18.6
Standard Error				**130215**				**1.2**
Critical Difference (5%)				**273581**				**2.6**
Karamana (Kerala)								
Rice - rice - fallow	3751	1416	0	70268	161215	-90946	0.44	17.9
Rice + fish - rice + fish - amaranthus	4915	3618	8351	215249	148278	66971	1.45	33.6
Rice - rice - amaranthus	4274	2324	8584	191703	270816	-79112	0.71	27.0
Rice + fish - rice + fish - water melon	5021	2945	22638	379994	145131	234863	2.62	38.0
Rice - rice - water melon	4131	2377	11257	223595	264522	-40928	0.85	27.7
Rice + fish - rice + fish - cowpea	5128	3546	18704	164163	120376	43787	1.36	33.0
Rice - rice - cowpea fodder	4701	2163	13981	127889	215011	-87122	0.59	26.0
Standard Error				**20880**				**3.7**
Critical Difference (5%)				**45498**				**8.0**
Thanjavur (T.N.)								
Rice + daincha - rice - brinjal	5647 + 0	6856	3389	207866	207866	141996	65870	44.1
Rice + daincha - rice - maize + black gram	4965 + 0	6583	5035 + 103	228519	228519	129549	98970	57.5
Rice + daincha - rice - groundnut + red gram	5621 + 0	6056	1385 + 115	219204	219204	139772	79432	48.6
Maize + black gram - rice - black gram + red gram	5319 + 394	6783	680 + 124	217767	217767	118792	98975	45.8

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Crop Sequence	Yield(kg/ha)			Gross Return (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Return (Rs/ha)	B:C ratio	Energy yield (K*10^6)
	Kharif	*Rabi*	Summer					
Sunflower – rice - green gram + red gram	1550	7000	705 + 125	192959	192959	109790	83169	36.6
Black gram + red gram - rice - red gram	788 + 335	6661	785	175740	175740	104298	71442	29.5
Green gram + red gram - rice – sesame	790 + 295	7167	790	185000.2	185000	100467	84533	32.9
Red gram - rice	1143	6661	2706	168712.1	168712	126356	42356	28.2
Onion								
Green manure - rice - sunflower	8817	7450	1672	185797.2	185797	87260	98537	37.5
Standard Error				**6867**				**1.4**
Critical Difference (5%)				**14558**				**2.9**
			Karjat (Maharashtra)					
Rice - groundnut - fallow	5571	2605	—	179975	126868	53108	1.42	34.0
Rice - mustard - fallow	5445	1005	—	107720	80723	26997	1.33	24.3
Rice - sunflower - fallow	5036	1126	—	110707	88019	22688	1.26	24.4
Rice - brinjal - fallow	5299	31497	—	423576	202084	221493	2.1	25.9
Rice - cabbage - fallow	5083	17714	—	184268	145430	38838	1.27	22.4
Rice - maize fodder - fallow	4585	56011	—	139646	104646	35000	1.33	24.8
Rice - cowpea - fallow	5785	1287	—	94117	83531	10585	1.13	20.6
Rice - dolichos bean - fallow	5445	5895	—	192840	180321	12519	1.07	21.7
Rice - okra - fallow	5220	10992	—	208401	162650	45751	1.28	21.9
Rice - chilli - fallow	4826	5136	—	178621	195579	-16957	0.91	19.0
Rice - rice - fallow	4765	4823	—	130395	124731	5664	1.05	33.2
Standard Error				**5148**				**0.7**
Critical Difference (5%)				**10739**				**1.4**

7.2.2 CONSERVATION AGRICULTURE AND CLIMATE CHANGE

Title of the experiment : Development of innovative farming practices to mitigate the effects of climate change

Objective:

- To design and identify economically viable and efficient farming practices for resource conservation and counteracting adverse effects of climate change.
- To study the effects of resource conservation technologies on photosynthetic efficiency, biomass production, economic yield, soil thermal regimes and soil health.

Year of start : 2011-12

Treatments:

A. Main plots (Crop establishment methods x Cropping Systems) – 8

I. Crop establishment method – 2

T1 = No tillage/minimum tillage/bed planting/and other suitable seed drill/planter

T2 = Conventional tillage

II. Cropping systems (location specific) - 4

CS1 = Predominant cropping system of the region

CS2 = Best identified cropping system from expt. 1(a)

CS3 and CS4 = New cropping systems designed by involving C4 plants (as they are known to perform better under enhanced CO2 and higher ambient temperatures), low water requiring and physiologically more efficient crops.

B. Sub-Plots (Mulch x Fertilizer) – 4

I. Mulch – 2

M1 = No mulch

M2 = Crop residue mulch (crop residue - straw or stover - to be recycled in situ, especially in rabi season crops, and to be applied uniformly on inter - row space after crop seeding establishment

II. Fertilizer rates – 2

F1 = Recommended dose of fertilizer (RDF)

F2 = 75% RDF + 25 % N through organic manure

Experimental Design : Split Plot with three replications

Results: Centre wise result are given in tables 7.2.2 (a-i) and discussed below.

S K Nagar: At SK Nagar pearlmillet equivalent yield, gross return and net return were significantly influenced by management of cropping systems for resource conservation and climate change. In case of tillage, conventional tillage recorded significantly the highest pearlmillet equivalent yield (11,887 kg ha^{-1}) and gross return (Rs. 1,42,646 ha^{-1}). This treatment also recorded the highest net return to the tune of 70,276 ha^{-1}. In cropping system Significantly the highest pearlmillet equivalent yield (14,223 kg ha^{-1}) and gross return (Rs. 1,70,674 ha^{-1}) were observed under C_3 (Greengram – mustard-pearl millet). Mulch/residue incorporation recorded significantly the highest pearlmillet equivalent yield (12,269 kg ha^{-1}) and gross return (Rs. 1,47,226 ha^{-1}). The highest net returns of Rs. 71,859 ha^{-1} was also observed under mulch/ residue incorporation. Application of 25% higher dose of recommended fertilizer recorded significantly the highest (11,726 kg ha^{-1}) pearlmillet equivalent yield and gross return (Rs. 1,40,707 ha^{-1}). Net return was also the highest (Rs. 69,362 ha^{-1}) under this treatment.

Table 7.2.2(a): Effect of different innovative farming practices on system productivity at S.K.Nagar

Main plot: Tillage x CS		Pearlmillet equivalent yield (Kg ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})
Tillage	T_1:Minimum	11317	135803	65439
	T_2:Conventional	11887	142646	70276
	CD at 5%	6.2	—	—
Cropping System	C_1: PM-Mustard	8548	102578	45311
	C_2: Castor + GG-GG	12035	144420	66836
	C_3:GG - Mustard -PM	14223	170674	90990
	CD at 5%	6.2	—	—
Mulch	M_1: No mulch	11012	132147	64549
	M_2: Mulch/Resi. inco.	12269	147226	71859
	CD at 5%	6.0	—	—
Fertilizer	F_1: RDF	11555	138666	68299
	F_2: 25% Higher of RDF	11726	140707	69361
	CD at 5%	6.0	—	—

Junagadh: At Junagadh groundnut equivalent yield and gross return didn't affected due to tillage practices. The maximum groundnut equivalent yield (4370 kg ha^{-1}) and gross return (Rs. 209063 ha^{-1}) were obtained under conventional tillage (T_2) which were 4.32 and 4.07 per cent higher than the minimum tillage, respectively. Among the three cropping systems, groundnut-onion-greengram (C_2) produced significantly the highest groundnut equivalent yield (8470 kg ha^{-1}) and gross return (Rs. 357876 ha^{-1}). The increase in groundnut equivalent yield and gross return over the

Table 7.2.2(b): Effect of different innovative farming practices on system productivity at Junagadh

	Treatment	Groundnut Equivalent Yield (kg ha^{-1})	Gross income (Rs. ha^{-1})	% Increase/decrease over respective control	
				GEY	Gross income
A. Main plot (Tillage x Cropping systems)	Tillage				
	T_1	4181	200549		
	T_2	4370	209063	4.32	4.07
	S. Em.±	120	5060	—	—
	C.D. at 5 %	NS	NS	—	—
	Cropping systems				
	C_1	2649	122511		
	C_2	8470	357876	219.74	192.12
	C_3	1707	134031	-35.56	9.40
	S. Em.±	146	6197	—	—
	C.D. at 5 %	462	19526	—	—
B. Sub plot (Mulch x Fertilizer)	Mulches				
	M_1	4046	194168		
	M_2	4505	215444	11.34	10.96
	S. Em.±	101	4380	—	—
	C.D. at 5 %	290	12570	—	—
	Fertilizer				
	F_1	4177	200415		
	F_2	4374	209197	4.72	4.38
	S. Em.±	101	4380	—	—
	C.D. at 5 %	NS	NS	—	—
Interactions		NS	NS	—	—

predominant cropping system (C_1) was 220 and 192 per cent, respectively. The highest groundnut equivalent yield (4505 kg ha^{-1}) and gross return (Rs. 215444 ha^{-1}) were gained by incorporating of mulch/crop residue in soil. Application of 100% recommended fertilizer dose and 25% higher recommended fertilizer dose to respective crops were failed to manifest their significant effect on groundnut equivalent yield and gross return. Though, the maximum GEY (4374 kg ha^{-1}) and gross return (Rs. 209197 ha^{-1}) were obtained with application of 125% recommended fertilizer dose to respective crops.

Navsari: At navsari Conventional tillage recorded significantly the highest paddy equivalent yield (16778 kg ha^{-1}) to the tune of 10.5 % higher over T_1 along with gross return of Rs. 1,82,045 ha^{-1} and net return of Rs. 92,560 ha^{-1} over minimum tillage treatment T_1. In cropping system Significantly the highest paddy equivalent yield was recorded under the cropping system C_3 (19652 kg ha^{-1}), which was higher to the tune of 19.6 and 71.4 % higher over the C_1 and C_2 cropping system, respectively. The highest gross return of Rs. 2,13,226 ha^{-1} were observed under C_3 (paddy-sorghum- summer green gram) along with net return of Rs. 1,23,400 ha^{-1}. Much does not reflect its significant effects on paddy equivalent yield, but numerically highest paddy equivalent yield (16274 kg ha^{-1}), grass return (Rs. 1,76,570 ha^{-1}) and net return (Rs. 91,815 ha^{-1}) were recorded under treatment M_2 (mulch incorporation). 25% higher dose of recommended fertilizer recorded significantly the highest paddy equivalent yield (16707 kg ha^{-1}). The tune of increase in yield was 9.6 % over RDF. The highest gross return (Rs. 1,81,274 ha^{-1}) was recorded under 25 % higher RDF over RDF. The same trend was observed in net return (Rs. 96,951 ha^{-1}).

Jammu: At Jammu crop establishment methods conventional tillage recorded significantly higher REY of 14395 kg ha^{-1}, production efficiency of 48 kg ha^{-1}, system duration (289 day), system profitability Rs. 389 ha day^{-1} and land use efficiency (79%) as compared to minimum tillage which recorded REY 12848 kg ha^{-1}, production efficiency 44 kg/ha/day, system duration (283), system profitability Rs. 344 kg ha^{-1} day^{-1} and land use efficiency (77%), respectively. Similarly under different cropping system experiments, Rice-Marigold-Frenchbean recorded higher REY of 22338 kg ha^{-1}, production efficiency of 72 kg ha^{-1} day^{-1}, system duration of 309 days, system profitability of Rs. 662 ha^{-1} day^{-1} and land use efficiency of 85% which was followed by Maize+Soyabean-Wheat cropping system. The least REY, production efficiency, system duration,

Table 7.2.2(c): Effect of different innovative farming practices on system productivity at Navsari

Treatment		Paddy Equivalent yield (kg ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})
Tillage	T_1 : Minimum tillage	15179	164687	88464
	T_2 : Conventional tillage	16778	182045	92560
CD at 5 %		1447	15703	NS
Cropping systems	C_1 : Paddy – green manure- Summer Groundnut	16815	182441	93690
	C_2 : Paddy – *Rabi* Castor – incorporation	11468	124430	54445
	C_3 : Paddy - Sorghum – Summer Green gram	19652	213226	123400
CD at 5 %		1773	19232	19232
Mulch	M_1 : No mulch	15683	170162	89209
	M_2 : Mulch/Residue Incorporation	16274	176570	91815
CD at 5 %		NS	NS	NS
Fertilizer	F_1 : RDF	15250	165458	84073
	F_2 : 25% higher of RDF	16707	181274	96951
CD at 5 %		719	7801	7801

Table 7.2.2(d): Effect of different innovative farming practices on system productivity at Jammu

Treatments	REY (kg ha^{-1})	Production Efficiency (Kg ha^{-1} day^{-1})	System Duration (days)	System Profitability (Rs ha^{-1} day^{-1})	Land Use Efficiency (%)
Crop Establishment Methods					
Minimum Tillage	12848	44	283	344	77
Conventional Tillage	14395	48	289	389	79
SEM ±	37.3				
LSD (P=0.05)	113.3				
Cropping System					
Rice-Wheat	8339	31	273	191	75
Rice-Marigold-Frenchbean	22339	72	309	662	85
Maize + Soybean –Wheat	10187	36	276	247	76
SEM ±	45.7				
LSD (P=0.05)	138.7				
Mulching					
No Mulch	13237	45	286	359	78
Mulch with rice straw	14006	48	286	374	78
SEM ±	37.5				
LSD (P=0.05)	106.8				
Fertilizer Rates					
100% RDF	13386	46	286	376	78
75%RDF+25% N through FYM	13855	47	286	356	78
SEM ±	37.5				
LSD (P=0.05)	106.8				

system profitability and land use efficiency was recorded under existing rice-wheat cropping system. Mulching with rice straw @ 5 ton/ha during *Rabi* crops also registered high REY of 14006 kg ha^{-1} production efficiency of 48 kg ha^{-1} day^{-1} and system profitability of Rs. 374 ha^{-1} day^{-1}. Application of 75% RDF+ 25% N through FYM also recorded significantly higher REY of 13855 kg ha^{-1} as compared to 100% RDF (13386 kg ha^{-1}) but system profitability was observed higher with 100% RDF which may be due to higher additional cost of FYM incorporation.

Jabalpur: At Jabalpur Under different tillage practices, conventional tillage recorded maximum REY, NMR and B:C ratio of 93.35 q ha^{-1} yr^{-1}, 59953 Rs ha^{-1} yr^{-1} and 1.17 followed by minimum tillage with REY, NMR and B:C ratio of 89.33 q ha^{-1} yr^{-1}, 56861 Rs ha^{-1} yr^{-1} and 1.13. Under different cropping system rice-berseem (F+S) cropping system gave the maximum REY, NMR and B:C

Table 7.2.2(e): Effect of different innovative farming practices on system productivity at Jabalpur

Treat.	Treatments	REY (q/ha/yr)	NMR (Rs./ha/yr)	B:C Ratio
Tillage level				
T_1	Minimam Tillage	89.33	56861	1.13
T_2	Conventional tillage	93.35	59953	1.17
Cropping systems				
CS_1	Rice-wheat	95.46	58078	1.19
CS_2	Rice-berseem (F+S)	121.40	78022	2.23
CS_3	Maize-wheat	74.94	49593	1.16
CS_4	Sorghum-wheat	73.56	47934	1.03
Mulch				
M_0	Without Mulch	92.22	58526	1.18
M_1	With Mulch	90.46	58287	1.12
Fertility levels				
F_1	100% RDF	88.06	55524	1.11
F_2	125% RDF	94.62	61290	1.19

ratio of 121.40 q ha^{-1} yr^{-1}, 78022 Rs ha^{-1} yr^{-1} and 2.23 followed by rice-wheat and sorghum-wheat cropping system. The minimum REY, NMR and B:C ratio obtained from the sorghum-wheat cropping system. As regard the mulches, maximum REY, NMR and B:C ratio was recorded with no mulch as compare to with mulch whereas under fertility levels 125% RDF gave maximum REY, NMR and B:C ratio followed by 100% RDF.

Bhubaneswar: At Bhubaneswar System of Rice Intensification (SRI) method of crop establishment resulted in the higher system yield of 12.54 t REY ha^{-1} yr^{-1} with net monetary returns of Rs. 57,782 ha^{-1} and BCR of 0.56, while the Conventional Method (CMS) of crop establishment gave 11.78 t REY ha^{-1} yr^{-1} as system yield with NMR Rs. 46,274 ha^{-1} and BCR 0.44. Among the cropping systems, rice-maize-lady's finger produced the highest system yield of 16.63 t REY ha^{-1} yr^{-1} and fetched the maximum net returns of Rs. 89,333 ha^{-1} yr^{-1} with BCR of 0.84 followed by rice-tomato-cowpea with corresponding values of 15.64 t, Rs. 71,123 and 0.83. The system yield of the prevalent rice-groundnut system was 8.42 t REY ha^{-1} yr^{-1}, which was at par with rice-*toria*-greengram (7.96 t REY ha^{-1}). The effect of mulching was significant with yield advantage of 10.5% over no mulching. Similarly, integrated use of 75% RDF + 25% N as FYM marginally increased system yield by about 7.1% over 100% RDF and fetched additional net returns of Rs. 3137/ha. Rice-maize-lady's finger system under SRI method of transplanting of rice with integrated use of 75% RDF + 25% N as FYM to all the crops and mulching to *rabi* and summer crops produced the highest system yield of 18.69 t REY ha^{-1} with NMR of Rs. 1,08,652 ha^{-1} and BCR of 91 followed by SRI method of transplanting of rice (17.93 t REY ha^{-1}, NMR Rs. 1,11,147 ha^{-1}, BCR 1.15.

Chiplima: At chiplima, Conventional method of crop establishment of rice (CMS) line transplanting resulted in significant higher system yield (13.05 t REY ha^{-1}) than direct seeded rice (DSR), and fetched higher net returns of Rs. 66,647 ha^{-1} with BCR of 0.69. Among the cropping systems, rice-maize-lady's finger produced the highest system yield of 16.64 t REY ha^{-1} yr^{-1}, net returns of Rs. 90,265 ha^{-1} yr^{-1} and BCR of 0.80 followed by rice-groundnut-cowpea with corresponding values of 13.76 t, NMR of Rs. 63,818 and BCR of 0.60 as

Table 7.2.2(f): Effect of different innovative farming practices on system productivity at Bhubaneswar

Particular	System yield (kg REY ha^{-1} yr^{-1})	Net monetary returns (Rs. ha^{-1} yr^{-1})	BCR
Method of crop establishment			
System of Rice Intensification (SRI)	12,543	57,782	0.56
Conventional method (CMS)	11,778	46,274	0.44
CD (0.05)	439.2	–	–
Cropping system			
Rice-groundnut-fallow (CS_1)	8,418	28554	0.38
Rice-tomato-cowpea (CS_2)	15,637	71,123	0.59
Rice-maize-lady's finger (CS_3)	16,628	89,333	0.84
Rice-*toria*-greengram (CS_4)	7,960	19,102	0.24
CD (0.05)	621.2	–	–
Mulching			
No mulch (M_1)	11,486	44,663	0.50
Mulch (M_2)	12,835	59,392	0.49
CD (0.05)	277.2	–	–
Nutrient management			
100% RDF (F_1)	11,714	50,459	0.50
75% RDF + 25% N as FYM (F_2)	12,607	53,596	0.49
CD (0.05)	277.2	–	–

Table 7.2.2(g): Effect of different innovative farming practices on system productivity at Chiplima

Particular	System yield (kg REY ha^{-1} yr^{-1})	Net monetary returns (Rs. ha^{-1} yr^{-1})	BCR
Method of crop establishment			
Direct seeded rice (DSR)	12,030	56,494	0.60
Conventional method (CMS)	13,050	66,647	0.69
CD (0.05)	413.61	-	-
Cropping system			
Rice-groundnut-fallow (CS_1)	10,082	50,188	0.67
Rice-groundnut -cowpea (CS_2)	13,762	63,818	0.60
Rice-maize-lady's finger (CS_3)	16,640	90.265	0.80
Rice-*toria*-greengram (CS_4)	9,678	42,012	0.53
CD (0.05)	584.95	-	-
Mulching			
No mulch (M_1)	12,165	57,698	0.61
Mulch (M_2)	12,915	65,442	0.68
CD (0.05)	440.69	-	-
Nutrient management			
100% RDF (F_1)	12,173	60,617	0.66
75% RDF + 25% N as FYM (F_2)	12,908	62,524	0.63
CD (0.05)	440.69	-	-

against the system yield of 10.08 t ha^{-1} yr^{-1} and net monetary returns of Rs. 50,188 ha^{-1} of the predominant rice-groundnut system (Table CRA 7). Mulching of *rabi* and summer crops with residues of previous crops increased system yield by 5.8% over no mulching with an increase of Rs. 7,744 ha^{-1} in NMR. Integrated use of 75% RDF + 25% N as FYM significantly increased system yield by about 5.7% over 100% RDF and fetched higher net returns of Rs. 62,524 ha^{-1} with BCR of 0.63. This was reflected in the highest system yield of 18.31 t REY ha^{-1} with NMR of Rs. 1,01,169 ha^{-1} and BCR of 0.82 by rice-maize-lady's finger system under conventional method of transplanting of rice with integrated use of 75% RDF + 25% N as FYM to all the crops and mulching to *rabi* and summer crops ($CMSCS_3M_2F_2$) followed by the direct seeded rice (DSR $CS_3M_2F_1$) with 100% RDF and mulching to *rabi* and summer crops (17.43 t REY ha^{-1} with NMR of Rs. 93,643 ha^{-1} and BCR of 0.78.

Varanasi: Two tillage practices caused difference in REY only during *Kharif* where conventional tillage produced significantly higher REY than reduced tillage. However, during *rabi* and summer the two tillage practices did not affect the REY to the level of significance. During *kharif* season, the grain yield of maize in maize-mustard-green gram sequence was recorded maximum and being at par with rice in rice-potato-green gram (S_2) produced significantly higher grain yield than rice in rice-wheat (S_1) and DSR-maize-green gram (S_4) sequences. It was further observed that grain yield of rice in S_2 was significantly higher than S_1 and S_4. However, maize recorded significantly higher stover yield than rice in different sequences. The straw yield of rice in S2 was significantly higher than S_1 and S_4. In the next season, the tuber and stover yield of potato were markedly higher than grain crops (wheat and maize) as well as mustard. The economic yield of maize was significantly higher than wheat and both produced significantly economic yield than mustard. The straw/stover yield followed similar trend. Nevertheless, in summer, green gram in different sequences performed differently. The grain yield of green gram in rice-potato-green gram sequence was significantly higher than rice-mustard-green gram. Similarly, grain yield of green gram in rice-mustard-green gram sequence was significantly higher than DSR-maize-green gram sequence. Mulching treatments involved no mulch and mulching with

Table 7.2.2(h): Effect of different innovative farming practices on system productivity at Varanasi

Treatments	REY (kg ha^{-1})	Cost of production (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
Tillage Practices				
Minimum Tillage	23130	133,352	106,515	0.80
Conventional Tillage	24620	138,677	118,705	0.86
CD(P=0.05)	480	-	4,980	NS
Cropping Systems				
Rice - wheat - mung bean	17170	88,763	99,934	1.13
Rice - potato - onion + maize (cob)	30650	176,159	129,293	0.73
Rice - potato + maize - cowpea (F)	27530	158,380	121,019	0.76
Rice - cabbage – mung bean	20130	120,757	100,192	0.83
CD(P=0.05)	677	-	7,042	0.09
Mulch				
No mulch	23760	133,636	113,836	0.85
Crop residue mulch	23990	138,393	111,383	0.80
CD(P=0.05)	N.S.	-	N.S.	NS
Fertilizer rates				
RDF	23130	131,317	109,549	0.83
75% RDF+25% through vermicompost	24610	140,712	115,671	0.82
CD(P=0.05)	650	-	6,559	NS

rice straw @ 6 t ha^{-1} during *rabi*. Marked differences in the economic and straw/stover yield of crops in different sequences was observed only during *rabi* season where mulching with rice straw produced significantly higher economic as well as straw/stover yield over no mulching. Marked effect of nutrient management was observed on rice equivalent yield in kharif and rabi seasons as well as the system REY. Application of 75% RDF accompanied with 25% N through FYM significantly increased the REY in *kharif* and *rabi* seasons as well as the system REY.

Ranchi: Cropping system: Rice - Potato + Wheat (1:1) – Green gram obtained significantly higher rice equivalent yield 185.23 q ha^{-1} with a productivity of 50.75 kg rice ha^{-1} day^{-1} followed by Maize – Lentil - Green gram System REY-64.68 q ha^{-1} and productivity 17.72 kg rice ha^{-1} day^{-1}. Net return Rs. 56587, B: C ratio 0.40 and profitability Rs. 155.03 ha^{-1} day^{-1} was maximum in Rice - Potato + Wheat (1:1) – Green gram system followed by Rice – Wheat system (Rs. 22204, 0.42, Rs. 60.83/ha/day). There was no significant effect of tillage on REY, productivity, B:C ratio, net return or profitability. Significantly higher REY (90.03 q ha^{-1}) was obtained in plots having crop residues as mulch (in rabi season) with productivity of 24.67 kg rice ha^{-1} day^{-1}. There was no effect of mulch on net return and profitability, however, B:C ratio was lower in mulched plots due to cost of mulch. Plot having 75% RDF with 25% N through FYM in all seasons recorded higher REY- 91.99 q ha^{-1} with productivity of 25.20 kg rice ha^{-1} day^{-1} and higher NR of Rs. 24912 ha^{-1} with profitability of Rs. 68.25 ha^{-1} day^{-1} and B:C ratio 0.25 than 100% RDF through chemical fertilizer (REY- 80.49 q ha^{-1}, productivity-22.05 kg ha^{-1} day^{-1}, NR- Rs. 17381 ha^{-1} and profitability-Rs. 47.62 ha^{-1} day^{-1}).

Sabour: Rice equivalent yield (REY) of the convention tillage was observed to be higher than the minimum tillage. Amongst different cropping systems, rice - potato - onion + maize (for cob) recorded the maximum rice equivalent yield of 30650 kg ha^{-1} following in descending order by rice - potato + maize - cowpea fodder (27530 kg ha^{-1}), rice - cabbage - mung bean (20130 kg ha^{-1}). Significantly lower REY of 17170 kg ha^{-1} was noticed for the rice - wheat - mung bean system. Crop residue mulching also established marginal superiority over no mulch system. Application of 75% recommended doses of fertilizers + 25% N through vermicompost was instrumental in significant increase in REY.

Table 7.2.2(i): Effect of different innovative farming practices on system productivity at Ranchi

Treatment	REY (q ha^{-1})	Productivity (kg ha^{-1} day^{-1})	B:C ratio	Net return (Rs. ha^{-1})	Profitability (Rs. ha^{-1} day^{-1})
A. Cropping System					
Rice - wheat	57.91	15.87	0.42	22204	60.83
Rice - potato + wheat (1:1) - green gram	185.23	50.75	0.40	56587	155.03
Maize - lentil - green gram	64.68	17.72	0.20	11912	32.63
Ragi - lentil - green gram	37.13	10.17	-0.13	-6115	-16.75
CD (P=0.05)	7.98	2.19	0.09	10426	28.56
B. Tillage					
Minimum tillage	81.93	22.45	0.18	17359	47.56
Conventional tillage	90.55	24.81	0.26	24934	68.31
CD (P=0.05)	NS	NS	NS	NS	NS
C. Mulch					
No mulch	82.45	22.59	0.24	20527	56.24
Mulch	90.03	24.67	0.20	21767	59.64
CD (P=0.05)	2.45	0.67	0.03	NS	NS
D. Fertilizer					
RDF	80.49	22.05	0.19	17381	47.62
75 % RDF+25 % N FYM	91.99	25.20	0.25	24912	68.25
CD (P=0.05)	2.45	0.67	0.03	2542	6.96
CV%	6.96	6.96	14.73	19.39	19.39

Table 7.2.2(j): Effect of different innovative farming practices on system productivity at Chiplima

Treatments	REY (kg ha^{-1})	Cost of production (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
Tillage Practices				
Minimum Tillage	23130	133,352	106,515	0.80
Conventional Tillage	24620	138,677	118,705	0.86
CD(P=0.05)	480	-	4,980	NS
Cropping Systems				
Rice - wheat - mung bean	17170	88,763	99,934	1.13
Rice - potato - onion + maize (cob)	30650	176,159	129,293	0.73
Rice - potato + maize - cowpea (F)	27530	158,380	121,019	0.76
Rice - cabbage – mung bean	20130	120,757	100,192	0.83
CD(P=0.05)	677	-	7,042	0.09
Mulch				
No mulch	23760	133,636	113,836	0.85
Crop residue mulch	23990	138,393	111,383	0.80
CD(P=0.05)	N.S.	-	N.S.	NS
Fertilizer rates				
RDF	23130	131,317	109,549	0.83
75% RDF+25% through vermicompost	24610	140,712	115,671	0.82
CD(P=0.05)	650	-	6,559	NS

7.3 SUSTAINABLE RESOURCE MANAGEMENT

7.3.1 INTEGRATED NUTRIENT MANAGEMENT (INM)

Title of the Experiment: permanent plot experiment on integrated nutrient management in cereal based cropping systems (Expt. No.2a).

Objectives:

1. To develop suitable integrated nutrient supply and management system.
2. To study the long –term effect of conjunctive use of fertilizers and organic manures on the productivity of cereal based crop sequences and on soil health.

Treatments:

	Kharif	*Rabi*
T_1	No fertilizer, no organic manure(control)	No, fertilizer, no organic manure(control)
T_2	50% rec. NPK dose through fertilizers	50% rec. NPK dose through fertilizers
T_3	50% rec. NPK dose through fertilizers	100% rec. NPK dose through fertilizers
T_4	75% rec. NPK dose through fertilizers	75% rec. NPK dose through fertilizers
T_5	100% rec. NPK dose through fertilizers	100% rec. NPK dose through fertilizers
T_6	50% rec. NPK dose through fertilizers+ 50% N through FYM	100% rec. NPK dose through fertilizers
T_7	75% rec. NPK dose through fertilizers+ 25% N through FYM	75% rec. NPK dose through fertilizers
T_8	50% rec. NPK dose through fertilizers+ 50% N through straw	100% rec. NPK dose through fertilizers
T_9	75% rec. NPK dose through fertilizers+ 25% N through straw	75% rec. NPK dose through fertilizers
T_{10}	50% rec. NPK dose through fertilizers+ 50 N through GM	100% rec. NPK dose through fertilizes
T_{11}	75% rec. NPK dose through fertilizers+ 25% N through GM	75% rec. NPK dose through fertilizers
T_{12}	Farmer's conservational practice	Farmer's conservational practice

(FYM=Farm Yard Manure and GM=Green manure)

Locations:

Cropping System	Ecosystem/ Centre (State)
Rice-Rice	Semi-arid: Rajendranagar (A.P.); Humid: Jorhat(Assam); Coastal : Maruteru (A.P.), Sub-humid: Pantnagar
Rice-Wheat	Semi-arid:Ludhiana(Punjab), Kanpur(U.P.);Sub-humid: R.S.Pura (J&K),Varanasi(U.P.) , Faizabad(U.P.), Sabour (Bihar) ,Humid: Kalyani(W.B.), Humid: Palampur
Rice-Mustard	Semi-arid:Rudrur(A.P.)
Maize- wheat	Sub-humid:Ranchi (Jharkhand)
Pearl millet-wheat	Semi-arid: Bichpuri

The centre-wise details in respect of year of start, crop varieties and fertilizer doses are given hereunder

Centre	Year of start	Crop variety		Recommended fertilizer doses ($N:P_2O_5:K_2O$ kg ha^{-1})		Farmers' practice ($N:P_2O_5:K_2$) kg ha^{-1})+ FYM, t ha^{-1}	
		Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Rice-Rice Cropping System							
Rajendranagar	1988	MTU-1010	MTU-1010	120:60:60	120:60:60	80:50:20	120:60:40
Jorhat	1987	Ranjit	Disang	46:16:60	46:16:60	NR	NR
Maruteru	1989	MTU-1075	MTU-1010	60:40:40	120:60:40	90:60:0	180:90:0
Pantnagar							
Rice-Wheat Cropping System							
Ludhiana	1983	PR-116	PBW-343	NR	120:60:30	NR	NR
Kanpur	1983	Pant-12	PBW-343	120:60:60	120:60:60	80:30:0	80:30:0
R.S.Pura	1985	Jaya	DBW-17	100:60:30	100:50:25	34:25:22	56:25:0
Palampur	1985	Arize-6129	HPW-155	90:40:40	120:60:30	36:16:16+5.0	48:36:12+5.0
Varanasi	1985	HUR-105	HUW-2387	120:60:60	120:60:60	50:0:0	60:0:0
Faizabad	1984	Sarju-52	PBW-343	120:60:60	120:60:60	90:40:0	90:40:0
Sabour	1984	Sita	PBW-343	80:40:20	80:40:20	60:30:15	68:33:0
Kalyani	1986	IET-4094	UP-262	80:40:40	100:60:40	50:30:20	60:20:20
Rice-Mustard Cropping System							
Rudrur	1984	MTU-1010	GM-1	120:60:40	80:40:30	150:40:0	60:0:0
Maize-wheat Cropping System							
Ranchi		Suwan	K-9107	100:50:25	100:50:25	23:0:0	23:0:0
Pearl millet-Wheat Cropping System							
Bichpuri	1990	Bioseed-8510	UP-2338	80:40:40	120:60:40	40:0:0	40:0:0

Results:

Rice-Rice Cropping System

At Rajendranagar, the highest yield of rice was recorded under T10 (5304 kg ha^{-1}) during kharif, and T11 in rabi (4564 kg ha^{-1}) respectvely. The increase in crop yield under highest yielding treatment over 100 % RDF was 2.69 and 6.53 percent during kharif and rabi, respectively It was statistically at par with T5 during kharif and T5 ,T9 and T10 during rabi.

At Muruteru, the highest yield of rice was recorded under T5 (5300 kg ha^{-1}) during kharif. The highest yielding treatment (i.e.T5) was at par with T6 and T7. During rabi T6 treatment gave the maximum yield (6652 kg ha^{-1}).The increase in crop yield under highest yielding treatment over 100% RDF was 1.34 per cent. The highest yielding treatment T6 at par with T8, T9 and T10.

At Pant Nagar, the rice yield recorded maximum (5710 kg ha^{-1}) under T_7 which was 26.32 per cent higher over recommended dose of fertilizer and maximum yield of wheat (4317 kg ha^{-1}) was also recorded under T_7 which was 9.45 per cent higher than recommended dose of fertilizer. The yield under highest yielding treatment during kharif T_7 was at par with T_8, While in rabi season highest yielding treatment (T_7) was at par with T_6.

At Jorhat, the highest yield of rice was recorded under T9 (4100 kg ha^{-1}) during kharif, and during rabi (2800 kg ha^{-1}). The increase in crop yield under highest yielding treatment over 100% RDF was 5.12 and 12.00 percent, during kharif and summer, respectively. During kharif T9 statistically at par with T8.

Table7.3/1(a): Grain yield(kg/ha) of rice–rice crop sequence under different integrated nutrient management treatments 2014-15

Treatment	Rajendranagar		Maruteru		Pantnagar		Jorhat	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	2387	1938	3883	3484	2548	1854	1600	1100
T_2	3616	3287	4535	5575	3123	2599	1975	1350
T_3	4166	3862	4819	6010	3971	2715	2238	1600
T_4	4416	3983	4904	5952	4148	2846	2600	1750
T_5	5165	4284	5300	6475	4520	3944	3900	2500
T_6	4355	3866	5159	6562	5213	4293	3550	2300
T_7	4691	4065	5074	6098	5710	4317	3300	2000
T_8	4274	3895	4875	6272	5624	3504	3700	2200
T_9	4602	4121	4819	6214	5415	3505	4100	2800
T_{10}	5304	4301	4989	6156	5623	4101	3150	2150
T_{11}	5286	4564	4875	5865	5517	4126	2900	1900
T_{12}	3561	3217	4904	5720	4493	3830	1920	1300
SEm±	**203**	**359**	**102**	**213**	**18**	**22**	**205**	**304**
CD at 5%	**422**	**745**	**211**	**442**	**36**	**45**	**418**	**619**

Rice-Wheat Cropping System

At Ludhiana**, the highest yield of rice was recorded under T_{11} (7145 kg ha^{-1}) during kharif, and in wheat during rabi T_{12} gave the maximum yield (5417 kg ha^{-1}) which was 10.33 and 6.38 per cent higher over recommended dose of fertilizers (T_5). The yield under highest yielding treatment (T11) during kharif was at par with T_6 T7 and T_{12} T13 whereas during rabi T_{12} it was at par with T_6, T_{10} T_{13} and T_{14}.

At Kanpur, the highest yield of rice and wheat was recorded under T_6 (4708 kg ha^{-1}) and (3240 kg ha^{-1}) during both the season respectively. Slightly higher yield in rice and wheat (2.61 and 5.36 percent) was recorded with T_6 treatment as compared to recommended dose of fertilizer (T_5).The yield under highest yielding treatment during kharif and rabi T_6 was at par with T_5.

At Jammu, in rice-wheat system, the treatment T_6 gave the maximum yield of rice (4875 kg ha^{-1}) and wheat (6250 kg ha^{-1}) which was 12.58 and 13.08 per cent higher over recommended dose of fertilizer (T_5). The yield under highest yielding treatment (T6) during kharif and rabi was at par with T_7.

At Varanasi, in rice –wheat cropping system, the treatment T-$_6$ gave maximum yield of rice (4720 kg ha^{-1}) and wheat (2955 kg ha^{-1}) which was 10.02 and 14.18 per cent higher over recommended dose of fertilizers (T_5). The yield under highest yielding treatment during kharif T_6 was at par with T_7 and T9 whereas during rabi T_6 treatment was at par with T_8.

At Faizabad , maximum yield of rice and wheat (4928 kg ha^{-1}) (4028 kg ha^{-1}) was recorded under T_6 which was 15.43 and 11.67 per cent higher than recommended dose of fertilizer. During kharif T_6 was statistically at par with T_7, T_{10} and T_{11}. Whereas, during rabi T_6 was statistically at par with T_7, T_8 and T_{11}.

Table7.3/1(b): Grain yield (kg/ha) of rice–wheat crop sequence under different integrated nutrient management treatments 2014-15

Treatment	Ludhiana		Kanpur		Jammu		Varanasi		Faizabad		Kalyani		Sabour		Palampur	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	1560	1695	894	522	1742	2434	2420	783	1232	582	1764	1623	935	771	2159	1101
T_2	3593	3885	3225	2264	3390	4801	3810	2013	3424	1911	3136	2485	2759	1976	3343	1062
T_3	3756	4795	3505	2493	3596	5211	3800	2772	3553	3504	3200	2986	2782	3719	3763	1490
T_4	4529	4258	3563	2425	3840	5160	4225	2497	3830	2916	3286	3467	3601	3028	3486	1888
T_5	6476	5092	4588	3075	4330	5527	4290	2588	4269	3607	3365	2942	4912	3904	3646	2528
T_6	6685	5375	4708	3240	4875	6250	4720	2955	4928	4028	3299	3368	5510	4345	4402	2252
T_7	6825	5221	4338	2865	4711	6164	4550	2618	4663	3681	3561	2926	5046	3976	3982	1701
T_8	5635	4665	4125	2785	3855	5438	4160	2880	4155	3886	3263	2997	5280	4080	3528	1741
T_9	5820	4570	4169	2691	4137	5293	4360	2737	4257	3560	3469	3322	4965	3896	3343	2242
T_{10}	6985	5188	4456	2972	3816	5246	4210	2656	4820	3917	3359	3365	5479	4289	4528	1593
T_{11}	7180	5110	4294	2891	4219	5547	4115	2243	4728	3634	2995	3643	5027	3968	3755	1446
T_{12}	7145	5417	2825	1938	3125	4449	3865	2082	3287	2353	3016	2833	3272	2651	3436	1397
T_{13}	6985	5395														
T_{14}	6525	5185														
SEm±	**180**	**237**	**62**	**88**	**170**	**252**	**192**	**115**	**137**	**173**	**188**	**278**	**221**	**179**	**382**	**472**
CD at 5%	**370**	**487**	**125**	**180**	**345**	**513**	**391**	**233**	**278**	**352**	**383**	**565**	**449**	**365**	**777**	**NS**

At Kalyani, the rice yield recorded maximum (3469 kg ha^{-1}) under T_9 which was 3.09 per cent higher over recommended dose of fertilizer and maximum yield of wheat (3643 kg ha^{-1}) was recorded under T_{11} which was 23.82 per cent higher than recommended dose of fertilizer. The yield under highest yielding treatment during kharif T_9 was at par with T_6, T_8 and T_{10}.while in rabi season highest yielding treatment (T_{11}) was at par with T_6 and T_{10}.

At Sabour, the rice yield was recorded maximum (4402 kg ha^{-1}) under T_6 which was 20.73 percent higher over recommended dose of fertilizer and maximum yield of wheat (2528 kg ha^{-1}) was recorded under T_5 The yield under highest yielding treatment during kharif was at par with T_8 and T_{10} whereas during rabi T_6 it was at par with T_{10}.

At Palampur, the rice yield was maximum (4528 kg ha^{-1}) under T_{10} and 24.19 percent higher than recommended dose of fertilizer and the maximum yield of wheat (2528 kg ha^{-1}) was recorded under T_5 100 percent recommended dose of fertilizer. The yield under highest yielding treatment during kharif was at par with T_6 and T_7 whereas during rabi various IPNS packages had significant effect on crop yield.

Maize-wheat cropping system

At Kanke (Ranchi), the maize yield was maximum (4429 kg ha^{-1}) under T_6 and 30.14 percent higher than recommended dose of fertilizer and the maximum yield of wheat (4667 kg ha^{-1}) was also under T_6 during rabi season which was 14.75 percent higher than recommended dose of fertilizer.

Rice-Mustard cropping system

At Rudrur, the rice-mustard system the treatment T_{11} (75% recommended NPK dose through fertilizer+ 25%N through GM) yielded maximum (7500 kg ha^{-1}) of rice during kharif, which

Table7.3/1(c): Grain yield (kg ha^{-1}) of maize–wheat crop sequence under different integrated nutrient management treatments

Treatment	Ranchi	
	Kharif	*Rabi*
T_1	1097	1000
T_2	1979	3167
T_3	2182	3500
T_4	2482	3333
T_5	3403	4067
T_6	4429	4667
T_7	3366	4017
T_8	3029	3667
T_9	2762	3500
T_{10}	2886	3583
T_{11}	2728	3167
T_{12}	1216	1667
SEm±	**322**	**279**
CD at 5%	**667**	**578**

Table7.3/1(d): Grain yield (kg ha^{-1}) of rice–mustard crop sequence under different integrated nutrient management treatments

Treatment	Rudrur	
	Kharif	*Rabi*
T_1	5750	509
T_2	6250	544
T_3	6000	655
T_4	6500	615
T_5	7050	860
T_6	7274	825
T_7	7203	890
T_8	7350	920
T_9	7258	850
T_{10}	7000	895
T_{11}	7500	945
T_{12}	6750	700
SEm±	**370**	**42**
CD at 5%	**768**	**87**

was 6.38 per cent higher than RDF(T_5) while in rabi the same treatment gave highest (945 kg ha^{-1}) yield of mustard, which was 9.88 per cent higher than RDF.

Pearl millet-wheat cropping system

At Bichpuri, in pearl millet –wheat cropping system, the treatment T_6 gave the maximum yield of pearl millet (2890 kg/ha) and wheat (5210 kg ha^{-1}) which were 14.22 and 12.77per cent higher over 100% recommended dose of NPK through fertilizers (T_5).

Table7.3/1(e): Grain yield (kg ha^{-1}) of pearlmillet–wheat crop sequence under different integrated nutrient management treatments

Treatment	Bichpuri	
	Kharif	*Rabi*
T_1	1090	1171
T_2	1460	2941
T_3	1640	4070
T_4	1970	3900
T_5	2530	4620
T_6	2890	5210
T_7	2500	4370
T_8	2311	4510
T_9	2006	4191
T_{10}	2690	5014
T_{11}	2400	4310
T_{12}	1510	2951
SEm±	**70**	**85**
CD at 5%	**142**	**173**

7.3.2 DEVELOPMENT OF ORGANIC FARMING PACKAGE

Title of the experiment: Development of organic farming packages in system based high value crops

Objectives

I. To develop organic nutrient management packages for system-based high value crops

II. To recycle farm waste to value added compost

II. To monitor soil health and crop quality and also to develop holistic approach for nutrient, pest and disease management as well as moisture conservation

Year of start: 2003-04

Treatments

T1 : 50% recommended NPK + Zn + S as per soil test + 50% N as FYM

T2: 100% organic nutrient sources as FYM, vermicompost and neem oil cake each equivalent to 1/3 of recommended N dose of crops

T3 : T2 + intercropping/trap cropping

T4 : T2 + agronomic practices for weed and pest control

T5: 50% N as FYM + seed treatment with Azotobacter and PSB + Rock phosphate

T6 : T2 + Azospirillum and phosphate solubilizing bacteria (PSB)

T7 : 100% NPK + Zn + S based on soil test

Results

I. Rice based cropping system

Jammu

At Jammu centre, in rice-potato-onion/ frenchbean system, the highest yield or rice (2.69 t ha^{-1}) and potato (9.85 t ha^{-1}) was recorded under treatment T2 and T6 during kharif and rabi seasons, respectively. The yield increase in these crops over RDF was 2.4% and 10.8%, respectively. During summer season onion was replaced by frenchbean and the highest yield (3.47 t ha^{-1}) was recorded under treatment T_7 receiving 100% NPK + Zn + S on soil test basis. However, as the yield performances of treatments over the years are concerned, the mean yield for rice, potato and frenchbean were highest under T_6, T_6 and T_2 during kharif, rabi and summer seasons, respectively.

Jorhat

At Jorhat, in rice-toria-blackgram system, highest grain yield of rice was recorded under T_3 at 3.30 t ha^{-1}. During rabi season highest yield of toria was recorded under T_4 at 1.40 t ha^{-1}. Percent increase in crop yield under these two treatments, were 26.9% and 55.5%, respectively over T_7. However, during summer season, highest grain yield of blackgram was recorded under T_4 at 0.62 t ha^{-1} being 24% more as compared with RDF under T_7. The mean yield performances of treatments over the years for rice, toria and blackgram were highest under T_3, T_4 and T_4 during kharif, rabi and summer seasons, respectively.

Kalyani

At Kalyani, in paddy-potato-groundnut system, highest grain yield of paddy (1.61 t ha^{-1}) was recorded under T_5. While highest potato yield (10.69 t ha^{-1}) was recorded under T_6 and highest groundnut yield (1.53 t ha^{-1}) was found under T_7 with recommended dose of fertilizers on soil test basis. However, the mean yield performances of treatments over the years for rice, potato and groundnut were highest under T_1, T_7 and T_7 during kharif, rabi and summer seasons, respectively.

Maruteru

In rice-rice system at Maruteru, highest rice yield during kharif and rabi season were recorded at 4.82 t h^{-1} and 5.31 t ha^{-1} under the treatments T_7 and T_1, respectively and these two treatments were also found superior over all the rest of the treatment

with the average yield of 5.0 t ha^{-1} and 5.06 t ha^{-1} obtained during both the seasons while other treatments were almost at par in respect of average yield which was around 4.0 t ha^{-1}. The mean yield performance of treatments over the years was also highest under T_7 and T_1 during kharif and rabi seasons, respectively.

Sabour

At Sabour, in rice-potato-onion system during kharif highest yield of rice (5.42 t ha^{-1}) was recorded under organic sources of nutrients with intercropping (T_3) whereas during rabi and summer seasons, highest tuber yield of potato and onion was recorded under integrated nutrient supply (T_1) with 23.62 and 12.35 t ha^{-1}, respectively. The percent increase in crop yields under these treatments (T_3 and T_1) over RDF (T_7) was 11.9, 4.1 and 1.0%, respectively. The yields of potato and onion were almost at par under T_1 compared to T_7. However, the mean yield performance of treatments over the years were highest under T_1 with yield levels of 4.87, 24.30 and 13.49 t ha^{-1}, for rice, potato and onion during kharif, rabi and summer seasons, respectively.

Jabalpur

At Jabalpur, in rice-potato-fallow system highest grain yield of rice and potato were recorded at 3.75 and 3.16 t ha^{-1} under RDF (T_7) during kharif and rabi seasons, respectively, followed by integrated nutrient management packages (T_1) where the yield for rice and potato was received at 3.48 and 3.04 t ha^{-1}. Among organic treatments, the yield of both the crops i.e., rice and potato during kharif and rabi seasons were almost at par. However, as the yield performances over the years concerned, the mean rice and potato yield were highest under T_7 (RDF) followed by integrated nutrient management packages (T_1).

Rewa

At Rewa, in rice-wheat+mustard-fallow system the highest yield of wheat (3.95 t ha^{-1}) was recorded under recommended doses of fertilizers (T_7) followed by 3.38 t ha^{-1} under integrated nutrient management (T_1). The reduction under INM compared to RDF was 14.5%. The yield of wheat under other organic nutrients management packages were almost at par. The yield of rice for the year under report has not been reported. However, as the mean yield performances of treatments over the years are concerned, the mean rice and wheat yields were highest under T_7 (RDF) during kharif and rabi seasons, respectively.

Karmana

At Karmana, in rice-cucumber-okra system, highest yield of rice (5.29 t ha^{-1}) was recorded under T_4 receiving 100% organic nutrient sources with agronomic practices for weed and pest control. Whereas, maximum yields of cucumber (13.43 t ha^{-1}) and okra (6.69 t ha^{-1}) were recorded under integrated nutrient management packages (T_1). However, other organic nutrient management packages were almost at par in respect of rice yields, the yield of cucumber was superior under T_7 except T_1. In respect of Okra yield, T_2, T_3 and T_4 followed by T_5, T_6 and T_7 were almost at par. However, as per yield performances of treatments over years are concerned, the treatment T_7 performed better during kharif, rabi and summer seasons, respectively.

Karjat

At Karjat, in rice-maize system, highest grain yield of rice and maize were recorded under RDF (T_7) at 4.44 and 12.11 t ha^{-1} followed by integrated nutrient management packages (T_1) with yields at 4.09 and 10.07 t ha^{-1} for rice and maize, respectively. Among organic nutrient management packages, treatment T_4 proved better in case of rice yield (3.69 t ha^{-1}) while T_6 proved better in case of maize yield (5.91 t ha^{-1}). However, as per yield performances of treatments over the years are concerned, the crop yield were highest under RDF (T_7).

Navsari

At Navsari, in rice-fallow-groundnut system, highest grain yield of rice (3.87 t ha^{-1}) was recorded under RDF (T_7) followed by 3.79 and 3.70 t ha^{-1}

under integrated nutrient management (T_1) and organic sources of nutrients plus PSB (T_6), respectively. The yield reduction compared under T_1 and T_6 compared to T_7 was meager at about 2.0 and 4.3%, respectively. Among other organic nutrient management treatments T_2 performed better with rice yield of 3.58 t ha^{-1}. The yield of groundnut has not been reported. However, as the yield performances of treatments over the years are concerned the mean rice and groundnut yields were highest under T_6 and T_2 during kharif and summer seasons, respectively.

Siruguppa

At Siruguppa, in rice-fallow-sesame system, highest yield of rice (3.15 t ha^{-1}) and sesame (0.45 t ha^{-1}) was recorded under T_7 followed by rice yield at 3.08 t ha^{-1} under integrated nutrient management (T_1). The yield of organic nutrient management packages varied from 2.53 to 2.80 t ha^{-1} being T_6 as the superior among them with the yield level of 2.80 t ha^{-1}. However, as per yield performances of treatments over the year are concerned, the mean rice and sesame yields were highest under RDF (T_7) during kharif and rabi seasons, respectively.

II.Maize based cropping system

Kanpur

At Kanpur, in maize (cob)-potato-onion system the highest cob yield of maize and potato both were recorded at 79.66 t ha^{-1} and 25.82 t ha^{-1} under T_3. During kharif and rabi seasons, respectively. Whereas onion crop failed during summer season. So far as the mean crop performances over the years are concerned, both the crops i.e., maize (cob) and potato responded best under T_7 (RDF) with mean yield levels of 76.04 t ha^{-1} and 23.72 t ha^{-1}, respectively.

Faizabad

In maize-potato-onion system at Faizabad, maize yield (3.01 t ha^{-1}) was highest under T_7 (RDF) whereas potato and onion yield highest under organic nutrient management packages *viz*; T_2 and T_4, respectively at crop yield level of 5.13 t ha^{-1} and 2.69 t ha^{-1}. As per mean crop yields over the years maize yield was also highest under T_7 (RDF) whereas potato and onion yielded highest under T_2 and T_3, respectively.

Ludhiana

At Ludhiana, in maize-potato-onion system, the highest yields for all the three crops in the system during kharif, rabi and summer were received under the treatments T_1 with yield levels of 5.83, 24.12 and 23.14 t ha^{-1}, respectively. The mean crop yields under various treatments over the years maize and potato yields were highest under the organic nutrient management package which received organics in the form of FYM, vermi-compost and neem oil cake plus intercropping (T_3) with yield level of 5.90 and 24.45 t ha^{-1}. Whereas, onion yield (23.38 t ha^{-1}) was highest under T_1, which received 50% RDF+Zn+S as per soil test + 50% N as FYM. The per cent yield increase under T_1 over RDF (T_7) for maize, potato and onion was 19.3, 18.8 and 21.5%, respectively.

Rajendranagar

At Rajendra Nagar, in maize-onion-fallow system, highest maize yield of 5.06 t ha^{-1} was recorded under T_7 during kharif followed by highest yield of onion at 13.77 t ha^{-1} during rabi too, under the same treatment. As per yield performance of organic nutrient management packages are concerned the treatment T_3 which received organic sources of nutrients and intercrops, the maize yield was found at 4.78 t ha^{-1} after T_7 which was found superior to other treatments of organics and other combinations. So far as the yield performances of treatments over the years is concerned, the highest crop yield of both i.e., maize and onion were also highest under RDF (T_7).

Kathelgere

At Kathelgere, in maize-fallow-groundnut system, highest yield of maize (5.31 t ha^{-1}) and groundnut (1.60 t ha^{-1}) was recorded under recommended doses of fertilizers (T_7) during kharif and summer seasons, respectively followed

highest yield of maize (4.76 t ha^{-1}) under integrated nutrient management (T_1) and highest yield of groundnut (1.60 t ha^{-1}) under 100% organic nutrient sources plus PSB (T_6). As the mean yield performance over the years is concerned, treatment T_7 (RDF) was found superior in respect of maize yield (4.86 t ha^{-1}) while the treatment T_1 (INM) performed better regarding groundnut yield (1.26 t ha^{-1}). There was a yield reduction of 10.4% in maize under INM compared to RDF.

Thanjavur

At Thanjavur, in maize-rice-green gram system, highest yield of 5.23, 5.37 and 1.05 t ha^{-1} for maize, rice and greengram were recorded under integrated nutrient management package (T1) followed by 4.69, 4.80 and 0.89 t ha^{-1} under 100% organic nutrient sources as FYM, vermi-compost and neem oil cake each equivalent 1/3 of recommended N doses of crops (T_2). The percent yield increase recorded compared to RDF (T_7) for maize rice and greengram were 71.0, 21.0 and 27% under T_1 and 52.0, 8.0 and 7.6% under T_2, respectively. As the mean performance of treatments over the years is concerned, treatment T_1 was found superior in attaining highest yield of crops under the system.

III. Miscellaneous cropping system

Palampur

At Palampur, in babycorn-chinese cabbage-onion system, integrated nutrient management package (T_1) proved superior over all the rest of the treatments with yield levels of 2.30, 9.85 and 26.24 t ha^{-1} during kharif, rabi and summer seasons, respectively. The percent yield increase under T_1 over RDF (T_7) was 24.4 and 91.8% during the respective seasons. There was a drastic reduction in yield of onion under T_7. The mean yield of crops over the years were also found highest under integrated nutrient management package (T_1) under all the three seasons followed by T_6 except rabi season where the yield reduced by almost 23% compared to T_1.

Rudrur

At Rudrur, in turmeric-sesame-fallow system, the yield of both the crops i.e., turmeric and season were highest under T_7 with mean yield of 17.07 and 0.72 t ha^{-1}, respectively during kharif and rabi seasons followed by integrated nutrient management packages (T_1) with corresponding yield of 15.82 and 0.64 t ha^{-1}, respectively. The mean yield performances of both the crops over the years were also highest under the application of recommended doses of fertilizer (T_7).

Akola

At Akola, in sweet corn (cob)-rajma-onion system highest yield was recorded for rajma (0.52 t ha^{-1}) during rabi under T_7 and onion (21.46 t ha^{-1}) during summer season under T_1, respectively. The yield data for sweet corn (cob) has not been reported. The yield performance of treatments having organic nutrient management packages were almost at par. As the mean performance of treatments over year are concerned, the integrated nutrient management package (T_1) proved superior other treatments in respect of rajma and onion yield giving 0.79 and 7.18 t ha^{-1} during rabi and summer seasons respectively.

Coimbatore

At Coimbatore, in chilly-bengalgram-babycorn system, the highest green chilly yield of 8.54 t ha^{-1} was recorded under integrated nutrient management package (T_1) and was 10.4% higher than the yield produced under RDF (7.74 t ha^{-1}) while in rabi and summer seasons the treatment T_4 which received N each equivalent to 1/3 N requirement of crops as FYM, VC and NOC with agronomic practices of weed and pest management proved superior over other treatments producing the bengalgram and babycorn yield of 1.23 and 6.28 t ha^{-1}, respectively and were 29.4 and 6.17% higher than the yield of these crops received under RDF (T_7). However, the mean yield performances of these crops over the years were highest under the treatments T_3, T_4 and T_2, respectively.

Durgapura

At Durgapura, in groundnut-onion-fallow system, the highest groundnut (1.27 t ha^{-1}) and onion (16.45 t ha^{-1}) yield was recorded under RDF (T_7) but including the yield of intercrop in the treatment T_3 was superior in attaining the highest yield levels. As the mean performance of treatments over the year is concerned, the treatment T_7 with recommended doses of fertilizers proved superior in respect of mean yield of groundnut and onion at 1.21 and 17.88 t ha^{-1}, respectively. The organic nutrient management packages which proved better over years and almost at par with RDF were T_3, T_4 and T_6 with mean yield levels at 1.14, 1.16 and 1.13 t ha^{-1} for groundnut and T_1, T_3, T_4 and T_6 for onion with mean yield levels at 15.53, 15.40, 16.36 and 15.41 t ha^{-1}, respectively with yield reduction of about 4-7% in groundnut and about 8.5-14.0% in onion in the respective treatments compared to RDF (T_7).

Hisar

At Hisar, in mungbean-wheat system the highest yield of moongbean (0.40 t ha^{-1}) was recorded during kharif under 100% recommended doses of NPK+Zn+S based on soil test (T_7) similarly the highest yield of wheat (0.99 t ha^{-1}) during rabi season was also recorded under the same treatment (T_7) followed by integrated nutrient management (T_1) i.e., 50% recommended NPK+Zn+S as per soil test + 50% N as FYM. The yield recorded for mungbean and wheat were 0.37 and 0.84 t ha^{-1}, respectively. Among organic nutrient management packages, treatment T_4 performed better with the yield performance of 0.31 and 0.74 t ha^{-1} for mungbean and wheat, respectively. The yield of wheat, in general, was low in all the treatments.

Kota

At Kota, in blackgram-coriander cropping system, T_4 recorded highest yield of blackgram at 1.65 t ha^{-1} while the highest yield of coriander (4.93 t ha^{-1}) was recorded under T_3 during kharif and rabi seasons, respectively. The other treatments of organic nutrient management packages were almost at par with RDF (T_7). The integrated nutrient management (T_1) found comparatively superior to RDF (T_7) in respect of blackgram yield (1.63 t ha^{-1}). However, as the performance of treatments over the years are concerned, integrated nutrient management packages (T_1) proved superior in respect of blackgram and organic nutrient sources (T_3) proved superior in respect of coriander.

Parbhani

At Parbhani, in soybean-onion-fallow system, highest soybean (2.65 t ha^{-1}) and onion (23.53 t ha^{-1}) yield was recorded under RDF (T_7) followed by integrated nutrient management (T_1) with yield levels of 2.37 and 21.71 t ha^{-1} for soybean and onion, respectively. Among organic nutrient management packages, the treatment T_4 proved better over others producing soybean (2.37 t ha^{-1}) and onion (17.57 t ha^{-1}), respectively. As the mean performance of treatments over the years are concerned, T_7 proved superior to all with soybean and onion yields at 2.65 and 23.72 t ha^{-1}, respectively. The performance of IPNS (T_1) was superior over organic nutrient management packages. Among organic nutrient management packages T_6 proved better with kharif and rabi crop yield at 2.20 and 18.08 t ha^{-1} at yield reduction to the tune of 17% and 23.8% over RDF.

Powerkheda

At Powerkheda, in soybean-wheat-fallow system, (T_7) recorded highest soybean yield at (0.56 t ha^{-1}) during kharif and highest wheat yield at 4.48 t ha^{-1} followed by T_1 where soybean and wheat yield of 0.54 and 3.89 t ha^{-1} was recorded during kharif and rabi seasons, respectively. Yield levels of crops under the treatments receiving organic sources of nutrients were almost at par. On an average, the yield reduction under organic nutrients management packages compared to RDF was around 16%. As the mean crop performances over the year are concerned, T_7 was found best among all the treatments.

Table 7.3.2(a): Effect of organic nutrient management packages on crop yields (kg ha) in rice based cropping system 2014-15

Treatment	Crop season	Jammu	Jorhat	Kalyani	Maruteru	Sabour	Jabalpur	Rewa	Karmana	Karjat	Navsari	Siruguppa
		Rice-Potato-Onion/ Frenchbean	Rice-Toria-Blackgram	Paddy-Potato-Groundnut	Rice-Rice	Rice-Potato-Onion	Rice-Potato-Fallow	Rice-Wheat+ Mustard-Fallow	Rice-Cucumber-Okra	Rice-Maize	Rice-Fallow-Groundnut	Rice-Fallow-Sesamum
T1	*Kharif*	2548	2750	1555	4815	4853	3481	-	5136	4096	3790	3079
	Rabi	8516	1000	7388	5315	23620	3039	3376	13431	10066	-	382
	Summer	3310	500	1467	-	12354	-	-	6690	-	-	-
T2	*Kharif*	2688	3000	1422	4285	4656	2858	-	5107	3556	3581	2657
	Rabi	9647	1250	4944	4108	22554	2407	2001	10457	5417	-	369
	Summer	3449	530	1083	-	11431	-	-	6549	-	-	-
T3	*Kharif*	2682	3300	1055	4201	5424	2951	-	5012	3617	3549	2529
	Rabi	9758	800+400**	3055+4833	4169	21039+6516*	2445	1507+235*	9615	5624	-	376
	Summer	3336	400+2000**	933+720	-	9741+6589**	-	-	6627	-	-	-
T4	*Kharif*	2168	3100	1244	4030	4759	3001	-	5287	3695	3372	2558
	Rabi	7683	1400	4422	3959	23214	2235	2109	11096	5809	-	370
	Summer	2133	620	1167	-	11693	-	-	6580	-	-	-
T5	*Kharif*	2593	2450	1611	3944	4365	2839	-	5043	3193	3147	2590
	Rabi	9075	860	4250	4027	19985	2404	1883	12014	5202	-	391
	Summer	3120	450	1361	-	9977	-	-	6091	-	-	-
T6	*Kharif*	2626	2300	1305	4186	4751	2803	-	5163	3685	3701	2801
	Rabi	9846	750	10688	4208	22498	2368	2064	12484	5907	-	386
	Summer	3137	420	1278	-	11742	-	-	6126	-	-	-
T7	*Kharif*	2626	2600	1389	4819	4845	3752	-	5128	4441	3867	3151
	Rabi	8887	900	4733	5194	22684	3163	3947	13015	12112	-	453
	Summer	3467	500	1528	-	12232	-	-	5988	-	-	-
T8	*Kharif*	2300	0	1167	4222	3643	2431	-	-	-	3349	2520
	Rabi	8156	0	4733	4346	20042	2051	1660	-	-	-	348
	Summer	2752	0	1528	-	9174.5	-	-	-	-	-	-

Table 7.3.2(b): Effect of organic nutrient management packages on crop yields (kg ha) in maize based cropping system 2014-15

Treatment	Crop season	Kanpur	Faizabad	Ludhiana	Rajendranagar	Kathalgere	Thanjavur
		Maize(cob)-Potato-Onion	Maize-Potato-Onion	Maize-Potato-Onion	Maize-Onion-Fallow	Maize-Fallow-Groundnut	Maize-Rice-Greengram
T1	*Kharif*	77243	2968	5832	4707	4756	5276
	Rabi	24491	5116	24118	12945	-	5367
	Summer	-	2497	23139	-	1550	1052
T2	*Kharif*	75508	2724	5588	4178	4215	4691
	Rabi	20332	5129	22809	12719	-	4797
	Summer	-	2563	21893	-	1517	889
T3	*Kharif*	79659+ 277*	2611	5254+ 332*	4785+ 565*	4471	4332+ 144*
	Rabi	25816+ 750**	1365+ 385*	21468+ 24220**	8167+ 6800**	-	4746
	Summer	-	590+ 13085**	19313+ 318***+ 58****	-	1439	846
T4	*Kharif*	75643	2988	5551	4164	3412	3967
	Rabi	19054	5099	22559	12318	-	4757
	Summer	-	2694	22124	-	1191	848
T5	*Kharif*	76527	2255	4044	3634	3900	4463
	Rabi	21476	4319	15255	11021	-	4179
	Summer	-	2188	13671	-	1480	623
T6	*Kharif*	76140	2687	5744	4166	4661	4187
	Rabi	21052	4974	23304	12187	-	4764
	Summer	-	2648	22166	-	1590	849
T7	*Kharif*	78200	3007	4887	5061	5311	3078
	Rabi	25451	4905	20294	13770	-	4424
	Summer	-	2617	19048	-	1600	826
T8	*Kharif*	68800	1989	4575	3223	3560	2582
	Rabi	18119	4279	19109	10274	-	3747
	Summer	-	2203	18143	-	1236	673

Rahuri

At Rahuri, in soybean-onion system highest yield of soybean (3.70 t ha^{-1}) and onion (27.48 t ha^{-1}) was recorded under 100% organic nutrient sources as FYM, vermi-compost and neem oil cake each equivalent 1/3 of recommended N doses of crops plus PSB (T_6) followed by highest yield of soybean (3.52 t ha^{-1}) under T_3 and highest yield of onion (26.18 t ha^{-1}) under application of recommended doses of fertilizers (T_7). Yield of both the crops under the treatments T_2 and T_4 were almost at par. The integrated nutrient management package (T_1) was inferior to organic packages including RDF (T_7) except T_5 with yield reduction of about 18% and 10% in both the crops compared to T_6.

S. K. Nagar

At S. K. Nagar, in green manure-potato-groundnut system, the highest yield of potato (41.90 t ha^{-1}) and groundnut (2.45 t ha^{-1}) was recorded under 100% organic nutrient sources as FYM, vermi-compost and neem oil cake each equivalent 1/3 of recommended N doses of crops plus intercropping (T_3) followed by highest yield of potato (28.02 t ha^{-1}) under RDF (T_7) and groundnut (2.13 t ha^{-1}) under integrated nutrient management package (T_1) with yield reduction of 33% and 13% for potato and onion, respectively under T_7 and T_1 compared to T_6. As the mean yield responses of treatments over the years are concerned, RDF (T_7) recorded highest yield of potato while T_1 recorded highest yield of groundnut.

Table 7.3.2(c): Effect of organic nutrient management packages on crop yields (kg ha) in miscellaneous crop based cropping system 2014-15

Treatment	Crop season	Palampur Babycorn-Chinese cabbage-Onion	Rudrur Termaric-Sesamum-Fallow	Akola Sweet corn(cob)-Rajma-Onion	Coimbatore Chillies-Bengalgram-Babycorn	Durgapura Groundnut-Onion-Fallow	Hisar Moongbean-Wheat	Kota Blackgram-Corriander	Parbhani Soyabean-Onion-Fallow	Powerkheda Soyabean-wheat-Fellow	Rahuri Soyabean-Onion	S. K. Nagar G.M-Potato-Groundnut
T1	*Kharif*	2304	15821	-	8545	1075	369	1627	2366	5400	3028	27275
	Rabi	9848	645	402	958	14182	839	2937	21708	3890	24604	2129
	Summer	26242	-	21464	6125	-	-	-	-	-	-	-
T2	*Kharif*	1723	14542	-	8476	1073	293	1557	1980	4800	3372	24110
	Rabi	7319	559	247	928	13441	730	2912	16204	2080	25340	2065
	Summer	21619	-	18687	6106	-	-	-	-	-	-	-
T3	*Kharif*	1677	3845+620	-	8516	1214+202*	257	1405+360	2238	4600	3524	41900+185*
	Rabi	8757	511	263+1806*	875	14282	706	4930+270	17438	2040	25545	2450+195*
	Summer	20743	-	14647+2778**	5911	-	-	-	-	-	-	-
T4	*Kharif*	1318	13393	-	7822	1190	312	1648	2366	4900	3400	23486
	Rabi	7283	505	321	1232	15266	739	3040	17567	2100	25742	2028
	Summer	19558	-	18182	6284	-	-	-	-	-	-	-
T5	*Kharif*	1572	14319	-	7238	1056	174	1455	1800	4800	2450	19660
	Rabi	8540	522	250	833	13267	493	2718	14352	2040	19301	1662
	Summer	23159	-	12121	5509	-	-	-	-	-	-	-
T6	*Kharif*	1808	14767	-	7580	1160	261	1531	2315	4300	3700	23544
	Rabi	8007	514	356	862	14361	741	2845	18441	2110	27476	2143
	Summer	21713	-	14647	5372	-	-	-	-	-	-	-
T7	*Kharif*	1854	17075	-	7737	1269	401	1588	2649	5600	3310	28020
	Rabi	5135	718	518	952	16451	987	2939	23534	4480	26180	1809
	Summer	2236	-	18687	5919	-	-	-	-	-	-	-
T8	*Kharif*	1590	14572	-	7773	967	166	1433	2098	-	862	20475
	Rabi	7347	562	285	887	13462	421	2408	16553	-	8971	1643
	Summer	19695	-	13889	5584	-	-	-	-	-	-	-

7.4 ON-FARM RESEARCH

7.4.1 ON-FARM CROP RESPONSE TO APPLICATION OF NUTRIENT

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

Objective: To assess the response of major crops to application of N, P and K at recommended rates in pre-dominate cropping systems in different agro-ecosystem under farmer's 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	Thiruvalla (Kerala), Chettinad&Paiyur (T.N.), Palghar (Maharashtra), Kamrup (Assam)	109
Rice-gram	Kawardha (C.G.)	24
Rice-green gram	Kendrapara (Orissa), Kakdwip (W.B.)	48
Rice-groundnut	Angul (Orissa), Paiyur (T.N.)	36
Rice-maize	Purnea (Bihar), Anand (Gujarat)	36
Rice-wheat	Pakur (Jharkhand), Dindori (M.P.), Amritsar (P.B.), Daleep nagar & Ambedkarnagar (U.P.), Jeolikote (U.K.), Dhainsar (J.K.)	151
Maize-wheat	Kangra (H.P.), Udaipur (R.J.), Dhainsar (J.K.)	60
Maize-maize	Derol (Gujarat)	12
Maize-gram	Gadag (Karnatka), Aurangabad (M.H.)	36
Soybean-wheat	Amravati (Maharashtra)	14
Soybean-gram	Amravati (Maharashtra)	8
Soybean-onion	Pune (Maharashtra)	24
Cotton-wheat	Sirsa (Haryana), Jagudan (Gujarat)	48
Cabbage-tomato	Kolar (Karnatka)	12
Cluster bean-wheat	Sikar (Rajasthan)	24
Fingermillet-potato	Kolar (Karnatka)	12
G'dnut-sorghum	Gadag (Karnatka)	12

Results

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

Rice-rice: In total 109 trials were conducted at 5 locations compromising of five NARP zones (North Konkan Coastal Zone- Karjat, South Tamil Nadu 5 & 6- Chettinad, Problem Areas Zone-Thiruvalla, North Western Zone- Paiyur and Lower Brahmaputra Valley Zone-Kamrup). Almost at all the locations excluding problem area zone (Kerala) significantly higher yields of rice were obtained in both the seasons due to application of NPK + Zn over Recommended Fertilizer (NPK only). Across the locations on an average of two growing seasons the highest increase (7.9%) in the yield of rice was found in North Konkan Coastal Zone of Maharashtra state under the NPK + Zn application treatments as compared to sole NPK application. The highest increase in the yield of rice in both the seasons (96.6% in kharif and 87.8% in rabi) was realized in lower Brahmaputra valley zone (kamrup) in Assam due to combined application of NPK + Zn as compared to the farmers practice. At all the locations treatment recommended dose of NPK application recorded the higher rice yield over the farmers' practice which was the highest in Kamrup (88.5% in kharif and 78.6% in rabi). However for the same the lowest increase in rice yields was noticed in Chettinad (TN). At all the 6 locations taken for study application of recommended dose of fertilizer recorded higher grain yield of rice in both the seasons as compared to control with minimum % increase of 61.5 to maximum of 167.4%. Improvement in yield of rice in both the seasons was found due to application of recommended fertilizer dose over the farmers practice except of North western zone of Tamil Nadu. At North Konkan Coastal Zone of Maharashtra application of 120:50:50:6 kg NPK Zn ha^{-1} during kharif and 100:50:50:6kg NPK Zn ha^{-1} during rabi gave 1042 kg ha^{-1} and 885 kg ha^{-1} additional yield over the farmer practices which was 19% higher for both kharif and rabi rice. On an average of all the locations taken for study application of Zn along with recommended dose of fertilizer (NPK) recorded significantly higher yield than control which was around 102.0%.

Rice-wheat: A total 151 trials were conducted at 7 locations compromising of 7 NARP zones. Under this Jharkhand, Madhya Pradesh, Uttar Pradesh, Uttarakhand, Punjab and Jammu Kashmir states have been covered. Almost at all the NARP zones significant increase in yield of both rice and wheat crop was found due to application of Zn in addition to NPK only. Though, same results were not obtained from Jammu & Kashmir (Sub-Tropical Zone) and Jharkhand (Central and North Eastern Plateau Zone) states. Across the locations application of Zn to both crops has improved the grain yield. At Dindori (MP) 13.2 and 6.9% increase in yield of rice and wheat were observed. Similarly at Kanpur dehat (UP), Jharkhand, Amritsar (Punjab) and Jeolokote (Uttarakhand) 8.3 and 8.6%, 3.5 and 4.2%, 7.7 and 10.7%, 4.5 and 2.9% yield enhancement of rice and wheat respectively was found. Due to micronutrient application the highest increase in yield of rice (350.2%) and wheat (379.5%) were found at Pakur in Jharkhand. Except Punjab, at all location there were huge yield gap recorded in recommended NPK application and farmer practices under both crops. Over the farmers practice at Central and North Eastern Plateu Zone (Pakur) application of 100:50:25 and 100:50:25 Kg NPK ha^{-1} in rice and wheat gave an additional yield of 1482 kg ha^{-1} and 1249 kg ha^{-1}, respectively. At Jeolikote (Uttarakhand) in total 24 trials were conducted and the results revealed an additional yield increase of 3279 kg ha^{-1} for rice and 2232 kg ha^{-1} for wheat crop due to application of 150:60:60: Kg NPK + 20 kg Sulphur ha^{-1} to rice and 150:60:40: Kg NPK + 20 kg Sulphur ha^{-1} to wheat. Though at Central Plain Zone (Amritsar) of Punjab, no significant additional yield increase was recorded under recommended NPK alone or with micronutrient which might be due to higher NPK dose use by the farmers. At Eastern Plain Zone (Ambedkarnagar) of Uttar Pradesh recommended NPK dose application to rice and wheat crops have increased their yield by 23.8 and 22.4%, respectively over the farmers practice.

Table-7.4.1 : Yield of different cropping systems under researcher designed farmer managed nutrient response experiment (2014-15)

State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Rice-Rice																							
Maharashtra	North Konkan Coastal Zone - Karjat/ Palghar/ 24	Not Available	Shyadri/ 120- 50-50/ $ZnSO_4$ (21%) 80- 22.5-12.5	-	-	-	-	-	2742	3794	4632	4424	5476	6062	4434	56	40	78	4.32	2734	586	1042
Maharashtra	North Konkan Coastal Zone - Karjat/ Palghar/ 24	Not Available	Karjat-3/ 100- 50-50/ $ZnSO_4$ (21%) 80-22.5-12.5	-	-	-	-	-	2649	3445	4126	4080	4533	4768	3649	54	38	74	4.78	1884	235	884
Tamil Nadu	South TN 5 & 6/ Chettinad-TN/24	Sandy Clay Loam	ADT-39/ 150- 50-50/ $ZnSO_4$ (25) 100- 50-30	6.5	0.5	224	10	238	2865	3451	3786	4118	4578	4913	4517	37	26	51	3.2	1713	335	61
Tamil Nadu	South TN 5 & 6/ Chettinad-TN/24	Sandy Clay Loam	ADT-39/ 150- 50-50/ $ZnSO_4$ (25) 100- 50-30	-	-	-	-	-	3018	3670	4010	4297	4591	4933	4413	35	24	47	2.9	1573	342	178
Kerala	Problem Areas Zone - Kumarakom/ Thiruvalla-KER/24	Not Available	Uma/ 90- 45 -45 / Zinc (25) 120- 45 -45	4.8	1.4	331	11	267	2406	3007	4915	4701	6314	6411	5737	126	89	174	9.13	3908	97	577
Kerala	Problem Areas Zone - Kumarakom/ Thiruvalla-KER/24	Not Available	Uma/ 90- 45 -45 / Zinc(25) 120- 45 -45	-	-	-	-	-	2388	3029	4776	4501	6168	6386	5755	134	95	186	9.83	3780	218	413

Contd/.....

State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Tamil Nadu	North Western Zone - Paiyur/13	Sandy Loam	ADT-39/ Zinc (25) 130- 40-42	7.7	0.5	219	14	181	3299	4642	5677	5558	6752	7159	5912	114	81	160	5.22	3453	407	840
Tamil Nadu	North Western Zone - Paiyur/ Paiyur-TN/13	Sandy Loam	TPS-3/ 120- 40-40/ Zinc(25) 110- 35 -39	—	—	—	—	-	3379	4606	5647	5528	6684	7042	5593	138	98	194	6.41	3305	358	1091
Assam	Lower Brahma-putra Valley Zone-kamrup (Rural)/ kamrup/24	Alluvial	Luit/ 40- 20 -20 / ZnSO4(25) 10-10-10	4.9	1	314	20	260	1992	2292	2494	2873	3412	3558	1810	68	48	94	8.92	1420	146	1602
Assam	Lower Brahma-putra Valley Zone-kamrup (Rural)/ kamrup/24	Alluvial	Joymati/ 60- 30 -30 / ZnSO4(25) 10-10-10	-	-	-	-	-	2833	3387	3652	3869	4351	4576	2436	83	58	114	7.98	1518	225	1915
	Total trials		109																				
Rice-Gram/Bengal Gram/Chick Pea																							
Chhattisgarh	CG Plain Zone/ Kawardha-CTG /24	Black Soil (Shallo Black)	MTU-1010/ 100- 60-40/ ZnSO4(25) 60- 40-30	7.3	0.6	256	12	301	1832	2732	4220	3314	4923	5118	3598	51	36	71	4.8	3091	195	1325

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Chhattisgarh	CG Plain Zone/ Kawardha-CTG/24	Black Soil (Shallo Black)	Vaibhav/ 20 - 50-20 / control 15- 46-0	-	-	-	-	-	431	722	1145	920	1413	1504	1120	31	22	43	10.2	982	91	293
									Rice-Green Gram													
Odisha	East & South Eastern Coastal Plain/ Kendr-apara-OR/24	Not Available	Ranidhana/ 80- 40-40/ Zn SO_4 (25) 26.25-30-0	5.9	0.6	286	16	177	3175	3709	3953	4078	4437	4709	3926	72	51	100	6.25	1262	272	511
Odisha	East & South Eastern Coastal Plain / Kendr-apara-OR/24	Not Available	Local/ 20 - 40-20 / 7.5 - 15-0	-	-	-	-	-	612	716	789	762	849	867	694	12	8	16	5.29	237	18	155
West Bengal	Coastal saline Zone W.B./ Kakdwip-WB/24	Coastal Saline Soil	Pratikshya/ 80- 40-40/ $ZnSO_4$ (20) 60-40-0	5.9	0.8	232	46	231	2625	3082	3410	3489	3794	3925	3538	62	44	86	6.31	1169	131	256
West Bengal	Coastal saline Zone W.B./ Kakdwip-WB/24	Coastal Saline Soil	Chait Moong/ 20 - 40-40/ control 15- 40-0	-	-	-	-	-	523	601	710	693	780	798	694	14	10	20	6.84	257	18	86

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	pH	Initial Soil Status				Yield (kg/ha)													
					OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Rice-Groundnut																						
Odisha	Mid-Central Table Land Zone - Mahispat/ Angul-OR/24	Mixed Red & Black	Naveen/ 80- 40-40/ Zinc(20) 30 - 15-15	6.1	0.6	280	16	162	2234	3084	3491	3617	4094	4243	3594	44	31	61	4.42	1860	149	500
Odisha	Mid-Central Table Land Zone - Mahispat/ Angul-OR/24	Mixed Red & Black	Kadiri6/ 20 - 40-40/ Gypsum(250) 25-10-00	—	—	—	—	-	1102	1335	1675	1633	1864	1957	1414	30	21	41	6.59	762	93	450
Tamil Nadu	North Western Zone - Paiyur/ Paiyur-TN	Sandy Clay Loam	ADT-39/ 150- 50-50/ 108- 35 -0	7.9	0.5	244	15	219	3050	3850	4892	4512	6274	6733	5102	118	83	166	5.62	3224	459	1172
Tamil Nadu	North Western Zone - Paiyur/ Paiyur-TN	Sandy Clay Loam	TMV-7/ 20 - 50-75/ 46- 30 -30	-	-	-	-	-	1029	1280	1531	1699	2120	2353	1831	45	31	62	6.17	1091	233	289
Rice-Maize																						
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/12	Not Available	GR-9/ 100- 50-50/ $ZnSO_4$(25) 65- 10-0	7	0.6	228	24	279	1115	1674	1888	1720	2030	2037	1542	57	41	82	8.18	915	7	488

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	pH	Initial Soil Status OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Yield (kg/ha) Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/12	Not Available	PAC-740/ 120- 60-60/ $ZnSO_4$ (25) 112.5- 35 -0	-	-	-	-	-	1779	2913	3250	2930	3446	3518	2723	123	87	174	10.2	1667	72	723
Bihar	North East Alluvial Plain Zone - Purnea-Kathiahar/ Purnea-BH/24	Alluvial	R.Suwasini/ 100- 40-20 / Zinc(25) 70- 30 -20	6.8	0.5	226	17	207	2418	3237	3713	3548	4393	4753	3643	129	91	178	12.1	1975	360	750
Bihar	North East Alluvial Plain Zone - Purnea-Kathiahar/ Purnea-BH/24	Alluvial	Maharaja/ 120- 75-50/ control 100- 50-15	-	-	-	-	-	4327	6159	7483	6956	7971	8611	7178	141	100	196	7.01	3644	640	793
									Rice-Wheat													
Madhya Pradesh	Northern Hill Zone of Chhatisgarh-Dindori/ Dindori-MP/24	Not Available	MTU-1010/ 120- 60-40/ $ZnSO_4$(25) 50- 25-0	0	0	0	0	0	1822	2545	3406	3088	3959	4483	2831	43	30	59	4.67	2137	524	1128

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Madhya Pradesh	Northern Hill Zone of Chhatisgarh-Dindori/ Dindori-MP/24	Not Available	GW-273/ 120- 60-40/ $ZnSO_4$ (25) 50- 25-0	-	-	-	-	-	2037	2755	3556	3305	4116	4399	2998	42	30	59	4.38	2079	283	1118
Uttar Pradesh	Central Plain Zone - Kanpur/ Daleep Nagar (Kanpur Dehat)/24	Not Available	Hybrid Sudha/ 150- 60-40/ $ZnSO_4$ (25) 220- 55-0	7.8	0.4	0	13	153	1983	2764	4261	3328	4905	5314	4413	35	25	49	3.16	2922	409	492
Uttar Pradesh	Central Plain Zone - Kanpur/ Daleep Nagar (Kanpur Dehat)/24	Not Available	PBW-343/ 120- 60-40/ control 140- 65-0	-	-	-	-	-	922	1406	2337	1952	2752	2990	2387	54	38	74	8.94	1830	238	365
Jharkhand	Central and North Eastern Plateau Zone-IV/ Pakur/24	Not Available	Naveen/ 100- 50-25/ Zn 5 60- 30 -0	5.7	0.6	292	5	158	806	2015	2958	2313	3507	3629	2147	63	45	88	8.79	2701	122	1360
Jharkhand	Central and North Eastern Plateau Zone-IV/ Pakur/24	Not Available	K-9107/ 100- 50-25/ Zn 5 60- 30 -0	-	-	-	-	-	711	1758	2885	1945	3271	3409	2160	60	43	84	9.05	2560	138	1111

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
J & K	Sub-Tropical Zone/ Dhainsar-JK/12	Sandy Clay Loam	Basmati- 370/ 30 - 20 -10/ $ZnSO_4$(25) 20 - 20 -0	7.3	0.5	230	14	123	1245	1687	2268	1989	2635	2664	2203	40	28	55	4.67	1390	29	432
J & K	Sub-Tropical Zone/ Dhainsar-JK/12	Sandy Clay Loam	PBW-550/ 100- 50-25/ control 75- 40-0	-	-	-	-	-	1201	1629	2181	1907	2548	2613	1996	48	34	67	5.88	1347	65	552
Punjab	Central Plain Zone III/ Amritsar-PB/24	Not Available	PR-111/ 120- 30 -30 / $ZnSO_4$ (25) 150- 0-0	7.8	0.6	249	31	142	4803	5346	5791	6316	6924	7458	7004	39	27	53	2.15	2121	534	-80
Punjab	Central Plain Zone III/ Amritsar-PB/24	Not Available	HD 2967/ 120- 30 -30 / $MnSo_4$(5) 150- 60-0	-	-	-	-	-	1594	1970	2393	2725	3098	3428	3075	26	19	37	3.49	1504	330	23
Uttarakhand	Hill Zone-Ranichauri/ Jeolikote-UK/24	Hilly	PHB-71/ 150- 60-60/ Sulphar 100- 50-0	6.4	0.7	276	18	168	2791	3910	4811	4329	5810	6070	4071	85	60	118	6.52	3019	260	1739
Uttarakhand	Hill Zone-Ranichauri/ Jeolikote-UK/24	Hilly	HD 2894/ 150- 60-40/ Sulphar 90- 40-0	-	-	-	-	-	2478	3215	4085	3763	4578	4710	3814	89	63	123	8.06	2100	132	764
Uttar Pradesh	Eastern Plain Zone - Kumarganj/ Ambedkar nagar/19	Alluvial	BPT-5204/ 150- 60-60/ $ZnSO_4$ (25) 120- 30 -0	7.7	0.5	182	17	173	1350	2530	3247	2900	3714	4016	3000	33	24	48	3.46	2364	302	714

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Uttar Pradesh	Eastern Plain Zone - Kumarganj/ Ambedkar nagar/19	Alluvial	HD-2733/ 150- 60-60/ $ZnSO_4$ (25) 120- 30 -0	-	-	-	-	-	1085	2058	2716	2385	3046	3250	2488	31	22	44	3.92	1961	204	558
									Maize-Wheat														
Himachal Pradesh	Sub- mountain and low hills sub-tropical zone/ Kangra-HP/24	Submontaneous	Hybrid; Kanchan/ 90- 45 -30 / $ZnSO_4$ (21%) 57.5- 0-0	6.2	0.6	269	29	141	1788	2206	2607	2509	3205	3399	2078	51	36	71	6.99	1417	194	1127
Himachal Pradesh	Sub- mountain and low hills sub-tropical zone / Kangra-HP/24	Submontaneous	HPW-236/ 80- 40-40/ $ZnSO_4$ (21%) 57.5- 0-0	-	-	-	-	-	1644	2045	2512	2524	3085	3279	2094	39	27	53	5.48	1441	194	991
J & K	Sub-Tropical Zone/ Dhainsar-JK/12	Sandy Loam	Kanchan/ 60- 40-20 / $ZnSO_4$ (10) 20 - 20 -0	7.5	0.5	226	14	126	1401	1848	2424	2183	2790	2920	2326	61	43	85	6.59	1389	130	464
J & K	Sub-Tropical Zone/ Dhainsar-JK/12	Sandy Loam	PBW175/ 60- 30 -20 / control 70- 37.5 -0	—	—	—	—	-	1387	1771	2391	2178	2788	2892	2251	44	31	61	4.86	1401	104	537

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	pH	Initial Soil Status				Yield (kg/ha)														
					OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Rajasthan	Sub-Humid Southern Plain and Aravalli Hill Zone-Udaipur/ Udaipur-RJ/24	Not Available	Rasi 4794/ 90- 35 -30 / $ZnSO_4$ (25) 40- 20 -0	7.9	0.4	219	16	199	644	1231	2571	2344	2968	3098	1274	57	41	80	9.86	2324	130	1694
Rajasthan	Sub-Humid Southern Plain and Aravalli Hill Zone-Udaipur/ Udaipur-RJ/24	Not Available	Raj 4120/ 120- 40-30 / control 90- 20 -0	-	-	-	-	-	1385	2592	3488	3198	3946	4194	2413	51	36	71	5.85	2561	248	1533
Maize-Maize																							
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/12	Not Available	90-V-99/ 100- 50-50/ ZnSO4(25) 110- 40-0	7	0.5	241	22	280	1127	1698	1962	1785	1998	2196	1696	72	51	102	9.96	871	198	302
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/12	Not Available	PAC-740/ 120- 60-60/ ZnSO4(25) 130- 46-0	-	-	-	-	-	1770	2859	3269	2940	3389	3441	2781	119	84	168	9.96	1619	52	608
Maize-Gram/Bengal gram/Chick pea																							
Karnataka	Northern dry zone/ Gadag-KAR/12	Deep Black soil	M900/ 150- 75-37.5 / $ZnSO_4$ (25) 90- 45 -0	7.7	0.6	103	21	293	1547	3079	3880	3792	4811	5688	3590	98	70	139	6.39	3264	877	1221

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Karnataka	Northern dry zone/ Gadag-KAR/12	Deep Black soil	JG 11/ 25- 50-0/ $ZnSO_4$(15) 15-10-00	-	-	-	-	-	783	975	1205	1065	1433	1664	1117	40	29	57	8.41	650	231	316
Maharashtra	Central Mahara-shtra Plateau Zone-Aurangabad/ Aurangabad-MH/24	Not Available	Maharaja/ 150- 75-75/ control 0- 0-0	0	0	0	0	0	1871	2280	2540	2600	2804	2920	2278	20	14	27	2.8	933	116	526
Maharashtra	Central Mahara-shtra Plateau Zone - Aurangabad/ Aurangabad-MH/24	Not Available	BDNG-797/ 25- 50-0/ control 0- 0-0	-	-	-	-	-	441	545	717	692	789	853	590	10	7	14	5.45	348	64	199
Soyabean-Wheat																							
Maharashtra	Western Vidarbha Zone/ Amravati-MH/14	Not Available	JS-9305/ 30 - 75-30 / control 25- 0-0	-	-	-	-	-	620	769	952	821	1136	1250	898	42	29	57	11.9	516	114	238
Maharashtra	Western Vidarbha Zone/ Amravati-MH/14	Not Available	GW-496/ 100- 50-50/ control 45 - 0-0	-	-	-	-	-	851	995	1176	1071	1300	1463	1228	64	46	91	14.7	449	163	72
Soyabean-Gram/Bengal gram/Chick pea																							
Maharashtra	Western Vidarbha Zone/ Amravati-MH/8	Not Available	JS-9305/ 30 - 75-30 / Sulphar 25- 25-0	-	-	-	-	-	842	1011	1246	1011	1432	1619	1142	44	31	63	7.35	590	187	290

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Maharashtra	Western Vidarbha Zone/ Amravati-MH/8	Not Available	JAKI 9218/ 20 - 40-20 / Sulphar 25- 25-0	-	-	-	-	-	851	1089	1254	968	1415	1567	1168	72	51	103	12.1	564	152	247
			Soyabean-Onion																				
Maharashtra	Western Maharashtra Plain Zone - Pune/ PUNEMH/24	Sandy Clay	JS-335/ 50- 75-25/ Zinc(20) 30 - 40-0	7.6	0.4	159	14	372	754	887	968	1048	1177	1273	783	11	8	16	3.8	423	96	394
Maharashtra	Western Maharashtra Plain Zone - Pune/ PUNEMH/24	Sandy Clay	N-2-4-1/ 100- 50-50/ Zinc(20) 90- 65-0	-	-	-	-	-	13137	14121	14795	15192	16346	18208	13641	141	100	196	3.24	3209	1862	2705
			Cotton-Wheat																				
Haryana	Western zone Sirsa/ Sirsa-HR/24	Alluvial	Kribhco Raja/ 175- 60-60/ $ZnSO_4$(5.25) 150- 60-30	8.4	0.2	130	8	253	800	1443	1950	1655	2107	2265	1944	48	34	67	9.63	1307	158	163
Haryana	Western zone Sirsa/ Sirsa-HR/24	Alluvial	HD 2967/ 150- 60-30 / $ZnSO_4$ (5.25) 150- 60-0	-	-	-	-	-	867	2168	3543	3321	3873	4108	3625	82	58	114	9.26	3006	235	248
Gujarat	North Gujarat Agroclimatic Zone/ Jagudan/ 24	Alluvial	BT II/ 180- 40-40/ $MgSO_4$ (25) 100- 50-0	7.7	0.5	211	23	248	953	1328	1476	1559	1748	1820	1524	38	27	53	8.87	795	72	224

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State	NARP Zone/ Centres/ No. of trials	Soil Type	Variety/ Recommened Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	pH	Initial Soil Status OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Yield (kg/ha) Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield gap 1 ----- RF vs Control (kg ha^{-1})	Yield gap 2 ----- RF+ vs RF (kg ha^{-1})	Yield gap 3 ----- RF vs FP (kg ha^{-1})
Gujarat	North Gujarat Agroclimatic Zone/ Jagudan/ 24	Alluvial	GW-496/ 120- 60-30 / $ZnSO_4$(15) 80- 50-0	-	-	-	-	-	2120	2925	3433	3244	3737	4020	3378	72	51	100	7.64	1617	283	359
Cluster Bean/Guar-Wheat																						
Rajasthan	Transitional Plain Zone of Inland Drainage - Fatehpur (Sikar)/ Fatehpur-RJ/24	Sandy Loam	RGC-1003/ 3.75 - 26.25-3.75 / $ZnSO_4$ (20) 15-10-00	0	0	0	0	0	1119	1123	1245	1250	1366	1513	1254	33	24	47	9.14	247	147	112
Rajasthan	Transitional Plain Zone of Inland Drainage - Fatehpur (Sikar)/ Fatehpur-RJ/24	Sandy Loam	RAJ-4037/ 35 - 22.5-7.5 / $ZnSO_4$ (25) 60- 30 -0	-	-	-	-	-	2702	3162	3542	3550	3800	4042	3335	41	29	57	4.13	1098	242	465
Ragi/Fingermillet-Potato																						
Karnataka	Eastern Dry Zone-Hebbel (Bangalore)/ Kolar-KAR/12	Red Soil	MR-1/ 100- 50-50/ Zinc(10) 65- 46-0	7.3	0.4	167	20	79	1839	3293	4338	4021	5008	5319	4816	136	96	190	8.15	3169	311	192
Karnataka	Eastern Dry Zone-Hebbel (Bangalore)/ Kolar-KAR/12	Red Soil	Abinava/ 250 - 250 -250 / Zinc(10) 250 - 250 -200	-	-	-	-	-	5	18399	22731	22887	30060	32976	28631	1927	1362	2697	19.7	####	2916	1429

Rice-green gram: A total 48 trials were conducted in two NARP zones. In Coastal saline Zone (West Bengal) and East& South Eastern Coastal Plain zone (Kendrapara) of Orissa, it was found that significantly higher additional yield of 387 and 783 kg ha^{-1} respectively can be obtained from rice through application of 80:40:40: Kg NPK + 25 kg zinc ha^{-1}. In green gram, the additional yield over farmer practice was found to be 173 kg ha^{-1} due to application of 20:40:20: Kg NPK ha^{-1} at Orissa. Application of zinc as micronutrient in rice and Molybdenum in green gram didnot give significantly higher yield over NPK alone at both centres.

Rice-groundnut: A total 36 trials were conducted in two NARP zones. Significantly higher yield of rice and groundnut was observed due to addition of zinc @ 25 and boron @ 10 kg ha^{-1} to these crops respectively in North Western Zone (Paiyur) of TN. The increase was observed to be 7.3 and 120.7% in rice and 10.9 and 128.6% in ground nut, over recommended nutrient application and control respectively. At Mid-Central Table Land Zone (Angul) Orissa in application of zinc @ 25in rice and Gypsum @ 250 kg ha^{-1} in groundnut along with RDF recorded 38.4% higher yield over the farmer practice.

Rice-gram: A total of 24 trials were conducted in CG Plain Zone (Kawardha) of Chhattisgarh. It was found that significantly higher additional yield of 1520 kg ha^{-1} and 3286 kg ha^{-1} can be obtained from rice through application of 100:60:40: Kg NPK + 20 kg zinc ha^{-1} as compared to farmers practice and control treatments respectively. In gram, the additional yield over farmer practice was found to be 384 kg ha^{-1} due to application of 20:50:20: Kg NPK ha^{-1} which was around 34.3% higher.

Rice-maize: In total 36 trials were conducted under rice-maize cropping system at two NARP zones *viz.,*North East Alluvial Plain Zone (Purnea) and Middle Gujarat Zone (Anand). At Purnea for rice application of 100:40:20 Kg NPK ha^{-1} gave additional yield of 2335 kg ha^{-1} and 1110 kg ha^{-1} over the control and farmer practice respectively. In the similar way at the same NARP zone application of 120:75:50 Kg NPK ha^{-1} to maize gave an additional yield of 4282 kg ha^{-1} and 1433 kg ha^{-1} over the control and farmer's practice respectively which were 99.0 and 19.9% higher over the control and farmer practice respectively. At Anand (Gujarat)in rice crop application of NPK along with micronutrients recorded 32.1 % yield increase over farmers practice and 82.7 % yield increase over control. Likewise in maize crop same treatment recorded around 97.7% and 29.2 % yield increase over control and farmers practice, respectively.

Maize-wheat: A total of 60 trials were conducted at 3 NARP zones *viz.,* Kangra (H.P.), Udaipur (R.J.) and Dhainsar (J.K.). At all the 3 locations over the farmers practice application of RDF along with Zinc recorded significantly higher yield. For both maize and wheat the highest yield increase of 143.2 and 73.8% respectively were noticed at Sub-Humid Southern Plain and Aravalli Hill Zone (Udaipur). Similarly at Sub-mountain and low hills sub-tropical zone (Kangra) of Himachal Pradesh due to application of 20 kg Zinc ha^{-1} an additional yield of 1321 and 1185 kg ha^{-1} for maize and wheat respectively were obtained over the farmers practice. At Kangra application of 90:45:30: Kg NPK + 20 kg zinc ha^{-1} in maize and 80:40:40: Kg NPK + 20 kg zinc ha^{-1} in wheat gave significantly higher yield 63.6 and 56.6% respectively over the farmer practices. At Udaipur (Rajasthan) application of recommended dose of fertilizer in maize and wheat recorded 381.1% and 202.8% higher yield of both the above crops over control. Lower yield of maize and wheat (464 and 537 kg ha^{-1}, respectively) were recorded under the farmer's practices of nutrient management as compared to application of recommended quantity of NPK at Sub-Tropical Zone (Dhainser) of Jammu & Kashmir.

Maize-gram: At Gadag (Karnataka) and Aurangabad (MH) total 36 trials were conducted involving maize-gram cropping system.In Northern dry zone (Gadag) of Karnataka, yield difference between farmers and recommended NPK application practices were found to be 1221 kg ha^{-1} in Maize and 316 kg ha^{-1} in gram. Application of micronutrient zinc @ 25 kg ha^{-1} to maize and @

15 kg ha^{-1} in wheat resulted in significantly higher yield (877 and 231 kg ha^{-1} for maize and wheat, respectively) than RDF. At Aurangabad application of 150:75:75: Kg NPK ha^{-1} in maize and 25:50:0: Kg NPK in gram gave 23.1 and 33.7% higher yield over the farmer practice.

Soybean-wheat: Involving soybean-wheat cropping system a total of 14 trials were conducted in Western Vidarbha Zone (Amravati) of Maharashtra. The results of trials indicated that farmer's nutrient management practice resulted in lower yield (238 and 72 kg ha^{-1}) of soybean and wheat compared to application of recommended quantity of NPK. Similarly for both of the crops the highest yield was found with treatment NPK + micronutrient application.

Soybean-gram: A total 8 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 477 and 399 kg ha^{-1}) in soybean and bengal gram respectively as compared to farmer practices. Which were 41.7 and 34.2% higher yield than farmer practices in soybean bengal gram respectively.

Soybean-onion: A total 24 trials were conducted in Western Maharashtra Plain Zone (Pune) 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 490 and 4567 kg ha^{-1}) in soybean and onion respectively as compared to farmer practices. Which were 62.6 and 33.5% higher yield than farmer practices in soybean onion, respectively.

Cotton-wheat: A total 48 trials were conducted in 2 NARP zones. In Western Zone (Sirsa) of Haryana application of recommended dose of fertilizer 175:60:60 Kg NPK ha^{-1}in cotton and 150:60:30: Kg NPK ha^{-1} in wheat gave significantly higher yield (additional yield of 1465 and 3241 kg ha^{-1}) over the control and (321 and 483 kg ha^{-1}) over farmer practices. Micronutrient application had only marginal effect on cotton and wheat. North Gujarat Zone (Jagudan) of Gujarat application of RDF in cotton and wheat gave significantly higher yield additional yield of 296 and 642 kg ha^{-1} over the farmer practices, respectively.

Cabbage-tomato: Total 12 trials were conducted at Kolar (Karnatka). Application of Zn with NPK resulted in 14.2 and 19.2% increase in yield over the NPK alone in both cabbage and tomato, but farmer's practices recorded higher yield than recommended dose of fertilizer alone and applied with micronutrient.

Cluster bean-wheat: At Transitional Plain Zone of Inland Drainage (Sikar) in cluster bean micronutrient use along with recommended dose of NPK gave yield increase of 35.2% over control which was only 10.6% higher in case of NPK application alone. Around 49.6% yield increase was noted in case of wheat crop under NPK + micronutrient application treatment over the control.

Finger millet-tomato: Under Eastern Dry Zone - Hebbel (Bangalore) a total of 12 trials were performed in finger millet-potato cropping system. In finger millet 10.4% and potato 15.2% yield increase was found under NPK + micronutrient application treatment over the farmers practice.

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

- Across various NARP zones and cropping systems, farmer's package resulted in lower yield compared to recommended package owing to the 26, 23, 73 and 100 % lower application of N P_2O_5 K_2O and micronutrients.
- On-farm system yield gap between recommended dose of N P_2O_5 K_2O + micronutrient and farmer's package was found to be 951, 865, 1970, 1698 and 621 kg ha^{-1} in

rice-rice, rice-wheat, maize-wheat, soybean-onion and rice-green gram cropping systems, respectively.

- Application of micronutrients based on soil test resulted in additional yield of 218, 224, 295, 234 and 85 kg ha^{-1} in rice-rice, rice- wheat, maize-wheat, soybean-onion and rice-green gram cropping systems, respectively.

- In all the NARP zones and systems, application of recommended N P_2O_5 K_2O alone or N P_2O_5 K_2O + 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.

Monitoring of OFR experiments at Amritsar by Director, ICAR-IIFSR

Response of major plant nutrients at farmer's field

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

The OFR-2 experiment on "On-Farm evaluation of new diversified cropping systems under irrigated/rainfed conditions" was concluded in 2012-13. A new 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 compulsorily made 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

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 wasintroduced 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 on farming systems including post harvest and value addition and assessing its impact) were implemented in randomly selected 24marginal farm households in each district.The general guidelines used for designing the modules are given below

Households: Twenty fourmarginal households were selected for experiment in all the locations. The average holding size of in the study locations ranged from 0.20 to 1.00 ha in various farming systems. Study involved 695 households with mean holding size of 0.70 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: 29 districts in 14 agro climatic regions covering 28 NARP zones have implemented the modulesin 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. Two locations namely Fathepur (Rajasthan) and Sirsa (Haryana)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

Kangra (Himachal Pradesh): Three major farming systems *viz.*, field crops, field crops + dairy and field crops + dairy + goat were found among which field crop + dairy is being practiced by 58% households having mean area of 0.70 ha. Diversification of crops in *kharif* and *rabi* along with introduction of kitchen garden resulted in improvement in production (6%), and increase in profit (12 %). Among the parameters, significant difference was observed between existing and diversified system for production, marketable surplus, cost and profit for field crop + dairy and field crop system. Among the different farming system, field crop + dairy registered significantly higher production (5257 kg), marketable surplus (1678 kg), and profit (Rs14,875) from 0.70 ha area compared to field crop + dairy +goat system.

Samba (Jammu and Kashmir): Only one farming system *viz;* crop + dairy was found in the district and practiced by 100 % householdshaving mean area of 0.83 ha. Diversification resulted in significantlyhigher profit (27 %).

Nainital (Uttarakhand): Six farming systems *viz.*, field crops, field crops + dairy, field crops + dairy + poultry, field crops + dairy + goat, dairy and field crops + dairy + goat + poultry were found among

Table 7.4.2(a). 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 households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
I. Western Himalaya														
Kangra (Himachal Pradesh)/Submon tanellow hills subtropical/ 104 rainy days/ 2336mm rain	Field crops	0.26	1	Maize/ sorghum	Wheat/ mustard	-	-	-	Maize	Wheat	-	-	Kitchen Garden	-
	Field crops+ dairy (1-2)	0.70	14	Maize/ rice/ colocassia/ sorghum	Wheat/ mustard/ potato/ berseem/ oats	-	Cow (1)+ Buffalo (1-2)	-	Maize/ rice/ sorghum/ soybean/ mash	Wheat/ berseem/ gobhi-sarson/ potato/ oat/ onion		Cow (1)+ Buffalo (1-2)	Kitchen Garden	-
	Field crops+ dairy (1-2)+ goat (2)	0.67	9	Maize/ rice/ sorghum/ sesame/ mash	Wheat/ mustard/ gobhi-sarson/ berseem	-	Cow (1)+ Buffalo (1) +Goat (2-3)	-	Maize/ rice/ sorghum/ mash	Wheat/ berseem/ gobhi-sarson/ potato/ onion	-	Cow (1)+ Buffalo (1) +Goat (2-3)	Kitchen Garden	
Samba (J&K)/ sub tropical low altitude /75 rainy days/1548 mm rain	Field crops+ dairy (2-3)	0.83	24	Rice/ maize/ fodder	Wheat/ berseem	-	Cow (1-2)+ Buffalo (1-2)	-	Rice/ maize/ fodder	Wheat/ berseem/ mustard	-	Cow (1-2)+ Buffalo (1-2)+ poultry (10)	Kitchen Garden	MM+high yielding chicks, seed & fertilizer for rice & wheat
Nainital (Uttarakhand)/ Hills of Uttarakhand/ Warm moist sub humid/ 90.5 rainy days/ 2597 mm rain	Field crops+ dairy	0.33	15	Rice/ soybean/ urd/ Jowar (F)	Wheat/ berseem/ mustard/ lentil/ gram	-	Cow (1-2) Calves (1) Buffalo (1-2)	-	Rice/ maize/ urd/ soybean/ tomato/ maize/ french bean/ zinger/ coriander/ chilli	Wheat/ pea/ onion/ potato/ lentil/ gram/ maize/ veg. pea/ berseem	-	Cow (1) Buffalo (1) Poultry (4)	Coriander leaves, Seeds of Brinjal, cauliflower, methi & palak	Herbicide & pesticide. Backyard poultry production, Goat rearing, Vermi-compost.

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy+ goat	0.27	3	Rice/ maize/ french bean/ ginger/ coriander/ chilli	Wheat/ gram/ pea/ onion/ lentil/ berseem/ vegetable pea/ potato	-	Bullocks (1-2) Cow (1) Calves (1) Buffalo (1-2) Goat (4-5)		Rice/ maize/ french bean/ ginger/ coriander/ chilli	Wheat/ gram/ pea/ onion/ lentil/ berseem/ vegetable pea/ potato	Coriander	Buffalo (2) Goat (4-5) poultry (20)	Coriander leaves, Seeds of Brinjal, cauliflower, methi & palak	-Do-
	Field crops+ dairy+ goat+ poultry	0.32	1	Rice/ french bean/ ginger/ coriander/ chilli	Wheat/ gram/ lentil/ potato/ berseem/ vegetable pea	Maize	Bullocks (2) Calves (1) Buffalo (2) Goat (4) Poultry (11)		Rice/ maize/ urd/ ginger/ coriander/ chilli	Wheat/ gram/ potato/ berseeem/ vegetable pea	Coriander	Buffalo (2)	Coriander leaves, Seeds of brinjal, cauliflower, methi & palak	-Do-
	Field crops+ dairy+ poultry	0.29	3	Rice/ maize/ urd/ ginger/ coriander/ chilli/ soybean/ tomato	Wheat/ gram/ pea/ onion/ berseeem/ vegetable pea/ potato	Maize	Bullocks (2) Cow (1) Calves (1-2) Buffalo (1)		Rice/ tomato/ coriander/ chilli/ wheat/ pea/ onion/ maize		Coriander	Cow (1) Buffalo (2) Poultry (15)	Coriander leaves, seeds of brinjal, cauliflower, methi & palak	-Do-
II. Eastern Himalaya														
Ambedkarnagar (Uttar Pradesh)/ Eastern Plain Zone/Sub-humid/ 54.4 rainy days/ 1426 mm rain	Field crops	0.30	1	Rice	Wheat/ berseem	-	-	-	Rice	Wheat/ berseem	-	Cow (2)	-	-
	Field crops+ dairy (1-2)	0.38	11	Rice/ fodder sorghum/ pigeon pea	Wheat/ mustard/ berseem/ potato/ chickpea/ pea	Sugar cane, mentha	Cow (1)+ Buffalo (1-2)	-	Rice/ fodder sorghum/ pigeon pea	Wheat/ mustard/ berseem/ potato/ chickpea/	Green gram/ okra	Cow (1-2)+ Buffalo (1-2)	-	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1-2)+ goat (3-4)	0.38	8	Rice/ fodder sorghum	Wheat/ mustard/ potato/ berseem	Lady finger, mentha	Cow (1)+ Buffalo (1) +Goat (3-4)	-	Rice	Wheat/ chickpea/ potato/ mustard/ pea/ berseem	Black gram/ green gram/ fodder sorghum/ okra	Buffalo (1)+ Goat (4)	-	-
III. Lower Gangetic Plains														
South 24 Paragnas (West Bengal)/ lower gangetic plains/100.8 rainy days/1789mm rain	Field crops	0.56	2	Rice	Tomato	Green gram/ okra	-	-	Rice	Sunflower	Green gram/ onion	Poultry (12)+ Pig (6)	Kitchen gardening, dal making	Improved cultivation techniques of sunflower, Integrated pest manage-ment of lady's finger
	Field crops+ dairy (1-2)	0.39	8	Rice	Green gram/ sunflower/ potato/ tomato	Green gram/ okra/ sesame	Cow (1-2)		Rice	Boro rice/ onion/ sunflower/ potato/ lathyrus	Green gram/ okra/ sunflower	Cow (2-3)+ Poultry (17-18)+ goat (1-2)	Kitchen gardening, dal making	-Do-
	Field crops+ dairy (2)+ fish	0.46	1	Rice	Brinjal	Green gram/ okra	Cow (2)+ Pond (1)		Rice	Onion/ cowpea/ tomato	Green gram/ okra	Cow (6)+ Poultry (9)	Kitchen gardening, dal making	-Do-
	Field crops+ dairy (3)+ goat (5-6)	0.45	3	Rice	Sunflower/ green gram/ potato	Green gram/ okra	Cow (3)+ Goat (5-6)		Rice	Sunflower/ onion/ potato/ lathyrus/ amaranths/ barboti/ fruit crops	Green gram/ okra/ Indian spinach	Cow (3-4)+ Poultry (17-18)	Kitchen gardening, dal making	-Do-
	Field crops+ dairy (4)+ goat (12)+ poultry (30)	0.26	1	Rice	-	Rice	Cow(4)+ Goat (12)+ Poultry (30)		Rice	Sunflower/ potato/ brinjal/ cucumber	Snake gourd/ boro rice	Cow(3)+ Poultry (62)	Kitchen gardening, dal making	-Do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (3-4)+ poultry (15-16)	0.52	6	Rice	Sunflower/ potato/ tomato/ sesame/ green gram	Green gram/ okra	Cow (3-4)+ Poultry (15-16)		Rice	Sunflower/ potato/ onion/ lathyrus/ boro rice	Okra/ green gram	Cow (4-5)+ Poultry (22-23)	Kitchen gardening, dal making	-Do-
	Field crops+ goat (2)	0.67	1	Rice	Tomato	Green gram/ okra	Goat (2)		Rice	Sunflower	Green gram/ okra	Poultry (8)+ Pig (5-6)	Kitchen gardening, dal making	-Do-
	Field crops+ poultry (4)	0.44	2	Rice	Sunflower	Green gram/ okra	Poultry (4)		Rice	Sunflower/ onion	Green gram/ okra/ onion	Poultry (23)	Kitchen gardening, dal making	-Do-
Kamrup (Assam)/ Eastern Himalayas Region/ AS-3 Central Brahmaputra Valley Zone / rainfall 2809 mm	Field crops+ dairy (2)+ Pig (3-4)	0.81	7	Rice	Rice/ toria	Arecanut plantation in home-stead garden	Cow (2)+ pig (3-4)		Rice	Rice/ toria	Arecanut plantation in home-stead garden	Cow (2)+ poultry (10)+ pig(3-4)		Toria seed variety TS-38
	Field crops+ dairy (3)+ Poultry (12)	1.4	2	Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow(3)+ Poultry (12)		Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow(3)+ goat (2)+ Poultry (22)		-do-
	Field crops+ dairy (2)+ Goat (4)+ Poultry (8) +Pig (3)	0.9	1	Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow(2)+ Goat (4)+ Poultry (8) +Pig (3)		Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow(2)+ Poultry (28)+ Pig (3)		-do-
	Field crops+ dairy (1)+ Goat (2)+ Pig (3)	0.9	1	Rice	Rabi vegetable	Arecanut plantation in home-stead garden	Cow(1)+ Goat (2)+ Pig (3)		Rice	Rabi vegetable	Arecanut plantation in home-stead garden	Cow(1)+ Goat (2)+ Poultry (10) + Pig (4)	-	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy(2)+ Goat (2)+ Poultry(10) +Fish	0.6	3	Rice	Rice/ toria	Arecanut plantation in home-stead garden	Cow(2)+ Goat (2)+ Poultry(10) +Fish		Rice	Rice/ toria	Arecanut plantation in home-stead garden	Cow(2)+ Goat (2)+ Poultry(20) pig (2)+ Fish		Toria seed variety TS-38
	Field crops+ dairy (3-)+ Poultry (10)+Fish	0.6	1	Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow (3-)+ Poultry (10)+Fish		Rice	-	Turmeric, Arecanut plantation in home-stead garden	Cow (3-)+ goat (2)+ Poultry (20)+Fish		
	Field crops+ dairy (2)+ Poultry (14-15)+ Pig (2-3)	0.78	2	Rice	Toria	Arecanut plantation in home-stead garden	Cow (2)+ Poultry (14-15)+ Pig (2-3)		Rice	Toria	Arecanut plantation in home-stead garden	Cow (2-)+ Poultry (25-26)+ pig (4-5)		Toria seed variety TS-38
	Field crops+ dairy (2-3)+ Goat (2)+ Poultry (58-60)	0.68	6	Rice	Rice/ toria	Turmeric, Arecanut plantation in home-stead garden	Cow (2-3-)+ goat (2)+ poultry (58)		Rice	Rice/ toria	Turmeric, Arecanut plantation in home-stead garden	Cow (2-3-)+ goat (2)+ poultry (68-70) + pig (2) fish		Toria seed variety TS-38
	Field crops+ dairy (1)+ Fish	0.6	1	Rice		Arecanut plantation in home-stead garden	Cow (1)+ Fish		Rice		Arecanut plantation in home-stead garden	Cow (1)+ poultry (10) + pig (2)		
IV. Middle Gangetic Plains														
Purnea (Bihar)/ north east alluvial plain (BI-2) / 40.5 rainy days/ 1013 mm rain	Field crops	0.50	1	Rice/ vegetable	Maize/ potato	-	-	Goat (6)	Rice/ vegetable	Maize/ vegetable	Green gram	Goat (1)	Kitchen garden, and preparation of vermicost	Goat kid & earth worm supply for vermi-compost
	Field crops+ dairy (2-3)	0.75	4	Rice/ vegetable	Maize/ potato	Chilli/ brinjal	Cow (2)	-	Rice/ vegetable/ okra	Wheat/ maize/ potato	Green-gram	Cow (2)	Kitchen garden, and preparation of vermi-compost	Goat kid & earth worm supply for vermi-compost

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (2-3)+ goat (1-2)	0.58	19	Rice/ vegetable	Maize/ wheat/ potato/ vegetable	-	Cow (1-2)+ Buffalo (0-1) +Goat (2-3)	-	Rice/ vegetable	Wheat/ maize/ potato/ vegetable	Green gram/ ladys' finger	Cow (1-2) Goat (3-4) Buffalo (1)	Kitchen garden, and preparation of vermi-compost	Goat kid & earth worm supply for vermi-compost
V. Upper Gangetic plains														
Kanpur Dehat (Uttar Pradesh)/ Central Plain Zone/ Kanpur	Field crops	0.80	3	Rice	Wheat	-	-	-	Rice/ maize/ green gram	Wheat/ mustard/ chickpea	Green gram	Cow (1)+ Goat (1)	-	Improved practices of rabi, goat rearing, poultry production, kitchen gardening
	Field crops+ dairy (1-2)	0.85	8	Rice/ maize/ pigeonpea	Wheat/ chickpea/ mustard	-	Cow (1)+ Buffalo (1-2)	-	Rice/ maize/ pigeonpea/ sorghum	Wheat/ chickpea/ mustard/ potato	Green gram	Cow (1-2)+ buffalo (1-2) +goat (1)	-	-Do-
	Field crops+ dairy (2-3)+ goat(2-3)	0.76	8	Rice/ maize/ pearl millet	Wheat/ mustard/ potato	-	Cow (1)+ Buffalo (2)+ Goat(2-3)	-	Rice/ maize/ pearl millet/ sorghum	Wheat/ mustard/ potato/ chickpea/ garlic	Green gram	Cow (1)+ buffalo (1-2) +Goat (2)	-	-Do-
	Field crops+ goat (2-3)	0.33	5	Rice/ pigeonpea	Wheat/ mustard	-	Goat (2-3)	-	Rice/ green gram/ maize	Wheat/ mustard/ chickpea/ potato	Green gram	Buffalo (1) +Goat (3)	-	-Do-
VI. Trans Gangetic Plains														
Sirsa (Haryana)/ Western/ 29 rainy days/ 292 mm rain	Field crops	0 .40	1	Cotton	Wheat	-	-	NKG	Cotton/ guar	Wheat	-	-	-	-
	Field crops+ dairy (1-2)	0.58	22	Cotton/ pearl millet/ guar	Wheat/ berseem	-	Cow (1)+ Buffalo (1)	Ghee making, dal making, NKG	Cotton/ guar	Wheat	-	Cow (1)+ Buffalo (1) +Goat (1)	Kitchen garden	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Amritsar (Punjab)/ Central Plain Zone/ 47 rainy days/ 936 mm rain	Field crops+ dairy (3-4)	1.08	24	Rice	Wheat	-	Cow (1)+ Buffalo (3-4)	-	Rice	Wheat	-	Cow (1)+ Buffalo (1-2)	Organic Kitchen garden	Preparation of Mineral Mixture
VII. Eastern Plateau and Hills														
Kabirdham (Chhattisgarh)/ Chhattisgarh Plain Zone/ Sub humid Area	Field crops	0.84	12	Rice/ soybean	Chickpea/ wheat	Vegetable		-	Rice/ soybean/ pigeon pea in bunds, vegetables	Chickpea/ wheat/ vegetable	Vegetable	Cow (1-2)+ Poultry (30-31)	Chickpea dal & besan preparation	Seeds of chickpea, wheat, vegetables & goat kid
	Field crops+ dairy (2-3)	0.77	9	Rice/ soybean	Wheat/ chickpea	Vegetable	Cow (2-3)	-	Rice/ soybean/ pigeon pea in bunds, vegetables	Wheat/ chickpea/ vegetable	Vegetable	Cow (1-2)+ Goat (2-3)+ Poultry (31-32)	Chickpea dal & besan preparation	Seeds of chickpea, wheat, vegetables & goat kid
	Field crops+ dairy (1)+ goat (1)	0.60	1	Rice/ soybean	Wheat/ chickpea	Vegetable	Cow(1)+ Goat (1)	-	Rice/ soybean/ pigeon pea in bunds, vegetables	Wheat/ chickpea/ vegetable	Vegetable	Cow (2)+ goat (3)+ Poultry (34)	Chickpea dal & besan preparation	Seeds of chickpea, wheat, vegetables & goat kid
	Field crops+ dairy (1)+ goat (8)+ poultry (10)	0.60	1	Rice/ soybean	Wheat/ chickpea	Vegetable	Cow (1)+ Goat (8)+ Poultry (10)	-	Rice/ soybean/ pigeon pea in bunds, vegetables	Wheat/ chickpea/ vegetable	Vegetable	Cow (2)+ Goat (10)+ Poultry (31)	Chickpea dal & besan preparation	Seeds of chickpea, wheat, vegetables & goat kid
	Field crops+ dairy (1)+ poultry (8)	0.80	1	Rice/ soybean	Wheat/ chickpea	Vegetable	Cow (1)+ Poultry (8)	-	Rice/ soybean/ pigeon pea in bunds, vegetables	Wheat/ chickpea/ vegetable	Vegetable	Cow (1)+ Goat (2)+ Poultry (36)	Chickpea dal & besan preparation	Seeds of chickpea, wheat, vegetables & goat kid

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Pakur (Jharkhand)/ Eastern plateau and hill-VII/central and north eastern plateau zone / 86 rainy days/ 1228 mm rain	Field crops	0 .76	22	Rice	Wheat/ lentil/ chickpea/ mustard/ linseed/ potato	-	-	-	Rice	Wheat/ mustard	-	Goat (2-3)+ Pig (1) + Poultry (5-6)	Kitchen - Garden, Dal Making	
	Field crops+ dairy (1)	0 .72	2	Rice	Wheat/ chickpea		Cow (1)	-	Rice	Wheat/ mustard	-	Goat (2)+ Pig (1)	Kitchen Garden, Dal Making	-
Dindori (Madhya Pradesh)/Northern Hills Zone of Chhattisgarh (CG-3)/ 72.6 rainy days/ 1593mm rain	Field crops	0.72	3	Rice/ soybean	Wheat/ chickpea/ lentil	-		-	Rice/ soybean/ kodo	Wheat/ chickpea/ lentil	-	Cow (1-2)+ Buffalo (1)+ Poultry (2-3)	-	-
	Field crops+ dairy (1-2)	0.76	16	Rice/ kodo	Wheat/ chickpea/ lentil	-	Cow (1-2)+ Buffalo (1)	-	Rice/ soybean/ kodo	Wheat/ chickpea/ lentil	-	Cow (1-2)+ Buffalo (1)	-	-
	Field crops+ dairy (1-2)+ goat (2)	0.73	2	Rice	Wheat/ chickpea	-	Cow (1-2)+ Buffalo (1)+ Goat (2)	-	Rice/ soybean	Wheat/ chickpea/ lentil	-	Cow (1)	-	-
	Field crops+ dairy (1)+ poultry (4-5)	0.69	2	Rice	Wheat/ chickpea	-	Cow (1)+ Buffalo (1)+ Poultry (4-5)	-	Rice/ soybean	Wheat/ chickpea/ lentil	-	Cow (1-2)	-	-
	Field crops+ goat (2)	0.65	1	Rice/ kodo	Wheat/ lentil	-	Goat (2)	-	Rice/ soybean/ kodo	Wheat/ chickpea/ lentil	-		-	-
Angul (Odisha)/ Mid-Central Table Land, / 81 rainy days/ 1560 mm rain	Field crops	0.80	1	Rice/ brinjal/ pointed guard/ mango/ banana/ cashew nut	Pigeon pea/ maize	Sesamum	-	-	Rice/ brinjal/ cashew nut/ mango/ banana/ pointed guard	Pigeon pea/ maize/ mustard/ onion/ cowpea/ cauliflower/ cabbage	Sesamum/ brinjal/ okra	Cow (1)	-	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved				
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1-2)	0.83	14	Rice/ brinjal/ cowpea/ pointed guard/ mango/ okra/ bitter guard/ banana/ cashew nut	Groundnut/ maize/ tomato/ cowpea/ okra/ brinjal/ cucumber/ onion/ potato	Black gram/ okra/ seasamum	Cow (1-2)	-	Rice/ brinjal/ cowpea/ okra/ mango/ bitter guard/ banana/ cashew nut	Groundnut/ tomato/ cowpea/ okra/ brinjal/ cucumber/ onion/ garden pea/ cauliflower/ maize/ potato/ bean/ cluster bean/ sunflower	Black gram/ green gram/ okra/ bitter guard/ sesamum/ cucumber/ brinjal/ cowpea/ pointed guard/ water melon/ ridge guard	Cow (1-2)	Compost Making	-
	Field crops+ dairy (2-3)+ Poultry	0.89	8	Rice/ ginger/ mango/ banana	Brinjal/ cowpea/ tomato/ cauliflower/ potato/ garden pea/ okra/ cabbage/ pointed guard/ maize	Brinjal/ cucumber	Cow (2-3)+ Poultry (25-30)	-	Rice/ ginger/ mango/ banana/ bitter guard	Brinjal/ cowpea/ bitter guard/ cauliflower/ potato/ garden pea/ okra/ cabbage/ pointed guard/ maize/ onion/ sunflower	Brinjal/ cucumber/ okra/ water melon	Cow (2-3)+ Poultry (65-70)+ Fish	-	-
	Field crops+ Poultry (2)	0.80	1	Rice/ cashew nut	Maize/ brinjal/ bitter guard/ cowpea/ pointed guard	Seasamum	Poultry (2)	-	Rice/ cashew nut/ bitter gourd/ cowpea/ brinjal/ pointed gourd	Maize/ onion/ cauliflower/ cabbage/ garden pea	Sesamum/ brinjal/ okra	Cow (1)+ buffalo (2)	-	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
VIII. Central Plateau and hills														
Katni (Madhya Pradesh)/ Kymore Pleateau and Satpura Hills/ 70 rainy days/ 1444mm rain	Field crops	0.70	3	Rice	Wheat	-	-	-	Rice	Wheat / chickpea	-	-	-	-
	Field crops+ dairy (1-2)	0.71	20	Rice/ marigold	Wheat/ marigold/ tomato/ chickpea	-	Cow (2)+ buffalo (1)	-	Rice	Wheat/ chickpea	-	Cow (2)+ buffalo (1)	Desi ghee making	Mineral mixture, albenda-zol etc.
	Field crops+ dairy (1-2)+ goat (2)	1.00	1	Rice	Wheat	-	Cow (2)+ Buffalo (1)+ Goat (2)	-	Rice	Wheat/ chickpea	-	Cow (2)+ Buffalo (1)+ Goat (2)	Desi ghee making	Mineral mixture, albenda-zol etc.
Udaipur (Rajasthan)/ Sub-humid Southern plain and aravali hills/ 47 rainy days/ 828 mm rain	Field crops	0.70	2	Maize	Wheat	-	-	-	Maize/ blackgram	Wheat/ vegetable	-	Cow(1)	-	Crop production, vegetable production, vermi-compost, Medicines, Mineral Mixture rearing for livestocks
	Field crops+ dairy (1-2)	0.60	7	Maize	Wheat	-	Cow (1)+ Buffalo (1)	-	Maize/ vegetable/ black gram	Wheat/ Vegetable vegetable		Cow (1)+ Buffalo (1)	Vermi-compost	-do-
	Field crops+ dairy (1-2)+ goat (3-4)	0.66	15	Maize/ guar	Wheat	-	Cow (1-2)+ Buffalo (1)+ Goat (3-4)	-	Maize/ vegetable/ black gram	Wheat/ Vegetable vegetable		Cow (2-3)+ Buffalo (1)+ Goat (3-4) Poultry (30-35)	Vermi-compost	-do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
IX. Western Plateau and Hills														
Aurangabad (Maharashtra)/ CMP/57.5 rainy days/666 mm rain	Field crops	0.47	21	Maize/ cotton/ sugar cane/ pearl millet/ ground nut/ okra/ hy. napier	Wheat/ chickpea/ coriander/ fenugreek/ lucern	Fodder maize	-	-	Cotton/ sugar cane/ pearl millet/ okra/ hy.napier/ chilli/ soybean/ coriander/ maize/ hy. napier/ ginger	Coriander/ wheat/ chickpea/ rabi sorghum/ lucern/ fenugreek	Fodder maize	Cow (1-2)+ Goat (4-5)	Kitchen garden, composting, desi ghee making	Importance of secondary and micro nutrients in cotton, clean milk production and importance of vaccination and mineral mixture
	Field crops+ dairy (7)	0.75	3	Maize/ cotton/ sugar cane/ hy.napier/ pigeon pea	Wheat/ coriander/ fenugreek/ chickpea	Fodder maize	Cow (7)	-	Sugarcane/ cotton/ maize/ ginger/ hy. Napier	Coriander/ wheat/ chickpea/ lucern/ fenugreek	Fodder maize	Cow (1-2)+ Goat (3)	-do-	-do-
Pune (Maharashtra)/ deccan Plateau, hot semi-arid eco sub region(6.1)/ Ganeshkhind Pune-7/ 48 rainy days/ 606 mm rain	Field crops+ dairy (1-2)	0.53	24	G.nut/ soybean/ rice/ sugar cane/ hy. napier/ fodder/ marvel/ gulchadi/ ghewada	Onion/ potato/ chickpea/ wheat/ maize/ garlic/ fodder/ lucerne	Pearl millet/ ground nut/ gulchadi/ hy. napier/ maize	Cow (1-2)+ Buffalo (0-1)	-	Rice/ G. nut/ soybean	Onion/ wheat/ chickpea	Pearl millet/ vegetable	Cow (1-2)+ Buffalo (1-2) +Goat (1)	-	-
Amravati (Maharahtra/) Central Maharastra Plateaue Zone (IX)/ Western Vidarbha Zone/71 rainfall days/1198 mm	Field crops+ dairy (1-2)	0.87	20	Soybean/ cotton/ pigeon pea/ orange	Chickpea/ wheat	-	Cow (1-2)	-	Soybean/ cotton/ okra/ marigold	Chickpea/ wheat/ linseed/ pigeon pea	Onion/ sesamum	Cow (1-2)+ Buffalo (0-1) +Goat (1-2)+ poultry (0-1)	Kitchen Garden, dal making, compost, mineral mixture, bur budding, boundary plantation	Soybean based multi-tier/ Inter Cropping System , Goat rearing

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ goat (2-3)	0.80	3	Soybean	Chickpea/ wheat	-	Goat (2-3)	-	Soybean/ pigeon pea/ cotton	Chickpea/ linseed/ wheat	Sesamum	Goat (6-7)+ Poultry (2)	-do-	-do-
	Field crops+ poultry (6)	0.80	1	Soybean	Chickpea	-	Poultry (6)	-	Soybean/ pigeon pea	Wheat	-	Goat (1)	-do-	-do-
X. Southern Plateau and Hills														
Warangal (Telangana)/ C.T. Zone/ rice eco system/ 67.3 rainy days/ 1263 mm rain	Field crops	1.00	1	Rice/ maize	Maize			-	Rice	Rice/ maize		Poultry (12)	Kitchen gardening, seed kit	Sunhump seed production
	Field crops+ dairy (1-2)	0.90	6	Rice/ cotton/ maize	Rice/ maize/ ground nut	-	Cow (1)+ Buffalo (1-2)	-	Rice	Rice/ maize	-	Cow (0-1)+ Buffalo (1-2) +Poultry (4)	Kitchen gardening, seed kit	Sunhump seed production
	Field crops+ dairy (2)+ goat (40-45)	0.87	3	Rice/ maize	Rice/ maize		Cow (1)+ Buffalo (1-2) +Goat (40-45)		Rice	Rice/ maize		Cow (0-11)+ Buffalo (1-2) +Poultry (5) +Goat (25-30)	Kitchen gardening, dal making	Sunhump seed production, Compost Making, Mineral Mixture
	Field crops+ dairy (2-3)+ goat (35-40) +poultry (7-8)	0.92	6	Rice/ cotton/ maize	Rice/ chilly/ maize/ water melon	-	Cow (1-2)+ Buffalo (1-2) +Goat (35-40) +Poultry (7-8)	-	Rice	Rice/ maize	-	Cow (1)+ Buffalo (0-1) +Goat (30) +Poultry (8-9)	Kitchen gardening, dal making	Sunhump seed production, Compost Making, Mineral Mixture
	Field crops+ dairy (2-3)+ poultry (6-7)	0.83	8	Rice/ cotton/ maize	Rice/ okra/ maize	-	Cow(0-1)+ Buffalo (1-2) +Poultry (6-7)		Rice	Rice/ maize		Cow(0-1)+ Buffalo (2-3) +Poultry	Kitchen gardening, dal making (9-10)	Sunhump seed production, Compost Making, Mineral Mixture

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Kolar (Karnataka)/ AEZ 8.2/Eastern Dry Zone/ 42 rainy days/ 612 mm rain	Field crops+ dairy (1-2)	0.91	12	Finger millet/ pole bean/ maize/ avare/ mulberry/ cauliflower/ tomato/ ridge guard/ sweet corn/ cabbage/ flat beans	Radish/ carrot/ tomato/ sweet corn/ bitter guard	Tomato/ mullbery/ maize/ coriander	Cow (1-2)	-	Finger millet/ pole bean/ avare/ maize/ mulberry/ cauliflower/ tomato/ ridge guard/ flat bean/ carrot/ red gram/ potato/ okra/ maize	Radish/ carrot/ sweet corn/ bitter guard	Tomato/ mulberry/ maize/ coriander/ fodder	Cow (1-2)+ sheep (1-2) +Poultry (8-9)	Feeding schedules in adverse climatic conditions, azolla	Vermi- composting -
	Field crops+ dairy (1-2)+ goat (5)	1.00	5	Finger millet/ mulberry/ tomato/ sericulture	Coriander/ tomato	-	Cow (1)+ Buffalo (1) +Goat (5)	-	Finger millet/ mulberry/ tomato/ mango/ sericulture/ hoarse gram/ ground nut/ maize	Coriander /tomato/ mulberry/ pumpkin/ mango	Mango/ mulberry	Cow (1-2)+ Buffalo (1) +Goat (8-9) +Poultry (4)	Feeding schedules in adverse climatic conditions, azolla, vermi-composting	-
	Field crops+ dairy (3-4)+ goat (5-6)+ poultry (7-8)	1.50	6	Finger millet/ rice/ mulberry/ tomato/ ridge guard	Carrot/ coriander/ radish	Tomato/ mango/ mulberry	Cow (2-3)+ Buffalo (1) +Goat (5-6) +Poultry (7-8)	-	Finger millet/ rice/ tomato/ mulberry/ ridge guard/ pole bean/ ground nut/ avare/ red gram/ maize/ horse gram/ pole bean	Carrot/ coriander/ radish/ pumpkin/ okra/ mango	Tomato/ mulberry/ mango/ pole bean/ beans/ coriander	Cow (2-3)+ Buffalo (1) +Goat (9-10) +Poultry (11-12)	Feeding schedules in adverse climatic conditions, azolla, Vermi-composting	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (2)+ poultry (3)	0.30	1	Finger millet/ rice	-	Mulberry	Cow (2)+ Poultry (3)	-	Finger millet/ rice/ mulberry/ chilli	Mulberry	Mulberry/ tomato	Cow (2)+ Poultry (3) +goat (1)	Feeding schedules in adverse climatic conditions, azolla, Vermi-composting	-
Gadag (Karanataka)/ Northern Dry Zone/ Arid/31.5 rainfall days/325 mm	Field crops+ dairy (1-2)	1.14	24	Maize/ vegetable/ ground nut/ Bt.cotton/ onion/ chilli	Vegetable/ chickpea/ wheat/ sunflower/ Bt.cotton/ sorghum/ ground nut/ maize	-	Cow (1)+ Buffalo (1)	-	Green gram/ maize/ ground nut	Sorghum/ chick pea/ sunflower/ Bt. cotton	-	Cow (1)+ Buffalo (1) +poultry (10)	Groundnut, Cotton, Green gram, Sorghum & Chickpea Seed & Fertilizer	Integrated Farming System a noble approach for enhancing farm income fodder crop Seedling & Azolla culture
Dharmapuri & Krishnagiri (Tamil Nadu)/NWZ/ Bimodal rainfall/ Start of deccan plateau/ 36.5 rainy days/ 656 mm rain	Field crops+ dairy (2-3)	0.67	22	Rice/ turmeric/ ground nut/ Button rose/ okra/ jasmine/ cotton/ maize/ redgram/ tapioca/ horse gram/ coconut/ black gram	Rice/ coconut/ tomato/ ragi/ brinjal/ cowpea/ fodder sorghum/ fodder grass/ ground nut	Coconut	Cow (2-3)	-	Rice/ turmeric/ ground nut/ button rose/ coconut/ fodder grass/ okra/ jasmine/ cotton/ fodder maize/ redgram/ topiaca/ fodder sorghum/ horse gram/ black gram	Rice/ ragi/ radish/ ground nut/ black gram/ fodder grass/ tomato/ cotton		Cow (2-3) +poutry (13-14)	-	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (2-3)+ poultry (17-18)	0.80	2	Rice/ jasmine/ fodder grass/ coconut	Rice	Coconut	Cow (2-3)+ Poultry (17-18)	-	Rice/ jasmine/ fodder grass	Rice/ ragi	-	Cow (2-3)+ poultry (8)	-	-
XI. East Coast Plains and Hills														
Srikakulam (Andhra Pradesh)/high altitude and tribal area zone/ 57.5 rainy days/ 1277mm rain	Field crops	0.20	1	Rice/ maize	Maize	-	-	-	Rice	Black gram	-	Poultry (10)	-	Vaccine supply
	Field crops+ dairy(1-2)	0.63	6	Rice/ maize/ green gram	Rice/ maize/ ground nut	-	Cow (0-1)+ Buffalo (1-2)	-	Rice	Black gram/ rice/ pigeon pea/ green gram/ maize/ finger millet/	Sesame	Goat (1)+ Poultry (13-14)	-	Vaccine supply
	Field crops+ dairy(2)+ goat (40-45)	0.73	3	Rice/ maize/ green gram	Rice/ maize	-	Cow-1, Buf-2, Goat-40-45	-	Rice	Black gram/ pigeon pea/ finger millet/ green gram/ maize	Sesame	Buf-0-1, Poultry (13-14)	-	Vaccine supply
	Field crops+ dairy+ goat+ poultry	0.73	6	Rice/ maize/ green gram	Rice/ chilli/ maize	-	Cow-1, Buf-1-2, Goat-30-32, Poul-7-8	-	Rice-	Black gram/ rice/ green gram/ finger millet	Sesame	Goat-3, Poul-12-15	-	Vaccine supply

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1-2)+ poultry (6-7)	0.62	8	Rice/ maize/ green gram	Rice/ maize/ okra/ vegetable	-	Buf-1-2, Poult-6-7	-	Rice/ sugar cane	Rice/ black gram/ maize/ green gram/ finger millet	Black gram	Cow-0-1, Buf-1, Poul-14-15	-	Vaccine supply
Kendrapara (Odisha)/east-south eastern coastal plain zone/ 77 rainy days/ 2002 mm rain	Field crops+ dairy (2)	0.88	8	Rice/ jute	Green gram/ rice/ black gram/ vegetable	-	Cow (2)	-	Rice/ jute	Green gram/ rice/ black gram/ vegetable/ bitter guard	-	Cow (1-2)+ Poultry (10)	Kitchen gardening, compost making, ber budding, mushroom production	Spawn, polythene
	Field crops+ dairy (1-2)+ Fish	1.02	5	Rice/ jute/ vegetable	Green gram/ black gram/ vegetable	-	Cow (2) + Fish	-	Rice/ jute	Rice/ green gram/ mustard/ black gram/ vegetable/ bitter guard/ ground nut	-	Cow (1-2) + goat (1) Poultry (10)	Kitchen gardening, compost making, ber budding, mushroom production	Spawn, polythene
	Field crops+ dairy (2)+ goat (12-15)	1.09	7	Rice/ vegetable	Green gram/ rice/ black gram/ vegetable	-	Cow (2)+ Goat (12-15)	-	Rice	Green gram/ rice/ vegetable/ black gram/ ground nut/ mustard/ bitter gourd	-	Cow (2-3)+ Poultry (10) +Goat (4-5)	Kitchen gardening, compost making, ber budding, mushroom production	Spawn, polythene

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1)+ goat (3)+ Fish	1.00	2	Rice/ vegetable	Green gram/ black gram/ vegetable	-	Cow (1)+ Goat (3) + Fish	-	Rice/ vegetable/ jute	Green gram/ black gram/ mustard/ bitter guard	-	Cow (2)+ Poultry (10) +Goat (2-3)	Kitchen gardening, compost making, ber budding, mushroom production	Spawn, polythene
	Field crops+ dairy (2)+ goat (3-4)+ Poultry (410)	0.89	2	Rice	Rice/ green gram/ black gram/ vegetable	-	Cow (2)+ Goat (3-4) +Poultry (410)	-	Rice/ jute	Rice/ black gram/ green gram/ bitter guard/ ground nut		Cow (3-4)+ Poultry (18) +Goat (3-4)	Kitchen gardening, compost making, ber budding, mushroom production	Spawn, polythene
Sivagangai (Tamil Nadu)/Southern/ Semi Arid Eco-Sub Region 8.1/ Southern Zone TN 5 & 6/ 41 rainy days/ 563 mm rain	Field crops+ dairy (3-4)+ poultry	0.80	14	Rice	Rice/ black gram/ brinjal/ okra/ maize/ cucumber	Groundnut/ black gram/ brinjal/ pumpkin	Cow (3) + Poultry		Rice	Rice/ fodder sorghum	Ground nut/ black gram/ brinjal/ pumpkin/ okra/ maize	Cow (3)+ Poultry (10)	Kitchen gardening, compost making, ber budding	Fertilizers, bio fertilizers, bio inoculants and PP chemicals & CNH CO4, MN mixture
	Field crops+ dairy(2)	0.80	10	Rice	Rice/ black gram/ cucumber	Groundnut/ pumpkin/ black gram	Cow (2)		Rice	Rice	Ground nut/ pumpkin/ black gram/ cucumber/ yam/ brinjal	Cow (2-3)+ Poultry (10)	Kitchen gardening, compost making, ber budding	-do-
XII. West Coast Plains and Ghats														
Palghar (Maharashtra)/ North konkan coastal Zone/ 107 rainy days/ 2954 mm rain	Field crops+ dairy (2)	0.39	24	Rice	Rice/ cowpea	-	Cow (1)+ Buffalo (1)	-	Rice	Rice/ cowpea/ cluster bean	-	Cow (1)+ Buffalo (1)	Kitchen garden, compost	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Thiruvalla (Kerala)/ West Coast Plains & Ghats Region/ KE-2 Southern Zone/3127 mm rain	Field crops+ dairy (1-2)+ horticulture	0.45	13	Rice/ coconut	Rice		Cow (1-2)		Rice/ coconut	Rice/ banana	Green manure	Cow (1-2)+ poultry (25) pisiculture	Kitchen gardening,	Fish feed, Grow bag & sprayer
	Field crops+ dairy (2)+ horticulture + fish	0.52	1	Rice/ coconut	Rice		Cow (2)		Rice/ coconut	Rice/ banana	Green manure	Cow (2)	-	-
	Field crops+ dairy (2)+ horticulture + Goat	0.46	1	Rice/ coconut	Rice		Cow (2)		Rice/ coconut	Rice/ banana	Green manure	Poultry (25)	Kitchen gardening	Grow bag & sprayer
	Field crops+ horticulture + poultry + fish	0.46	1	Rice/ coconut	Rice		Poultry		Rice/ coconut	Rice/ vegetable	Green manure	poultry (25)	Pisiculture	Fish feed
	Field crops+ horticulture	0.42	7	Rice/ coconut	Rice		-		Rice/ coconut	Rice/ banana/ nutmeg	Green manure	Poultry (25)	Kitchen gardening	Growbag
	Field crops+ horticulture+ poultry	0.47	1	Rice/ coconut	Rice		-		Rice/ coconut	Rice/ cocoa	Cocoa	Poultry (50)	Pisiculture	Fish fingerlings
XIII. Gujarat Plains and Hills														
Mehsana (Gujrat)/ north Gujrat agro climate zone / 44.8 rainy days/ 551 mm rain	Field crops	0.95	2	Cotton/ fodder sorghum	Wheat/ mustard/ lucerne	Fodder sorghum	-	-	Cotton/ Rijeka/ pearl millet/ sorghum/ cowpea/ green gram	Castor/ wheat/ lucerne/ mustard	Fodder sorghum/ pearl millet/ cluster bean	Cow (2)+ Buffalo (2)	Kitchen gardening, compost making	Cow & buffalo Mineral Mixture & Albendezole

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (3-4)	0.97	15	Cotton/ castor/ pearl millet/ sorghum/ rice/ cluster bean/ fodder sorghum/ lucerne	Wheat/ mustard/ lucerne	Sorghum/ pearl millet/ fodder sorghum	Cow (1)+ Buffalo (3)	-	Cotton/ cluster bean/ castor/ sorghum/ lucerne/ pearl millet/ tomato/ fodder maize/ brinjal/ cowpea/ okra/ chicory/ green gram	Wheat/ castor/ mustard/ oat/ lucerne/ chicory	Fodder sorghum/ pearl millet	Cow (1)+ Buffalo (2-3) +Goat (1)	Compost making	Cow & buffalo Mineral Mixture & Albendezole
	Field crops+ dairy (2-3)+ goat (15-16)	1.07	7	Fodder sorghum/ cotton/ pearl millet/ castor/ cluster bean/ rice/ guar	Wheat/ lucerne/ tobacco	Sorghum/ lucerne/ pearl millet	Cow (1)+ Buffalo (2-3) +Goat (40-41)	-	Cotton/ cluster bean/ fodder sorghum/ castor/ bottle guard/ rice	Wheat/ lucerne/ cumin/ mustard/ fennel/ okra/ chicory	Fodder sorghum/ lucerne/ pearl millet	Cow (1)+ Buffalo (2-3)	Compost making	Cow & buffalo Mineral Mixture & Albendezole
Panchmahal (Gujarat)/middle gujarat III/ 44 rainfall days/ 1008 mm rain	Field crops+ dairy (2-3)	0.90	7	Rice/ maize/ pigeon pea	Maize/ wheat	Pearl millet	Cow (0-1)+ Buffalo (2-3)	-	Rice/ maize/ pigeon pea/ guar/ Bt. cotton	Maize/ wheat/ guar/ cotton	Pearl millet	Cow (0-1)+ Buffalo (2-3)	-	Package of practices for Bt. cotton and guar, rearing of calves, Importance of green fodder in animal nutrition, manage-ment of goatry and backyard poultry

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop(s)/Cropping system(s)			Livestock/ houshold (including fisheries, if any)	Product diversif-ication	Crop(s)/Cropping system(s)			Livestock/ household (including fisheries, if any)	Product diversif-ication	Capacity buiding
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1-2)+ goat (3-4)	0.69	7	Rice/ maize/ pigeon pea	Maize/ wheat	Ground nut/ pearl millet	Cow (1-2)+ Buffalo (1-2) +Goat (3-4)	-	Rice/ maize/ pigeon pea/ guar/ Bt. cotton/ castor	Maize/ wheat/ guar/ cotton/ castor	Ground nut/ pearl millet	Cow (1-2)+ Buffalo (1-2) +Goat (4-5)	-	Seed of GG-2 variety & castor variety GCH 7
	Field crops+ dairy (1-2)+ goat (4-5)+ Poultry (5-6)	1.06	7	Rice/ pigeon pea/ maize	Maize	Pearl millet	Cow (0-1)+ Buffalo (2)+ Goat (4-5)+ Poultry (5-6)		Rice/ maize/ pigeon pea/ guar/ Bt. cotton	Maize/ guar/ cotton	Pearl millet	Cow (0-1)+ Buffalo (2) +Goat (6-7) +Poultry (5-6)	-	Seed of GG-2 variety
	Field crops+ goat (8)+ Poultry (12)	0.84	1	Rice/ maize	Maize	Groundnut	Goat (8)+ Poultry (12)		Rice/ maize/ cotton	Maize/ cotton	Ground nut	Goat (12)+ Poultry (12)		-do-
	Field crops+ dairy (1) + Poultry (6)	0.84	1	Rice/ maize	Maize		Buffalo (1)+ Poultry (6)		Rice/ maize/ cotton	Maize/ cotton		Buffalo (1)+ Poultry (6)		-do-
	Field crops+ goat (4)	0.54	1	Rice/ maize	Maize	-	Goat (4)		Rice/ maize/ Bt. cotton	Maize/ Bt. cotton		Cow (1)+ Buffalo (2) + Goat (6)		-do-

Table 7.4.2(b). Production (on equivalent basis of base crop), marketable surplus and economics of existing and improved farming systems in marginal households

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 (Rs)	Profit (Rs)
Kangra (Himachal Pradesh)																	
FC	0.26	1	3899	1021	23305	23487	11055	4323	1021	25111	26761	12861	-	-	-	-	-
FC+D	0.70	14	5072 (548)	1678 (320)	33692 (3135)	27175 (4738)	13551 (3155)	5257 (551)	1678 (320)	35016 (3171)	28071 (48040)	14875 (3273)	0.008***	1.000	0.003***	0.021**	0.003***
FC+D+G	0.67	9	4997 (684)	725 (399)	28060 (3910)	31904 (5909)	19357 (3936)	5213 (687)	725 (399)	29735 (3954)	32815 (5992)	21032 (4083)	0.018**	1.000	0.018**	0.063*	0.018**
Overall FS								P value Significance - Existing vs Improved					0.018**	<0.001***	<0.001***	0.001***	<0.001***
CD [P = 0.05]		FS 2 vs FS3	1822	1065	10423	15751	10490	1831	1065	10541	15971	10882					
Samba (Jammu and Kashmir)																	
FC+D	0.83	24	6931	4092	47575	49458	9717	6972	4092	47740	49873	12345	<0.001***	<0.001***	<0.001***	<0.001***	0.001***
Jeolikote / Nainital (Uttrakhand)																	
FC	0.4	1	5893	4021	29810	40900	18440	10228	6740	2850	49175	29780	-	-	-	-	-
FC+D	0.33	14	6380 (511)	4258 (478)	33385 (2495)	43180 (4017)	17712 (3752)	11143 (188)	8064 (9189)	4196 (352)	52965 (1965)	41475 (1954)	0.013**	0.925	0.001***	0.064	0.004***
FC+D+P	0.3	4	6429 (956)	4631 (895)	31978 (4667)	45172 (7515)	23594 (7020)	11627 (352)	8417 (354)	4265 (658)	52115 (3676)	41168 (3656)	0.144	0.715	0.068*	0.465	0.068*
FC+D+G	0.31	3	3975 (1104)	1938 (1033)	19627 (5389)	28074 (8677)	23633 (8106)	7623 (406)	5205 (409)	2767 (760)	41008 (4245)	36443 (4222)	1.000	0.285	0.109	0.109	0.109
D	0.30	1	5370	2617	28290	36154	3110	9982	6864	3550	51790	47410	-	-	-	-	-
FC+D+G+P	0.40	1	4082	2794	26070	22910	7460	7166	5534	2175	34830	30705	-	-	-	-	-
Overall FS								P value Significance - Existing vs Improved					0.002***	0.595	<0.001***	0.005***	<0.001***
CD [P = 0.05]		FS2 vs FS3	2277	2131	11119	17902	16722	838	844	1567	8758	8710					
CD [P = 0.05]		FS2 vs FS4	2555	2391	12477	20089	18765	940	947	1759	9828	9775					
CD [P = 0.05]		FS3 vs FS4	3067	2871	14979	24117	22527	1129	1137	2112	11798	11734					
Ambedkarnagar (Uttar Pradesh)																	
FC	0.30	1	5111	2941	26607	34721	8688	5250	3045	27567	35433	8976	-	-	-	-	-
FC+D	0.38	11	6585 (1684)	4576 (1313)	31050 (1884)	47975 (19029)	23865 (11496)	6769 (1658)	4660 (1301)	31829 (1867)	49400 (18727)	24090 (14354)	0.005***	0.018**	0.005***	0.005***	0.575
FC+D+G	0.38	8	9305 (1975)	4974 (1539)	34412 (2209)	77250 (22313)	25272 (16998)	9738 (1944)	5214 (1526)	35586 (2189)	81270 (21959)	26985 (16831)	0.012**	0.042**	0.012**	0.012**	0.575
Overall FS								P value Significance - Existing vs Improved					<0.001***	0.003***	<0.001***	0.001***	0.098*
CD [P = 0.05]		FS2vs FS3	5475	4269	6126	61871	47131	5389	4232	6069	60890	46672					

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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 (Rs)	Profit (Rs)
Kamrup (Assam)																	
FC+D+PG	0.81	7	2028 (119)	1471 (118)	10086 (982)	14256 (1459)	7565 (1403)	2351 (114)	1691 (118)	12400 (959)	15816 (1429)	7895 (1403)	0.028**	0.028**	0.014**	0.028**	0.028**
FC+D+P	1.40	2	2326 (223)	1757 (221)	12700 (1838)	15214 (2730)	8389 (2624)	2704 (213)	2011 (220)	15400 (1794)	17044 (2673)	8734 (2625)	-	-	-	-	-
FC+D+G+PG+P	0.90	1	2550	2081	11700	18901	13276	2940	2336	14400	20881	13636	-	-	-	-	-
FC+D+G+PG	0.90	1	2248	1524	12900	14076	5386	2248	1524	12900	14076	5386	-	-	-	-	-
FC+D+G+P+F	0.60	3	2876 (182)	2330 (180)	14933 (1501)	19579 (2229)	13021 (2142)	3124 (174)	2495 (180)	16733 (1464)	20759 (2182)	13202 (2143)	0.180	0.180	0.157	0.180	0.180
FC+D+P+F	0.60	1	2261	2062	12700	14427	12043	2626	2302	15400	16107	12223	-	-	-	-	-
FC+D+PG+P	0.78	2	2071 (223)	1330 (221)	11550 (1838)	13303 (2730)	4409 (2624)	2264 (213)	1460 (220)	12900 (1794)	14263 (2673)	4619 (2625)	-	-	-	-	-
FC+D+G+P	0.68	6	3036 (129)	2577 (127)	19867 (1061)	16570 (1576)	11054 (1515)	3403 (123)	2822 (127)	22567 (1035)	21260 (1543)	11294 (1516)	0.028**	0.028**	0.014**	0.028**	0.043**
FC+D+F	0.60	1	2881	2167	14400	20166	11607	2881	2167	14400	20166	11607	-	-	-	-	-
Overall FS								**P value Significance - Existing vs Improved**					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	539	534	4442	6597	6341	514	532	4335	6459	6345					
CD [P = 0.05]		FS1 vs FS5	464	459	3823	5678	5458	442	458	3731	5559	5460					
CD [P = 0.05]		FS1 vs FS7	539	534	4442	6597	6341	514	532	4335	6459	6345					
CD [P = 0.05]		FS1 vs FS8	374	370	3082	4578	4400	357	369	3008	4482	4402					
CD [P = 0.05]		FS2vs FS5	614	608	5058	7511	7220	585	606	4935	7354	7224					
CD [P = 0.05]		FS2 vsFS7	673	666	5541	8228	7909	641	664	5406	8056	7913					
CD [P = 0.05]		FS2 vsFS8	549	544	4524	6718	6458	524	542	4414	6578	6461					
CD [P = 0.05]		FS5 vs FS7	614	608	5058	7511	7220	585	606	4935	7354	7224					
CD [P = 0.05]		FS5 vsFS8	476	471	3918	5818	5593	453	469	3823	5696	5595					
CD [P = 0.05]		FS 7 vsFS8	549	544	4524	6718	6458	524	542	4414	6578	6461					
South 24 Paragnas (West Bengal)																	
FC	0.56	2	4564	1556	28804	30523	8571	5658	1756	39991	33564	17158	-	-	-	-	-
FC+D	0.39	8	4108 (988)	1849 (679)	28318 (6986)	25090 (7165)	4276 (4841)	5963 (2175)	2686 (1957)	45591 (13583)	31932 (15557)	10674 (13231)	0.012**	0.018**	0.012**	0.012**	0.012**
FC+D+F	0.46	1	1403	313	16084	2161	12020	2899	783	24390	13296	14213	-	-	-	-	-
FC+D+G	0.45	3	3555 (1613)	1932 (1109)	39229 (11407)	6990 (11701)	14118 (7906)	4764 (3552)	2585 (3196)	48113 (22181)	13818 (25405)	14513 (21606)	0.109	0.180	0.109	0.109	1.000
FC+D+G+P	0.26	1	6942	4142	51234	39011	26160	11590	5268	66806	83863	36181	-	-	-	-	-

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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 (Rs)	Profit (Rs)
FC+D+P	0.52	6	5377 (1141)	3287 (784)	28429 (8066)	42951 (8274)	14300 (5590)	12960 (2512)	10126 (2260)	80110 (15685)	89855 (17964)	51530 (15278)	0.028**	0.109	0.028**	0.028**	0.345.
FC+G	0.67	1	3995	1098	38113	16945	23833	4323	1098	42047	17273	27767	-	-	-	-	-
FC+P	0.44	2	4876	1990	16463	47382	9407	5678	2069	25011	49259	18850	-	-	-	-	-
Overall FS							P value Significance - Existing vs Improved						0.003***	0.028**	0.001***	0.008***	0.378
CD [P = 0.05]		FS1 vs FS2	4738	3258	33506	34367	23222	10433	9388	65149	74618	63459					
		FS1vs FS4	5471	3762	38689	39683	26814	12047	10840	75228	86161	73276					
		FS1 vs FS6	4894	3365	34604	35494	23983	10775	9696	67286	77065	65540					
		FS1 vs FS8	5994	4121	42382	43471	29373	13197	11875	82408	94385	80270					
		FS2 vs FS4	4058	2790	28692	29430	19886	8934	8039	55791	63899	54343					
		FS2 vs FS6	3237	2226	22889	23477	15863	7127	6413	44506	50974	43351					
		FS2 vs FS8	4738	3258	33506	34367	23222	10433	9388	65149	74618	63459					
		FS4 vs FS6	4238	2914	29968	30739	20770	9332	8397	58271	66740	56759					
		FS4 vs FS8	5471	3762	38689	39683	26814	12047	10840	75228	86161	73276					
		FS6 vs FS8	4894	3365	34604	35494	23983	10775	9696	67286	77065	65540					
							Purnea (Bihar)										
FC+D+G	0.58	19	6747 (508)	3667 (169)	29734 (2259)	71464 (6253)	25270 (1939)	-	-	-	-	-	-	-	-	-	-
FC+D	0.75	4	7029 (1107)	3839 (368)	34825 (4923)	70616 (13628)	22766 (4226)	-	-	-	-	-	-	-	-	-	-
FC	0.50	1	14767	6624	46500	175010	52860	-	-	-	-	-	-	-	-	-	-
Overall FS							P value Significance - Existing vs Improved										
CD [P = 0.05]		FS1 vs FS2	2534	843	11265	31182	9669	-	-	-	-	-	-	-	-	-	-
							Kanpur Dehat (Uttar Pradesh)										
FC	0.80	3	10330 (2647)	8267 (2274)	62683 (16458)	61276 (16470)	36516 (12041)	44634 (3545)	15099 (730)	39534 (3286)	69607 (42910)	42447 (6886)	0.109	0.109	0.109	0.109	0.109
FC+D	0.85	8	10804 (1621)	8291 (1392)	72455 (10079)	57189 (10086)	27031 (7373)	25562 (4484)	14213 (923)	37321 (4157)	94270 (54278)	33741 (8710)	0.012**	0.012**	0.012**	0.012**	0.123
FC+D+G	0.76	8	8505 (1621)	6856 (1392)	55131 (10079)	46931 (10086)	27144 (7373)	32411 (3790)	11740 (780)	34897 (3513)	54030 (45873)	33717 (7361)	0.012**	0.012**	0.012**	0.012**	0.012**
FC+G	0.33	5	7217 (2051)	6071 (1761)	42345 (12748)	44261 (12758)	30501 (9327)	27254 (7090)	11396 (1459)	33713 (6573)	93333 (85821)	34183 (13771)	0 .043**	0.043**	0.043**	0.043**	0.686
Overall FS							P value Significance - Existing vs Improved						<0.001***	<0.001***	<0.001***	<0.001***	0.058*
CD [P = 0.05]		FS1 vs FS2	6473	5559	40238	40267	29438	14154	2913	13120	171316	27492					

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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 (Rs)	Profit (Rs)
CD [P = 0.05]		FS1 vs FS3	6473	5559	40238	40267	29438	14154	2913	13120	171316	27492					
CD [P = 0.05]		FS1 vs FS4	6982	5996	43406	43437	31755	15268	3142	14153	184802	29656					
CD [P = 0.05]		FS2 vs FS3	4780	4105	29718	29739	21741	10453	2151	9690	126525	20304					
CD [P = 0.05]		FS2 vs FS4	5450	4681	33884	33908	24789	11918	2453	11048	144261	23150					
CD [P = 0.05]		FS3 vs FS4	5450	4681	33884	33908	24789	11918	2453	11048	144261	23150					
Amritsar (Punjab)																	
FC+D	1.08	24	9734	7874	70624	162987	118362	19478	7885	70720	163142	118517	0.002***	0.002***	0.003***	0.003***	0.003***
Kabirdham (Chhatisgarh)																	
FC	0.84	12	7487 (184)	6173 (175)	28654 (640)	72415 (1993)	54675 (1862)	12846 (639)	9205 (307)	34696 (667)	138725 (8499)	89565 (3852)	0.002***	0002***	0.002***	0.002***	0.002***
FC+D	0.77	9	7590 (213)	6078 (202)	28932 (739)	73534 (2302)	53125 (2150)	12549 (738)	8801 (354)	35186 (770)	134231 (9813)	83632 (4448)	0.008***	0.008***	0.008***	0.008***	0.008***
FC+D+G	0.60	1	7706	6027	30800	73235	50560	10764	8227	37020	108300	74040	-	-	-	-	-
FC+D+G+P	0.60	1	7222	5781	28400	69100	49640	12296	8921	34705	131295	85735	-	-	-	-	-
FC+D+P	0.80	1	6885	5637	29600	63350	46500	9835	7752	35615	97157	69035	-	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**										<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS 1vs FS 2	589	560	2045	6373	5954	2044	980.51	2131.8	27172	12314					
Pakur (Jharkhand)																	
FC	0.76	22	1312 (179)	259 (17)	8280 (222)	4865 (1759)	3188 (251)	1475 (33)	594 (12)	9130 (139)	5622 (373)	4590 (183)	0.082*	<0.001***	<0.001***	0.123	<0.001***
FC+D	0.72	2	517 (594)	203 (55)	6927 (735)	1762 (5834)	1929 (834)	1323 (109)	504 (40)	6970 (461)	6262 (1236)	5088 (606)	-	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**										0.240	<0.001***	0.004***	0.453	<0.001***
CD [P = 0.05]		FS1vs FS2	1287	119	1593	12637	1806	235	88	998	2678	1313					
Dindori (Madhya Pradesh)																	
FC	0.72	3	6766 (1988)	4614 (1498)	21972 (2881)	69370 (24098)	40311 (17476)	8408 (1980)	5978 (1488)	30822 (2882)	82691 (23984)	49883 (17333)	.109	.109	.083	.109	.109
FC+D	0.76	16	6075 (861)	4282 (649)	20333 (1248)	61686 (10435)	37470 (7567)	7735 (857)	5682 (644)	29180 (1248)	75239 (10385)	47523 (7505)	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
FC+D+G	0.73	2	5655 (2435)	3416 (1836)	16439 (3529)	59907 (29514)	29682 (21403)	7502 (2425)	4985 (1823)	25289 (3529)	75987 (29374)	42012 (21228)	-	-	-	-	-
FC+D+P	1.06	2	360 (2435)	2544 (1836)	14489 (3529)	34232 (29514)	19857 (21403)	5354 (2425)	4011 (1823)	23339 (3529)	48935 (29374)	30810 (21228)	-	-	-	-	-
FC+G	0.65	1	6569	4980	23539	65141	43691	8340	6473	32389	80196	54996	-	-	-	-	-

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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 (Rs)	Profit (Rs)
Overall FS							P value Significance - Existing vs Improved						<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	4529	3414	6562	54885	39801	4509	3389	6563	54623	39475					
CD [P = 0.05]		FS1 vs FS3	6571	4954	9522	79635	57750	6542	4918	9523	79255	57277					
CD [P = 0.05]		FS1 vsFS4	6571	4954	9522	79635	57750	6542	4918	9523	79255	57277					
CD [P = 0.05]		FS2 vs FS3	5399	4070	7823	65427	47446	5375	4040	7824	65114	47058					
CD [P = 0.05]		FS2 vs FS4	5399	4070	7823	65427	47446	5375	4040	7824	65114	47058					
CD [P = 0.05]		FS3 vs FS4	7198	5426	10430	87236	63261	7166	5387	10432	86819	62744					
							Angul (Odhisha)										
FC	0.80	1	5808	4588	40446	29254	14604	8943	7501	14142	34830	20808	-	-	-	-	-
FC+D	0.83	14	6005 (691)	4664 (747)	38555 (2735)	33507 (6368)	17409 (7100)	9988 (535)	8371 (479)	17176 (1722)	39078	27311 (4400)	0.011**	0.177	0.001***	0.826	0.109
FC+D+P	0.89	8	5730 (914)	3870 (989)	32259 (3617)	36506 (8424)	14175 (9393)	9600 (708)	7301 (634)	15358 (2277)	31078 (6725)	25811 (5821)	0.093*	0.779	0.012**	0.674	0.263
FC+P	0.80	1	3235	2569	24980	13845	5845	6181	5114	14640	20710	15900	-	-	-	-	-
Overall FS							P value Significance - Existing vs Improved						0.001***	0.119	<0.001***	0.447	0.033**
CD [P = 0.05]		FS2 vs FS3	2390	2586	9459	22028	24561	1851	1658	5955	17584	15222					
							Katni (Madhya Pradesh)										
FC	0.70	3	5078 (1126)	4796 (919)	- (13480)	55070 (15206)	51270 (12409)	10576 (1257)	9592 (919)	13480	55070 (15207)	51270 (12409)	1.000	1.000	1.000	1.000	1.000
FC+D	0.71	20	3489 (436)	3138 (356)	- (13480)	33626 (5889)	28883 (4806)	7499 (487)	6276 (356)	13480	33626 (5889)	28883 (4806)	0.003***	0.003***	0.001***	0.003***	0.003***
FC+D+G	1.00	1	2222	2222	13480	16520	16520	5246	5026	18530	22299	19322	-	-	-	-	-
Overall FS							P value Significance - Existing vs Improved						<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vsFS2	2512	2050	-	33913	27673	3600	3438	104156	84901	84010					
							Udaipur (Rajasthan)										
FC	0.70	2	3944 (636)	1877 (480)	32948 (9078)	16350 0	9486 (10267)	6247 (1761)	3556 (117)	16185 (1997)	61905 (20714)	28265 (14273)	-	-	-	-	-
FC+D	0.60	7	2914 (340)	890 (256)	30557 (4852)	5870 (4755)	1935 (5488)	7216 (941)	5334 (626)	14985 (1067)	7521 (11072)	5169 (7629)	0.018**	0.018**	0.028**	0.018**	0.018**
FC+D+G	0.66	15	2970 (232)	946 (175)	38374 (3315)	1254 (3248)	547 (3749)	5835 (643)	4080 (427)	11605 (729)	6133 (7564)	393992 (5212)	0.001***	0.001***	0.001***	0.001***	0.001***
Overall FS							P value Significance - Existing vs Improved						<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	1500	1131	21399	20969	24204	4151	2759	4707	48830	33647					
CD [P = 0.05]		FS1 vs FS3	1408	1061	20091	19687	22725	3898	2590	4420	45845	31590					

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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 (Rs)	Profit (Rs)
CD [P = 0.05]		FS2 vs FS3	856	645	12217	11971	13818	2370	1575	2687	27877	19209					
Aurangabad (Maharashtra)																	
FC	0.47	21	5598 (4819)	4921 (5138)	67039 (7387)	44923 (6489)	31390 (4784)	5733 (4997)	5042 (5204)	68633 (7464)	46040 (6648)	37206 (4768)	0.068*	0.109	0.068*	0.068*	0.144
FC+D	0.75	3	2738 (12751)	451 (13593)	69442 (19543)	14667 (17170)	20829 (12658)	2835 (13220)	451 (13770)	70575 (19749)	17857 (17589)	21696 (12614)	0.317	1.000	0.317	0.317	0.317
Overall FS								P value Significance - Existing vs Improved					0.109	0.147	0.107	0.111	0..287
CD [P = 0.05]		FS 1 vs FS2	28270	30137	43328	38066	28063	29310	30528	43784	38996	27967					
Pune (Maharashtra)																	
FC+D	0.53	24	2656	2119	57952	27053	9863	3419	2746	76402	33010	11455	0.008***	0.013**	.0.023**	<0.001***	0.022**
Amravati (Maharashtra)																	
FC+D	0.87	20	980 (151)	141 (134185)	14249 (1777)	17123 (3448)	15273 (4293023)	1508 (74)	437 (60)	7525 (2258)	19370 (2667)	17230 (2403)	0.030**	0.023**	0.015**	0.351	0.852
FC+G	0.80	3	620 (391)	403 (346465)	16201 (4588)	3649 (8904)	3314 (11084538)	703 (190)	452 (155)	2614 (5830)	4500 (6885)	3944 (1051)	0.109	0.109	0.109	1.000	0.593
FC+P	0.80	1	162	162	5633	443		641	407	4480	1084	8540	-	-	-	-	-
Overall FS								P value Significance - Existing vs Improved					0.012**	0.327	0.006***	0.141	0.327
CD [P = 0.05]		FS1 vs FS2	872	772664	10231	19857	2.47E7	425	347	13001	15354	13837					
Warangal (Telangana)																	
FC	1.00	1	5201	4130	31250	36360	22440	6843	5772	37500	51460	37540	-	-	-	-	-
FC+D	0.90	6	2927 (2287)	2972 (1941)	13338 (7524)	24718 (23460)	25298 (19178)	4944 (2254)	4773 (1927)	18632 (7615)	45634 (23062)	43419 (18953)	0.028**	0.028**	0.028**	0.028**	0.028**
FC+D+G	0.87	3	506 (3234)	425 (2746)	3450 (10640)	3128 (33178)	2080 (27122)	1992 (3188)	1901 (2725)	9723 (10769)	16178 (32615)	14996 (26804)	0.109	0.109	0.109	0.109	0.109
FC+D+G+P	0.92	6	3021 (2287)	1993 (1941)	13540 (7524)	25735 (23460)	12374 (19178)	5044 (2254)	3617 (1927)	18665 (7615)	46908 (23063)	28359 (18953)	0.028**	0.028**	0.028**	0.028**	0.028**
FC+D+P	0.83	8	6856 (1980)	5598 (1681)	21703 (6516)	67420 (20317)	51073 (16609)	8780 (1952)	7154 (1669)	26014 (6594)	88128 (19973)	66993 (16414)	0.012**	0.012**	0.012**	0.012**	0.012**
Overall FS								P value Significance - Existing vs Improved					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS2 vs FS3	8277	7028	27235	84926	69425	8160	6976	27564	83486	68611					
CD [P = 0.05]		FS2 vs FS4	6759	5738	22238	69341	56685	6662	5696	22506	68166	56021					
CD [P = 0.05]		FS2 vs FS5	6322	5368	20801	64863	53024	6232	5328	21053	63764	52403					
CD [P = 0.05]		FS3 vs FS4	8278	7028	27235	84926	69425	8160	6976	27564	83486	68611					
CD [P = 0.05]		FS3 vs FS5	7925	6729	26076	81310	66469	7812	6679	26391	79932	65690					
CD [P = 0.05]		FS4 vs FS5	6322	5368	20801	64863	53024	6232	5328	21053	63764	52403					

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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 (Rs)	Profit (Rs)
Kolar (Karnataka)																	
FC+D	0.91	12	28103 (3631)	26404 (3469)	154869 (19192)	182369 (31187)	161982 (30991)	35701 (7924)	27385 (6208)	88854 (15183)	339555 (87635)	239761 (65757)	0.002***	0.002***	0.002***	0.002***	0.002***
FC+D+G	1.00	5	13884 (5626)	10686 (5375)	89806 (29732)	7680 (48314)	3843 (48011)	15403 (12276)	11320 (9617)	10207 (23522)	8018 (135763)	5597 (101870)	0.043**	0.043**	0.043**	0.043**	0.225
FC+D+G+P	1.50	6	29232 (5136)	27112 (4906)	135116 (27141)	21567 (44104)	19023 (43828)	40258 (11206)	34298 (8779)	31993 (21473)	42567 (123935)	54245 (92994)	0.028**	0.028**	0.028**	0.028**	0.028**
FC+D+P	0.30	1	14355	11850	68010	104250	74190	31583	29891	129520	249473	229173	-	-	-	-	-
Overall FS								P value Significance - Existing vs Improved					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	13961	13338	73783	119892	119171	30464	23866	58373	336920	252811					
CD [P = 0.05]		FS1 vs FS3	13114	12529	69307	112619	111941	28616	22418	54832	316481	237475					
CD [P = 0.05]		FS2 vs FS3	15882	15173	83935	136388	135568	34656	27150	66405	383277	287597					
Gadag (Karnataka)																	
FC+D	1.14	24	3540	3086	15397	27078	21638	5392	4940	24092	40609	35189	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
Dharmapuri & Krishnagiri (Tamil Nadu)																	
FC+D	0.67	22	15114 (1603)	13744 (1498)	132709 (12478)	109119 (14263)	87196 (13028)	17284 (1728)	15571 (1624)	153078 (13249)	109119 (14263)	87196 (13028)	0.005***	0.005***	0.001***	0.035**	0.124
FC+D+P	0.80	2	5391 (5316)	4844 (4970)	57701 (41386)	28562 (47306)	19797 (43209)	7957 (5731)	6756 (5386)	80257 (43943)	28562 (47306)	19797 (43209)	-	-	-	-	-
Overall FS								P value Significance - Existing vs Improved									
CD [P = 0.05]		FS1 vs FS2	4675	4569	55693	91442	51472	12415	11666	95185	112370	101669					
Srikakulam / Seetampeta (Andhra Pradesh)																	
FC	0.20	1	1341	336	7040	9728	- (2838)	1514	199	745	18185	17400	-	-	-	-	-
FC+D	0.63	6	1796 (2448549)	1299 (756)	13557 (4273)	8889 (30607031)	2686 (7922)	2128 (222)	1420 (26)	4023 (1097)	22581 (2297)	18540 (1316)	0.345	0.028**	0.116	0.046**	0.345
FC+D+G	0.73	3	1067 (3462772)	1603 (1069)	9667 (6043)	13343 (43284878)	10368 (11203)	2224 (314)	1603 (37)	6357 (1551)	21442 (3248)	15607 (1861)	1.000	0.109	0.109	1.000	0.285
FC+D+G+P	0.73	6	1434 (2448549)	193 (756)	5782 (4273)	12140 (30607031)	3366 (7922)	2103 (222)	1570 (26)	3953 (1097)	22334 (2297)	17093 (1316)	0.345	0.463	0.028	0.345	0.600
FC+D +P	0.62	8	2547 (2120506)	1065 (655)	9067 (3700)	22766 (26506466)	4241 (6861)	4341 (192)	1950 (23)	5658 (950)	36432 (1989)	33220 (1140)	0.674	0.012**	0.123	0.674	0.017**
Overall FS								P value Significance - Existing vs Improved					0.961	0.033**	0.030**	0.314	0.157
CD [P = 0.05]		FS2 vs FS3	8863424	2736	15467	110799572	28677	804	96	3970	8315	4764					
CD [P = 0.05]		FS2 vs FS4	7236955	2234	12629	90467471	23415	656	78	3241	6789	3890					

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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 (Rs)	Profit (Rs)
CD [P = 0.05]		FS2 vs FS5	6769552	2090	11813	84624571	21903	614	73	3032	6351	3639					
CD [P = 0.05]		FS3 vs FS4	8863424	2736	15467	110799572	28677	804	96	3970	8315	4764					
CD [P = 0.05]		FS3 vs FS5	8486082	2619	14809	106082513	27456	770	91	3801	7961	4561					
CD [P = 0.05]		FS4 vsFS5	6769552	2090	11813	84624571	21903	614	73	3032	6351	3639					
Kendrapara (Odhisha)																	
FC+D	0.88	8	24675 (1623)	4111 (479)	28398 (2777)	267698 (19886)	20933 (4342)	44634 (3545)	6832 (730)	39534 (3286)	496075 (42910)	42447 (6886)	0.012**	0.012**	0.012**	0.012**	0.012**
FC+D+F	1.02	5	13765 (2052)	3170 (606)	22816 (3512)	142366 (25155)	15226 (5492)	25562 (4484)	5922 (923)	37321 (4157)	269427 (54278)	33741 (8710)	0.043**	0.043**	0.043**	0.043**	0.043**
FC+D+G	1.09	7	17591 (1735)	2733 (512)	26783 (2968)	184310 (21260)	6009 (4642)	32411 (3790)	4884 (780)	34897 (3513)	354030 (45873)	23717 (7361)	0.018**	0.018**	0.018**	0.018**	0.018**
FC+D+G+F	1.00	2	14593 (3245)	2854 (958)	23069 (5553)	152049 (39773)	11179 (8684)	27254 (7090)	5325 (1459)	33713 (6573)	293333 (85821)	30183 (13772)	-	-	-	-	-
FC+D+G+P	0.89	2	15448 (3245)	3340 (958)	32584 (5553)	152797 (39773)	7497 (8684)	28043 (7090)	6183 (1459)	43371 (6573)	293143 (85821)	30823 (13772)	-	-	-	-	-
Overall FS								P value Significance - Existing vs Improved					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	5468	1614	9357	67018	14632	11947	2459	11075	144607	23206					
CD [P = 0.05]		FS1 vsFS3	4964	1465	8495	60842	13284	10846	2232	10054	131280	21067					
CD [P = 0.05]		FS1 vs FS4	7583	2238	12976	92937	20292	16567	3410	15358	200534	32181					
CD [P = 0.05]		FS1 vs FS5	7583	2238	12976	92937	20292	16567	3410	15358	200534	32181					
CD [P = 0.05]		FS2 vs FS3	5616	1658	9611	68835	15029	12271	2525	11375	148527	23835					
CD [P = 0.05]		FS2 vs FS4	8025	2369	13732	98356	21475	17533	3608	16254	212225	34057					
CD [P = 0.05]		FS2 vs FS5	8025	2369	13732	98356	21475	17533	3608	16254	212225	34057					
CD [P = 0.05]		FS3 vs FS4	7691	2270	13160	94256	20579	16802	3458	15576	203378	32637					
CD [P = 0.05]		FS3 vs FS5	7691	2270	13160	94256	20579	16802	3458	15576	203378	32637					
CD [P = 0.05]		FS4 vs FS5	9592	2831	16413	117558	25667	20956	4313	19427	253657	40706					
Sivagangai /Chettinad (Tamil Nadu)																	
FC+D	0.80	10	17941 (1659)	13165 (1428)	53805 (5221)	161493 (16184)	104179 (13717)	19128 (64)	13354 (16)	36770 (207)	195465 (760)	148675 (228)	0.005***	0.005***	0.005***	0.005***	0.009***
FC+D+P	0.80	14	13299 (1402)	10228 (1207)	44849 (4413)	114743 (13678)	77890 (115930)	14279 (54)	10382 (13)	33850 (175)	129876 (642)	99279 (193)	0.001***	0.001***	0.001***	0.001***	0.001***
Overall FS								P value Significance - Existing vs Improved					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS2	4504	3878	14177	43946	37247	173	42	562	2064	619					

Contd/.....

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 (Rs)	Profit (Rs)
Palghar (Maharashtra)																	
FC+D	0.39	24	8661	6718	39105	69158	44874	13741	10965	34491	89014	69840	<0.001***	0.005***	<0.118	<0.001***	0.001***
Pathinamthitta (Kerala)																	
FC+D+H	0.45	13	9222 (631)	8741 (603)	75650 (6737)	110641 (8231)	97873 (7828)	15943 (1566)	8741 (603)	80586 (5945)	117246 (7921)	98550 (7833)	0.018**	-	0.018**	0.018**	0.018**
FC+D+H+F	0.52	1	15770	15060	140852	174552	160352	15770	15060	140852	174552	160352	-	-	-	-	-
FC+D+H+G	0.46	1	4011	3778	33656	46579	41904	19247	3778	39968	60824	43154	-	-	-	-	-
FC+H+P+F	0.46	1	6991	6631	56523	83300	76100	23436	6631	67697	99745	77350	-	-	-	-	-
FC+H	0.42	7	5631 (860)	5372 (822)	41100 (9180)	71520 (11216)	66339 (10668)	22098 (2134)	5372 (822)	50866 (8101)	87618 (10795)	67524 (10675)	0.018**	-	0.018**	0.018**	0.018**
FC+H+P	0.47	1	16262	8994	88810	236428	91078	64862	8994	113785	285028	92078					
Overall FS								P value Significance - Existing vs Improved					<0.001***	-	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS5	2241	2141	23923	29229	27800	5561	2141	21111	28130	27818					
Mehsana (Gujarat)																	
FC	0.95	2	8719	7057	253099	95656	29196	8719	7057	256589	99166	45706	-	-	-	-	-
FC+D	0.97	15	5685 (987)	4613 (937)	176528 (27949)	50885 (23173)	8008 (22550)	5856 (974)	4816 (930)	184410 (28165)	58676 (22958)	8217 (22718)	0.012**	0.012**	0.001***	0.551	0.470
FC+D+G	1.07	7	6387 (1444)	5745 (1372)	140299 (40914)	115193 (33922)	89514 (33009)	6494 (1425)	5852 (1361)	144599 (41230)	115155 (33608)	89477 (33255)	0.180	0.180	0.109	1.000	1.000
Overall FS								P value Significance - Existing vs Improved					0.009***	0.005***	0.0001***	0.654	0.985
CD [P = 0.05]		FS1 vs FS2	5847	5548	165378	137432	133441	5769	5502	166633	136225	134450					
		FS1 vs FS3	6228	5909	176145	146380	142129	6144	5861	177482	145094	143204					
		FS2 vs FS3	3555	3374	100561	83568	81142	3508	3346	101324	82834	81755					
Panchmahal / Derol (Gujarat)																	
FC+D	0.90	7	9349 (1806)	7731 (1685)	59927 (8612)	33558 (10558)	17387 (10125)	13627 (1796)	12010 (1700)	69877 (8083)	66394 (10999)	50223 (10805)	0.018**	0.018**	0.018**	0.018**	0.018**
FC+G	0.54	1	3910	1350	12125	26975	13750	7254	4694	28501	44039	18439	-	-	-	-	-
FC+G +P	0.84	1	16163	8295	46027	115598	36918	19660.5	11792.5	64438	132167	53487	-	-	-	-	-
FC+D+G	0.69	7	13251 (1806)	9365 (1685)	68873 (8612)	63636 (10558)	24782 (10125)	18715 (1796)	14829 (1700)	82886 (8083)	104259 (10999)	65405 (10805)	0.018**	0.018**	0.018**	0.018**	0.018**
FC+D +P	0.84	1	4668	2377	23260	23422	21680	22474.4	18128	91517	133227	89763	-	-	-	-	-
FC+D +G +P	1.06	7	16969 (1806)	11184 (1685)	76712 (8612)	92975 (10558)	35128 (10125)	20191 (1796)	14406 (1700)	89442 (8083)	112470 (10999)	54623 (10805)	0.018**	0.018**	0.018**	0.018**	0.018**
Overall FS								P value Significance - Existing vs Improved					<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
CD [P = 0.05]		FS1 vs FS4	5365	5005	25588	31368	30084	5336	5051	24016	32678	32102					
		FS1 vs FS6	5365	5005	25588	31368	30084	5336	5051	24016	32678	32102					
		FS4vs FS6	5365	5005	25588	31368	30084	5336	5051	24016	32678	32102					

Note: FC: Field crops, D: Dairy, P: Poultry, G:Goat, F: Fish; * indicates significance at 10% level; * indicates significance at 5% level; *** indicates significance at 1% level; - Values in ( ) indicates standard error of mean values; - The farming system with only one household were not considered for ANOVA as well as for paired t test.

which field crop + dairy is being practiced by 58% households having mean area of 0.33 ha. Diversification of crops in *kharif* and *rabi* along with introduction of kitchen garden resulted in improvement in production (75%), and increase in profit (134 %). Among the parameters, significant difference was observed between existing and diversified system for production, marketable surplus, cost and profit for field crop + dairy, dairy and field crops + dairy + goat + poultry system. Among the different farming system, dairy in 0.30 ha registered significantly higher profit (Rs47, 410) while production and marketable surplus was higher in field crops + dairy and field crops + dairy + poultry.

Eastern Himalaya

Ambedkarnagar (Uttar Pradesh): Three farming systems *viz*; field, crops, field crops + dairy and field crops + dairy + goat was found among which field crops + dairy was practiced by 55 % farm households having mean area of 0.38 ha while field crops + dairy + goat system was found in 40 % households having mean area of 0.38 ha. Diversification of cropping and livestock components resulted in significantly higher return in field crop +dairy +goat systems.Among the systems, higher production and return was observed in field crops +dairy + goat system while the cost increase due to interventions was lesser in field crop + dairy system (3 % only).

Kamrup (Assam): Nine farming systems *viz*; field, crops + dairy + poultry + goat, field crops + dairy + poultry, field crops + dairy + goat + poultry + pig, field crops +dairy + goat + poultry + fish, field crops + dairy +poultry + fish, field crops + dairy + pig +poultry, field crops + dairy + goat + poultry and field crops + dairy + fishwere found among which field, crops + dairy + poultry + goat and field crops + dairy + goat + poultry are dominant based on number of households adopting the system. Diversification of cropping and livestock components resulted in increase in production (12 %), marketable surplus (10 %) and return (11 %).Among the systems, higher production was observed in field crops +dairy + goat + poultry + fish system while the profit was higher in field crops + dairy + goat + pig + poultry.

Lower Gangetic Plains

South 24 Paragnas (West Bengal): Eight farming systems *viz;* , field crops, field crops + dairy, field crops + dairy + fish, field crops + dairy + goat, field crops + dairy + goat + poultry, field crops + dairy + poultry, field crops + goat and field crops + poultry were found among which field crops + dairy system is practiced by 33 % households having mean area of 0.39 ha followed by field crops + dairy +poultry by 25 % households having mean area of 0.52 ha. Significantly higher production (45 %), marketable surplus (45 %), cost (61 %), and profit (150 %) were observed with diversification in field crops + dairy compared to existing system. Among the farming systems, diversification in field crop + dairy + goat resulted in higher profit.

Middle Gangetic Plains

Purnea (Bihar): Three farming systems *viz;*, field crops, field crops + dairy and field crops + dairy + goat was found among which 79% households were having the field crops + dairy + goat system. Among the farming systems, field crops outperformed other systems in terms of production and profit.

Upper Gangetic Plain

Kanpur Dehat (Uttar Pradesh): Four farming systems *viz;,* field crops, field crops + dairy, field crops + dairy + goat and field crops + goat were found among which field crops + dairy and field crops + dairy + goat were practiced by 66 % households. Diversification of existing systems resulted in significantly higher production, marketable surplus, returns and profit in both the dominant farming systems. The improvement was found to be 137, 71,65 and 25 % respectively for field crop + dairy and 281, 71, 15, 24% respectively for field crops + dairy + goat system. Reduction in cost due to recycling was found to be in the range of 37 to 48 %. Among the farming systems, significantly higher production and profit was

observed in field crops followed by field crops + dairy + goat system.

Trans Gangetic Plains

Amritsar (Punjab): Only one farming system *viz*;, field crops + dairy was observed in all the households having mean area of 1.08 ha. Diversification did not influence significantly the existing farming systems in terms of profit, cost reduction and also profit.

Eastern plateau and hills

Kabirdham (Chhatisgarh): Five farming systems namely field crops, field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry and field crops + dairy + poultry were found among which field crops alone was practiced by 50% households having mean area of 0.84 ha followed by field crops + dairy by 37.5 % households having mean area 0.77 ha. Field crops and field crops + dairy + goat + poultry system performed better in terms of production, profit and marketable surplus.

Pakur (Jharkhand): Two farming systems namely field crops and field crops + dairy were found among which 91% households were having the field crops + dairy system with mean area of 0.76 ha. Among the farming systems higher improvement in production (156%), marketable surplus (148 %) returns (2.5 times) and profit (1.6 times) was observed in field crops + dairy system. The cost increase due to diversification was only 1 % which can be attributed to better recycling.

Dindori (Madhya Pradesh): Five farming systems namely field crops, field crops + dairy, field crops + dairy + goat, field crops + dairy + poultry and field crops + goat were found among which 66% farm households were having field crops + dairy system with mean area 0.76 ha. Diversification resulted in significantly higher return and profit in field crops + dairy + poultry farming systems.

Angul (Odisha): Four farming systems namely field crop, field crop + dairy, field crops + dairy + poultry and field crops + poultry were found among which 58% households were having field crops + dairy with mean area 0.83 ha followed by 33 % households having field crops + dairy + poultry system with 0.89 ha as mean area. Diversification of field crops + poultry system resulted in higher improvement in production (91 %), marketable surplus (99%), cost reduction (41%), returns (50 %) and profit (1.7 times).

Central Plateau and hills

Katni (Madhya Pradesh): Three farming systems *viz;* field crops, field crops + dairy and field crops + dairy + goat were found among which 83 % households were having field crops + dairy farming system. Diversification resulted in significantly higher marketable surplus, cost, return and profit in field crops + dairy + goat system. The improvement was found to be 136, 126, 37, 35 and17 % in production, marketable surplus, cost, returns and profit respectively.

Udaipur (Rajasthan): Three farming systems *viz;* field crops, field crops + dairy and field crops + dairy + goat were found among which 62.5 % households were having the field crops + dairy + poultry system with mean area of 0.66 ha followed by 29% households having field crops + dairy with mean area of 0.60 ha. Significantly higher production and marketable surplus was observed in field crops + dairy system while cost reduction (70 %) and profit (6.2 times) was higher in field crops + dairy + goat system (70 %) compared to existing systems.

Western Plateau and hills

Aurangabad (Maharashtra): Two farming systems namely field crops and field crops + dairy were found among which 87.5 % households were having field crops alone with mean area of 0.47 ha. Significantly higher production, marketable surplus, and cost were observed in field crops + dairy system due to diversification.

Pune (Maharashtra): All the households were having field crops + dairy farming system with mean area of 0.53 ha. Significantly higher production (29 %), marketable surplus (30 %), cost

(32 %), return (22 %) and profit (16 %) was recorded due to diversification of cropping systems and livestock component in field crops + dairy system.

Amravati (Maharashtra): Three farming systems *viz;*, field crops + dairy, field crops + goat and field crops + poultry were foundamong which 83% households were having field crops + dairy system with mean area of 0.87 ha followed by 12.5 % households with field crops + goat having mean area of 0.80 ha. Cost reduction due to recycling (84 %) and profit (19 %) was better in field crops + goat system compared to existing system.

Southern Plateau and hills

Warnagal (Telangana): Five farming systems *viz;,* field crops, field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry andfield crops + dairy + poultry were found among which 33 % households were having field crops + dairy + poultry having mean area of 0.83 ha followed by 25% households each of field crops + dairy (mean area 0.90 ha) and field crops + dairy + goat + poultry (mean area 0.92 ha). Field crops + dairy + goat recorded significantly higher production, marketable surplus, returns and profit. The cost also increased significantly.

Kolar (Karnataka): Four farming systems namely field crops + dairy, field crops + dairy + goat, field crops + dairy +goat + poultry and field crops + dairy + poultry were observed among which 50% households were having field crops + dairy system with mean area of 0.91 ha. Field crops + dairy + poultry system recorded higher production, marketable surplus and profit while the cost reduction (89 %) in field crops + dairy + goat system due to better resource recycling.

Gadag (Karnataka): Only one farming system of field crops + dairy was observed with mean area of 1.14 ha. Significantly higher production (52 %), marketable surplus (60 %), cost (56 %), return (50 %) and profit (63 %) was observed with diversification of field crops + dairy system compared to existing system.

Dharmapuri / Krishnagiri (Tamil Nadu): Two farming systems namely field crops + dairy and field crops + dairy + poultry were found among which 92% households were having field crops + dairy system with mean area of 0.67 ha. Significantly higher production (17284 kg), marketable surplus (15571 kg), return (Rs1,09,119) and profit (Rs 87,196) were recorded with diversification than existing system in field crops + dairy system. Similarly, under field crops + dairy + poultry system, significant improvement in production, marketable surplus, cost and profit was observed. Among the two farming systems, diversification approach resulted in higher production, marketable surplus and profit in field crops + dairy + poultry.

Eastcoast plains and hills

Srikakulam (Andhra Pradesh): Five farming systems namely field crops, field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry and field crops + dairy + poultry were found among which 33 % households were having field crops + dairy + poultry having mean area of 0.62 ha followed by 25 % each of field crops + dairy and field crops + dairy + goat + poultry having mean area of 0.63 and 0.73 ha respectively. Significantly higher production (69 %), marketable surplus (83 %), cost reduction (38 %), returns (60 %) and profit (5.5 times) were observed due to diversification of field crops + dairy + poultry system. Similar trend was also observed in field crops + dairy and field crops + dairy + goat + poultry systems.

Kendrapara (Odisha): Five farming systems namely field crops + dairy, field crops + dairy + fish, field crops + dairy + goat, field crops + dairy + goat + fish and field crops + dairy + goat + poultry were found among which 33 % households were having field crops + dairy (mean area 0.88 ha) followed by field crops + dairy + goat having mean area of 1.09 ha. Diversification of existing systems resulted in significantly higher production (81 %), marketable surplus (66 %), cost (39 %), returns (85 %) and profit (103 %) in field crops + dairy system. Similar trend was also observed in all

other systems with varying degree of improvement. Higher gain in profit (3 times) due to diversification was observed in field crops + dairy + goat + poultry system. Among the various faming systems, higher production, marketable surplus, returns and profit was observed in field crops + dairy system due to diversification of existing systems. Lower cost increase due to diversification was also observed in the same system.

Sivagangai & Pudukottai (Tamil Nadu): Two farming systems namely field crops + dairy + poultry and field crops + dairy were found among which 58 % households were having field crops + dairy + poultry with mean area of 0.80 ha. Diversification of existing systems, resulted in significantly higher production and profit in field crops + dairy + poultry system while only profit was significant in field crops + dairy system. However, in both the systems, the improvement of existing system through diversification resulted in significant reduction in cost (32 and 25 % respectively in field crops + dairy and field crops + dairy + poultry).

West coast plains and ghats

Palghar (Maharashtra): Only one farming system of field crops + dairy was observed with mean area of 0.39 ha. Improvement of existing farming systems with critical interventions and diversification approach resulted in significant improvement in production (59 %), marketable surplus (63 %), cost reduction (12 %), returns (29 %) and profit (56 %).

Pathinamthitta (Kerala): Six farming systems namely field crops + dairy + horticulture, field crops + dairy + horticulture + fish, field crops + dairy + horticulture + goat, field crops + horticulture + poultry + fish, field crops + horticulture and field crops + horticulture + poultry were found among which 54 % households were having field crops + dairy + horticulture with mean area of 0.45 ha. Diversification of existing systems resulted in higher production while increase in profit is marginal.

Gujarat plains and hills

Mehsana (Gujarat): Three farming systems namely field crops, field crops + dairy and field crops + dairy + goat were found among which 62.5 % households were having field crops + dairy with mean area of 0.97 ha followed by field crops + dairy + goat in 29% households having area of 1.07 ha. The interventions and diversification were not significant in all the farming systems except field crop alone system. Among the different farming systems, diversification resulted in higher production, marketable surplus, return and profit in field crops.

Panchmahal: Six farming systems *viz;,* field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry, field crops + goat + poultry,field crops + dairy + poultry and field crops + goat were found among which the first three farming systems were found in each 29% of households having mean area of 0.90, 0.69 and 1.06 ha respectively. Significantly higher production, marketable surplus, cost, returns and profit was observed in all the 3 dominant farming systems namely field crops + dairy, field crops + dairy + goat and field crops + dairy + goat + poultry. The higher improvement in production (3 times), marketable surplus (6 times), returns (4 times) and profit (3 times) was observed in field crops + dairy + poultry due to diversification. Among the farming systems, performance of field crops + dairy + goat was found to be significantly better in terms of production, marketable surplus, return and profit. The cost of diversification was minimum (17 %) in field crops + dairy and field crops + dairy + goat + poultry system.

The results across the locations are summarized below

- The number of farming systems in different districts varied from 1 to 9. Presence of maximum of 9 farming systems was observed in Kamrup district (Assam) followed by 8 systems in South 24 Paragnas (West Bengal). Minimum of one farming systems in 5 districts

namely Samba (Jammu & Kashmir), Amritsar (Punjab), Palghar and Pune (Maharashtra) and Gadag (Karnataka).

- Existence of six farming systems at Panchmahal (Gujarat), Pathinamthitta (Kerala) and Nainital (Uttarakhand) and 5 farming systems at Kabirdham (Chhatisgarh), Dindori (Madhya Pradesh), Srikakulam (Andhra Pradesh), Warangal (Telangana), Kendrapara (Odisha) districts were also observed.
- Field crops + dairy was found to be the common farming system at all locations in marginal households and it is the dominant system practiced in 20 districts based on number of households adopting the system.
- Field crops + dairy + poultry is found to be the dominant farming system in Udaipur (Rajasthan), Warangal (Telangana), Srikakulam (Andhra Pradesh) and Sivagangai (Tamil Nadu). Similarly, field crops + dairy + goat were found to be pre-dominant system in Purnea (Bihar) district. At Kanpur Dehat (Uttar Pradesh), both field crops + dairy and filed crops + dairy + goat were found as dominant systems. In case of South 24 Paragnas (West Bengal) and Panchmahal (Gujarat), Kamrup (Assam), Pathinamthitta (Kerala), highly diversified system was noticed.
- Field crop alone was found to be dominant practice adopted by large number of households in Kabirdham (Chhatisgarh) and Aurangabad (Maharashtra) districts.
- Across the locations and farming systems, improvement of existing farming systems with diversification approach in cropping system, livestock, product diversification and capacity building module resulted in considerable improvement in production (87 %), marketable surplus (73 %), returns (59 %) and profit (cash flow for family by 93 %).
- Across the systems and districts, the increase in cost due to diversification in various modules was found to be only 6 % owing to better linkage and recycling.
- Based on the statistical analysis, best performing farming system has been identified for each district which can be up-scaled along with all possible interventions and diversification approach for improving the livelihood of marginal farm households.

Crop diversification module in farming system diversification experiment in farmers field

Distribution of livestock component to OFR experimental farmers by Director, ICAR-IIFSR at Samba district (J&K)

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

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

Households: Twelve households consisting of 6 each in small and marginal categories was selected for experiment in all the locations except Kangra (Himachal Pradesh) and South 24 Paragnas (West Bengal) where in all the selected 12 households belong to marginal. The average holding size of households in the study locations ranged from 0.27 to 2.00 ha for small households.

Locations: 28 districts in 14 agro climatic regions covering 27 NARP zones have implemented the interventions in different modules. The details of locations, number of households covered and farming systems are given in Table 7.3.1. Two locations namely Fathepur (Rajasthan), Nainital (Uttarakhand) and Pakur (Jharkhand) 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

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

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, costand 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

Kangra (Himachal Pradesh): Two farming systems namely field crops + dairy and field crops + dairy + goat were found among which 75% households were having field crops + dairy system with mean area of 0.78 ha. Interventions made in crop, livestock, processing and optional module resulted in improvement in production and profit by 92 and 105 % in field crops + dairy and 90 and 102 % in field crops + dairy + goat system respectively. Among the two systems, field crop + dairy + goat recorded higher production and profit.

Samba (Jammu and Kashmir): Only one farming system of field crops+ dairy was observed with mean area of 1.14 ha. Interventions in crop module (introduction of pea in *rabi*), livestock and optional module (nutritional kitchen garden) resulted in significant improvement in production (30 %), marketable surplus (36%) and profit (40 %). The cost also increased to the extent of 48% due to interventions.

Eastern Himalaya

Ambedkarnagar (Uttar Pradesh): Field crops + dairy farming system were found in all the households with mean area of 0.73 ha. Interventions made in crop, livestock and optional (kitchen garden) modules resulted in significant improvement in production (81 %), marketable surplus (85 %) and profit (1.1 times) in the field crops + dairy system.

Kamrup (Assam): Four farming systems namely field crops + dairy + poultry, field crops + dairy + goat + poultry, field crops + dairy + poultry + pig and field crops + dairy + goat + poultry + pig were found among which 50% households were having field crops + dairy + poultry + pig system with mean area of 1.60 ha. Interventions made in crop, livestock, processing and optional module resulted in significantly higherimprovement in production and profit in field crops + dairy + goat + poultry. Among the four systems, field crops + dairy + poultry + pig recorded higher profit.

Lower Gangetic plains

South 24 Paragnas (West Bengal): Four farming systems namely field crops + fishery, field crops + dairy + fishery, field crops + dairy + poultry and field crops + dairy + poultry + fishery were found among which 66% households were having field crops + dairy + fishery with mean area of 0.60 ha followed by field crops + dairy + poultry in 16% households having area of 0.34 ha. Interventions made in crop, livestock, processing (sunflower oil, vermicompost) and optional (nutritional kitchen garden) resulted in significant improvement in production, marketable surplus, cost and profit in all the systems. Among the systems, performance of field crops + dairy + fish systems was found to be better in terms of production and profit.

Middle Gangetic plains

Purnea (Bihar): Four farming systems namely field crops, field crops + dairy, field crops + dairy + goat and field crops + goat were found among which 50% households were having field crops + dairy with mean area of 1.30 ha followed by field

Table 7.4.3(a). Details of interventions made in crop, livestock, processing and optional modules at different locations

District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
I. Western Himalaya														
Kangra (Himachal Pradesh) /Sub-montanellow hills subtropical /104 rainy days/ 2336 mm rain	Field crops + dairy (1-2)	0.78	9	Maize/ sorghum/ rice/ colocasia	Wheat/ mustard/ berseem	-	Cow (0-1) +Buffalo (1-2)	-	Maize/ sorghum/ rice	Wheat/ mustard/ berseem/ gobhi-sarson/ oats	-	Cow (1)+ Buffalo (1-2)+ Goat (1)	Graded seed	Nutritional kitchen garden
	Field crops + dairy (1-2) + goat (2)	0 .57	3	Maize/ sorghum/ rice	Wheat/ barley/ mustard/ berseem/ gobhi-sarson/ oats	-	Cow (0-1) +Buffalo (1-2)+ Goat (2)	-	Maize/ sorghum/ rice	Wheat/ mustard/ berseem/ Cauliflower/ oats	-	Cow (1)+ Buffalo (1-2) +Goat (2)	Graded seed	-do-
Samba (J&K)/ sub tropical low altitude/ 75 rainy days/ 1548 mm rain	Field crops + dairy (1-2)	1.14	12	Rice/ fodder crops	Wheat/ berseem	-	Cow (1-2)+ Buffalo (0-1)	-	Rice/ fodder crops	Wheat/ berseem	Black gram	Cow (1-2)	-	-do-
II. Eastern Himalaya														
Ambedkarnagar (Uttar Pradesh)/ Eastern Plain Zone/Sub-humid/ 54.4 rainy days/ 1426 mm rain	Field crops + dairy (1-2)	0.73	10	Rice/ pigeon pea/ sorghum	Wheat/ berseem/ pea/ chickpea/ mustard/ tomato/ potato	Mentha/ ladyfinger/ sudanchary	Cow (0-1) + Buffalo (1-2)	-	Rice	Wheat/ pea/ mustard/ potato/ chickpea	-	Cow (0-1) + Buffalo (1-2)	-	Nutritional kitchen gardening
III. Lower Gangetic Plains														
South 24 Paragnas (West Bengal)/ lower gangetic plains/100.8 rainy days/1789mm rain	Field crops + dairy (2-3) + Fish	0.6	8	Rice	Green-gram/ sunflower/ Lady's finger	Green-gram/ okra/ sunflower	Cow (2-3)	-	Rice	Sunflower/ Khesari/ Onion/ Potato/ Barboti/ Lady's finger/ Tomato/ Cucumber	Green-gram/ okra/ sunflower/ tomato/ Snake gourd	Cow (3-4) +goat (2-3) Poultry (16-17)+ Fish pond	Sunflower Oil extraction/ Vermicompost	Nutritional kitchen garden

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops + dairy (2)+ Poultry(13-14)	0.34	2	Rice	Okra/ sunflower	Greengram/ okra/ sunflower/ Cucumber	Cow (2))+ Poultry (13-14)	-	Rice	Sunflower/ Onion/ Khesari	Green-gram/ Lady's finger/ sunflower/ Boro rice	Cow (2-3)+ Goat (2-3)+ Poultry (12-13)+ Fish pond	-do-	-do-
	Field crops + dairy(1)+ Poultry(6)+ Fish	0.8	1	Rice	Sunflower	Lady's finger/ green-gram	Cow (1)+ Poultry(6)+ Fish pond		Rice/ sunflower/ potato/ onion/ Knoll khol/ Khesari	Lady's finger/ sunflower	Amara-nthous/ Boro Rice	Cow (4)+ goat (3)+ Poultry(23)+ Fish pond	Oil extraction	-do-
	Field crop + fish	0.93	1	Rice/ green-gram	Lady's finger	Lady's finger / sunflower	Fish pond		Rice	Lady's finger/ sunflower	Lady's finger / green-gram	Poultry (4) + Fish pond	Oil extraction	-do-
Kamrup (Assam)/ Eastern Himalayas Region/ AS-3 Central Brahmaputra Valley Zone/ rainfall 2809 mm	Field crops + dairy(1)+ Poultry (20)	2	1	Winter Rice/ Arecanut Plantation	Summer Rice		Cow (1) + poultry (20)		Winter Rice/ Arecanut Plantation	Summer Rice		Cow (1) + poultry (20)	Making of supari from raw Arecanut	
	Field crops + dairy(4)+ goat (1)+ Poultry (15)	1.5	2	Winter Rice/ Arecanut Plantation	Toria		Cow (4)+ goat (1)+ Poultry (15)		Winter Rice/ Arecanut Plantation	Toria		Cow (4)+ goat (1)+ Poultry (15)		
	Field crops + dairy(2)+ Poultry (18) +pig (2)	1.6	6	Winter Rice/ Arecanut Plantation	Summer Rice / toria/ rabi vegetable	Turmeric/ rabi vegetable	Cow (2)+ Poultry (18) +pig (2)		Winter Rice/ Arecanut Plantation	Summer Rice / toria/ rabi vegetable	Turmeric/ rabi vegetable	Cow (2)+ Poultry (18) +pig (2)	Making of supari from raw Arecanut	
	Field crops + dairy(2)+ goat (2)+ Poultry (80) +Pig (2-3)	1.43	3	Winter Rice/ Arecanut Plantation	Summer Rice/ toria	Turmeric/ rabi vegetable	Cow (2)+ goat (2)+ Poultry (80) +Pig (2-3)		Winter Rice/ Arecanut Plantation	Summer Rice/ toria	Turmeric/ rabi vegetable	Cow (2)+ goat (2)+ Poultry (80) +Pig (2-3)	Making of supari from raw Arecanut	
IV. Middle Gangetic Plains														
Purnea (Bihar)/ north east alluvial plain (BI-2)/ 40.5 rainy days/ 1013 mm rain	Field crops	0.95	1	Rice	Wheat/ maize/ brinjal	-			Rice	Wheat/ maize/ brinjal	-	Goat (3)	Grading	Nutritional kitchen garden

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops + dairy (1-2)	1.3	6	Rice/ brinjal/ chilli/ vegetable/ maize fodder	Maize/ wheat/ vegetable/ potato/ lentil	-	Cow (1-2)		Rice/ brinjal/ chilli/ vegetable/ maize fodder	Maize/ wheat/ vegetable/ potato/ lentil	-	Cow (2-3)+ Goat (2-3)	Grading of potato	-do-
	Field crops + dairy (1-2)+ goat (4-5)	1.13	3	Rice/ brinjal/ okra	Maize/ wheat/ cucumber	-	Cow (1-2) + Goat (4-5)		Rice/ brinjal/ okra	Maize/ wheat/ cucumber	-	Cow (2)+ Goat (3)	Grading of brinjal	-do-
	Field crops+ goat (2-3)	0.7	2	Rice/ vegetable	Maize/ wheat/ cucumber	-	Goat (2-3)		Rice/ vegetable	Wheat/ maize/ cucumber	Chickpea	Cow (2-3)+ Goat (2)	Grading	-do-
V. Upper Gangetic plains														
Kanpur Dehat (Uttar Pradesh)/ Central Plain Zone/Kanpur	Field crops + dairy (2-3)	0.8	4	Rice/ pigeon pea/ maize	Wheat	-	Cow (0-1)+ Buffalo (1-2)	-	Rice/ pigeon pea/ maize/ sorghum	Wheat/ pea	Green-gram	Cow (0-1)+ Buffalo (1-2) + Goat (0-1)	Cleaning of rice	Nutritional kitchen garden
	Field crops	1.18	8	Rice/ maize/ pearl millet	Wheat	Greengram	-	-	Rice/ pigeon pea/ maize/ pearl millet	Wheat/ potato/ mustard	Green-gram	Cow (0-1)+ Buffalo (1-2) + Goat (0-1)	Cleaning of rice & wheat	-do-
VI. Trans Gangetic Plains														
Sirsa (Haryana)/ Western/ 29 rainy days/292 mm rain	Field crops + dairy (3-4)	0.85	12	Cotton/ guar/ rice/ sorghum	Wheat/ berseem	-	Cow (1-2)+ Buffalo (2-3)	Ghee	Cotton/ rice/ sorghum	Wheat/ berseem	-	Cow (2-3)+ Buffalo (2-3)	Ghee	Nutritional kitchen garden
Amritsar (Punjab)/ Central Plain Zone/ 47 rainy days/ 936 mm rain	Field crops + dairy (3-4)	0.96	12	Rice	Wheat	-	Cow (0-1) + Buffalo (3-4)	-	Rice	Wheat	-	Cow (0-1) + Buffalo (3-4)	-	-do-
VII. Eastern Plateau and Hills														
Kabirdham (Chhattisgarh)/ Chhattisgarh Plain Zone/ Sub humid Area	Field crops	1.2	1	Rice/ soybean	Chickpea/ vegetable	-		-	Rice/ soybean	Chickpea/ wheat/ vegetable	-	Cow (1) + Goat (1-2)+ Poultry (29) +Pig (0-1)	Gram dal. besan, Ghee	Nutritional kitchen garden

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops + dairy (1-2)	1.17	7	Rice/ soybean	Chickpea/ wheat/ vegetable	Vegetable	Cow (1-2)	-	Rice/ soybean	Chickpea/ wheat	Vege-table	Cow (1-2)+ Goat (2-3)+ Poultry (25-26) +Pig (0-1)	-do-	-do-
	Field crops + dairy (2)+ Poultry(18)+ Goat(3-4)	1.05	2	Rice/ soybean	Chickpea/ wheat/ vegetable	Vegetable	Cow(2)+ Poultry(18)+ goat(3-4)		Rice/ soybean	Chickpea/ wheat/ vegetable	Vege-table	Cow(2)+ Poultry(25-26) +goat(6)+ pig (1-2)	-do-	-do-
	Field crops + dairy (1)+ Poultry (18) +horticulture +fish	0.8	1	Rice/ soybean	Chickpea	Vegetable	Cow (1)+ Poultry (18)		Rice/ soybean	Chickpea/ wheat	Vege-table	Cow(1)+ Poultry(35) +goat(8) +pig (1)	-do-	-do-
Dindori (Madhya Pradesh)/Northern Hills Zone of Chhattisgarh (CG-3)/72.6 rainy days/ 1593mm rain	Field crops + dairy (2)	1.25	9	Rice/ black gram	Wheat/ chickpea		Cow (1-2)+ Buffalo (1-2)	-	Rice/ black gram	Wheat/ chickpea		Cow (1-2)+ Buffalo (1)+ gaot (1-2) + poultry (21)	-	-
	Field crops + dairy (6-7) + goat (6)	0.9	2	Rice/ black gram	Wheat/ chickpea		Cow (5)+ Buffalo (2-3) +Goat (6)		Rice/ black gram	Wheat/ chickpea	-	Cow (5)+ Buffalo (2-3) + Goat (6)+ poultry (11)	-	-
	Field crops + dairy (2) + poultry (10)	0.75	1	Rice/ black gram	Wheat/ chickpea		Buffalo (2)+ Poultry (10)		Rice/ black gram	Wheat/ chickpea		Buffalo (2)+ Poultry (10)	-	-
Angul (Odisha)/ Mid-Central Table Land, /81 rainy days/1560 mm rain	Field crops + dairy (0-1)	1.18	4	Rice/ ginger/ snake guard/ ridge guard/ cucumber/ cowpea/ brinjal	Groundnut/ brinjal/ tomato/ cauliflower/ cucumber/ cowpea/ tomato/ onion	Bitter guard/ okra	Buffalo (0-1)	-	Rice/ ginger/ bitter gourd/ cowpea/ okra/ brinjal/ cucumber/ snake gourd/ spine gourd/ Bottle gourd/ coloacassia/ yam/ maize/ mango	Groundnut/ brinjal/ tomato/ cauliflower/ cucumber/ cowpea/ tomato/ onion/ maize	Bitter gourd/ cucumber/ pumpkin/ water-rmelon	Cow (1)+ Poultry (20)	Pickle making from green mangoes & ghee making	Fruits, boundary plantations, fisheries

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops + dairy (3-4) + poultry (65-66)	1.22	8	Rice/ cowpea/ brinjal	Groundnut/ Pointed gourd/ onion/ cowpea/ brinjal/ sunflower/ potato/ gardenpea	Bitter guard/ green-gram/ cowpea	Cow (3-4) + poultry (65-66)	-	Rice/ brinjal, cowpea, colocassia/ ricebean/ maize/ cucumber/ pointed gourd/ chilli/ mango/ banana/ cashewnut	Groundnut/ Pointed gourd/ onion/ cowpea/ brinjal/ sunflower/ potato/ gardenpea/ garlic/ water melon/ tomato/ beans/ cabbage	Bitter gourd, cucumber, pumpkin, water-melon	Cow (1-2)+ Poultry (38-39)	pickle making from green mangoes & ghee making	-do-
VIII. Central Plateau and hills														
Katni (Madhya Pradesh)/ Kymore Pleateau and Satpura Hills/ 70 rainy days/ 1444mm rain	Field crops	0.8	2	Rice	Wheat	-	-	-	Rice	Wheat	-	-	-	-
	Field crops + dairy (1-2)	0.71	10	Rice/ ginger/ marrigold	Wheat/ chickpea/ chilli	-	Cow (1-2)+ Buffalo (0-1)	-	Rice/ ginger/ marrigold	Wheat/ chilli/ brinjal	-	Cow (1-2)+ Buffalo (0-1)	Making chana dal & ghee making	Nutritional kitchen garden
Udaipur (Rajasthan)/ Sub-humid Southern plain and aravali hills/ 47 rainy days/ 828 mm rain	Field crops + dairy (1)	0.58	2	Maize	Wheat	-	Buffalo (1)		Maize/ brinjal	Wheat/ tomato/ black gram	Green-gram/ pea	Buffalo (1)	Vermicompost	-
	Field crops + dairy (2)+ goat (4-5)	0.8	9	Maize	Wheat	-	Cow (2)+ Goat (4-5)		Maize/ brinjal/ ridge gaurd/ tinda	Wheat/ tomato/ bottle gourd/ ridge gaurd/ cauliflower	Moong/ onion/ bottle gourd	Cow (2) + goat (4-5)	-do-	—
	Field crops + dairy (1) + Poultry (18)	0.6	1	Maize	Wheat	-	Buffalo (1)		Maize/ brinjal	Wheat/ tomato/ blackgram	Green-gram/ pea	Buffalo (1)	Vermicompost	-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
IX. Western Plateau and Hills														
Aurangabad (Maharashtra)/ CMP/57.5 rainy days/666 mm rain	Field crops + dairy (0-1)	0.64	9	Cotton/ pearl millet/ maize fodder/ Hy.napier/ ginger/ sugar cane	Chickpea/ wheat/ okra/ maize fodder	maize fodder	Cow (1)	-	Sugarcane/ cotton/ maize/ pearl millet/ maize fodder/ napier	Groundnut/ maize/ onion/ garden pea/ okra/ tomato/ cauliflower/ sunflower	Okra/ wheat/ chickpea/ sorghum/ lucerne/ fodder maize/ feenu-greek	Cow (1-2)+ Buffalo (0-1)	Ghee making	-
	Field crops + dairy (2)+ goat (2)	1.01	3	Cotton/ pearl millet/ maize fodder/ coriander/ sugar cane/ okra/ hybrid napier/ brinjal/ fenugreek	Chickpea/ wheat/ Okra/ maize fodder	Maize fodder	Cow (1-2)+ Buffalo (0-1) +goat (2)	-	Cotton/ pearl millet/ maize fodder/ coriander/ sugar cane/ okra/ hybrid napier/ brinjal/ fenugreek	Wheat/ chickpea/ okra/ lucern/ fenugreek/ coriander/ fodder maize	Fodder maize/ lucern	Cow (1-2)+ Buffalo (1-2) + goat (4)	Ghee making	-
Pune (Maharashtra)/ deccan Plateau, hot semi-arid eco sub region (6.1)/Ganeshkhind Pune-7/48 rainy days/606 mm rain	Field crops + Dairy (1-2) + Poultry	0.7	2	Soybean/ rice/ Hy.napier	Coriender/ tomato/ Hy.napier	Bottle gourd/ Pearl millet	Cow (1-2)+ Buffalo (0-1)		Soybean/ rice/ Hy.napier	Soybean/ rice/ Hy.napier	Bottle gourd/ Pearl millet	Cow (1-2)	Soybean flour	Nutritional kitchen garden
	Field crops + Dairy (1-2) + horticulture + Poultry (2)	0.7	6	Soybean/ groundnut/ rice/ chilli/ lady's finger	Wheat/ chickpea/ onion/ lucerne	Pearl millet	Cow (1-2)		Soybean/ groundnut/ rice/ chilli/ maize fodder/ lucerne	Wheat/ sorgum/ chickpea/ onion/ maize fodder/ lucerne	Pearl millet/ lucerne/ Hy.Napier	Cow (1-2) + Poultry(2)	Prepared curd	Nutritional kitchen garden
	Field crops + Dairy + Horticulture (2-3)	0.69	4	Soybean/ lucerne/ rice/ chilli/ lady's finger	Wheat/ brinjal/ onion/ lucerne/ Hy.napier	Hy. napier/ pearlmillet	Cow (2-3)+ Buffalo (0-1)		Soybean/ lucerne/ rice/ chilli/ lady's finger	Wheat/ brinjal/ onion/ lucerne /Hy.napier	Pearl millet/ Hy.napier/ lucerne/ groun-dnut	Cow (2)	Prepared curd	-do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Amravati (Maharahtra/) Central Maharastra Plateaue Zone (IX)/Western Vidarbha Zone/ 71 rainfall days/ 1198 mm	Field crops + dairy (1-2)	1.08	8	Soybean/ cotton/ pigeon pea/ orange	Wheat/ chickpea	-	Cow (1-2)	-	Soybean/ pigeon pea/ sorghum/ cotton/ orange/ okra	Wheat/ chickpea/ linseed	Sesamum	Cow (1-2)	Fortified wheat atta, mineral mixture	Nutritional kitchen garden, fruit / boundary plantations, compost
	Field crops + dairy (1) + goat (3)	1.3	2	Soybean/ piegeon pea/ orange	Wheat		Cow (1)+ Goat (3)		Sorghum/ pigeon pea/ soybean	Wheat/ chickpea/ linseed	Sesamum	Cow (1) + Goat (3)	-do-	-do-
	Field crops + dairy (1) + poultry (4)	1.4	1	Soybean/ pigeon pea/ Cotton	-		Cow (1) + Poultry (4)		Soybean/ pigeon pea	Wheat	-	Cow (1) + Poultry (4)	Mineral mixture	-do-
	Field crops + goat (5)	1.2	1	Soybean/ sorghum	-	-	Goat (5)		Soybean/ sorghum	Chickpea/ linseed	-	Goat (3)	-do-	-do-
X. Southern Plateau and Hills														
Warangal (Telangana)/ C.T.Zone/ rice eco system/ 67.3 rainy days/ 1263 mm rain	Field crops + dairy (1-2)	1.32	5	Rice/ cotton/ ground nut/ maize	Rice/ ground nut/ maize	-	Cow (0-1)+ Buffalo (1-2)		Rice/ cotton/ ground nut/ cucumber	Maize/ vegetable	-	Cow (0-1)+ Buffalo (2-3)+ Poultry (6-7)	Ghee	Nutritional kitchen garden, Azolla
	Field crops + dairy (3-4)+ goat (7-8)	1	2	Rice/ cotton	Rice/ maize	-	Cow (0-1)+ Buffalo (3)+ Goat (7-8)		Rice/ maize	Cotton/ maize	-	Cow (1)+ Buffalo (3)+ Poultry (10)	-do-	-do-
	Field crops + dairy (2-3)+ goat (34-35)+ poultry (7-8)	1.44	2	Rice/ cotton/ maize/ chilli	Rice/ maize/ vegetables	-	Cow (1-2)+ Buffalo (1-2)+ Goat (34-35)+ Poultry (7-8)		Rice/ cotton/ maize/ chilli/ green gram	Maize/ vegetables/ water-mellon	-	Cow (2)+ Buffalo (1-2)+ Goat (40)+ Poultry (6-7)	-do-	-do-
	Field crops + dairy (1-2)+ poultry (7-8)	1.13	3	Rice/ cotton/ maize	Rice/ ground nut/ maize/ vegetables	-	Cow (0-1)+ Buffalo (1)+ Poultry (7-8)		Rice/ cotton/ turmeric/ cucumber	Rice/ ground nut/ chickpea	-	Cow (1-2)+ Buffalo (1-2)+ Poultry (25)	-do-	-do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Kolar (Karnataka)/ AEZ 8.2/Eastern Dry Zone/ 42 rainy days/ 612 mm rain	Field crops + dairy (2-3)	0.88	7	Finger millet/ sericulture/ rice/ cabbage/ ground nut/ tomato/ Beet root/ maize fodder	Potato/ radish/ ridge guard/ coriander	Fodder maize/ tomato	Cow (2-3)	-	Finger millet+/ sericulture/ tomato/ rice/ cabbage/ fodder maize/ chilli/ coriander	Carrot/ ridge guard/ chilli/ sericulture	Fodder maize/ carrot/ mulberry	Cow (2-3)+ goat (2-3)+ Poultry (10-11)	-	Nutritional kitchen garden
	Field crops + dairy (3) + goat(1)	0.5	1	Finger millet/ tomato/ grass	Grass	Cabbage/ maize/ grass	Cow (2)+ Buffalo (1)+ Goat (1)	-	Finger millet/ red gram/ fodder maize	-	-	Cow (1)	-	Nutritional kitchen garden
	Field crops + dairy (3-4)+ goat (5-6)+ poultry (6-7)	0.84	3	Sericulture/ brinjal/ finger millet+ redgram/ fodder maize/ grass	Rabi grass	Knol-khol/ fodder maize/ grass	Cow (2-3)+ Buffalo (1)+ Goat (5-6)+ Poultry (6-7)	-	Sericulture/ Finger millet+ red gram/ tomato/ polebeans/ avare	Sericul-ture	Knol-khol/ sericulture	Cow (1-2)+ Buffalo (0-1)+ Goat (6)	-	Nutritional kitchen garden
	Field crops + dairy (4)+ poultry (2)	0.27	1	Finger millet/ fodder maize	-	-	Cow (2)+ Buffalo (2)+ Poultry (2)		Finger millet/ maize/ redgram/ avare	-	-	Cow (1)+ Buffalo (1)+ goat (1)		Nutritional kitchen garden
Gadag (Karanataka)/ Northern Dry Zone/Arid/ 31.5 rainfall days/ 325 mm	Field crops + dairy (1-2)	1.3	12	Ground nut/ Bt. cotton/ Hy. maize/ onion/ chilli	Sorghum/ chickpea/ wheat	-	Cow (1-2) + Buffalo (0-1)	-	Bt. cotton/ ground nut/ Hy. maize/ green gram/ sunflower/ Deccan hemp/ onion/ Lady's finger/ onion/ curry leaf/ brinjal	Wheat/ sorghum/ chickpea/ cucumber/ ridge gourd/ tomato/ mentha/ coriandar/ radish/ crysanthmum/ chilli/ Hy. maize/ pumpkin	Deccan hemp/ onion/ brinjal	Cow (1-2) + Buffalo (0-1)	Butter, vermicompost	Nutritional kitchen garden

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Dharmapuri & Krishnagiri (TamilNadu)/ NWZ/Bimodal rainfall/Start of deccan plateau/ 36.5 rainy days/ 656 mm rain	Field crops + dairy (2-3)	1.02	10	Rice/ coconut/ fodder grass/ sugar cane/ green gram/ ground nut/ turmeric/ redgram/ fodder sorghum/ crossandra	Rice/ coconut/ okra/ fodder sorghum/ ground nut	-	Cow (2-3)	-	Rice/ tuberose/ cotton/ turmeric/ sugar cane/ coconut/ fodder grass/ fodder sorghum/ chilli/ sorghum/ ragi/ bitter gourd/ ground nut/ crossandra	Rice/ coconut/ fodder grass/ ground nut/ chick pea/ cotton	Fodder sorghum	Cow (2-3)+ Buffalo (0-1) +goat (0-1)	Cleaning and grading	Nutirtional kitchen garden
	Field crops + dairy (2-3)+ goat (3-4)	1.36	2	Coconut/ jasmine/ fodder grass	-	-	Cow (2-3)+ Goat (3-4)	-	Rice/ fodder grass	Ragi/ jasmine/ groundnut/ coconut	-	Cow (2-3)		Nutirtional kitchen garden
XI. East Coast Plains and Hills														
Srikakulam (Andhra Pradesh)/ high altitude and tribal area zone/ 57.5 rainy days/ 1277mm rain	Field crops	0.9	2	Rice	Black gram/ ragi	-			Rice	Ragi	-	Buffalo (1) + Poultry (19)	-	Nutirtional kitchen garden
	Field crops + dairy (1-2)	0.3	2	Rice	Sesamum/ green gram	-	Cow (1-2) + Buffalo (0-1)		Rice	Sesamum/ green gram	-	Cow (1) + Buffalo (2) + Goat (4) + Poultry (8-9)	-	-do-
	Field crops + dairy (4)+ goat (10)	1	1	Rice	Rice	-	Cow (1) + Buffalo (3) + Goat (10)		Rice	Rice/ maize	-	Cow (2) + Goat (15) + Poultry (18)	-	-do-
	Field crops + dairy (1)+ goat (35)+ poultry (5)	0.52	1	Rice	Rice	-	Cow (1)+ Goat (35)+ Poultry (5)		Rice	Green gram/ sesame	Green gram/ sesamum	Buffalo (4)+ Poultry (20)	-	-do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops+ dairy (1-2)+ poultry (6)	0.8	3	Rice	Black gram/ ragi	-	Cow (0-1) + Buffalo (1-2)+ Poultry (6)		Rice	Ragi	-	Buffalo (1-2)+ Poultry (19)		-do-
	Field crops + goat (4)	0.2	1	Rice	Sesamum	-	Goat (4)		Rice	Greengram	-	Buffalo (3) + Poultry (18)		-do-
	Field crops+ poultry (6)	0.7	2	Rice	Rice	-	Poultry (6)		-	Mesta	-	Poultry (18)		-do-
Kendrapara (Odisha)/East-south eastern coastal plain zone/ 77 rainy days/ 2002 mm rain	Field crops+ dairy (4)	0.6	1	Rice	Rice/ green gram/ black gram	-	Cow (4)	-	Rice	Rice/ green gram/ black gram/ vegetables	Jute	Cow (2))+ Poultry (23)	Ghee and cheese making	Nutritional kitchen garden
	Field crops + dairy (2) + goat (3)+ Fish	0.95	3	Rice/ jute	Rice/ green gram/ black gram/ vegetables	-	Cow (2)+ Goat (3)	-	Rice	Rice/ green gram/ black gram/ vegetables	Jute	Cow (3-4)+ Goat (5-6)+ Poultry (20)	Grading and cleaning of rice & ghee and cheese making	-do-
	Field crops + dairy (1) + goat (4)+ poultry (20)	1.2	1	Rice/ jute	Rice/ green gram/ black gram/ vegetables	-	Cow (1) + goat (4)+ poultry (20)		Rice	Rice/ green gram/ black gram/ vegetables	Jute	Cow (2)+ Goat (5)+ Poultry (29)	Grading and cleaning of rice & ghee and cheese making	-do-
	Field crops + dairy (2) + goat (1-2)+ poultry (9) + fish	0.91	4	Rice	Green gram/ black gram/ rice/ vegetables	-	Cow (2) + Goat (1-2) + Poultry (9) + Fish pond		Rice	Rice/ green gram/ black gram/ rice/ vegetables	-	Cow (3)+ Goat (1) + Poultry (16)	Grading and cleaning of rice & ghee and cheese making	-do-
	Field crops + dairy (2) + poultry (10)	1.08	1	Rice/ jute	Black gram/ vegetables	-	Cow (2) + Poultry (10)		Rice	Black gram/ vegetables	Jute	Cow (4) + Poultry (19)	Grading and cleaning of rice & ghee and cheese making	-do-
	Field crops + dairy (3-4) + poultry (14) + fish	68	2	Rice/ jute	Black gram/ vegetables	-	Cow (1) + Poultry (12) + Fish pond		Rice	Green gram/ black gram/ vegetables	Jute	Cow (5) + Poultry (16)	Grading and cleaning of rice & ghee and cheese making	-do-

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
Sivagangai (Tamil Nadu)/ Southern/ Semi Arid Eco-Sub Region 8.1/ Southern Zone TN 5 & 6/ 41 rainy days/ 563 mm rain	Field crops + dairy (3-4)	1.05	12	Rice/ sugar cane/ black gram/ pumpkin	Rice/ ground nut/ gingelly/ pumpkin/ maize/ black gram	Black gram	Cow (3-4) + Poultry (15-16)	-	Rice	Rice/ black gram	Black gram/ sugar cane/ pumpkin/ ground nut	Cow (3-4) + Poultry (33-34)	Cleaning and grading of grains	Nutritional kitchen gardening, poultry
XII. West Coast Plains and Ghats														
Palghar (Maharashtra)/ North konkan coastal Zone/ 107 rainy days/ 2954 mm rain	Field crops	1.2	1	Rice	Rice	-	-		Rice	Rice	-	Buffalo (1)	Processing of milk	Nutritional kitchen garden
	Field crops + dairy (2)	0.49	5	Rice	Rice/ cucumber	-	Buffalo (2)		Rice	Rice/ vegetables		Buffalo (1-2)	Processing of milk	Nutritional kitchen garden
	Field crops + dairy (1-2)+ Poultry (23-24)	0.43	4	Rice	Rice/ cowpea		Cow (1-2)+ Poultry (23-24)		Rice	Rice/ vegetables		Cow (1)	Processing of milk	Nutritional kitchen garden
	Field crops + dairy (2)+ Goat (6)+ Poultry (14)	0.43	1	Rice	Rice		Cow (2)+ Goat (6)+ Poultry (14)		Rice	Rice		Goat (6)	-	Nutritional kitchen garden
	Field crops + dairy (4)+ Horticulture	0.8	1	Rice	Rice	-	Cow (4)	Kitchen garden	Rice	Rice	-	Cows (2)+	Processing of milk	-do-
Pathinamthitta (Kerala)/Hot Humid per Humid eco region/Southern Zone/95 rainy days/ 3679 mm rain	Field crops + horticulture + dairy (3-4)	1.3	11	Rubber/ coconut/ pepper/ nutmeg/ banana/ rice/ vegetables/ tapioca	Banana/ rice	-	Cow (3-4)+ Buffalo (0-1)		Coconut/ rice/ pepper	Rice/ banana	Vegetables	Cows (3-4)+ Buffalo (0-1)	Cured garcinia, coconutoil, graded coconut, garbled pepper, drymace, packed milk after filtration	Fisheries, terrace gardening, apiary, Vermi-compost

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District (state)/ NARP zone/ soil type/ rainfall (mm)/ rainy days	Farming System (s)	Area (ha)	No. of Farm households	Existing components (As per benchmark, 2014)					Improved					
				Crop module			Livestock module	Processing module	Crop module			Livestock module	Processing module	Optional module
				Kharif	*Rabi*	Summer			*Kharif*	*Rabi*	Summer			
	Field crops + horticulture + dairy (2) + Poultry (8)	0.96	1	Coconut	Rice	-	Cow (2)+ Poultry (8)	-	Nutmeg	Rice	-	Cows (2)	Storage of nutmeg seeds & mace in air tight steel bin.	-
XIII. Gujarat Plains and Hills														
Mehsana (Gujraat)/ north Gujrat agro climate zone / 44.8 rainy days/ 551 mm rain	Field crops + dairy (1-2)	1.13	12	Sorghum/ rice/ cotton/ pearl millet/ castor/ cluster bean/ rajka bajri	Cumin/ lucerne/ tobbaco/ mustard/ wheat	Sorghum/ pearl millet/ cluster bean/ fodder sorghum	Cow (0-1)+ Buffalo (1-2)	-	Cotton/ sorghum/ cluster bean/ brinjal/ fodder sorghum/ Green gram/ pearl millet/ rice/ castor	Wheat/ lucerne/ chikory/ castor/ fodder maize/ mustard/ fanel/ oat/ guar	Fodder sorghum/ pearl millet/ cluster bean	Cow (0-1)+ Buffalo (1-2)	-	Nutritional kitchen garden
Panchmahal (Gujarat)/middle gujarat III/ 44 rainfall days/ 1008mm rain	Field crops + dairy (1-2)	0.4	1	Rice/ maize	Maize	-	Cow (1)+ Buffalo (2)	Maize, chaff cutting	Rice/ maize	Maize		Cow (1)+ Buffalo (2)	Grading	Nutritional kitchen garden, fruits, boundary plantations, stubbles of fodder crop
	Field crops + dairy (3) + goat (4-5)	0.72	3	Rice/ maize	Maize	Groundnut	Buffalo (3)+ Goat (4-5)	Maize, chaff cutting	Rice/ maize	Maize	Ground nut	Buffalo (3)+ Goat (5-6)	-	-do-
	Field crops + dairy (2-3) + goat (5-6) + poultry (6-7)	1.04	6	Rice/ maize/ pigeon pea	Maize	Pearl millet	Buffalo (2-3)+ Goat (5-6) + Poultry (6-7)	Maize, chaff cutting, pearl millet	Rice/ maize/ pigeon pea	Maize	Pearl millet	Buffalo (2-3)+ Goat (5-6)+ Poultry (9)	-	-do-
	Field crops + dairy (1)+ poultry (5)	0.9	1	Rice/ maize	Maize	-	Buffalo (1)+ Poultry (5)	Maize, chaff cutting	Rice/ maize	Maize	-	Buffalo (1)+ Poultry (7)	Grading	-do-
	Field crops + poultry (5)	0.84	1	Rice/ maize	Maize	Groundnut	Poultry (5)	Maize, chaff cutting	Rice/ maize	Maize	Ground nut	Poultry (8)	-	-do-

Table 7.4.3(b). Improvement of production (on equivalent basis of base crop), marketable surplus and economics in different farming systems in various locations

Farming system	Area (ha)	No. of households	Existing System				Improved 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)
Kangra (Himachal Pradesh)														
FC+D	0.78	9	9209	2204	18550	55125	17740	4204	28907	113011	0.0053***	0.1162	0.0133**	0.0044***
			(1766)	(1344.23)	(4463)	(10338)	(1814)	(1605)	(4425)	(11367)				
FC+D+G	0.57	3	11236	3782	19383	70508	21444	8954	28462	143092	0.0534*	0.1625	0.0936*	0.0534*
			(3059)	(2328)	(7730)	(17905)	(3141)	(2779)	(7665)	(19687)				
Overall FS			P value Significance - Existing vs Improved								0.0011***	0.0629*	0.0054***	0.0011***
CD [P = 0.05]	FS1 Vs FS2		12687	12779	42183	80793	3628	3209	8851	22733				
Samba (Jammu and Kashmir)														
FC+D	1.14	12	4629	3016	81368	103783	2053	1094	39843	42296	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0047***	0.0042***	0.0025***	0.0012***
Ambedkarnagar (Uttar Pradesh)														
FC+D	0.73	10	9923	5428	57300	41927	8087	4641	34009	46865	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0782*	0.5412	0.0037***	0.4919
Kamrup (Assam)														
Fc+D+P	2	1	16147 (2729)	15272 (2777)	96329 (15038)	145887 (43552)	5806 (2230)	3766 (1781)	19300 (24235)	38768 (10886)	-	-	-	-
FC+D+G+P	1.5	2	9649 (4169)	8160 (4242)	73098 (22972)	71644 (66527)	7356 (1827)	4071 (1259)	37350 (17137)	36217 (7697)	-	-	-	-
FC+D+P+Pig	1.6	6	15680 (7222)	10877 (7347)	99627 (39789)	135573 (115228)	10252 (1054)	7335 (727)	44950 (9894)	57573 (4444)	0.0308**	0.0233**	0.0306**	0.0075**
FC+D+G+P+Pig	1.43	3	6600 (7222)	5520 (7347)	62200 (39789)	36800 (115228)	10363 (1491)	6958 (1028)	61416 (13992)	42216 (6285)	0.0534*	0.0534*	0.2708	0.0534*
Overall FS			P value Significance - Existing vs Improved								0.0009***	0.0007***	0.0118**	0.0003***
CD [P = 0.05]	FS1 Vs FS2		8846	8999	48732	141126	3165	2181	29682	13333				
CD [P = 0.05]	FS1 Vs FS3		7801	7936	42977	124462	2791	1924	26177	11759				
CD [P = 0.05]	FS1 Vs FS4		8340	8484	45945	133055	2984	2057	27985	12571				
CD [P = 0.05]	FS2 Vs FS3		5897	5999	32488	94084	2110	1454	19788	8889				
CD [P = 0.05]	FS2 Vs FS4		6593	6707	36323	105189	2359	1626	22124	9938				
CD [P = 0.05]	FS3 Vs FS4		5107	5195	28135	81479	1827	1259	17137	7698				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
South 24 Paragnas (West Bengal)														
FC+D+F	0.6	8	13413 (8897)	11055 (8226)	54802 (12166)	65923 (74142)	42419 (61402)	34320 (11908)	164922 (35183)	216850 (542140)	0.0041***	0.0118**	0.0021***	0.0177**
FC+D+ P	0.34	2	9074 (3145)	6481 (2908)	36774 (4301)	44896 (26213)	71363 (21708)	17863 (4210)	120632 (12439)	521635 (191675)	-	-	-	-
FC+D+ P + F	0.8	1	4315 (6291)	2534 (5816)	28312 (8602)	10524 (52426)	19812 (43417)	11050 (8420)	89585 (24878)	88722 (383351)	-	-	-	-
FC+ F	0.93	1	5561 (8897)	2532 (8226)	46217 (12166)	3832 (74142)	26803 (61402)	4743 (11908)	97526 (35183)	143702 (542140)	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0018***	0.0002***	0.0028***	0.0005***
CD [P = 0.05]	FS1 Vs FS2		7034	6503	9618	58614	48543	9415	27815	428600				
CD [P = 0.05]	FS1 Vs FS3		9438	8725	12904	78640	65127	12631	37318	575027				
CD [P = 0.05]	FS1 Vs FS4		9438	8725	12904	78640	65127	12631	37318	575027				
CD [P = 0.05]	FS2 Vs FS3		10898	10075	14901	90805	75202	14585	43091	663984				
CD [P = 0.05]	FS2 Vs FS4		10898	10075	14901	90805	75202	14585	43091	663984				
CD [P = 0.05]	FS3 Vs FS4		12584	11633	17206	104853	86836	16842	49757	766703				
Purnea (Bihar)														
FC+D	1.3	6	16147 (2729)	15272 (2777)	96329 (15038)	145887 (43552)	26045 (2941)	24489 (3690)	95461 (12311)	138947 (15783)	0.0132**	0.0530*	0.0405**	0.0099***
FC+D+G	1.13	3	9649 (4169)	8160 (4242)	73098 (22972)	71644 (66527)	27602 (4159)	21522 (5218)	116488 (17411)	131936 (22320)	0.0534*	0.1625	0.1625	0.0534*
FC+G	0.7	2	15680 (7222)	10877 (7347)	99627 (39789)	135573 (115228)	22666 (5094)	17639 (6391)	51064 (21324)	152935 (27337)	-	-	-	-
FC	0.95	1	6600 (7222)	5520 (7347)	62200 (39789)	36800 (115228)	19526 (7204)	14846 (9039)	68221 (30157)	107519 (38661)	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0003***	0.0036***	0.0388**	0.0003***
CD [P = 0.05]	FS1 Vs FS2		5107	5195	28135	81479	5094	6392	21324	27338				
CD [P = 0.05]	FS1 Vs FS3		5897	5999	32488	94084	5882	7381	24623	31567				
CD [P = 0.05]	FS1 Vs FS4		7801	7936	42977	124462	7781	9764	32574	41759				
CD [P = 0.05]	FS2 Vs FS3		6593	6707	36323	105189	6577	8252	27530	35293				
CD [P = 0.05]	FS2 Vs FS4		8340	8484	45945	133055	8319	10438	34823	44642				
CD [P = 0.05]	FS3 Vs FS4		8846	8999	48732	141126	8823	11071	36935	47350				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
Kanpur Dehat (Uttar Pradesh)														
FC+D	0.8	4	13965 (1731)	11193 (1826)	56662 (4891)	82987 (14382)	23396 (3951)	18469 (3861)	123565 (18481)	110397 (23461)	0.0415**	0.0634*	0.0271**	0.1431
FC	1.18	8	12983 (1224)	10333 (1291)	56546 (3458)	73285 (10169)	27693 (2793)	21963 (2730)	142713 (13068)	134220 (16590)	0.0033**	0.0041**	0.0021**	0.0077**
Overall FS			**P value Significance - Existing vs Improved**								0.0004***	0.0007***	0.0002***	0.0021***
CD [P = 0.05]	FS1 Vs FS2		2120	2237	5991	17615	4839	4729	22635	28735				
Sirsa (Haryana)														
FC+D	0.85	12	80213	78212	99662	3189080	728	409	55508	2871823	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.1729	0.0115**	0.1684	0.888
Amritsar (Punjab)														
FC+D	0.96	12	15104	13791	76997	134457	14803	10964	74663	132582	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0007***	0.0316**	0.6268	0.8243
Kabirdham (Chhatisgarh)														
FC	**1.2**	1	10062 (2734)	7409 (1839)	38020 (7352)	97830 (30036)	12790 (4553)	9969 (3855)	44800 (11722)	127865 (50710)	-	-	-	-
FC+D	1.17	7	8117 (1033)	5924 (695)	34901 (2779)	74689 (11352)	13313 (1721)	9612 (1457)	42287 (4430)	137438 (19166)	0.0106**	0.0218**	0.0828*	0.0083***
FC+D+P+G	1.05	2	10141 (1933)	6372 (1300)	39235 (5199)	97670 (21238)	17822 (3219)	13195 (2725)	50640 (8289)	189962 (35857)	-	-	-	-
FC+D+P+F+H	0.8	1	9105 (2734)	4383 (1839)	39050 (7352)	83870 (30036)	19581 (4553)	14315 (3855)	50300 (11722)	214055 (50710)	-	-	-	-
FC+D+G	1.2	1	8349 (2734)	6261 (1839)	44700 (7352)	68020 (30036)	13645 (4553)	9989 (3855)	43950 (11722)	140260 (50710)	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0011***	0.0011***	0.0388**	0.0007***
CD [P = 0.05]	FS1 Vs FS2		2923	1967	7861	32110	4868	4121	12532	54212				
CD [P = 0.05]	FS1 Vs FS3		3349	2253	9006	36787	5577	4721	14357	62108				
CD [P = 0.05]	FS1 Vs FS4		3867	2602	10399	42478	6440	5452	16578	71716				
CD [P = 0.05]	FS1 Vs FS5		3867	2602	10399	42478	6440	5452	16578	71716				
CD [P = 0.05]	FS2 Vs FS3		2192	1475	5895	24082	3651	3091	9399	40659				
CD [P = 0.05]	FS2 Vs FS4		2923	1967	7861	32110	4868	4121	12532	54212				
CD [P = 0.05]	FS2 Vs FS5		2923	1967	7861	32110	4868	4121	12532	54212				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
CD [P = 0.05]	FS23 Vs FS4		3349	2253	9006	36787	5577	4721	14357	62108				
CD [P = 0.05]	FS23 Vs FS5		3349	2253	9006	36787	5577	4721	14357	62108				
CD [P = 0.05]	FS24 Vs FS5		3867	2602	10399	42478	6440	5452	16578	71716				
			Dindori (Madhya Pradesh)											
FC+D	1.25	9	3928 (420)	2347 (404)	27600 (3009)	25440 (2722)	52044 (18132)	87819 (807)	49151 (3581)	653454 (241920)	0.0002***	0.0012***	0.0021***	0.0012***
FC+D+G	0.9	2	5572 (891)	3665 (858)	40325 (6383)	34907 (5775)	81789 (38465)	13852 (1713)	66849 (7598)	1037310 (513191)	-	-	-	-
FC+D+P	0.75	1	7080 (1260)	5265 (1214)	49800 (9027)	45790 (8168)	168362 (54398)	7971 (2422)	30334 (10745)	2242555 (725762)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0002***	0.0002***	0.0032***	0.0002***
CD [P = 0.05]	FS1 Vs FS2		985	949	7057	6386	42526	1894	8400	567354				
CD [P = 0.05]	FS1 Vs FS3		1328	1280	9516	8610	57341	2554	11327	765021				
CD [P = 0.05]	FS2 Vs FS3		1544	1487	11057	10004	66625	2967	13161	888874				
			Angul (Odhisha)											
FC+D+P	1.22	8	5719 (527)	3311 (481)	46178 (4283)	11018 (5436)	17736 (2130)	12980 (2065)	108640 (10977)	68727 (13092)	0.0021***	0.0021***	0.0021***	0.0021***
FC+D	1.18	4	4796 (746)	2818 (681)	29375 (6058)	18587 (7688)	14664 (3013)	9811 (2921)	76932 (15524)	69716 (18515)	0.0271**	0.0271**	0.0271**	0.0271**
Overall FS			P value Significance - Existing vs Improved								0.0002***	0.0002***	0.0003***	0.0003***
CD [P = 0.05]	FS1 Vs FS2		914	834	7420	9416	3691	3578	19014	22677				
			Katni (Madhya Pradesh)											
FC+D	0.71	10	5607 (4479)	3022 (4213)	27575 (4916)	28500 (44546)	10701 (5288)	5712 (4626)	34026 (4551)	72992 (52002)	0.2758	0.3545	0.2518	0.3273
FC	0.8	2	7340 (2003)	5508 (1884)	19140 (2198)	54260 (19921)	9047 (2365)	6535 (2069)	21592 (2035)	68878 (23256)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.168	0.2656	0.1974	0.1974
CD [P = 0.05]	FS1 Vs FS2		4907	4616	5386	48798	5794	5068	4986	56965				
			Udaipur (Rajasthan)											
FC+D+G	0.8	9	4985 (603)	2806 (454)	6377 (855)	53443 (7192)	8916 (854)	5864 (511)	31442 (2346)	75553 (8325)	0.0077***	0.0044***	0.0012***	0.0440**
FC+D+P	0.6	1	4482 (1810)	2975 (1363)	9000 (2565)	44785 (21577)	11925 (2562)	5725 (1533)	29543 (7038)	113557 (24975)	-	-	-	-

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
FC+D	0.58	2	2466 (1280)	925 (963)	11000 (1813)	18600 (15257)	6045 (1812)	4335 (1084)	24258 (4977)	48289 (17660)	-	-	-	-
Overall FS						P value Significance - Existing vs Improved					0.0021***	0.0011***	0.0002***	0.0118***
CD [P = 0.05]	FS1 Vs FS2		1416	1066	2005	16868	2004	1199	5502	19524				
CD [P = 0.05]	FS1 Vs FS3		2218	1670	3142	26427	3139	1878	8621	30589				
CD [P = 0.05]	FS2 Vs FS3		1909	1437	2704	22745	2702	1616	7419	26327				
						Aurangabad (Maharashtra)								
FC+D	0.64	9	4210 (662)	4092 (645)	93249 (11976)	75158 (15655)	10201 (1523)	8577 (1218)	225934 (31140)	182135 (33390)	0.0090***	0.0090***	0.0016**	0.0694*
FC+D+G	1.01	3	1007 (382)	962 (372)	16155 (6914)	24138 (9038)	3896 (879)	3483 (703)	100506 (17979)	55348 (19278)	0.0534*	0.0534*	0.0534*	0.0534*
Overall FS						P value Significance - Existing vs Improved					0.0054***	0.0061***	0.0010***	0.0307**
CD [P = 0.05]	FS1 Vs FS2		764	745	13829	18077	1759	1407	35958	38556				
						Pune (Maharashtra)								
FC + D+ P	0.7	2	4589 (1558)	3975 (1635)	90300 (29753)	56554 (32829)	12290 (2945)	11031 (3121)	197842 (59546)	195447 (61453)	-	-	-	-
FC+D+horticulture+P	0.7	6	7997 (899)	7035 (944)	195988 (17178)	59925 (18953)	15537 (1700)	13825 (1802)	383190 (34379)	114009 (35480)	0.0099***	0.0176**	0.0176**	0.0308**
FC+D+ horticultue	0.69	4	4610 (1738)	4064 (1824)	89545 (33185)	57999 (36616)	11467 (3286)	10392 (3481)	172444 (66416)	194499 (68542)	0.0534*	0.0534*	0.0534*	0.0534*
Overall FS						P value Significance - Existing vs Improved					0.0005***	0.0009***	0.0042***	0.0018***
CD [P = 0.05]	FS1 Vs FS2		2700	2833	51534	56862	5103	5407	103138	106440				
CD [P = 0.05]	FS1 Vs FS3		1800	1889	34356	37908	3402	3605	68759	70960				
CD [P = 0.05]	FS2 Vs FS3		2381	2498	45449	50148	4500	4768	90959	93872				
						Amravati (Maharashtra)								
FC+D	1.08	8	16147 (2729)	15272 (2777)	96329 (15038)	145887 (43552)	3787 (411)	3277 (415)	54877 (6045)	58751 (8074)	0.0265**	0.0680*	0.0472**	0.0811*
FC+D+G	1.3	2	9649 (4169)	8160 (4242)	73098 (22972)	71644 (66527)	5398 (822)	3880 (831)	61890 (12090)	100077 (16149)	-	-	-	-
FC+D+P	1.4	1	15680 (7222)	10877 (7347)	99627 (39789)	135573 (71891)	5744 (1175)	5744 (1175)	77766 (17098)	96174 (22838)	-	-	-	-
FC+G	1.2	1	6600	5520	62200	36800	4169	2280	34053	91021	-	-	-	-
			(7222)	(7347)	(39789)	(115228)	(1163)	(1175)	(17098)	(22838)				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
Overall FS			P value Significance - Existing vs Improved								0.0483**	0.0171**	0.0275**	0.0062***
CD [P = 0.05]	FS1 Vs FS2		5710	5809	31456	91097	920	929	13518	18056				
CD [P = 0.05]	FS1 Vs FS3		7661	7793	42203	122219	1234	1247	18136	24224				
CD [P = 0.05]	FS1 Vs FS4		7661	7793	42203	122219	1234	1247	18136	24224				
CD [P = 0.05]	FS2 Vs FS3		8846	8999	48732	141126	1425	1440	20942	27972				
CD [P = 0.05]	FS2 Vs FS4		8846	8999	48732	141126	1425	1440	20942	27972				
CD [P = 0.05]	FS3 Vs FS4		10214	10391	56271	162958	1646	1662	24181	32299				
			Warangal (Telangana)											
FC+D	1.32	5	17621 (2417)	16270 (2182)	3200 (1436)	208252 (28745)	40856 (6525)	37618 (5102)	15585 (5865)	474692 (74731)	0.0141**	0.0141**	0.0137**	0.0141**
FC+D+P	1.13	3	20496 (3120)	18402 (2817)	2533 (1854)	243421 (37109)	43732 (8423)	38868 (6587)	11130 (7572)	513656 (96478)	0.0534*	0.0534*	0.0534*	0.0534*
FC+D+G	1	2	27836 (3822)	16660 (3450)	10050 (2271)	323987 (45449)	61885 (10316)	36819 (8067)	39350 (9274)	703276 (118161)	-	-	-	-
FC+D+G+P	1.44	2	42187 (3822)	31975 (3450)	11475 (2271)	494775 (45449)	58728 (10316)	37528 (8067)	36545 (9274)	668197 (118161)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0007***	0.0009***	0.0009***	0.0009***
CD [P = 0.05]	FS1 Vs FS2		3948	3564	2346	46940	10655	8332	9579	122037				
CD [P = 0.05]	FS1 Vs FS3		4523	4083	2688	53777	12207	9546	10974	139811				
CD [P = 0.05]	FS1 Vs FS4		4523	4083	2688	53777	12207	9546	10974	139811				
CD [P = 0.05]	FS2 Vs FS3		4935	4454	2933	58676	13319	10415	11974	152546				
CD [P = 0.05]	FS2 Vs FS4		4935	4454	2933	58676	13319	10415	11974	152546				
CD [P = 0.05]	FS3 Vs FS4		5406	4880	3213	64276	14590	11409	13117	167106				
			Kolar (Karnataka)											
FC+D	0.88	7	16147 (2729)	15272 (2777)	96329 (15038)	145887 (43552)	10801 (2523)	10383 (2965)	37544 (11546)	124481 (33288)	0.0671*	0.0671*	0.0106**	0.331
FC+D+G+P	0.84	3	9649 (4169)	8160 (4242)	73098 (22972)	71644 (66527)	21928 (3854)	18907 (4529)	120487 (17636)	208440 (50848)	0.0936*	0.0936*	0.1625	0.0936*
FC+D+G	0.5	1	15680 (7222)	10877 (7347)	99627 (39789)	135573 (115228)	21452 (6675)	15895 (7845)	124475 (30548)	197311 (88071)	-	-	-	-
FC+D+P	0.27	1	6600 (7222)	5520 (7347)	62200 (39789)	36800 (115228)	12392 (6675)	11312 (7845)	70088 (30548)	115804 (88071)	-	-	-	-

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
Overall FS			P value Significance - Existing vs Improved								0.3877	0.4545	0.0663*	0.1084
CD [P = 0.05]	FS1 Vs FS2		4984	5070	27457	79516	4606	5414	21080	60775				
CD [P = 0.05]	FS1 Vs FS3		7721	7855	42537	123185	7136	8387	32657	94153				
CD [P = 0.05]	FS1 Vs FS4		7721	7855	42537	123185	7136	8387	32657	94153				
CD [P = 0.05]	FS2 Vs FS3		8340	8484	45945	133055	7708	9059	35274	101697				
CD [P = 0.05]	FS2 Vs FS4		8340	8484	45945	133055	7708	9059	35274	101697				
CD [P = 0.05]	FS3 Vs FS4		10214	10391	56271	162958	9441	11095	43202	124552				
			Gadag (Karnataka)											
FC+D	1.3	12	5204	4698	16700	45752	12830	11922	60050	93912	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0001***	0.0001***	0.0001***	0.0007***
			Dharmapuri & Krishnagiri (Tamil Nadu)											
FC+D	1.02	10	31149 (8350)	32911 (8745)	135542 (39468)	6709 (43032)	88985 (15206)	82982 (15826)	267248 (52557)	92928 (51671)	0.0025***	0.0049***	0.0151**	0.0277**
FC+D+G	1.36	2	45370 (18672)	53664 (19555)	110296 (88254)	80935 (96224)	157921 (34002)	156140 (35388)	353768 (117521)	287668 (115540)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0012***	0.0024***	0.0054***	0.0151**
CD [P = 0.05]	FS1 Vs FS2		20455	21422	96678	105408	37247	38767	128738	126568				
			Srikakulam (Andhra Pradesh)											
FC	0.9	2	1945 (1435)	350 (1205)	10000 (6998)	13340 (17941)	7048 (1412)	4588 (1126)	27715 (10096)	56871 (22810)	-	-	-	-
FC+D+G	1	1	16333 (2030)	10625 (1704)	55030 (9897)	140970 (25372)	25610 (1998)	13095 (1592)	86741 (14278)	220588 (32259)	-	-	-	-
FC+D+G+P	0.52	1	21389 (2030)	4633 (1704)	49400 (9897)	207275 (25372)	32075 (1998)	10506 (1592.56)	62932 (14278)	321970 (32259)	-	-	-	-
FC+G	0.2	1	3340 (2030)	145 (1704)	11000 (9897)	29090 (25372)	9662 (1998)	5190 (1592)	56778 (14278)	59177 (32259)	-	-	-	-
FC+D	0.3	2	5278 (1435)	3569 (1205)	26500 (6998)	36846 (17941)	11667 (1412)	7420 (1126)	49392 (10096)	90621 (22810)	-	-	-	-
FC+D+P	0.8	3	7234 (1172)	4363 (984)	26633 (5714)	60185 (14649)	13613 (1153)	9495 (919)	41052 (8243)	122304 (18625)	0.0534*	0.0534*	0.0936*	0.0936*
FC+P	0.7	2	7521 (1435)	6225 (1205)	38300 (6998)	51962 (17941)	8966 (1412)	7403 (1126)	42882 (10096)	64718 (22810)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0118**	0.0062***	0.0151**	0.0193**

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
CD [P = 0.05]	FS1 Vs FS2		2487	2088	12122	31075	2447	1950	17488	39510				
CD [P = 0.05]	FS1 Vs FS3		2487	2088	12122	31075	2447	1950	17488	39510				
CD [P = 0.05]	FS1 Vs FS4		2487	2088	12122	31075	2447	1950	17488	39510				
CD [P = 0.05]	FS1 Vs FS5		2030	1705	9897	25373	1998	1593	14279	32260				
CD [P = 0.05]	FS1 Vs FS6		1854	1556	9035	23162	1824	1454	13035	29449				
CD [P = 0.05]	FS1 Vs FS7		2030	1705	9897	25373	1998	1593	14279	32260				
CD [P = 0.05]	FS2 Vs FS3		2871	2411	13997	35883	2826	2252	20193	45622				
CD [P = 0.05]	FS2 Vs FS4		2871	2411	13997	35883	2826	2252	20193	45622				
CD [P = 0.05]	FS2 Vs FS5		2487	2088	12122	31075	2447	1950	17488	39510				
			Kendrapara (Odisha)											
FC+D	0.6	1	6470 (1636)	3941 (1405)	31905 (13677)	23095 (13328)	15351 (4707)	8729 (3392)	59905 (15780)	70585 (24868)	-	-	-	-
FC+D+P	1.08	1	9701 (1636)	7883 (1405)	65220 (13677)	17243 (13328)	31602 (4707)	25560 (3392)	121895 (15780)	146728 (24868)	-	-	-	-
FC+D+G+F	0.95	3	6962 (944)	3524 (811)	61270 (7896)	-2012 (7695)	32614 (2718)	20891 (1958)	115040 (9110)	162265 (14357)	0.0534*	0.0534*	0.0534*	0.0534*
FC+D+G+P	1.2	1	3644 (1636)	1470 (1405)	23520 (13677)	7455 (13328)	17827 (4707)	10506 (3392)	60243 (15780)	91292 (24868)	-	-	-	-
FC+D+P+F	0.68	2	5804 (1157)	3543 (994)	47275 (9671)	1971 (9424)	14714 (3329)	10061 (2398)	40036 (11158)	85040 (17584)	-	-	-	-
FC+D+G+ P+F	0.91	4	5857 (818)	3374 (702)	36614 (6838)	13263 (6664)	14781 (2353)	9478 (1696)	37728 (7890)	87911 (12434)	0.0271**	0.0271**	0.5000**	0.0271**
Overall FS			P value Significance - Existing vs Improved								0.0002***	0.0002***	0.13	0.0002***
CD [P = 0.05]	FS1 Vs FS2		2314	1988	19342	18849	6658	4798	22317	35170				
CD [P = 0.05]	FS1 Vs FS3		1890	1623	15793	15390	5436	3918	18222	28716				
CD [P = 0.05]	FS1 Vs FS4		2314	1988	19342	18849	6658	4798	22317	35170				
CD [P = 0.05]	FS1 Vs FS5		2004	1722	16751	16324	5766	4155	19327	30458				
CD [P = 0.05]	FS1 Vs FS6		1830	1572	15291	14902	5264	3793	17643	27804				
CD [P = 0.05]	FS2 Vs FS3		1890	1623	15793	15390	5436	3918	18222	28716				
CD [P = 0.05]	FS2 Vs FS4		2314	1988	19342	18849	6658	4798	22317	35170				
CD [P = 0.05]	FS2 Vs FS5		2004	1722	16751	16324	5766	4155	19327	30458				
CD [P = 0.05]	FS2 Vs FS6		1830	1572	15291	14902	5264	3793	17643	27804				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
CD [P = 0.05]	FS3 Vs FS4		1890	1623	15793	15390	5436	3918	18222	28716				
CD [P = 0.05]	FS3 Vs FS5		1494	1283	12485	12167	4298	3097	14405	22702				
CD [P = 0.05]	FS3 Vs FS6		1250	1074	10446	10180	3596	2591	12052	18994				
CD [P = 0.05]	FS4 Vs FS5		2004	1722	16751	16324	5766	4155	19327	30458				
CD [P = 0.05]	FS4 Vs FS6		1830	1572	15291	14902	5264	3793	17643	27804				
CD [P = 0.05]	FS5 Vs FS6		1417	1218	11845	11543	4077	2938	13666	21537				
			Sivagangai&Pudukotai (Tamil Nadu)											
FC+D	1.05	12	14101	12378	100240	68968	23320	20323	57696	236820	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0106**	0.0011***	0.0067***	0.0010***
			Palghar (Maharashtra)											
FC	1.2	1	7100 (3374)	6300 (3500)	55480 (28255)	29720 (16554)	13663 (8336)	11170 (8441)	93405 (51232)	70548 (52112)	-	-	-	-
FC+D	0.49	5	6492 (1509)	4912 (1565)	56672 (12636)	21240 (7403)	14642 (3728)	11181 (3775)	101649 (22911)	74064 (23305)	0.0280**	0.0280**	0.0548*	0.0199**
FC+D+P	0.43	4	9496 (1687)	7221 (1750)	72067 (14127)	41892 (8277)	21678 (4168)	17009 (4220)	130516 (25616)	129627 (26056)	0.0415.**	0.0961*	0.1431	0.0271**
FC+D+G+P	0.43	1	3925 (3374)	2825 (3500)	38300 (28255)	8800 (16554)	8288 (8336)	5956 (8441)	66995 (51232)	32458 (52112)	-	-	-	-
FC+D+H	0.8	1	13005 (3374)	11205 (3500)	98750 (28255)	57320 (16554)	28107 (8336)	23888 (8441)	173395 (51232)	163900 (52112)	-	-	-	-
Overall FS			P value Significance - Existing vs Improved								0.0014***	0.0054***	0.0091***	0.0011***
CD [P = 0.05]	FS1 Vs FS2		710	817	6277	7734	52334	37402	10749	734355				
CD [P = 0.05]	FS1 Vs FS3		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS1 Vs FS4		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS1 Vs FS5		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS2 Vs FS3		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS2 Vs FS4		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS2 Vs FS5		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS3 Vs FS4		1419	1419	12555	15468	104668	74804	21499	1468710				
CD [P = 0.05]	FS3 Vs FS5		1419	1419	12555	15468	104668	74804	21499	1468710				
CD [P = 0.05]	FS4 Vs FS5		1419	1419	12555	15468	104668	74804	21499	1468710				

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Farming system	Area (ha)	No. of households	Existing System				Improved 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)
Pathinamthitta (Kerala)														
FC+horticulture+D	1.3	11	35546 (5738)	33510 (5779)	142597 (19078)	141773 (36539)	97025 (8181)	89458 (9004)	359356 (23457)	416843 (53140)	0.0006***	0.0009***	0.0005***	0.0014***
FC+horticulture+D+P	0.96	1	22986 (19031)	21019 (19167)	86060 (63274)	97832 (121189)	57890 (27136)	54499 (29864)	228083 (77798)	235044 (176245)	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0004***	0.0006***	0.0003***	0.0009***
CD [P = 0.05]	FS1 Vs FS2		19877	20020	66088	126578	28343	31193	81258	184082				
Mehsana (Gujarat)														
FC+D	1.13	12	6255 (1047)	2882 (855)	69287 (29583)	193408 (20705)	12654 (1439)	8478 (1298)	247670 (37238)	283802 (38843)	0.0035***	0.0068***	0.0030***	0.0427**
Overall FS			**P value Significance - Existing vs Improved**								0.0011***	0.0014***	0.0007***	0.0309**
Panchmahal (Gujarat)														
FC+D+P+G	1.04	6	10214 (409)	5488 (471)	55886 (3624)	87120 (4465)	128599 (30214)	96439 (21593)	145747 (6206)	1654649 (423980)	0.0075***	0.0075***	0.0075***	0.0075***
FC+D+G	0.72	3	9486 (579)	5072 (667)	48620 (5125)	84196 (6314)	153675 (42730)	92427 (30538)	137767 (8776)	2013689 (599598)	0.0534*	0.0534*	0.0534*	0.0534*
FC+D+P	0.9	1	5320 (1003)	3496 (1155)	40300 (8877)	34180 (10937)	13599 (74011)	9583 (52894)	81681 (15201)	108707 (1038535)	-	-	-	-
FC+P	0.84	1	4245 (1003)	3109 (1155)	25860 (8877)	33580 (10937)	10439 (74011)	8381 (52894)	59708 (15201)	86446 (1038535)	-	-	-	-
FC+D	0.4	1	5775 (1003)	4500 (1155)	41600 (8877)	39250 (10937)	13460 (74011)	10942 (52894)	102221 (15201)	862251 (38535)	-	-	-	-
Overall FS			**P value Significance - Existing vs Improved**								0.0003***	0.0002***	0.0003***	0.0008***
CD [P = 0.05]	FS1 Vs FS2		710	817	6277	7734	52334	37402	10749	734355				
CD [P = 0.05]	FS1 Vs FS3		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS1 Vs FS4		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS1 Vs FS5		1084	1084	9589	11814	79941	57132	16420	1121746				
CD [P = 0.05]	FS2 Vs FS3		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS2 Vs FS4		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS2 Vs FS5		1159	1159	10251	12630	85461	61077	17554	1199197				
CD [P = 0.05]	FS3 Vs FS4		1419	1419	12555	15468	104668	74804	21499	1468710				
CD [P = 0.05]	FS3 Vs FS5		1419	1419	12555	15468	104668	74804	21499	1468710				
CD [P = 0.05]	FS4 Vs FS5		1419	1419	12555	15468	104668	74804	21499	1468710				

Note: FC: Field crops, D: Dairy, P: Poultry,G:Goat, F: Fish; * indicates significance at 10% level; ** indicates significance at 5% level; *** indicates significance at 1% level; - Values in ( ) indicates standard error of mean values; - The farming system with only one household was not considered for ANOVA as well as for paired t test.

crops + dairy + goat with 25 % households practicing with area of 1.13 ha. Interventions made in crop, livestock, processing and optional (nutritionalkitchen garden) modules resulted in significant improvement in marketable surplus and profit of all the systems. Among the systems, field crops + goat recorded the higher profit while field crops + dairy system recorded higher production.

Upper Gangetic plains

Kanpur Dehat (Uttar Pradesh): Two farming systems namely field crops and field crops + dairy were found among which 66 % households were having field crops alone with mean area of 1.18 ha. Interventions made in crops, livestock, processing and optional (nutritional kitchen garden) resulted in marginal improvement in production, marketable surplus and profit of all the systems. Among the farming systems, field crops + dairy recorded higher production while field crops alone system recorded higher profit.

Trans Gangetic plains

Sirsa (Haryana): All the households were having only one farming system of field crops + dairy (2-3 animals) with mean area of 0.85 ha. Interventions in crop, livestock, processing (ghee) and optional (kitchen garden) modules resulted in significant improvement in production (10%), marketable surplus (11 %), cost reduction (44 %) and profit (90 %) in the system.

Amritsar (Punjab): All the households were having only one farming system of field crops + dairy with mean area of 0.96 ha. Interventions in existing systems in different modules such as crop, livestock, processing and optional could not influence significantly on production, cost and profit.

Eastern plateau and hills

Kabirdham (Chhatisgarh): Five farming systems namely field crops, field crops + dairy, field crops + dairy + poultry + goat, field crops + dairy + poultry + fisheries + horticulture and field crops + dairy + goat were found among which 58% households were having field crops + dairy with mean area of 1.17 ha area. Interventions in crop, livestock, processing (pulse dal, besan and ghee) and optional (nutritional kitchen garden) resulted in significantly higher production, marketable surplus and profit in all the systems. Among the farming systems, field crops + dairy + poultry + fisheries + horticulture recorded higher profit of Rs 2,14,055 from 0.80 ha.

Dindori (Madhya Pradesh): Three farming systems namely field crops + dairy, field crops + dairy + goat and field crops + dairy + poultry were found among which 75 % households were having field crops + dairy system with mean area of 1.25 ha. Interventions made in crop and livestock module resulted in significant increase in marketable surplus of all the systems. Among the farming systems, field crops + dairy + poultry system recorded higher profit.

Angul (Odisha): Two farming systems namely field crops + dairy and field crops + dairy + poultry were found among which one third households were having field crops + dairy + poultry and remaining with field crops + dairy with mean area of 1.22 and 1.18 ha respectively. Interventions made in crop, livestock, processing (ghee) and optional (fruits plantation, boundary plantation and fisheries) modules resulted in significantly higher production, marketable surplus, cost and profit in both the farming systems. Among the two farming systems interventions in field crops + dairy + poultry system resulted in higher production and profit.

Central Plateau and hills

Katni (Madhya Pradesh): Two farming systems namely field crops and field crops + dairy were found among which 83% households were having field crops + dairy system with mean area of 0.71 ha. Interventions made in crop and livestock module resulted in significant improvement in production in field crops + dairy system. Among the two systems, field crops + dairy gave higher production, marketable surplus and profit (Rs72, 992/- in 0.71 ha) with additional cost of Rs6,451/- due to interventions.

Udaipur (Rajasthan): Three farming systems namely field crops + dairy, field crops + dairy + poultry and field crops + dairy + goat were found among which 75% households were having field crops + dairy + goat system. Interventions made in crop, livestock, processing (vermicompost) and optional (fruits and boundary plantations) resulted in significant improvement in profit (Rs75,553/- in 0.80 ha) of field crops + dairy + goat. Among the systems, field crops + dairy + poultry was found to be more profitable (Rs 1,13,557 from 0.60 ha).

Western Plateau and hills

Aurangabad (Maharashtra): Two farming systems namely field crops + dairy and field crops + dairy + goat were found among which 75% households were having field crops + dairy systems with mean area of 0.64 ha. The other system was present in 25 % households with mean area of 1.01 ha. Interventions made in crop, livestock and processing (sugarcane juice and ghee) resulted in significant improvement in production, marketable surplus and profit in field crops system. Among the systems, field crops + dairy was found to be highly profitable (Rs 1,82,135 from 0.64 ha).

Pune (Maharashtra): Three farming systems namely field crops + dairy + poultry, field crops + dairy + horticulture + poultry and field crops + dairy + horticulture were found among which 50% households were having field crops + dairy + horticulture + poultry systems with mean area of 0.70 ha. The interventions made in crop, livestock, processing and optional module (nutritional kitchen garden) resulted in significantly higher production (94 %) and marketable surplus (96 %) in field crops + dairy + horticulture + poultry system. The cost of interventions also increased significantly. Among the systems, higher profit was observed in field crops + dairy + poultry system.

Amravati (Maharashtra): Four farming systems namely field crops + dairy, field crops + dairy + goat, field crops + dairy + poultry and field crops + goat were found among which 66 % households were practicing field crops + dairy system with mean area of 1.08 ha. Interventions made in crop, livestock, processing (fortified wheat atta and mineral mixture) and optional (nutritional plantation) resulted in significant improvement in production, marketable surplus and profit. Among the systems, higher production, marketable surplus and profit were observed in field crops + dairy + poultry system.

Southern Plateau and hills

Warangal (Telangana): Four farming systems namely field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry and field crops + dairy + poultry were found among which 41 % households were having field crops + dairy with mean area of 1.32 ha. Interventions made in crop, livestock, processing (ghee) and optional (nutritional kitchen garden and azolla) resulted in significant improvement in production and marketable surplus of all the systems. Among the systems, field crops + dairy, goat + poultry recorded higher production and profit compared to other systems due to interventions.

Kolar (Karnataka): Four farming systems namely field crops + dairy, field crops + dairy + goat, field crops + dairy + goat + poultry and field crops + dairy + poultry were found among which 58 % households were having field crops + dairy system with mean area of 0.88 ha. Interventions made in crop and livestock module resulted in improvement in production, marketable surplus and profit of all the systems. Among the farming systems, field crops + dairy + goat + poultry was found to be more profitable.

Gadag (Karnataka): All the households were having field crops + dairy system with mean area of 1.30 ha. Interventions made in crop, livestock, processing (butter, vermicompost) and optional (nutritional kitchen garden) resulted in significantly higher production, marketable surplus and profit (1.05 times) in the system.

Dharmapuri and Krishnagiri (Tamil Nadu): Two farming systems namely field crops + dairy and field crops + dairy + goat was found among which

83 % households were practicing field crops + dairy system with mean area of 1.02 ha. Interventions made in crop and livestock module resulted in significant improvement in marketable surplus of field crops + dairy + goat system. Among the two systems, higher production (45370 kg) and profit (Rs 2, 87,668) was observed in field crops + dairy+goat in 1.36 ha.

East coast plains and hills

Srikakulam (Andhra Pradesh): Seven farming systems namely field crops, field crop + dairy + goat, field crops + dairy + goat + poultry, field crops + goat, field crops + dairy, field crops + dairy + poultry and field crops + poultry were found among which field crops, field crops + dairy, field crops + poultry and field crops + dairy were found predominant. Interventions made in crop, livestock and optional (azolla) modules resulted in significant improvement in production and marketable surplus of all the systems. Among the various farming systems, after interventions, the production (32075 kg), marketable surplus (10506 kg) and profit (Rs 3,21,970) was higher in field crops + dairy + goat + poultry system with the total cost of Rs 62,932/- in 0.52 ha.

Kendrapara (Odisha): Six farming systems namely field crops + dairy, field crops + dairy + poultry, field crops + dairy + goat + fishery, field crops + dairy + goat+ poultry, field crops + dairy + poultry + fish, field crops + dairy + goat + poultry + fish were found among which 25% households were having field crops + dairy + goat + poultry + fish with mean area of 1 ha. Interventions made in crop, livestock, processing and optional (nutritional kitchen garden mushroom and fishery) modules resulted in significant improvement in production, marketable surplus and profit in all the systems. Among the different farming systems, higher production, marketable surplus and profit was observed in field crops + dairy + goat + fish system. The least cost was found to be in field crops + dairy + goat + poultry + fishery.

Sivagangaiand Pudukottai (Tamil Nadu): All the households were having the field crops + dairy system with mean area of 1.05 ha. Interventions in crop, livestock, processing and optional modules resulted in significant improvement in production, marketable surplus and profit.

West Coast Plains and ghats

Palghar (Maharashtra): Five farming systems namely field crops, field crops + dairy, field crops + dairy + poultry, field crops + dairy + goat + poultry and field crops + dairy + horticulture were found. Interventions in crop, livestock and optional (nutritional kitchen garden) modules resulted in significant improvement in production marketable surplus and profit. Among the systems field crops + dairy + horticulture resulted in higher production and profit.

Pathinamthitta (Kerala): Two farming systems namely field crops + horticulture + dairy and field crops + horticulture + dairy + poultry were found among which 92 % households were having field crops + horticulture + dairy system with mean area of 1.30 ha. The interventions made in crop, livestock, processing (curing of garcinia, coconut oil, dry mace, graded pepper and packed milk after filtration) and optional (fisheries, terrace gardening, apiary and vermicompost) in field crops + horticulture + dairy system resulted in higher production, marketable surplus and profit . Among the two farming systems, higher production, marketable surplus and profit were observed in field crops + horticulture + dairy due to interventions.

Gujarat plains and hills

Mehsana (Gujarat): All the households were having field crops + dairy farming system with mean area of 1.13 ha. Interventions made in crop and livestock modules resulted in significant improvement in production (102 %), marketable surplus (2 times) and profit (47 %) in field crops + dairy system.

Panchmahal (Gujarat): Five farming systems namely field crops + dairy, field crops + poultry, field crops + dairy + poultry, field crops + dairy + goat and field crops + dairy + poultry + goat were

found among which field crops + dairy + poultry + goat were present in 50 % of households having mean area of 1.04 ha. Interventions made in crop, livestock, processing and optional (nutritional kitchen garden, fruit, boundary plantations and utilization of stubbles of fodder crop) resulted in higher production, marketable surplus and profit from all the systems. Among the different farming systems, higher production (15367 kg), marketable surplus (9242 kg), and profit (Rs 2,01,368) was observed in field crops + dairy + goat system in 0.72 ha due to interventions.

The results across the locations are summarized as below:

- The number of farming systems in different districts ranged between 1 (Samba, Sirsa, Amritsar, Sivagangai & Pudukottaiand Gadag) to 7 (Srikakulam). Panchmahal, Palghar and Kabirdham districts were having 5 farming systems while Kendraparahas 6 systems.
- Field crops + dairy was found to be the dominant farming system based on number of households in 18 districts (64 % of total districts studied).
- Highly diversified system was observed in Srikakulam district of Andhra Prades, South 24 Paragnas in West Bengal, Panchmahal district of Gujarat having many components of farming system namely field crop, dairy, goat, poultry, fish in different combinations ranging from 1 to 5. Horticulture component was found to be contributing for better income in Pune, Pathinamthitta and Palghar districts.
- In general, at all the locations, constraint based interventions in crop, livestock, processing and optional modules resulted in improvement in production (1.5 times), marketable surplus (2 times) and profit (2 times).

Crop module under farming system diversification

Poultry module under IFS

7.4.4 FRONTLINE DEMONSTRATION ON CROPPING SYSTEMS INVOLVING OILSEEDS AND TRAINING OF EXTENSION OFFICIALS AND INPUT DEALERS

The results of the FLD's conducted in farmer'sfield's by OFR units of AICRP on IFS during 2015-16 are given below.

Objective: To demonstrate the productionpotential and monetary advantages of well identifiedcropping and inter cropping systems under realfarm situation involving oilseed as one of thecomponent crops in various agro ecosystems.

Technical Programme: The FLD's were conducted at 10 OFR units of All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) in five agro ecosystems *viz.,* Arid, Semi-Arid, Sub Humid, Humid and Coastal; covering 10 states. Crops/cropping systems in which FLDs were conducted are given in Table7.4.6.In Arid ecosystem, at Jagudan (Gujarat) centre38 and at Gadag (Karnataka) centre 12 demonstrations were conducted. Under Semi-Arid ecosystem, 10and 22 demonstrations were conducted by Amritsar (Punjab) and Seethampeta (Andhra Pradesh) centres, respectively. For Sub humid agro-ecosystem, 12, 6 and 8 demonstrations were conducted by Fathepur (Rajasthan), Kangra (Himachal Pradesh) and Angul (Odisha) centres, respectively. Under Humid ecosystem in Kamrup (Assam) centre 5 and in coastal ecosystem Thiruvalla (Kerala) centre 10 demonstrations were conducted. In all 125 demonstrations were conducted during 2015-16.Major cropping systems in which oilseed crops were tested are hybrid castor, hybrid castor without sunhump in farmers practice and with sunhump in improved practice, hybrid castor+ lucerne, groundnut + hybrid castor (2:1) and Maize – Sunflower in arid ecosystem, gobhi sarson, sunflower, groundnut and sesame in Semi-Arid, groundnut-mustard, maize-gobhi sarson and groundnutin Sub Humid, toria in Humid and sesame in Coastal ecosystems. Total39 demonstrations were on systems involving groundnut followed by 38 demonstrations systems with hybrid caster. The systems involving sunflower

Table 7.4.4(a). List of centres of Front Line Demonstrations (FLD) on oilseed based cropping systems (2015-16)

Agro Ecosystem	Name of Centre (State)	Crop/cropping system (s)	Number of demonstrations
1. Arid	Jagudan (Gujarat)	Hybrid (Hy.) castor	15
		Hy. castor without sunhump in Fm& with sunhump in IP	4
		Hy. Castor+ lucerne	8
		Groundnut + Hy. castor (2:1)	7
		Hy.Bt. cotton + Hy. castor (1:1)	4
	Gadag (Karnataka)	Maize - Sunflower	12
2. Semi-Arid	Amritsar (Punjab)	Gobhisarson	12
	Seethampeta (Andhra Pradesh)	Sunflower(S)	10
		Sesame Rabi	
		Groundnut (K)	12
3. Sub humid	Fathepur (Rajasthan)	Groundnut-Mustard	12
	Kangra (Himachal Pradesh)	Maize-Gobhi sarson	6
	Angul (Odisha)	Groundnut	8
4. Humid	Kamrup (Assam)	Toria	5
5.Coastal	Thiruvalla (Kerala)	Sesame	10
Total			125

was undertaken in 22demonstrations while gobhi sarson and mustard crops were taken in 18 and 12 demonstrations, respectively. There were only two treatments taken for comparison, i.e. farmers practice (FP) and improved practice (IP). These treatments were applied on a time tested; well recognized oilseed based cropping systems of the location.

Financial source: FLDs on oilseed basedcropping systems were 100% financed by Department of Agriculture and Cooperation,Ministry of Agriculture, Government of India throughICAR-Indian Institute of Oilseeds Research, Hyderabad.During 2015-16, an amount of Rs 2,35,000/- has been released to the different centres.Further Rs 1,44,000/- was released to centres for organizing 4 training programmes.

Salient findings

Out of 125 demonstrations on oilseed basedcropping systems, 39 demonstrations were on systems involving groundnut followed by 38 demonstrations systems with hybrid caster. In total 22 demonstrations were undertaken on cropping systems involving sunflower while 18 and 12 demonstrations were done involving gobhi sarson and mustard crops, respectively. For sesame, sumhemp and toria crops 10, 4 and 5 demonstrations were conducted respectively for each.

Yield

The influence of different improved crop production practices on the yield of different crops was presented in Table 4. At Jagudan (Gujarat), 136.54% increase in hybrid caster yield was seen due to improved practice over farmer's practice. In groundnut + hybrid castor intercropping system, 63.71% enhancement in the yield was noted under the improved practice. Likewise in Gadag, 36.30% improvement in sunflower yield was seen due to maintenance of row to row distance of 20 cm as improved practice in maize-sunflower cropping system.At Amritsar (Punjab), 19.25% increase in gobhi sarson yield was recorded by maintaining 45 x 10 spacing by thinning as improved practice.With the introduction of improved variety K-6 25.28% improvement in the yield of ground nut was recorded at Seethampeta (Andhra Pradesh).In groundnut-mustard cropping system at Fathepur (Rajasthan), 24.11% and 27.11% increase in the yield of groundnut and mustard was seen owing to the improved practice over the farmers practice. Enhancement in yields of maize and gobhi-sarson (85.34% and 88.26%, respectively) at Kangra (Himachal Pradesh) was found due to improved management practice. For gobhi-sarson this increase was due to the replacement of Kanchan with the new improved variety HPN-3.Likewise, in Thiruvalla also replacement of Kayamkulam-1 with HYV Tilak produced 32.06% higher yield over the farmers adopted variety (Kayamkulam-1).

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. During 2015-16, total 38 demonstrations involving Hybrid castor were conducted at Jagudan centre with the following results:

1. The mean data of 4 demonstrations revealed that green manuring with sunhamp in hybrid castor gave 38.13 and 66.78% higher gross and net returns than only sole castor crop.

2. The mean data of 8demonstrations involving hybrid caster and lucerne intercropping revealed 29.38 and 79.82% higher gross and net returns over sole crop of hybrid caster in farmer's practice.

3. The mean data of 7 demonstrations revealed that groundnut + Hybrid castor intercropping gave 63.68 and 91.06% higher gross and net returns than sole crop of hybrid caster in the farmers practice.

At Amritsar (Punjab), higher gross and net returns of 19.25 and 26.42% respectively, were found in gobhi sarson with maintaining 45 x 10 spacing by thinning.At Fathepur (Rajasthan) in groundnut-mustard cropping system, replacement

Table 7.4.4(b). Influence of farmers and improved practices on grain or pod yield (kg/ha) of various crops under FLD (2015-16)

Agro Eco system / Centre	Cropping system		No. of demonstrations	Farmers Practice (FP)		Improved Practice (IP)		% increase over FP	
	Kharif	*Rabi*		*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
1.Arid									
Jagudan (Gujarat)	Hy. castor		15	2173		5140		136.54	
	Hy. Castor without sun hump in Fm & with sunhump in IP		4	1571		2170		38.13	
	Hy. Castor+ lucern		8	2173		3509		61.48	
	Groundnut + Hy. castor		7	2790		4568		63.71	
	Hy. Bt. cotton + Hy. castor		4	2538		3935		55.03	
Gadag	Maize	Sunflower	12		1138		1550		36.30
2. Semi Arid									
Amritsar (Punjab)		Gobhisarson	12		1268		1513		19.25
Seethampeta	Sesame Rabi	Sunflower(S)	10	325	345	474	524	45.85	51.88
(Andhra Pradesh)	Groundnut		12	898		1125		25.28	
3. Sub Humid									
Fathepur (Rajasthan)	Groundnut	Mustard	12	2480	1289	3078	1638	24.11	27.11
Kangra (Himachal Pradesh)	Maize	Gobhi-sarson	6	1882	603	3488	1136	85.34	88.26
Angul (Odisha)	-	Groundnut	8		1799		2450		36.21
4. Humid									
Kmrup (Assam)	Rice	Toria	5	-	-	-	866	-	-
5. Coastal									
Thiruvalla (Kerala)	Rice	Sesame	10		407		538		32.06

of local varieties of groundnut and mustard with improved groundnut variety (HNG-10) and mustard variety (Laxmi) has resulted in 102.68% increase in gross returns and 97.80% increase in net returns. Likewise at Angul (Odisha), 36.21% increase in gross and 73.29% increase in net

Table 7.4.4(c). Influence of farmers and improved practices on gross returns (Rs/ha) of various crops under FLD (2015-16)

Agro Eco system / Centre	Cropping system		No. of demonstrations	Farmers Practice (FP)		Improved Practice (IP)		% increase over FP	
	Kharif	*Rabi*		*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
1.Arid									
Jagudan (Gujarat)	Hy.castor		15	67348		159325		136.57	
	Hy.Castor without sunhump in Fm & with sun hump in IP		4	48701		67270		38.13	
	Hy. Castor + lucern		8	67348		87132		29.38	
	Groundnut + Hy. castor		7	139507		228339		63.68	
	Hy.Bt. cotton + Hy. castor		4	114210		177150		55.11	
Gadag	Maize	Sunflower	12		45479		57365		26.14
2. Semi Arid									
Amritsar (Punjab)		Gobhi sarson	12		40587		48400		19.25
Seethampeta (Andhra Pradesh)	Sesame Rabi	Sunflower(S)	10	25881	13800	35800	22100	38.33	60.14
	Groundnut		12	44348		55559		25.28	
3. Sub Humid									
Fathepur (Rajasthan)	Groundnut	Mustard	12	48944	62244	99200	123120	102.68	97.80
Kangra (Himachal Pradesh)	Maize	Gobhi-sarson	6	-	-	-	-	-	-
Angul (Odisha)	-	Groundnut	8		89938		122500		36.21
4. Humid									
Kmrup (Assam)	Rice	Toria	5	-	-	-	-	-	-
5. Coastal									
Thiruvalla (Kerala)	Rice	Sesame	10		81420		107520		32.06

returns of groundnut (variety ICGS 91114) were observed by maintaining 30 x 10 cm spacing. Gross returns of 107520 Rs/ha and net returns of 43007 Rs/ha were realized due to replacement of sesame variety Kayamkulam-1 with the variety HYV Tilak at Thiruvalla (Kerala).

Table 7.4.4(d). Influence of farmers and improved practices on net returns (Rs/ha) of various crops under FLD (2015-16)

Agro Eco system / Centre	Cropping system		No. of demonstrations	Farmers Practice (FP)		Improved Practice (IP)		% increase over FP	
	Kharif	*Rabi*		*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
1. Arid									
Jagudan (Gujarat)	Hy.castor		15	32724		77365		136.42	
	Hy. Castor without sun hump in Fm & with sun hump in IP		4	15221		25386		66.78	
	Hy. Castor + lucern		8	32724		58843		79.82	
	Groundnut + Hy. castor		7	89646		171281		91.06	
	Hy.Bt. cotton + Hy. castor		4	73382		113741		55.00	
Gadag	Maize	Sunflower	12		24406		31499		29.06
2. Semi Arid									
Amritsar (Punjab)		Gobhi sarson	12		7852		16665		118.76
Seethampeta (Andhra Pradesh)	Sesame Rabi	Sunflower(S)	10	20634	10825	29680	18113	43.84	67.33
	Groundnut		12	27338		36159		32.27	
3. Sub Humid									
Fathepur (Rajasthan)	Groundnut	Mustard	12	30444	42644	66600	87800	118.76	105.89
Kangra (Himachal Pradesh)	Maize	Gobhi-sarson	6	-	-	-	-	-	-
Angul (Odisha)	-	Groundnut	8		32512		56341		73.29
4. Humid									
Kmrup (Assam)	Rice	Toria	5	-	-	-	-	-	-
5. Coastal									
Thiruvalla (Kerala)	Rice	Sesame	10		18611		43007		131.08

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.

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.	Crop	Location (ecosystem)	Improved Package	Increase in yield (%)	Increase in net returns (%)
1.	Mustard	Fathepur (Sub humid)	Variety Laxmi + 60:40:0 kg NPK/ha	27	105
2.	Hybrid Castor	Jagudan (Arid)	Lucerne as intercrop	61	79
			Green manuring with sunhemp	38	66
			Improved variety	136	136
			Hybrid cotton + Hybrid Castor (1:1)	55	55
			Groundnut + Hybrid castor (2:1)	63	91
3.	Sesame	Seethempeta (Semi Arid)	YLM-66 variety	45	43
		Thiruvalla (Coastal)	High yielding variety Tilak	32	131
4.	Sunflower	Gadag (Arid)	Line sowing, thinning to maintain 20 cm plant to plant sowing	36	29
		Seethempeta (Semi Arid)	Improved Hybrid	51	67
5.	Gobhisarson	Amritsar (Semi Arid)	Spacing: 45 X 10 cm through thinning	19	118
		Kangra (Sub humid)	Improved variety HPN-3	88	-
6.	Groundnut	Seethempeta (Semi Arid)	Variety K6	25	32
		Fathepur (Sub humid)	Variety HNG10 + 45X15 cm + 30:60:0 kg NPK/ha	24	118
		Angul (Sub humid)	Improved variety ICGS 91114 with spacing 30 X 10 cm + 20:40:40 kg NPK/ha	36	73

Sl. No.	Location (State)	Title of training	Date (s)	Number of participants		
				Extension officials	Input dealers	Total
1.	Kamrup (Assam)	Scientific Production Technology of Oil Seed Crop in Rice–Toria Cropping System under rainfed condition in Assam	28-29 February 2016	14	6	20
2.	Srikakulam (Andhra Pradesh)	New technologies and developments in oilseeds cultivation	12-13 January 2016	20	-	20
3.	Amritsar (Punjab)	Recent advancements in oilseeds cultivation	21-22, March, 2016	16	4	20
4.	Modipuram (Uttar Pradesh)	Oilseeds for farming systems	29-30, March 2016	26*	1	27
	Total			**76**	**11**	**87**

*includes 11 technocrats from the institute

Glimpses of FLDs and trainings

Srikakulam (Andhra Pradesh)


Sunflower Front Line Demonstrations (Seethampeta OFR center, AP)


Groundnut and Sesame Front Line Demonstrations (Seethampeta OFR center, AP)

Trainings Multipurpose Extension officers(MPEO's)

Kamrup (Assam)

Toria demonstration

Angul (Odisha)

Groundnut demonstration

Thiruvalla (Kerala)

Seasum demonstration

Trainings organized

Kamrup (Assam)

Modipuram (Uttar Pradesh)

Amritsar (Punjab)

8. GENERAL/MISCELLANEOUS

8.1 List of Publications

8.2 Group Meetings/Workshops Organised

8.3 Radio and Television Talks Delivered by Project Staff

8. GENERAL/MISCELLANEOUS

8.1 LIST OF PUBLICATIONS

8.1.1 Research Papers

IGKVV Raipur

Chitale, S and Pandey, N. 2014. Effect of system of rice intensification and integrated crop management in terms of water use efficiency and productivity of rice (Oryza sativa L.) under different water management practices. Journal of Agricultural Issues 19 (1):33-37

NAU, Navsari

Kaneriya, U.J., Desai, L.J. And Mansuri, R.N.2015. Increasing productivity and nutrient uptake of chickpea *(Cicer arietinum* l) through integrated weed management, *Multilogic in Science*, (V) XIII :68-73.

Chaudhary J. H., Ramdev, Sutaliya and Desai L. J 2015. Growth, yield, yield attributes and economics of summer groundnut (*Arachis hypogaea* L.) as influenced by integrated nutrient management. *Journal of Applied and Natural Science,* 7 (1) : 369–372.

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Sandhi S.J., Patel J.G., Mansuri R.N. and Desai L.J. 2015. Economics, yield, quality & nutrient content as well as uptake of sunflower as influenced by spacing,inorganic fertilizer & biofertilizer, *Green farming* 6(2): 294-297

Desai L.J., Thanki, J.D. Pankhaniya R.M. and Dungarani R.A. *2015.* Evaluation of Organic Farming Package for Rice - Groundnut Crop Sequence, *Indian Journal of Ecology*, 42(1):153-156.

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Desai L.J., Thanki J.D. and Dungarani R.A. 2014. Studies on rice (*oryza sativa L*) based cropping system under south Gujarat condition. *Bioinfolet*. 11(2C): 658-662.

JNKVV, Jabalpur

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Dubey, Megha, Agrawal K.K., Vishawakarma S.K. and Gangwar Suchi 2014. Effect of nutrient management and cropping system on growth, yield attributes and soil microbial population under different rice based cropping systems in Madhya Pradesh. JNKVV, Res. J. 47: (2): 145-148

PJTSAU, Rajendranagar

Sridevi. S and Venkata Ramana. M 2014 Productivity, soil fertility and sustainability of continuous rice system under long-term substitution of nitrogen through organics. Research on Crops 15(1): 22-27.

Sridevi.S., and Venkata Ramana. M. 2014. Evaluation of different integrated management practices as carbon sequestration strategies in an Inceptisol. Progressive Research 9 (2): 725-728.

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Gouse Mohioddin, Venkata Ramana M, Sridevi S. and Reddy A.P.K. 2014. Influence of Integrated Nitrogen Management on yield components and yield of scented rice. Progressive Research – An International Journal 9(1): 31-33.

Suresh K, Praveen Rao V, Srinivas A, Siva Sankar A and Govardhan V 2015 Studies On Supplemental Irrigation Through Drip System In Pigeonpea. Annals of Plant and Soil Research 17 (Special Issue): 401-403

TNAU, Coimbatore(T.N.)

Gnanasoundari, P and E. Somasundaram. 2014. Non-Chemical weed management in organic rice. African Journal of Agricultural Research, 9(26) pp. 2077 - 2084.

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DBSKV, Dapoli, Karjat

Chavan L.S., Jondhale D.G., Dalvi A.S. and More S.S. Long term effect of integrated nutrient management in cereal-based cropping system in North Konkan Coastal zone of Maharashtra, paper presented in International Rice Symposium- IRS 2015, Nov., 18-20, DRR, Hyderabad.

KAU, Karamana

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UAHS, Kathalgere

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MAU, Parbhani

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IGKVV, Raipur

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GBPUAT, Pantnagar

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BHU, Varanasi

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8.1.2 Paper presented in seminar/symposia

NAU, Navsari

Desai, L.J. Thanki J.D. and Dungarani, R.A. 2014. Development of organic farming package for high value crop sequence (*Kharif* paddy- summer groundnut). National seminar on Role of organic farming in climate resilient and sustainable farming organized by ASPEE college of Horticulture and Forestry, Navsari and Navsari Agricultural University Navsari on 9-10 January 2014. pp: 189 at Navsari.

Desai L.J., Thanki J.D. and R.A.Dungarani, 2014. Diversification of rice (*Oryza sativa* L.) based cropping system under south Gujarat condition. National Symposium on Agriculture Diversification, for Sustainable Livelihood and Environmental Security" at Punjab Agricultural University, Ludhiana from November 18–20, 2014

JNKVV, Jabalpur (M.P.)

Dixit B.K. and Vishwakarma S.K. 2014. Effect of Organic, Inorganic and Integrated Nutrient Management Practices on Productivity and soil health under Scented rice-potato cropping system. Paper presented in National conference on "Soil Health: A key to unlock and sustain production potential" is to be held from September 3 - 4, 2014 organised by Jabalpur chapter of Indian society of Soil Science, Department of Soil Science and Agriculture Chemistry, JNKVV, Jabalpur pp. 67

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Shukla, V.K.,Vishwakarma, S.K. Khamparia, N.K. Jha Girsh Heeresh Sharma and Akhilesh Kuril.(2015)."Studies on Comparitive efficiency of organic chemical and Integrated nutrient management practices on crop productivity and Soil health under various cropping system ". Poster Presented in National symposium on Organic Agriculture held on 26-27 Feb 2015 at agriculture collage and research Institute, Madurai pp.

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Sahu, R. P. and Sahu B. L. Appropriate management practices for getting higher yield attributes and yield of scented rice under the concept of SRI to mitigate the climate change. In National Seminar on "Weather and Climate Risks in Agriculture: Management and Mitigation" held on 12-13 March, 2015 at College of Agriculture, JNKVV, Tikamgarh (M.P.) pp. 88-89.

Sahu B. L., Suman Kumar and Sahu, R. P. Socio-economic upliftment of rural people through value addition in ber fruits of Bundelkhand region. In National Seminar on "Weather and Climate Risks in Agriculture: Management and Mitigation" held on 12-13 March, 2015 at College of Agriculture, JNKVV, Tikamgarh (M.P.) pp. 118.

OUA&T, Bhubaneswar (Orissa)

Mohapatra, B.K., Garnayak.L.M, Nanda, S.S.,.Patra, A.K., Swain, S.K., Mishra, K.N. and Satpathy. M.R., 2014. Productivity enhancement of rice (Oryza sativa)-groundnut (Arachis hypogaea) system through agronomic management practices. Pages 69-70. In Extended Summaries.National Symposium on "Management options for enhancing farm productivity and livelihood security under changing climate", Odisha Chapter, Indian Society of Agronomy, held at OUAT, Bhubaneswar from 29-31, October, 2014.

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Kar, M. and Garnayak.L.M,, 2015. Integrated farming systems for improving profitability and livelihood of small and marginal holders in Odisha. Abstract. XII Agricultural Science Congress on 'Sustainable Livelihood Security of Smallholder Farmers' held during 2-6 February, 2015 at NDRI, Karnal, Haryana.

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DBSKV, Karjat

Jondhale D.G., Chavan L.S., More S.S., Mhatre S.J., Dalvi A.S. and. Sawant V.P. Alternative cropping systems for North Konkan Coastal zone of Maharashtra, paper presented in International Rice Symposium- IRS 2015, Nov., 18-20, DRR, Hyderabad.

8.1.3 Popular Articles

BAU, Sabour

Gupta, Sanjeev Kumar, Haque M., Kumar, Sunil, Ghosh, Mainak and Sushant. 2014. Garma mausam mei chara faslo ki unnat kheti. *Krashak Sandesh BAU, Sabour, Bihar* 4(2) : 21-22.

Pathak, S. K., Sushant, Kumar, Sanjay and Chaudhary, A.R. 2015. : Ropani

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IGKVV, Raipur (Chatisgarh)

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CSAUAT, Kanpur

Mayank Dubey, Naushad Khan, M.P.Yadav, Alok Yadav and U.S.Tiwari. "Laghu Awam Semant Bhumidharko ki Aajivika me Dairy Pasuo ki Mahati Bhumika"(Hindi)Krishk Bharti (Kharif Viseshank) at CSAUA&T, Kanpur. (2014), Pg no. 71-73.

Alok Yadav, Naushad Khan, M.P.Yadav, Mayank Dubey and U.S.Tiwari. "Akikrit Krishi Pranali me Falo Awam Sabjiyo ka Utpadan Tatha Mahatwa"(Hindi)Krishk Bharti (Kharif Viseshank) at CSAUA&T, Kanpur. (2014), Pg no. 71-73.

MAU, Parbhani

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Narkhede W. N., Khazi G. S. and Bende M. J.Importance of intercultural operations in sugarcane crop. (Shetibhati, March, 2015), pp 8-11

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Narkhede W. N., V. Sutar and S. Nayak Cultivation of summer green gram. (Krishidut, February, 2016) Vol-2, pp 48-49.

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IGKVV, Raipur

Pali, V., Chitale, S. and Savu, R.M. 2014. Beej ka Bhandaran: Samasya aur Samadhan. Chhattisgarh Kheti; an IGKVV publication 21(1): 20-22, January-march 2014.

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GBPUAT, Pantanagar

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8.1.4 Books/Book chapter

IGKVV, Raipur (Chatisgarh)

Sarawgi, S.K., Chitale, S., Tiwari, A. Shrivastava, G.K., Nanda, H.C. and Nair, S. 2014. Chhattisgarh In Enhancing Pulses Production: Technologies & Strategies Gangwar. B and Singh A.K.(Eds) New India Publishing Agency, New Delhi pp.79-122.

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8.2 GROUP MEETING/WORKSHOP ORGANIZED

AnnualGroup Meeting of ICAR-AICRP on Integrated Farming Systems organized at Assam Agricultural University, Jorhat

The group meeting of ICAR-AICRP on Integrated Farming Systems was organized during 16-18 December, 2015 at Assam Agricultural University, Jorhat (Assam) in which review of on-going research programmes of on-station and on-farm centres including Tribal Sub Plan, discussion on formulation of new experiments and special lectures on identified topics were undertaken.

The inaugural programme of the group meeting started with *SaraswathiVandana* performed by AAU staff. Dr. Ajit Baishya, Chief Agronomist welcomed the guests and delegates. He briefly informed that the cropping intensity in the region increased from 131 to 142 %. Dr G.N. Hazarika, Director of Research informed that contribution of university is immense in the region and farming system is native to these lands. Dr. K. M. Bujarbaruah, Vice Chancellor, AAU inaugurated the programme as chief guest. Dr. J.P. Singh, Director (Acting), ICAR-IIFSR gave brief history of ICAR-IIFSR. He appraised about the changed mandate of the institute, vision, mission and schemes, additional responsibilities and future functioning of different programmes of the institute. A brief note of the progress made by ICAR-IIFSR and AICRP on IFS during 2014-15 was also explained by him. Dr N.P. Singh, Director, ICAR-CCARI in his address, made it that carbon sequestration and microbial studies should be undertaken in farming system models being developed at various regions. The following publications brought out by the ICAR-IIFSR and AICRP on IFS centres were released by the Chief Guest.

Inauguration of the programme by lighting of lamp

Release of Annual report of the scheme

1. Annual Report, 2013-14 of AICRP on IFS
2. Long term Integrated Nutrient Management in cereal based cropping systems (B. Gangwar, Kamta Prasad, N. Ravisankar& JP Singh)
3. Farming Systems Research: Success Stories (Series 1) (N. Ravisankar, B. Gangwar, Kamta Prasad, Raghuveer Singh and Rajbir Singh)
4. Farmer perception on climate change and Integrated Farming System as adaptation measure towards changing climate (Mohd. Shamim, N. Ravisankar, B. Gangwar and Kamta Prasad)
5. CD on "TSP interventions in Bali Island" (AICRP on IFS centre, BCKV, Kalyani)

Dr KM Bujarbaruah, Vice Chancellor and Chief Guest, pointed out that systematic farming system research was initiated in 1975 at ICAR Research complex in Umiam (Meghalaya) and said that filing of data and information on machinery, parameters, weather and output filing needs to be created. He

Dr K.M Bujarbaruah, Vice Chancellor, AAU addresses during inaugural session

wished that at the end of delibrations, some useful recommendations will come which can be utilized in the development schemes. Dr N. Ravisankar, PF (CU) proposed the vote of thanks in the inaugural programme. The progress of research at main, sub and OFR centres were reviewed. The salient recommendations of the group meeting are given below.

Recommendations

On-station Research

- All the centres should ensure compliance of recommendations made in Technical Programme Review workshop held in 18-19 May 2015 at ICAR-IIFSR, Modipuram. Accordingly action needs to be taken to conclude the cropping system experiments and prepare the new experiments in farming systems perspective for discussion in the 32nd Biennial workshop.

- As per decision of technical programme review workshop, organic farming study to be continued at identified 8 centres only with modified technical programme. Formulation of study on weed management under organic condition to be made in consultation with DWR/ AICRP on WM.

- On-station centres should transfer the best treatments from concluded experiments to farmer's field through OFR programme of AICRP on IFS for farmer participatory evaluation. Publications/technical bulletins should also be broughtout from the concluded experiments.

- Responses / feedback of visiting farmers/stake holders to IFS models should be recorded and considered for improving the components of farming systems. Resource recycling flow chart should be prepared and presented by all centres.

- IFS models for different regions and resources should be synthesized using the standard methodology finalized during on-station regional workshops. In view of shortage of funds provided by council in the scheme, upscale the IFS models using Central Government schemes/other funding sources/state plan schemes/university extension programmes. It will be one of performance indicator for judging the centre.

- Preparation of bankable project on IFS for different regions is essential. Using the on-station & on-farm data, bankable project on IFS for each on-station IFS model should be prepared by Agricultural Economists in the scheme. Each scientist may be assigned the responsibility for 2-3 on-station/sub centres for preparation of bankable project.

- Farming Systems Characterization work is joint responsibility of main, sub and OFR centres. Agricultural Economists in the scheme should be made responsible for survey, analysis and preparation of report. Each Agricultural Economist may be assigned 2 states for farming systems characterization work.

- In the existing IFS model, carbon sequestration and greenhouse gas emissions estimation needs to be made by Soil Scientists in the project. To ensure uniform methodology, training for Soil Scientists be arranged at ICAR-IIFSR.

- IFS model for marginal farmer should be established by all sub centres. Initially keep low cost livestock components. Later on dairy and other infrastructure can be added provided additional funds are received from council.

On-Farm Research

- OFR farming systems data should be synthesized in terms of production (on equivalent basis), marketable surplus (on equivalent basis), total cost of the system, total net income, savings after meeting all house hold demand, resource recycling and its impact on saving of nutrients/water/market inputs. All the above parameters should be used for comparing the various farming systems in the district.

- Farming system wise resource recycling flow chart should be prepared by all OFR centres.

- Impact study of interventions made in OFR 2 & 3 experiments should be taken up during 2016-17. Clear recording of reasons for adoption/partial adoption/rejection of farming system interventions to be noted. Schedule for impact study to be prepared by ICAR-IIFSR and sent to all centres by May 2016.

- Under TSP, seed bank can be developed for better performing variety. Use of chemical fertilizers and pesticides should be avoided because tribal area comes under natural de-facto organic production systems.

Administrative

- Delegation of financial power equivalent to the HoD's/Principal Investigators (as per ICAR guidelines) of external funded projects should be given to Chief Agronomists/Agronomists/ Principal Investigators of the AICRP-IFS centres. This will facilitate for the round the year management of activities related to livestock, fisheries and other important components of the IFS model which requires timely attention.

- A separate meeting of identified centres for undertaking weed management in organic farming experiment along with Scientists from Directorate of Weed Research, Jabalpur and AICRP on Weed Management centres should be organized during April/May 2016 for formulating the technical programme.

- Each fund receiving university/institute should submit the scheme annual report containing the details of *staff, technical progress, collaborative studies under inter-institutional linkage, TSP activities, publication details, extension activities, financial statement including revenue generation, infrastructure development (NRC items), ATR on the discussion in the workshop/group meeting and ATR on monitoring visits.*Five hard copies of report and a soft copy (in editable mode to pcifs.iifsr@rediffmail.com) should be submitted to ICAR-IIFSR by 31 January.

- Best centre in each category (main, sub and OFR centres) may be identified based on overall performance including up-scaling of IFS models and additional contingencies along with certificate may be given in the Biennial workshops.

8.3 RADIO AND TELEVISION TALKS DELIVERED BY PROJECT STAFF

Centre/Date	Title of the talk	Name of Doordarshan/ Akaswani Kendra	Name of Staff
Rajendranagar			
1.10.2014	Advantages of Integrated Farming Systems	V6 Channel	Dr. M. Venkataramana
29.4.2015	Integrated Farming Systems	AIR, Hyderabad	Dr. S. Sridevi
1.5.2015	Integrated Farming Systems	TV5 Channel	Dr. S. Sridevi
Jabalpur			
20.10.2014	अलसी की उन्नत कृषि कार्यमाला। कार्यक्रम कृषि विश्वविद्यालय से खेतो तक		
12-03-14	ग्रीष्म कालीन मूंग व उडद की उन्नत कृषि कार्यमाला। कार्यक्रम कृषि विश्वविद्यालय से खेतो तक।		
Sabour			
07.08.2014	अरहर की खेती तथा मूंग एवं उरद की खेती	AIR, Bhagalpur	Dr. Sushant
08.08.2014	गन्ना की फसल की देखभाल एवं गन्ना की फसल के कीट एवं व्याधि नियंत्रण	AIR, Bhagalpur	Dr. S.K. Pathak
02.07 2015	खरीफ फसलों की खेती कैसे करें	AIR, Bhagalpur	Dr. R.P. Sharma
13.07.2015	वर्मीकम्पोस्ट बनाने की विधियां	AIR, Bhagalpur	Dr. Sushant
Ludhiana			
30.9.2014	*Kheti bhinta layee faslan di chon*	Doordarshan Kendra, Z Punjabi	
12.12.2014	Crop Diversification Options	AIR,Jalandhar	
6.1.2015	*Kanak di dekhbhal*	AIR,Jalandhar	
3.5.2015	Cultivation of Direct Seeded rice	AIR,Jalandhar	
Karjat			
21-01-15	Integrated Farming Systems for Konkan	AIR, Mumbai	Dr. L.S. Chavan
19-09-14	Harvesting, Threshing and Storage of Rice	AIR, Mumbai	Dr. L.S. Chavan
20-11-14	Interview : Sweet corn cultivation	AIR, Mumbai	Dr. A. S. Dalvi
01-07-14	*Bhat pik ropvatika vyasthapan*	Mumbai	Dr. L.S. Chavan
Coimbatore			
09.12.2014	Integrated Farming Systems for CDZ	Doordarshan (DD), Pothigai	

Contd..../-

Centre/Date	Title of the talk	Name of Doordarshan/ Akaswani Kendra	Name of Staff
5.12.2014	Certificate course on water management	Central University, Tiruvarur	
Sirruguppa			
1.8.2014	DSR in Paddy	Door Darshan Kendra, Gulbarga	
3.12.2014	Importance of hand pump in farm pond	Door Darshan Kendra, Banglore	
15.12.2014	Integrated Farminf system model for irrigated area of TBP	Door Darshan Kendra, Banglore	
12.3.2015	Research Contribution of ARS, Siruguppa	AIR, Raichur	
Parbhani			
11-02-14	Importance of intercultural operations in sugarcane crop	Radio	Dr. W.N. Narkhede
26-08-15	Cultivation techniques in Pre seasonal sugarcane crop	Radio	Dr. W.N. Narkhede
13-08-15	Integrated Nutrient Management in Various Cropping System	Radio	Dr. R.N. Khandare
29-06-15	Integrated Farming System – A need of Era	Mumbai Doordarshan	Dr. W.N. Narkhede
Ranchi			
02.07.2014	Taking care of maize crop after sowing-	TV Talk	Dr. R.P. Manjhi
05.07.2014	Management of pulse crops-	TV Talk	Dr. R.P. Manjhi
29.06.2014	Upland rice -	Radio	Dr. R.P. Manjhi
27.03.2015	Harvesting, threshing and storage of wheat-	Radio	Dr. R.P. Manjhi
Bichpuri			
	Integrated Nutrient Management in pearlmilet-wheat cropping system	Sea news channel, Agra	Dr. S.B. Singh and Dr Rahul Pundir
Kathalagere			
09-04-15	1. Low cost dry land production technology. 2. Management of flower dropping/ square dropping in Cotton. 3. Efficient use of irrigation water. 4. Precautionary measures in using Herbicides. 5. Integrated farming system	Bhadravathi, AIR	Dr. Kumara. O, Chief Agronomist
16.04.2015	1. Precautionary measures to be adopted by farmers before using Insecticides. 2. Insect pest management in Papaya crop	Bhadravathi, AIR	Mr. Vijay S. Danaraddi, Tech. Assistant

Contd..../-

Centre/Date	Title of the talk	Name of Doordarshan/ Akaswani Kendra	Name of Staff
29-06-14	Broadcast on IFS model	e TV Kannada	
Navsari			
25-06-15	Cultivation practices of Sorghum	Akashwani Daman	
Pantanagar			
19.3.2014	Chhote avam simant kisano ki aay badhane ke upay	Pantnagar Janwani	
25.3.2014	Chetaki avam jethi dhan ki kheti	Pantnagar Janwani	
17.4.2014	पर्वतीय क्षेत्रों में कालीन धनिये की खेती	Pantnagar Janwani	
21.4.2014	पर्वतीय क्षेत्रों में कालीन मिर्च की खेती	Pantnagar Janwani	
AAU Anand, Derol			
	Gahu ni Vignanik Kheti	Door Darshan	Sonani V.V.
16.12.2014	Gahu ni Vignanik Kheti	Akashwani Kendra, Godhra	Sonani V.V.
29-08.2014	Divelani Vignanik Kheti	Akashwani Kendra, Godhra	Sonani V.V.
23.8.2014	Soyabean ni Vignanik Kheti	Akashwani Kendra, Godhra	Hajari R.V.
18.12.2014	Siylu Pakomo piyat vayvastha	Akashwani Kendra, Godhra	Hajari R.V.
30.8.2014	Makai mo jivat vayvasthapan	Akashwani Kendra, Godhra	Patel S.D.

9. APPENDICES

APPENDIX I: INITIAL SOIL PARAMETERS FOR ON-STATION EXPERIMENTAL SITES DURING 2014-15

Name of CSR centre	Expernment no	PH	EC (m mhos/cm)	O.C. (% g^{-1} kg^{-1})	Available nutrient (kg/ha)		
					N	P	K
Rajendranagar	1(a)	7.72	0.27	0.51	210	32.0	288
	2(a)	8.5	0.24	0.54	-	34.0	224
Maruteru	1(a)	-	-	0.9	-	38.0	314
	2(a)	5.1	0.38	0.9	-	38.0	344
Rudrur	1(a)	6.68	0.55	0.46	-	39.6	305
	2(a)	7.99	0.36	0.56	-	17.5	304
	OF	7.3	0.48	0.46	-	41.0	425
Sabour	1(a)	7.5	0.13	0.63	213	23.6	226
	2(a)	7.4	0.23	0.46	246	23.6	155
	OF	8.1		0.50	153	26.9	122
Hisar	1(a)	7.8	0.21	0.46	170	12.7	292
Raipur	1(a)			0.49	248	18.6	262
Palampur	1(a)	5.6		0.99	293	63.1	11
	2(a)	5.5		0.60	667	21.9	221
	OF	5.7		0.80	505	35.5	186
Jammu	1(a)	8.4		0.55	216	23.0	119
	2(a)	7.1		0.62	456	13.8	154
	OF	8.1		0.51	210	14.7	114
Ranchi	1(a)	6.0		0.38	225	20.0	115
	2(a)	6.5		0.42	260	19.5	195
S.K.Nagar	1(a)			0.33	195	15.9	198
	OF			0.26	195	23.9	261
Junagarh	1(a)			0.68	190	9.5	140
Navsari	1(a)			0.59	194	18.2	153
	CA		0.59	256	21.4	160	219
	OF			0.56	176	16.5	197
Kathalagere	1(a)	6.1	0.20	0.60		22.0	211
Siruguppa	1(a)	8.2	0.38	0.65	177	19.3	341
	OF	8.1	0.34	0.59	221	18.1	364
Jabalpur	1(a)	7.7	0.48	0.68	266	9.2	448
	OF	7.5	0.50	0.64	210	8.8	NR
Powarkheda	1(a)	7.6	0.55	0.66	260	9.0	300
Rewa	1(a)	7.7	0.53	0.65	260	9.0	500
Indore	1(a)	7.5	0.45	0.34	150	8.0	480
Rahuri	1(a)	8.0	0.26	0.62	178	7.0	705
Karjat	1(a)	7.0	0.30	0.97	217	18.4	245
Bhubaneswar	1(a)	6.7	0.27	0.69	212	15.7	210
	CA	5.5	0.29	0.65	260	14.6	210
Chiplima	1(a)	6.1	0.41	0.58	315	16.0	185
	CA	6.8	0.11	0.45	273	10.4	100

Name of CSR centre	Expernment no	PH	EC (m mhos/cm)	O.C. (% g^{-1} kg^{-1})	Available nutrient (kg/ha)		
					N	P	K
Ludhiana	1(a)	7.8	0.40	0.38	242	47.5	101
	2(a)	8.2	0.32	0.31	143	11.2	140
	OF	7.5	0.20	0.39	179	22.3	180
Durgapura	1(a)	8.2	0.28	0.22	NR	38.1	190
	OF	8.1	0.18	0.21	NR	21.9	482
Coimbatore	1(a)			0.60	252	23.9	398
	OF			0.59	249	19.2	528
Kanpur	1(a)	8.1	0.18	0.45	NR	11.5	170
	2(a)	8.1	0.18	0.24	NR	10.4	186
	OF	8.0	0.16	0.40	NR	14.4	203
Faizabad	1(a)	7.3	0.11	0.51	142	18.0	355
	2(a)	8.8	0.50	0.37	102	13.8	113
	OF	8.2	0.40	0.46	127	17.4	NR
Varanasi	1(a)	NR	NR	NR	NR	NR	216
	2(a)	7.9	0.22	0.44	192	12.0	NR
Bichpuri	1(a)	NR	NR	NR	NR	NR	204
	2(a)	NR	NR	0.31	124	10.6	284
Pantnagar	1(a)	7.8	NR	NR	122	5.6	143
	2(a)	5.5	NR	0.60	NR	20.0	125
Kalyani	1(a)	7.2	0.65	0.65	123.2	11.9	81
	2(a)	7.4	0.59	0.92	110	12.1	93
	OF	7.1	0.46	0.62	129.8	11.9	NR

APPENDIX II A: WEATHER PARAMETERS (MONTHLY AVERAGES RAINFALL) AT DIFFERENT CROPPING SYSTEM CENTERS DURING 2014-15

Name of CSR centre	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Rajendranagar	108.0	184.1	60.6	69.2	10.6	0.0	0.0	0.0	41.6	117.5	13.8	160.0
Maruteru	194.0	176.0	203.0	119.6	19.8	7.0	0.0	0.0	0.0	35.4	25.0	316.2
Rudrur	101.0	145.7	40.6	0.0	19.0	5.6	0.0	0.0	48.2	52.0	45.0	147.0
Sabour	505.2	274.0	131.5	3.2	0.0	0.4	39.3	4.7	22.0	70.9	27.2	170.1
Raipur	525.4	212.7	232.9	58.8	0.0	0.0	9.4	2.2	19.3	51.4	13.4	271.6
SK Nagar	438.2	85.8	527.8	NR	NR	NR	NR	NR	NR	NR	NR	101.6
Junagadh	542.2	198.1	226.0	12.2	34.6	0.0	0.0	15.0	9.0	6.7	0.0	NR
Navsari	719.0	324.0	379.0	0.0	67.0	0.0	NR	NR	10.0	0.5	0.0	379.5
Hisar	73.1	34.2	81.5	21.3	0.0	9.0	15.4	12.2	121.1	91.1	0.0	161.0
Palampur	622.6	373.2	173.0	31.6	5.0	58.8	110.6	142.4	203.0	93.5	48.0	180.4
Jammu	98.0	258.7	512.4	18.5	8.0	0.0	42.2	116.5	221.6	120.6	18.7	NR
Ranchi	142.1	195.3	168.8	39.4	0.0	0.0	22.2	8.1	4.1	69.7	63.9	146.0
Kathalagere	162.4	238.9	155.7	197.7	5.3	8.2	0.0	0.0	0.0	4.3	49.4	229.2
Karmana	193.8	524.3	231.1	314.7	119.6	84.6	1.5	1.3	49.8	191.5	405.1	312.9
Jabalpur	350.1	239.3	96.3	58.4	0.0	77.0	3.6	29.0	94.1	43.2	4.0	99.5
Powarkheda	386.3	135.1	293.1	14.9	0.0	32.6	31.5	12.4	195.4	23.0	0.0	34.0
Rewa	273.2	109.8	98.4	161.0	Nil	21.0	57.4	21.6	53.4	15.4	1.6	96.6
Indore	375.6	155.6	174.2	31.4	0.0	12.8	60.6	0.0	8.8	4.4	0.0	273.5
Rahuri	65.2	21.0	19.8	21.8	95.6	0.0	1.2	42.4	76.4	7.2	11.0	18.4
Bhubneswar	291.9	428.7	276.9	163.1	0.0	0.0	21.5	184.0	25.2	44.7	30.2	72.3
Chiplima	296.1	787.5	433.9	27.1	4.0	0.0	118.3	4.2	3.3	0.0	27.3	NA
Parbhani	102.0	108.9	135.7	24.6	13.0	0.0	9.2	24.3	16.6	91.8	24.8	125.6
Akola	290.0	139.5	112.4	0.0	20.1	0.9	51.4	31.4	15.1	7.2	0.2	88.1
Karjat	1643.0	958.1	571.4	120.1	5.5	18.0	0.0	0.0	52.8	35.2	6.0	NR
Ludhiana	152.2	89.6	0.0	0.0	0.0	42.2	24.6	38.6	84.6	29.4	17.0	18.3

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Name of CSR centre	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Durgapura Jaipur	222.8	213.0	90.0	12.0	0.0	0.0	21.0	1.4	80.0	16.0	0.0	126.5
Coimbatore	41.2	75.8	90.4	352.1	3.4	16.3	0.0	0.0	3.7	62.7	195.8	46.9
Thanjavur	118.7	258.3	55.3	26.5	84.2	115.4	0.4	0.0	9.1	96.7	161.3	72.3
Kanpur	213.6	52.9	136.7	60.4	0.0	16.8	24.1	0.8	170.3	8.3	26.9	48.9
Varanasi	378.0	205.6	61.7	56.9	0.0	2.8	47.2	11.8	8.0	61.3	0.0	201.4
Bichpuri	110.9	141.2	85.0	5.2	0.0	0.0	45.0	0.0	120.2	41.8	28.4	51.8
Pantnagar	428.0	89.0	38.2	45.4	0.0	40.1	32.8	8.4	87.1	20.1	30.1	332.6
Kalyani	278.1	281.4	330.5	81.3	0.0	0.0	0.0	0.0	21.4	98.3	31.1	306.0
Faizabad	305.8	47.0	29.0	98.2	NR	19.1	39.1	49.5	6.7	52.6	4.0	NR
Jorhat	305.3	260.4	286.0	77.2	1.2	0.0	4.3	23.4	42.7	293.3	298.0	335.8
Siruguppa	26.0	112.5	115.0	39.0	5.0	18.0	0.0	0.0	0.0	0.0	0.0	60.0
Kota	230.5	500.1	51.0	0.0	0.0	6.0	16.8	2.0	15.8	0.0	0.0	7.5
Port Blair	696.5	281.6	276.4	653.3	183.0	13.4	189.9	0.0	15.5	163.9	368.8	409.5
Patna	151.4	472.4	184.0	33.0	0.0	0.2	14.3	0.0	24.5	5.0	0.0	62.7
Umiam	253.8	582.8	463.1	213.3	2.8	2.8	37.6	13.8	63.8	162.8	333	214

APPENDIX II B : MAXIMUM AND MINIMUM TEMPERATURE (^{0}C) (JULY 2014 TO JUNE 2015)

Name of CSR centre	Temperature (^{0}C)																							
	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		June	
	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
Rajendranagar	31.8	23.6	32.2	23.3	30.3	22.6	31.6	20.1	30.6	16.5	28.3	12.1	28.4	10.8	32.2	15.0	33.7	19.7	35.2	22.9	39.3	26.7	33.5	24.9
Maruteru	32.1	27.4	32.0	26.9	30.6	26.4	30.7	25.3	29.6	21.7	28.7	19.8	28.2	20.1	29.1	20.3	31.5	22.6	31.5	25.3	35.5	28.5	34.2	27.3
Rudrur	30.2	25.2	33.6	26.0	33.9	24.0	31.7	24.5	29.2	19.4	22.7	14.7	27.0	16.5	30.7	18.7	37.3	23.7	37.3	23.7	44.5	29.6	36.8	25.5
Sabour	32.6	25.2	32.5	26.4	32.5	23.8	32.2	20.3	29.0	14.4	21.5	9.1	20.6	8.8	26.5	11.4	30.6	16.3	32.5	19.4	36.1	24.2	35.0	25.8
Raipur	32.3	24.9	31.2	25.1	31	24.3	30.9	21.9	30.4	15.6	27.3	11.3	26.5	11.4	30.9	14.4	33.6	19.1	37.3	23.1	41.9	27.4	36	26
SK Nagar	28.8	21.0	33.2	25.5	26.8	18.9	35.6	25.3	32.9	20.1	27.6	11.8	30.3	10.0	31.4	11.5	33.9	15.9	39.4	22.9	33.5	24.5	39.3	27.2
Junagadh	32.3	24.2	31.4	23.2	31.7	22.9	35.6	20.3	34.0	17.7	30.4	11.2	29.2	10.2	33.8	13.7	36.1	18.4	40.4	21.9	40.3	25.5	NR	NR
Navsari	30.8	25.8	30.3	25.1	31.3	24.5	35.9	22.4	33.6	19.2	30.4	14.0	28.9	12..9	30.9	14.1	32.5	18.2	33.3	22.8	35.0	26.4	31.9	25.7
Hisar	42.0	23.4	38.9	24.1	36.7	20.5	37.4	14.0	30.9	5.7	28.6	1.1	21.4	0.8	26.9	4.0	35.4	5.4	40.0	14.6	43.9	18.9	43.0	22.1
Palampur	27.2	19.7	27.3	19.0	26.1	16.6	24.3	13.0	21.5	8.3	17.5	4.6	15.2	4.0	17.4	7.1	20.0	9.0	24.1	13.4	30.2	17.6	29.1	17.8
Jammu	34.6	25.8	34.0	24.4	30.5	22.4	29.1	17.5	24.8	9.9	18.8	5.0	15.9	5.9	21.5	9.1	24.8	12.0	30.9	17.3	38.0	21.2		
Ranchi	30.8	22.9	29.7	22.7	29.6	21.3	28.6	17.3	25.6	8.8	21.5	4.3	21.1	7.6	26.8	12.7	29.9	17.0	33.0	21.2	37.6	24.5	33.3	22.3
Kathalagere	34.0	22.0	32.0	21.0	31.0	22.0	33.0	22.0	32.0	15.0	31.0	16.0	14.0	33.0	16.0	37.0	21.0	38.0	24.0	42.0	22.0	41.0	21.0	34.0
Karmana	29.7	24.9	30.5	24.6	31.2	24.9	31.4	24.5	30.1	24.1	31.0	24.0	31.4	22.0	31.4	22.6	32.1	23.8	32.3	24.4	31.4	25.5	30.7	24.2
Jabalpur	32.5	25.1	28.1	24.3	33.0	23.7	34.3	19.6	28.0	12.9	27.0	8.0	21.4	8.6	26.0	10.3	28.3	13.8	40.5	23.8	41.4	27.8	38.7	27.6
Powarkheda	38.8	19.2	37.0	19.0	36.4	17.0	36.0	14.0	35.0	9.2	32.9	5.1	27.1	4.6	33.8	5.6	38.3	12.0	41.8	18.1	44.9	18.1	41.2	22.8
Rewa	34.2	24.4	33.0	23.4	33.9	15.8	33.0	15.9	30.8	7.9	24.9	5.5	25.7	7.4	30.0	7.4	31.8	8.6	35.1	16.9	42.6	23.3	39.4	26.1
Indore	30.6	23.8	29.2	22.3	28.6	22.4	32	18	30.4	14.1	24.8	7.5	21.5	8.3	28.5	10.3	31.1	16.8	37.3	23.9	42.3	28.5	35.6	26
Rahuri	31.2	23.1	30.9	22.0	31.4	21.0	32.6	18.6	30.2	15.8	27.8	10.3	28.0	11.4	31.6	13.0	33.7	17.5	37.3	19.7	39.4	23.7	33.4	23.2
Bhubneswar	31.6	24.8	32.5	24.8	31.9	24.3	32.0	22.4	30.8	17.9	27.5	13.9	27.6	14.0	31.7	16.7	35.3	21.5	37.2	24.1	38.9	27.0	35.7	26.3
Chiplima	33.2	21.6	34.3	20.2	33.6	23.2	35.4	16.6	32.1	9.6	31.0	5.6	28.3	5.4	29.3	8.2	33.0	16.3	35.0	18.9	40.9	24.1	NA	NA
Parbhani	37.6	21.5	34.1	20.9	34.4	18.4	35.7	17.8	32.9	12.8	31.3	6.3	31.1	5.8	35	12.3	37.6	15	40.2	18.9	44.2	22.4	42.8	23.1
Akola	33.7	24.9	32.9	23.8	31.0	22.3	34.9	20.5	32.3	16.5	29.5	10.6	26.9	11.5	32.1	13.4	33.0	16.9	38.3	23.1	42.9	27.6	36.6	25.1
Karjat	29.8	23.7	29.8	23.7	30.2	23.1	33.8	21.5	34.6	18.4	32.9	21.4	32.2	12.9	35.8	14.6	37.1	18.2	37.7	22.6	39.2	24.5	NR	NR
Ludhiana	35.5	27.9	34.4	26.9	32.2	24.1	31.2	18.7	26.9	10.4	17.6	6.9	15.6	7.0	22.2	10.5	25.5	13.3	32.6	19.5	39.6	23.8	37.6	26.0
Durgapura, Jaipur	36.0	26.3	33.5	24.9	32.6	23.5	34.0	21.7	30.0	14.2	23.4	8.9	20.3	8.1	26.6	13.2	29.0	16.3	35.6	21.4	38.8	25.0	38.7	26.3

Contd..../-

Name of CSR centre	Temperature (^{0}C)																							
	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		June	
	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
Coimbatore	30.7	23.3	30.6	23.1	31.9	22.6	30.1	22.5	29.5	21.3	28.8	21.0	30.1	19.5	32.2	20.0	34.5	23.1	34.3	24.0	32.7	23.5	32.3	23.7
Thanjavur	36.0	27.2	35.0	25.9	35.2	25.3	32.5	25.6	29.1	23.1	28.2	21.7	30.1	21.1	31.9	20.8	35.0	23.4	35.5	25.9	35.3	26.6	36.5	31.1
Kanpur	34.8	24.3	34.6	27.1	33.2	25.2	32.2	20.2	28.8	12.7	20.8	8.8	16.6	8.9	25.3	12.6	28.3	15.4	35.0	20.0	41.3	23.6	39.4	25.5
Varanasi	33.9	27.2	33.4	27.1	32.8	25.6	30.5	21.0	28.4	13.2	20.7	8.8	18.2	10.2	25.7	14.1	30.6	16.9	35.9	22.5	40.8	27.6	37.8	21.4
Bichpuri	37.0	27.5	34.7	26.1	35.1	24.4	34.4	20.0	29.8	12.3	20.6	7.2	16.6	8.3	25.7	10.7	28.9	15.4	36.4	20.5	42.1	25.2	40.4	27.4
Pantnagar	32.4	25.9	33.4	25.9	32.8	23.5	30.4	17.8	27.5	10.2	20.5	7.6	17.1	8.8	23.9	10.5	27.3	13.4	32.4	17.6	32.4	17.6	37.0	24.9
Kalyani	32.9	26.9	34.2	26.5	34.0	25.8	33.6	23.1	32.2	15.9	26.7	12.0	24.3	10.4	31.7	15.4	35.4	19.2	35.8	24.1	37.6	27.2	34.6	26.9
Faizabad	33.4	26.2	34.5	26.0	32.8	25.0	30.8	18.3	28.2	10.1	19.1	6.8	17.7	8.8	24.9	11.7	28.7	14.2	34.8	20.2	40.2	25.9	NR	NR
Jorhat	33.1	25.7	32.6	25.4	32.8	25.5	33.5	21.7	28.4	16.6	25.5	11.1	25.1	10.8	26.0	12.4	24.2	16.1	29.8	19.0	30.1	22.5	31.6	24.4
Siruguppa	33.2	23.8	32.4	23.0	31.7	22.5	31.9	21.6	30.0	18.3	29.0	16.7	30.0	15.9	33.0	16.7	35.9	21.7	36.5	23.4	38.4	25.7	34.4	24.1
Kota	35.5	26.7	32.5	25.6	33.3	24.4	35.6	22.7	30.9	18.0	24.2	7.6	20.3	7.4	24.8	9.4	28.9	12.1	39.7	25.1	44.4	30.1	40.9	28.8
Port Blair	29.9	24.9	30.1	24.9	29.9	24.1	30.4	24.5	30.6	25.1	31.1	25.7	30.0	23.6	30.6	24.0	32.6	23.9	32.5	25.1	31.8	25.4	30.5	25.1
Patna	33.2	26.7	32.1	27	32.3	25.8	30.5	22	28.4	14.3	19.7	10	19.1	10.5	25.7	13.3	29.6	17.6	33.6	21.9	37.9	25.5	37	27.8
Umiam	29.1	20.0	28.0	19.2	27.0	18.2	27.0	14.4	24.1	10.9	22.4	7.1	21.6	6.5	22.8	7.6	26.8	11.8	26.6	14.3	27.8	16.4	28.0	19.2

APPENDIX III: CENTRE-WISE STAFF POSITION

1. AAU JORHAT (ASSAM)

Main Centre, Jorhat

Chief Agronomist	Dr. Ajit Baishya
Jr. Soil Scientist	Dr. B.K. Medhi
Asst.Jr.Economist	Dr. J.P. Hazarika
Technical Asstt.	Mr. B. Dutta
Field assistant	Mr. T. Gogoi
Field assistant	Mr. J.C. Dutta
Jr. Steno/UDC	Mr. A.B. Rajkonwar
Messenger	Mr. B. Kalita

On-Farm Centre, Karimganj

Agronomist	Dr. M.C. Kalita
Asst.Jr.Economist	Dr. J.K. Gogoi
Field assistant	Mr. B. Saikia
Field assistant	Mr. S. Pathak
Field assistant	Vacant
Field assistant	Mr. N.N. Kalita
Field assistant	Mr. H.K. Goswami
Field assistant	Mr. I. Gogoi
Jr.Stenographer	Mrs. Beauti Devi
Driver	Mr. B. Boruah
Watchman	Mr. D.P. Gohani

2. ANGRAU,HYDERABAD (A.P.)

Sub Centre, Maruteru

Agronomist	Dr. U. Nagabhushanam
Technical Asstt.	Vacant
Field assistant	Mr. Shekar
Field assistant	Mr. Sailu
LDC/Typist	Mr. K. Sanker

On-Farm Centre,Seetampet

Agronomist	Dr. K. Tejeswara Rao
Field assistant	Mr. T. Ramjogi/ Mr. N. Murali Mohan Rao
Field assistant	Mr. B.V.A. Satyanarayana
Field assistant	Mr. A.V. Ramana
Field assistant	Mr. K. Gopi
Field assistant	Mr. K. Jaganmohan Rao
Field assistant	Mr. T.D.M. Murthy
Jr.Stenographer	Vacant
Driver	Vacant
Watchman	Vacant

3. BAU, Sabour (BIHAR)

Main Centre, Sabour

Chief Agronomist	Dr. R.P. Sharma
Jr. Agronomist	Dr. Sushant
Technical Asstt.	Mr. K.R. Raman
Field assistant	Vacant
Field assistant	Mr. Rajeev Kumar
Jr. Steno/UDC	Mr. A.P. Yadav
Watchman	Mr. Ganesh Ram

On-Farm Centre, Patna

Agronomist	Dr. D.K. Mahto
Technical Asstt.	Vacant
Field assistant	Mr. Gautam Prasad
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Mr. Surendra Kumar
Watchman	Mr. Gajendra Mandal

4. IGKV, RAIPUR (CHHATISSGARH)

Main Centre, Raipur

Chief Agronomist	Dr. M.C. Bhambri
Jr. Soil Scientist	Mr. Anup Kumar Singh
Jr. Agronomist	Mr. Sunil Kumar
Technical Asstt.	Mr. B.K.Chandrakar
Field assistant	Mr. Dilip Kumar Verma
Field assistant	Vacant
Jr. Steno/UDC	Shri Gopal Yadu
Messenger	Shri Shivcharan Yadav

On-Farm Centre, Kawardha

Agronomist	Dr. Chandresh Kumar Chandrakar
Technical Asstt.	Mr. Sanjeev Kumar Singh
Field assistant	Mr. D.D. Singh
Field assistant	Kanhaiya Jaiswal
Field assistant	Abhishek Patel
Field assistant	Omprakash Patel
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Mr. Prasant Kumar Choure
Watchman	Mr. Gaindlal Nirmalkar

5. SDAU, S.K. NAGAR (GUJRAT)

Chief Agronomist	Dr. A.M. Patel
Jr. Soil Scientist	Mr. P.K. Patel
Jr. Agronomist	Shri A.K. Saini
Agril. Officer	Dr. Kunjal M. Patel
Agril. Supervisor	Shri B.B. Patel
Agril. Supervisor	Shri M.G. Patel
Field assistant	Mr. C.B. Patel
Field assistant	Vacant
Sr. Clerk	Shri K.R. Patel
Sr. Clerk	Shri D.P. Patel
Messenger	Shri P.B. Fof

On-Farm Centre, Jagudan

Agronomist	Dr. S.K. Patel
Jr. Sci.(Eco)	Dr. R.R. Patel
Field assistant	Mr. A.K. Goswami
Field Assistant	Mr. A.G. Patel
Field Assistant	Mr. L.S. Chaudhary
Field Assistant	Mr. D.P. Parekh
Field Assistant	Mr. J.H. Chaudhary
Field Assistant	Mr. S.S. Patel
Jr.Stenographer	Mr. P.B. Joshi
Driver	Vacant
Watchman	Mr. G.K. Chaudhary

6. JAU, JUNAGADH (GUJARAT)

Sub Centre, Junagadh

Agronomist	Dr. B.M. Dabhi
Technical Asstt.	Shri R.B. Rakholia
Field assistant	Mr. C.T. Dalwadi
Field assistant	Vacant
Jr. Steno/UDC	Vacant

7. NAU, NAVSARI (GUJRAT)

Sub Centre, Navsari

Agronomist	Dr. L.J. Desai
Technical Asstt.	Vacant
Field assistant	K.G. Parmar
Field assistant	Vacant
Jr. Steno/UDC	Vacant

8. AAU, ANAND (GUJRAT)

On-Farm Centre, Thasra

Agronomist	Vacant
Field assistant	Mr. R.S. Rana
Field assistant	Mr. M.M. Mori
Field assistant	Mr. S.S. Rathava
Field assistant	Mr. K.B. Raval
Field assistant	Mr. D.J. Gohil
Field assistant	Mr. V.H. Rathva
Jr.Stenographer	Vacant
Driver	Vacant
Watchman	Vacant

9. CCS HAU, HISAR (HARYANA)

Main Centre, Hisar

Chief Agronomist	Dr. R.K. Narwal
Asstt. Agronomist	Dr. Shweta
Sr. Soil Scientist	Dr. M.K. Sharma
Technical Asstt.	Vacant
Technical Asstt.	Vacant
Agir. Inspector	Sh. Rajbir
Agir. Inspector	Sh. Bajrang
Jr. Steno/UDC	Mr. M.L. Wadhwa
Messenger	Vacant

On-Farm Centre, Kurukshetra

Agronomist	Dr. Anil Mehta
Asst. Scientist	Vacant
Agir. Inspector	Mr. Mahinder Singh
Agir. Inspector	Sh. Sadhi Lal
Agir. Inspector	Sh. Hariom
Agir. Inspector	Mr. Sube Singh
Agir. Inspector	Mr. Sat Narain
Agir. Inspector	Vacant
Clerk	Mr. Kulbir Singh
Driver	Vacant
Watchman	Vacant

10. CSK HPKVV, PALAMPUR (H.P.)

Main Centre, Palampur

Chief Agronomist	Dr. S.C. Negi
Jr. Soil Scientist	Dr.S.K. Subehia
Jr. Agronomist	Dr. S.S. Rana
Technical Asstt.	Mr. R.K. Sharma
Field assistant	Mr. Pradeep Kumar
Field assistant	Mr. Bikram Singh
Jr. Steno/UDC	Mr. Mehar Chand
Watchman	Mr. Surjeet Kumar

On-Farm Centre, Kangra

Agronomist	Dr. S.K. Sharma
Technical Asstt.	Mrs. Anuradha
Field assistant	Mr. Rakesh Kumar
Field assistant	Mr. Pratap Chand
Field assistant	Mr. Bihari Lal
Field assistant	Mr. Anirudh
Field assistant	Mr. Amarjit Singh
Field assistant	Mr. Gian Chand
Jr. Steno/UDC	Mr. Saran Das
Driver	Mr. Santosh Kumar
Messenger	Vacant

11. SKUAST, Jammu (J &K)

Main Centre, Chatta, Jammu

Chief Agronomist	Prof. Dileep Kachroo
Jr. Soil Scientist	Dr. N.P. Thakur
Jr. Agronomist	Dr. Vijay Khajuria
Technical Asstt.	Mr. Mahesh Kumar
Technical Asstt.	Mr. Parshotam kumar
Field assistant	Mr. Bishan Lal
Field assistant	Mr. Romesh Lal
Jr. Steno/UDC	Mrs. Rajni Bharti
Messenger	Mr. Tarsem Singh

OFR Centre, Jammu

Agronomist	Dr. A.K. Gupta
Field assistant	Kuldeep Sharma
Field assistant	Dhiraj Rajwal
Field assistant	Mr. A.W. Katoch
Field assistant	Mr. Ashwani Kumar
Field assistant	Mr. Ghulam Mohd.
Field assistant	Mr. Jai Krishan
Jr. Steno/UDC	Mrs. Pardeep Kour
Driver	Mohd. Saleem
Watchman	Mohd. Yaqoob

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
Field assistant	Mr. M. Munda
Field assistant	Mr. Raju Gari
Jr. Steno/UDC	Mr. S.S. Jha
Messenger	Mrs. Deomani Devi

On-Farm Centre, Pakur

Agronomist	Mr. W. Aind
Technical Asstt.	Mr. Rakesh Kumar Sinha
Field assistant	Shri K. Kalindi
Field assistant	Shri S. Baitha
Field assistant	Shri D.S.K. Soy
Field assistant	Shri Sakiullah
Field assistant	Shri K. Oraon
Field assistant	Shri B.L. Singh
Jr.Stenographer	Mr. Dinesh Toppo
Driver	Mr. Krishun Kujur
Watchman	Mr. Sarif Ansari

13. UAHS, Shivamoga

Main Centre, Kathalelgere

Chief Agronomist	Dr. Kumara O.
Jr. Soil Scientist	Vacant
Jr. Agronomist	Mr. H.G. Sannathimmappa
Technical Asstt.	Vijay S. Danaraddi
Field assistant	Vacant
Field assistant	Mr. P. Maheshwarappa
Jr. Steno/UDC	Vacant
Messenger	Mr. K.M. Chandrakala

14. UAS, Banglore (KARNATAKA)

On-Farm Centre, Banglore

Agronomist	Dr. A.P. Viswanath
Jr.Scientist	Vacant
Field assistant	Mr. Manjunatha. N
Field assistant	Mr. Puttaswamy
Field assistant	Mr. Basavaraja
Field assistant	Mr. Nagaraja. B
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

15. UAS, Raichur (KARNATAKA)

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
Technical Asstt.	Mr. Bhimanna Hugar
Field assistant	Mr. Somanagouda H
Field assistant	Mr. Gangadhar Swami S.

16. UAS, Dharwad (KARNATAKA)

On-Farm Centre, Gadag (KARNATAKA)

Agronomist	Dr. S.M. Hiremath
Field assistant	Mr. V.H. Jamadar
Field assistant	Mr. V.K. Hiremath
Field assistant	Mr. V.D. Kalawad
Field assistant	Mr. V.G. Chickmath
Field assistant	Mr. Anand Gouda Patil
Field assistant	Mr. Manoj Nandikolmath
Jr. Steno/UDC	Mr. R.N. Vagole
Driver	Mr. A.R. Mutalik Sir Desai
Watchman	Mr. A.M. Harinath

17. KAU, THRISSUR (KERALA)

Main Centre, Karmana (Thiruvandrum)

Chief Agronomist	Dr. P. Sukumari
Jr. Soil Scientist	Dr. B. Rani
Jr. Agronomist	Dr. B. Jacob john
Technical Asstt.	Mr. Hirosh Kumar
Technical Asstt.	Shri Thulaseedharan
Field assistant	Mr. Tomy Abraham
Field assistant	Mrs. K.S. Sujatha
Jr. Steno/UDC	Mrs. P.S. Sindhu
Messenger	Mr. K. Maniyan

On-Farm Centre, Thiruvella

Agronomist	Dr. Thomas Mathew
Jr. Soil Scientist	Dr. D. Jocob
Field assistant	Mr. P.S. Sanal Kumar
Field assistant	Mr. K.O. Shahul Hamed
Field assistant	Mr. A.R. Venu
Field assistant	Shri K.M. Eldo
Field assistant	Mr. Mathew Thomas. C
Field assistant	Vacant
Jr. Steno/UDC	Mr. Aneesh Kumar. M
Driver	Vacant
Messenger	Mr. K.G. Pushpakumari

18. JNKVV, Jabalpur (M.P.)

Main Centre, Jabalpur

Chief Agronomist	Dr. V.K. Shukla
Jr. Soil Scientist	Vacant
Scientist Agronomy	Vacant
Technical Asstt.	Dr. S.K. Vishwakarma
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Messenger	Mr. N.L. Bhumiya

Sub Centre, Rewa

Agronomist	Dr. B.M. Mouya
Tech.Assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Mr. S.K. Upadhyay

Sub Centre, Powerkheda

Agronomist	Dr. R.S. Lidder
Tech.Assistant	Sh. P.S. Yadav
Field assistant	Vacant
Field assistant	Mr. Sudhir Dubey
Jr. Steno/UDC	Mrs. Sushila Jhariya

On Farm Centre, Dindori

Agronomist	Mr. D.N. Shriniwas
Jr.Economist	Vacant
Field assistant	Mr. V.R. Ghorke
Field assistant	Mrs. Jaya Kori
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

On Farm Centre, Katni

Agronomist	Dr. R.P. Sahu
Technical Asstt.	Vacant
Field assistant	Shri M.S. Prajapati
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

19. RMVR, SUA&T, GWALIOR (M.P.)

Sub Centre, Indore

Agronomist	Dr. S.K. Choudhary
Tech.Assistant	Mr. N.K. Sinha
Field assistant	Mr. R.K. Tamere
Field assistant	Mr. L.K. Pandey
Jr. Steno/UDC	Mr. N.K. Bangre

20. MPKV, RAHURI (MAHARASHTRA)

Main Centre, Rahuri

Chief Agronomist	Vacant
Jr. Agronomist	Vacant
Jr.Soil Scientist	Dr. V.S. Patil
Tech. Assistant	Mr. A.B. Dhage
Field Assistant	Mr. B.K. Jadhay
Field Assistant	K.P. Thorat
Jr.Stenographer	Mr. A.M. Chavan
Messenger	Vacant

On Farm Centre, Chas (Ahmednagar)

Agronomist	Prof. M.M. Desai
Jr.Economist	Prof. Y.C. Sale
Tech. Assistant	Vacant
Field Assistant	Mr. S.P. Kahar
Field Assistant	Mr. R.P. Gangurde
Field Assistant	Mr. N.S. Kudal
Field Assistant	Mr. R.H. Rathod
Field Assistant	Mr. A.B. Nikrad
Field Assistant	Vacant
Jr.Stenographer	Mr. A.M. Chavan
Driver	Mr. E.R. Jadhav
Watchman	Vacant

21. DPDKV, AKOLA (MAHARASHTRA)

Main Centre, Akola

Chief Agronomist	Dr. (Mrs.) Mangala Ghanbahadur
Jr. Agronomist	Mr. B.S. Morwal
Jr.Soil Scientist	Dr. O.S. Rakhode
Jr.Res. Assistant	Vacant
Field Assistant	Mr. M.M. Deshmukh
Field Assistant	
Jr.Stenographer	Mr. B.W. Ahir
Messenger	Mrs. L.P. Ingle

Sub Centre, Hiwara

Agronomist	Mr. B.S. Morwal/ Dr. Varsha V. Tapre
Technical Assistant	Mr. F.F. Khan
Field Assistant	Mr. R.G. Langewar
Field Assistant	Mr. S.D. Kadam
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Driver	Vacant
Jr.Stenographer	Vacant
Watchman	Mr. Y.S. Ghonmode

22. MAU, PARBHANI (MAHARASHTRA)

Main Centre, Parbhani

Chief Agronomist	Dr. W.N. Narkhede
Jr.Economist	Vacant
Jr.Soil Scientist	Mr. R.N. Khandare
Jr.Stenographer	Vacant
Tech. Assistant	Vacant
Field Assistant	Mr. G.Y. Sonwane
Field Assistant	Vacant
Messenger	Vacant

On Farm Centre, Aurangabad

Agronomist	Prof. S.B. Pawar (Additional charge)
Tech. Assistant	Dr. D.P. Deshpande
Field Assistant	Vacant
Field Assistant	Mr. S.K. Choudhari
Field Assistant	Mr. B.N. Ambad
Field Assistant	Mr. R.P. Kerai
Field Assistant	Mr. B.S. Kakade
Field Assistant	Mr. S.S. Mundhe
Jr.Stenographer	Vacant

23. DBS KKV, DAPOLI (MAHARASHTRA)

Main Centre, Karjat

Chief Agronomist	Dr. L.S. Chavan
Jr. Soil Scientist	Dr. D.G. Jondhale
Jr. Agronomist	Mr. A.S. Dalvi
Technical Asstt.	Mr. A.B. Gaikwad
Technical Asstt.	Mr. S.A. Diwate
Field assistant	Shri N.P. Patil
Field assistant	Mr. J.P. Hambir
Jr. Steno/UDC	Mr. R.L. Biwalkar
Messenger	Mr. L.N. Hambir

On Farm Centre, Palghar

Agronomist	Dr. S.B. Bhagat
Field Assistant	Mr. S.V. Kamble
Field Assistant	Mr. B.L.Shanwar
Field Assistant	Mr. S.R. Iware
Field Assistant	Mr. S.D. Phale
Field Assistant	Mr. V.S. Daphal
Field Assistant	Mr. N.H. Paradhi
Jr.Stenographer	Mr. K.P. Malche
Driver	Vacant
Messenger	Mr. V.D. Zagade

24. OUAT, BHUBNESWAR (ORISSA)

Main Centre, Bhubaneswar

Chief Agronomist	Dr. L.M. Garnayak
Jr. Agronomist	Mr. A.K. Patra
Jr. Soil Scientist	Dr. Kshitiendra Narayan Mishra
Tech. Assistant	Mrs. Somanath Sahu
Tech. Assistant	Mr. D.K. Raut
Field Assistant	Mr. Trinath Routray
Field Assistant	Mr. B. Biswal
Jr.Stenographer	Mr. Sameer Kumar Mallick
Messenger	Mr. G. Mahabhoi

Sub Centre, Chiplima

Agronomist	Mr. J. Haldar
Tech. Assistant	Mr. Prafulla Kumar Mohanty
Field Assistant	Mr. J.K. Behera
Field Assistant	Mr. Bhakta Danta
Jr.Stenographer	Vacant

On Farm Centre, Angul

Agronomist	Vacant
Jr.Economist	Vacant
Field Assistant	Mr. S. Baral

Field Assistant	Mr. Kasinath Mallick
Field Assistant	Mr. Basanta Kumar Dash
Field Assistant	Mr. Biranchi Pradhan
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr. Fulendu Kumar Behra
Driver	Mr. B. Behra
Watchman	Vacant

On Farm Centre, Kendrapara

Agronomist	Dr. Susant Kumar Swain
Field Assistant	Mr. T. Sahoo
Field Assistant	Mr. Pravat Kumar Mohanty
Field Assistant	Mr. Rama Chandra Singh
Field Assistant	Mr. Madhusudan Nayak
Field Assistant	Mr. Ananda Chandra Sahu
Field Assistant	Vacant
Jr.Stenographer	Mr. Basant Kumar Nayak
Driver	Mr. K.C. Mallick
Watchman	Mr. S. Munda

25. PAU, LUDHIANA (PUNJAB)

Main Centre, Ludhiana

Chief Agronomist	Dr. Sohan Singh Walia
Agronomist	Dr. C.S. Aulakh
Jr.Soil Scientist	Dr. Roopinder Singh
Tech. Assistant	Mr. Surender Kumar Sharma
Field Assistant	Mr. Balbir Singh
Field Assistant	Mr. Baljit Singh
Field Assistant	Mr. Prem Prakash
Jr.Stenographer	Mr. Ram Ji Dass
Watchman	Mr. Jagmohan Singh

On Farm Centre, Amritsar

Agronomist	Dr. Harpreet Singh
Field Assistant	Mr. Amrik Singh
Field assistant	Mr. Tarseem Dass
Field assistant	Mr. Gurdip Singh
Field assistant	Mr. Sukhdev Singh
Field assistant	Vacant
Field assistant	Mr. Harjit Singh
Jr.Stenographer	Mrs. Sukhdeep Kaur
Driver	Mr. Avtar Singh
Watchman	Mr. Danial

26. AU, KOTA

Sub Centre, Kota

Agronomist	Dr. G.S. Bhatnagar
Tech. Assistant	Dr. H.P. Meghwal
Field Assistant	Mr. Bhagwan Singh
Field Assistant	Vacant
Jr.Stenographer	Vacant

27. MPUAT, UDAIPUR (RAJASTHAN)

On Farm Centre, Udaipur

Agronomist	Dr. S.K. Sharma
Jr.Economist	Mr. Hari Singh
Field Assistant	Mr. N.S. Jhala
Field Assistant	Mr. Ramji Lal
Field Assistant	Mr. Madan Lal
Field Assistant	Mr. A.S. Rathore
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr. Vishal Ajmera
Driver	Mr. Yogesh Chandra Damami
Watchman	Mr. Shanker Lal Nagda

28. SKNAU, JOBANER (RAJASTHAN)

Main Centre, Durgapura

Chief Agronomist	Dr. A.K. Gupta
Jr. Agronomist	Vacant
Technical Asstt.	Mr. Mangal Ram Sharma
Field assistant	Mr. Nonand Singh
Field assistant	Mr. M.L. Kumawat
Jr. Steno/UDC	Vacant
Messenger	Mr. Kana Ram

On-Farm Centre, Fatehpur (Sikar)

Sr. Agronomist	Vacant
Agri Supervisor	Mr. Banwari Lal
Agri Supervisor	Mr. Chaju Ram Jat
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Driver	Vacant
Jr. Steno/UDC	Vacant
Watchman	Vacant

29. PJTSAU, RAJENDERNAGAR, HYDERABAD

Main Centre, Rajendranagar

Chief Agronomist	Dr. M. Venkata Ramana
Jr. Agronomist	Dr. K. Suresh
Jr. Soil Scientist	Dr. S. Sridevi
Technical Asstt.	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Messenger	Mr. G. Saibaba

Sub Centre, Rudrur

Agronomist	Smt. Firdoz Shahana
Technical Asstt.	Vacant
Field assistant	M. Shekar
Field assistant	G. Sailu
LDC/Typist	

On-Farm Centre, Warangal

Agronomist	Dr. Md. Lateef Pasha
Jr.Economist	Vacant
Field assistant	Mr. K.V. Subramanyam
Field assistant	Sri. P. Yadagiri
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr.Stenographer	Mr. T. Laxmi
Driver	Sri. Shaik Shabbir
Watchman	Vacant

30 .TNAU, COIMBATORE (TN)

Main Centre, Coimbatore

Chief Agronomist	Dr. K. Siddeswaran/ Dr. E. Somasundaram
Jr. Soil Scientist	Dr. K. Sathiya Bama
Jr. Agronomist	Dr. P.M. Shanmugam
Jr. Economist	Dr. V. Sarvanakumar
Tech. Assistant	Vacant
Field Assistant	Mr. A. Gowthaman
Field Assistant	Vacant
Jr.Stenographer	Mrs. K. Suguna
Messenger	Mrs. M. Vijayalakshmi

Sub Centre, Thanjavur

Agronomist	Dr. R. Marimuthu
Tech. Assistant	Vacant
Field Assistant	Ms. S. Chitra Devi
Field Assistant	M. Palanisamy
Jr.Stenographer	Mr. Mahalingam

On farm, Chettinad

Agronomist	Mr. P. Kathirvelan
Tech. Assistant	Vacant
Field Assistant	Mr. M. Baskarapandian
Field Assistant	Mr. P. Sakthivel
Field Assistant	Mrs. M. Punitha
Field Assistant	Mr. M. Periyasamy
Field Assistant	Mr. A.R. Sivamani
Field Assistant	Mr. M.K. Rajendran
Jr.Stenographer	Mr. S. Nagarajan
Driver	Mr. M. Radha
Messenger	Vacant

On farm, Paiyur

Agronomist	Dr. S. Vijayabaskaran
Tech. Assistant	Vacant
Field Assistant	Mr. A. Murugan
Field Assistant	Mr. D. Gnanandurai
Field Assistant	Mr. K. Mohandass
Field Assistant	Mr. R. Solai
Field Assistant	Mr. A. Ravichandran
Field Assistant	Mr. G. Mahalingam
Jr.Stenographer	Mr. R. Chitra

Driver	Mr. K. Murugesan
Messenger	Mr. C. Murugesan

31. CSAUAT, KANPUR (U.P.)

Main Centre, Kanpur

Chief Agronomist	Dr. M.P. Yadav
Jr. Soil Scientist	Dr. U.S. Tiwari
Jr. Agronomist	Dr. Y.K. Singh
Technical Asstt.	Mr. U.S. Yadav
Field assistant	Sri. Virendra Singh
Field assistant	Mr. Anil Kumar Singh
Jr. Steno/UDC	Sri. Jagat Narayan
Messenger	Mr. Vijay Bahadur

On Farm Centre, Daleep Nagar

Agronomist	Vacant
Field Assistant	Mr. Sudhir Pratap Singh
Field Assistant	Mr. Jagdish Chandra
Field Assistant	Mr. R.B. Yadav
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Vacant
Driver	Mr. Mahendra Singh
Watchman	Sri. Man Singh

32. NDUAT, FAIZABAD (UP)

Main Centre,Faizabad

Chief Agronomist	Dr. N.B. Singh
Jr. Soil Scientist	Dr. Alok Kumar
Jr. Agronomist	Dr. R.A. Yadav
Technical Asstt.	Mr. Ishwar Nath
Technical Asstt.	Dr. R.P. Dwivedi
Field assistant	Mr. A.P. Singh
Field assistant	Mr. R.A. Pandey
Jr. Steno/UDC	Mr. S.A.R. Zaidi
Messenger	Mr. Jag Jeevan

On Farm Centre, Ambedkar Nagar

Agronomist	Vacant
Field Assistant	Mr. A.N. Pandey
Field Assistant	Mr. P.C. Tripathi
Field Assistant	Mr. Tilak Ram
Field Assistant	Mr. V.B. Singh
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr. Ram Lal
Driver	Mr. J.P. Yadav
Watchman	Mr. S.P. Singh

33. BHU, Varanasi (UP)

Sub Centre, Varanasi

Agronomist	Dr. J.S. Bohra
Tech. Assistant	Mr. Manoj Kumar Singh
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr.Mohan Ram

34. RBS COLLEGE, BICHPURI (AGRA)

Agronomist	Dr. S.B. Singh
Tech. Assistant	Dr. Rahul Pundir
Field Assistant	Vacant
Field Assistant	Dr. Susheel Kumar Singh
Jr. Stenographer	Dr. Bhumi Raj Singh

35. GBPUAT, PANTNAGAR (UTTARAKHAND)

Main Centre, Pantnagar

Chief Agronomist	Dr. Rohitashav Singh
Jr.Soil Scientist	Dr. Ajeet Pratap Singh
Jr. Agronomist	Dr. Sumit Chaturvedi
Jr. Scientist	Dr. Devendra Singh
Tech. Assistant	Mr. Y.S. Khokar
Field Assistant	Mr. A.K. Tiwari
Field Assistant	Mr. M.P. Singh
Jr.Stenographer	Vacant
Messenger	Mr. Lalloo Singh

On Farm Centre, Jeolikot (Nainital)

Agronomist	Dr. D.K. Singh
Field Assistant	
Field Assistant	
Field Assistant	Mr. Gulsher Ahmed
Field Assistant	Mr. Virendra Singh
Field Assistant	Vacant
Field Assistant	Vacant

Jr.Stenographer	Vacant
Driver	Vacant
Messenger	Mr. Panjabi Mahato

36. BCKV, KALYANI

Main Centre, Kalyani

Chief Agronomist	Dr. Mahadev Pramanick
Jr. Soil Scientist	Dr. Sushanta Saha
Jr. Economist	Dr. S. Chatterjee
Technical Asstt.	Dr. Dilip Saha
Technical Asstt.	Mr. Basudev Datta
Field assistant	Mr. Bipul Chandra Pal
Field assistant	Vacant
Jr. Steno/UDC	Smt. Sonali Rakhit
Messenger	Smt. Dipankar Mazumder

On-Farm Centre, Kakdwip

Agronomist	Dr. Manabendra Ray
Field assistant	Mr. A.K. Bhaumik
Field assistant	Mr. K. Maiti
Field assistant	Mr. N. Das
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Mr. Nilanjan Mukherjee
Driver	Vacant
Watchman	Vacant

APPENDIX IV: SOIL FERTILITY STATUS AND NUTRIENT UPTAKE

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	Season centre	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rajendranagar	*Kharif*	OC%	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.5
		N												
		P	29.3	34.4	28.5	33.1	28.1	28.1	29.4	32.8	28.1	29.8	29.1	32.5
		K	315.8	309.9	345.0	336.4	354.3	324.8	313.6	340.1	336.4	309.5	321.4	313.2
	Rabi	OC%	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		N	186.1	194.4	204.9	213.2	194.4	211.2	196.5	188.2	194.4	179.8	211.2	192.3
		P	32.2	33.5	29.6	32.3	33.3	37.3	32.2	35.7	29.6	30.9	33.3	31.6
		K	323.7	330.4	334.9	309.1	336.0	320.3	343.8	330.4	336.0	319.2	340.5	332.6
Navsari	Summer	OC%	0.64	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6		
		N	264.7	267	270.2	269	268	269.3	272.3	273.3	265	272		
		P	36.5	35.1	35	34.2	39.5	38.1	41.5	38.6	38.3	38.1		
		K	226.7	237.3	201.3	191	208	228	266	266.7	210.7	259.3		
Rewa	*Rabi*	OC%	0.6	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.6	0.6		
		N	236	248	251	231	231	241	253	239	243	237		
		P	8.7	9.3	9.2	8.91	8.8	9.2	9.0	9.1	8.9	8.9		
		K	293	280	296	294	295	295	294	284	287	275		
Kalyani	Summer	OC%	0.8	0.9	0.8	0.9	1	0.9	0.9	1.02	1.0	0.7	0.8	
		N	235.3	228.2	194.5	270.9	276.8	193.7	227.3	275.6	262.3	288.9	282.2	
		P	60.9	60.5	67.4	50.3	74.9	60.3	61.0	57.1	52.6	64.06	60.51	
		K	226.5	346.3	362.9	255.3	217	285.4	296.7	291.4	271.4	322.0	340.9	
Junagadh	Summer	OC%	0.7	0.8	0.7	0.7	0.7	0.6	0.6	0.7	0.8	0.7	-	-
		N	253	256	263.7	235.7	258.3	242.3	234.7	268.7	261.7	245	-	-
		P	22.1	19.3	23.5	22.4	21.7	23.8	22.8	23.7	24.0	24.5	-	-
		K	147.3	138	152.7	148.7	138.3	136	138.3	153.3	160.3	166	-	-
Karamana	*Summer	OC %	21.9	18.3	24.7	20.05	27.4	19.0	24.7					
		N	234.2	225.8	219.5	242.5	196.5	238.3	217.4					
		P	48.3	45.1	49.0	46.6	46.3	42.2	44.2					
		K	134.2	156.9	180.7	131.1	144.0	158.7	174.5					
Hisar	*Kharif*	OC%	0.5	0.44	0.4	0.5	0.4	0.4	0.42					
		N	154	141.8	150.5	154	141.8	143.5	136.5					
		P	16.5	16	16	18.5	17	17	14					
		K	213	233.9	229.1	286.9	253.1	224.6	230.7					

Contd..../-

Name of CSR	Season centre	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	Rabi	OC%	0.4	0.4	0.4	0.5	0.5	0.5	0.4					
		N	157.5	157.5	168	171.5	166.3	164.5	162.8					
		P	12.5	12	13	13	12	13.5	12.5					
		K	272	268.8	267.8	269.9	276.7	270.1	274.7					
	Summer	OC%	-	-	0.5	0.5	-	0.5	-					
		N	-	-	166.3	176.8	-	166.3	-					
		P	-	-	11.5	13	-	13.5	-					
		K	-	-	261.7	268	-	271.4	-					
Rahuri	*Kharif*	O.C.%	0.6	0.6	0.62	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		N	189	187	194	195	195	191	191	186	189	187	192	185
		P	15	16	17	15	14	18	17	16	16	16	16	16
		K	589	597	590	589	595	586	583	585	586	585	591	578
	Rabi	O.C.%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6
		N	202	194	206	191	205	206	198	204	212	207	203	208
		P	15	15	15	15	16	17	16	17	17	15	17	17
		K	582	577	571	582	574	574	572	571	586	579	586	577
Palampur	*Kharif*	OC%	1.2	1.2	1.3	1.5	1.4	1.3	1.4	1.5				
		N	161.3	322.7	267.9	215.0	295.7	304.6	215.0	225.1				
		P	69.6	48.5	65.5	89.35	75.2	66.81	75.2	81.05				
		K	151.2	84	104	112	106.4	190.4	128.8	168				
	Rabi	OC%	1.2	1.3	1.1	1.3	1.4	1.3	1.3	1.5				
		N	244.9	250.9	241.9	244.9	188.2	241.2	170.2	180				
		P	41.2	41.1	66.8	69.6	78.1	66.8	66.8	65.4				
		K	79.9	78.4	112	123.2	112	151.2	196	197.8				
Parbhani	*Kharif*	OC%	0.6	0.6	0.5	0.5	0.56	0.5	0.56	0.6				
		N	180.8	185.5	188.6	172.3	190.6	175.6	172.6	165.2				
		P	13.5	13.6	13.8	13.9	14.1	12	12.6	11.8				
		K	366	371.1	366.6	367.8	372.8	370.9	358.1	366				
	Rabi	OC%	0.6	0.6	0.5	..	..	0.5	0.55	0.54				
		N	181	—	187	—	—	174.2	172	162.3				
		P	13.9	—	13	—	—	12.5	12	11.5				
		K	365	—	364.4	—	—	369	356.6	365				
	Summer	OC%	..	0.6	0.5	0.5	0.5	0.5	0.55	0.54				
		N	—	185	185.5	171.5	191.4	174.4	170.6	166.5				
		P	—	14	13.6	13.5	14	12.6	12.8	12				
		K	—	370.2	365	366	370.5	371.6	358	364				

Contd..../-

Name of CSR	Season centre	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Coimbatore	*Kharif*	OC%	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6			
		N	252	278	265	286	275	252	275	260	277			
		P	20.6	20.8	21.8	22	21.8	22.2	20.8	20.1	21.3			
		K	521	589	565	549	550	518	536	538	528			
	Rabi	OC%	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6			
		N	295	285	282	280	288	285	302	285	282			
		P	22.3	21.5	21	21.2	22.5	21.8	22.1	21.8	20.8			
		K	520	542	526	539	540	536	523	527	521			
	Summer	OC%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6			
		N	323	314	305	298	307	312	303	290	288			
		P	21.3	22.8	24.1	25	27.3	25	23.9	24.4	23.0			
		K	532	544	551	560	548	557	519	497	510			
Bhubneswar	Summer	OC%	0.8	0.8	0.7	0.6	0.7	0.7	0.8	0.7	0.8	0.8		
		N	308.7	337.7	298.4	292.3	328.8	302.1	328.3	312.4	337.9	336.2		
		P	14.6	14.8	14.1	13.4	14.9	14.1	14.4	14.5	14.4	14.8		
		K	134.1	141.1	136.4	128.6	134.9	131.1	135.1	130.9	138.5	138.1		
Chiplima	Summer	OC%	0.7	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.8		
		N	298.6	336.7	302.7	295.9	309.8	296.7	314.1	299.1	317.5	315.9		
		P	13.7	14.1	15.1	13.2	13.6	13.3	13.6	13.3	14.3	14.6		
		K	147.1	141.5	152.9	138.8	140.1	134.3	141.1	137.5	149.6	151		
Siruguppa	Summer	OC%	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.6		
		N	172	174	185	183	181	181	190	203	175	172		
		P	12.7	13.7	12.7	13.7	13.5	14.7	15.2	14.2	14	11.7		
		K	366	394	382	369	359	376	367	381	386	366		

Table B : Nutrient uptake N P and K kg/ha in exp no1(a)

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rajendranagar	*Kharif*	N	97.6	40.6	92.1	40	98.3	53.5	105	51.9	62.5	50.2	29.1	50.2
		P	27.3	5.8	28.4	5.7	25.2	4.3	25.3	13.8	4.7	3.7	5.6	2.8
		K	87.8	35.4	82.3	37.2	76.7	28.9	77.9	25.9	23.1	25.8	36.3	25.6
	Rabi	N	36.2	56.3	82.9	95	56.5	98.1	64.2	34	62.9	15.7	87.2	113.5
		P	6.3	6.9	8.6	11	7.3	11.3	7.7	7.1	8.2	2.9	9.4	22.8
		K	13.9	61.7	27.3	33.9	63.1	32.5	26.7	48.3	71.2	7.5	28.7	76.9
Navsari	*Kharif*	N	71.5	68.9	74.4	69.1	69.9	68.5	71.2	71.1	67.7	77.6		
		P	14.9	13.5	14.5	15.2	15.7	15.8	14	14.7	15.5	15.6		
		K	74.2	69	73.2	72.1	81.9	83.1	72.4	75	72	81.3		
	Rabi	N	14.5	52.1	56.6	35.8	46.1	43.7	0	21	21	48.5		
		P	1.5	11.1	10.1	3.5	5.3	14.8	0	3.8	5.1	7.7		
		K	3.3	87.3	31	5.4	9.2	59.4	0	29.2	24.4	56.4		
	Summer	N	0	24.8	47.8	23.4	0	0	86.7	59.3	74.1	10.1		
		P	0	4.3	6.9	3.1	0	0	10.9	8.2	8.6	1.6		
		K	0	20.7	33.5	30.6	0	0	30.5	34.9	56.5	8		
Rewa	*Rabi*	N	49	21	24	65	157	172	20	42	13	96		
		P	25	30	30	26	30	23	40	22	20	24		
		K	152	18	60	126	181	205	19	177	40	125		
Kalyani	*Kharif*	N	76.62	106.07	74.15	0	100.77	161.37	58.02	95.98	48.96	50.37	137.48	
		P	22.97	18.03	23.28	0	20.9	36.97	6.28	20.82	5.8	12.81	33.93	
		K	83.37	79.99	79.82	0	74.75	118.42	21.14	69.5	15.51	61.98	154.55	
	Rabi	N	41.66	85.76	0	0	46.92	66.84	14.49	97.52	29.58	119.55	165.74	
		P	12.81	22.37	0	0	15.25	27.39	4.2	24.5	6.45	15.87	43.45	
		K	50.98	91.64	0	0	49.2	69.78	15.93	97.24	33.86	89.12	176.35	
	Summer	N	0	51.69	12.34	97.89	15.76	14.93	15.56	32.14	27.07	14.34	130.86	
		P	0	6.33	1.97	106.98	1.96	5.66	3.76	5.98	7.43	2.2	29.38	
		K	0	40.9	5.45	352.66	5.55	6.16	16.49	32.3	34.18	12.25	149.54	
Junagadh	*Kharif*	N	52.43	49.01	38.08	76.02	58.29	25.77	67.1	44.98	86.14	32.31	-	-
		P	5.13	5.19	6.86	12.46	6.96	2.59	19.18	3.7	5.75	10.31	-	-
		K	13.46	14.12	14.47	64.66	44.76	6.78	35.62	11.99	20.1	8.48	-	-
	Rabi	N	64.57	35.9	45.19	28.49	70.6	38.28	64.08	27.65	10.95	55.26	-	-
		P	12.07	8.4	3.92	7.29	9.67	2.92	6.74	5.45	1.03	7.79	-	-
		K	19.47	70.42	12.55	15.39	22.07	10.15	50.73	25.51	3.6	19.37	-	-

Contd..../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	Summer	N	0	50.59	31.88	47.48	45.16	43.42	54.66	42.26	36.53	14.15	-	-
		P	0	37.06	3.25	30.57	8.56	5.84	6.33	17.02	6.14	3.54	-	-
		K	0	53	6.2	48.46	19.48	35.84	25.27	32.07	34.62	13.05	-	-
Karmana	*Kharif*	N	59.94	100.91	76.62	82	67.16	90.23	85.25					
		P	37.7	49.95	42.26	43.22	36.68	48.83	39.33					
		K	49.64	63.68	69.82	78.36	64.49	84.6	64.36					
	Rabi	N	29.96	73.98	49.01	57.48	44.82	68.77	43.86					
		P	21.3	37.24	29.5	31.83	28.05	37.81	27.21					
		K	18.22	49.24	37.35	40.27	30.21	46.29	29.36					
	Summer	N		16.01	15.85	20.64	10.21	58.6	52.12					
		P		7.51	6.59	8.54	4.45	16	11.29					
		K		9.28	7.55	9.57	4.31	17.41	13.53					
Hisar	*Kharif*	N	105.6	96.8	107.7	69.9	101.4	111.2	100.5					
		P	25.2	17.9	24.6	11	17.3	26.2	23.3					
		K	192.7	164.1	195.7	94.4	78	202.8	176.9					
	Rabi	N	138.3	143.2	75.2	224	119.1	71	127.4					
		P	24.4	25.6	15.6	28.3	29.1	12	22.2					
		K	161	162.9	142.4	359.5	138	117	158.3					
	Summer	N	-	-	27.8	71.4	-	54.3	-					
		P	-	-	4.6	16.9	-	5.8	-					
		K	-	-	37.4	54.2	-	53.8	-					
Rahuri	*Kharif*	N	98.01	32.26	103.29	26.37	104.74	34.39	143.46	33.49	149.62	35.42	163.35	30.09
		P	48.07	15.45	48.86	12.18	52.37	15.86	22.25	15.85	23.36	16.07	25.45	4.95
		K	80.25	26.03	83.12	20.54	84.82	26.98	59.46	26.08	61.54	27.41	66.71	54.18
	Rabi	N	114.24	79.88	36.89	40.65	58.62	125.86	131.71	142.59	45.11	40.45	61.92	14.89
		P	22.75	17.55	8.23	15.68	22.01	25.19	26.63	23.13	10.76	9.44	25.16	5.85
		K	19.86	36.72	29.42	49.27	73.64	22.03	23.37	65.93	36.09	32.55	79.71	18.75
	Summer	N	Not Applicable											
Palampur	*Kharif- Rabi*	N	180.38	174.47	71.52	125.79	152.44	134.74	146.64	63.31				
		P	45.24	71.08	12.6	26.5	28.13	49.7	43.52	14.04				
		K	64.93	50.42	38	54.48	38.9	41.2	52.45	23.04				
	Summer	N												
		P												
		K												
Parbhani	*Kharif*	N	79.08	89	77.03	104.88	78.58	174.28	88.29	160.13				
		P	23.94	23.59	25.09	29.78	23.06	54.34	23.59	49.19				
		K	59.35	61.99	62.09	68.5	44.79	110.19	41.8	100.44				

Contd..../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	Rabi	N	34.67	—	44.12	—	—	47.66	35.03	44.75				
		P	25.38	—	23.53	—	—	18.75	11.9	19.31				
		K	10.52	—	8.17	—	—	21.75	13.4	22.78				
	Summer	N	—	43.89	120.61	15.32	36.5	133.07	44.55	81.74				
		P	—	11.17	43.17	6.5	10.1	54.76	26.35	26.75				
		K	—	6.38	19.04	4.89	17.3	71.36	25.72	43.84				
Coimbatore	*Kharif*	N	65	82.7	66.3	174	182	144	68	98.7	157.4			
		P	25.4	40.3	34	47.1	47.3	52.1	37.3	40.5	60.6			
		K	72	110.7	49.6	159.3	154.4	165	51.7	100.7	163			
	Rabi	N	122	127	126	52.3	81	52.3	151.3	73	159			
		P	51.1	51.2	49.1	27.3	32.7	20.3	42.8	27.5	47.7			
		K	123.4	131.7	113.4	60.7	73.4	68	132	80.7	148			
	Summer	N	88.4	115.6	167	111.6	55.4	167	88.4	133.6	53.7			
		P	35.6	48.9	42.1	22.1	28.3	42.1	35.6	33.8	16.8			
		K	88.7	69.4	146.4	123.4	55.4	146.4	88.7	82.4	55			
Bhubaneshwar	*Kharif*	N	63.1	64.3	60.4	61.1	66	64.7	69.3	62	65	64.7		
		P	20.2	21	18.6	19.3	18.5	20.5	19.8	20	20.3	22.4		
		K	84.8	86.8	71.4	84.5	71.3	90.5	77.9	89.2	80.2	92		
	Rabi	N	80.9	91.6	96.5	215	70.4	143.5	31.1	661.5	558.4	30.9		
		P	9.3	11.7	11.6	37.2	13.6	25.5	4	84.2	63.4	5		
		K	18.3	20.6	22.8	122	115.3	118.8	105	339.4	318.2	32.1		
	Summer	N	0	25.6	171.8	90.1	129.8	29.1	200.8	18.4	175.2	157.1		
		P	0	2.9	12.6	19.8	9.6	6.7	14.5	1.3	12.8	11.5		
		K	0	7.4	26.9	56.3	21	11.7	32.3	14.6	27.7	24.8		
Chiplima	*Kharif*	N	60.8	64.2	69.8	65.4	72.7	61.7	72	66	74.4	67.3		
		P	18.9	20	21.6	20.1	22	18.2	21.4	19.6	22.7	21.1		
		K	76.9	78.6	83	82.7	89.3	72.3	87.1	79.5	91.3	83.3		
	Rabi	N	120.5	86.7	104.1	468.5	101.6	37.4	36.1	407.2	62.3	42.5		
		P	13.8	10.1	12.7	102.5	48.8	4.7	4.4	77.7	11.3	7.1		
		K	33.3	69.3	29.9	457.7	128.7	58	57.3	443.5	125.3	48		
	Summer	N	0	82.7	161.1	59.6	42.5	63.7	149	57.9	63.9	23.1		
		P	0	42.3	142.2	45.3	6	33.3	128.2	16.5	41.4	9.2		
		K	0	35.1	81.4	77.7	17.2	34.5	75.8	55.1	22	12.5		
Siruguppa	*Kharif*	N	104.7	110.7	111.5	114.2	111.7	116.8	93.1	88.6	85.5	79.8		
		P	24.5	29.6	28.8	28.1	27.4	28.5	21	22.5	21.8	19.5		
		K	153.2	153.1	155.3	153.8	149.9	162.7	131.4	135.2	110.1	118.3		
	Summer	N	58.8	13.5	8.4	22.7	17.8	13	54.9	56	66.1	64.7		
		P	19.4	1.6	1.6	5.6	3.6	3.1	9.9	8.2	22.5	20.6		
		K	96.3	24.4	4.5	18.8	11.5	18.6	29.5	27	101.2	100.1		

Table C : Soil fertility Status (kg/ha) of different crop sequence in Exp. No 2 (a)

Name of CSR Centre	Season	Nut./Treat.	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14
Rajendra nagar	*Kharif*	OC%	0.54	0.52	0.54	0.57	0.61	0.62	0.65	0.63	0.63	0.64	0.62	0.62	0.61	
		N	151	163	169	180	185	192	182	187	176	175	181	176	171	
		P	34	30.6	31.5	30.3	35.4	35.2	34.3	43.6	41.8	40.9	37.4	39.3	38.7	
		K	224	127.3	130.2	121.8	162	164.6	140	183.4	211.8	223.9	171.3	146.4	147	
	Rabi	OC%		0.58	0.6	0.6	0.61	0.62	0.64	0.63	0.66	0.64	0.61	0.6	0.58	
		N		174	201	163	184	182	205	184	194	209	180	192	180	
		P		25.9	33.3	34.4	36.3	42.7	41.8	40.3	36.8	40.7	40.4	38.4	36.4	
		K		159.4	162.8	157.9	163.5	157.5	178.1	180.7	193.8	197.9	172.9	165	159.8	
Kalyani	*Rabi*	OC%	0.58	0.6	0.57	0.57	0.63	0.76	0.81	0.77	0.74	0.79	0.62	0.61		
		N	181.13	159.44	164.28	186.94	198.73	211.91	217.94	164.84	162.78	187.27	157.95	158.43		
		P	21.95	24.27	38.52	33.04	47.84	57.73	41.24	50.98	30.9	29.83	30.29	24.03		
		K	155.23	181.4	193.93	184.72	196.76	188.07	182.23	185.54	183.4	180.97	172.14	162.09		
Karamana	*Rabi*	OC %	1.14	1.24	1.25	1.2	1.25	1.33	1.28	1.39	1.4	1.44	1.32	1.27		
		N	177.18	197.57	217.95	232.06	236.77	222.66	210.11	221.09	214.82	227.36	225.79	202.27		
		P	34.96	39.08	39.29	40.73	40.94	39.39	46.1	42.9	38.47	38.57	38.16	38.26		
		K	81.14	87.3	110.68	100.16	123	124.71	118.38	135.02	129.86	121.66	124.26	75.91		
Palampur	*Rabi*	OC%	0.59	0.56	0.61	0.61	0.66	1.15	0.8	0.74	0.69	0.73	0.68	0.66		
		N	203	218.23	231.18	249.15	248.03	289.98	279.08	286.75	277.58	279.45	272.98	238.65		
		P	17.98	33.43	56.1	52	60.8	82.1	62.13	64.28	49.88	61.38	58.43	54.33		
		K	109.18	114.53	121.15	120.75	123.2	136	121.78	125.38	121.78	130.65	127	126.05		

Table D : Nutrient uptake (kg/ha) of different crop sequence in Exp. No 2 (a)

Name of CSR Centre	Season	Nut./Treat.	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14
Rajendra nagar	*Kharif*	N	36.8	54.4	66	80.7	88.6	77.6	79.2	67.7	70.7	96.3	98.4	66.4		
		P	9.8	14.5	16.7	18.3	19.9	18.4	19.9	16.6	17.7	21.2	21	13.2		
		K	34.9	60.5	73	75.8	82.9	78.1	81	63.1	76.1	98	89.9	57.8		
	Rabi	N	30.6	53.2	65.6	76.2	80.3	70.4	71	65.1	68.7	77.6	80.5	56.2		
		P	8.8	12	16.4	18.2	18.6	19.3	21.7	20.6	23.3	19.7	22.1	15.1		
		K	28.3	52.4	59.6	63.4	63	65.1	74	67.9	79.3	73.2	74.3	50.3		
Kalyani	*Kharif*	N	54.33	67.29	70.07	80.46	92.93	96.14	113.48	94.9	105	101.75	85.08	66.25		
		P	13.73	19.3	21.87	25.56	29.54	26.49	30.39	24.29	27.94	26.03	21.95	18.65		
		K	46.03	63.03	62.34	69.01	87.65	78.69	94.82	87.55	106.76	94.84	68.9	69.9		
	Rabi	N	39.33	68.2	94.94	95.92	96	109.6	93.97	106.57	111.18	132.31	120.38	75.54		
		P	11.22	20.7	27.11	29.44	32.09	35.83	31.81	34.36	37.56	36.62	36.33	23.62		
		K	47.4	84.7	112.34	110.71	116.41	123.7	111.19	132.73	134.22	140.47	122.32	91.33		
Karmana	*Kharif*	N	42.27	58.95	65.41	70.36	84.79	79.3	87.67	88.5	86.77	66.02	81.05	62.14		
		P	20.67	31.14	33.58	35.34	41.99	38.55	45.18	38.9	46.99	43.29	43.47	31.52		
		K	44.37	65.68	80.88	74.82	97.54	97.11	107.91	92.79	109.29	103.95	111.54	73.59		
	Rabi	N	28	43.22	54.39	46.92	66.33	70.25	66.09	63	57.96	59.89	56.22	47.1		
		P	31.66	42.66	53.15	52.44	61.98	65.47	61.48	59.67	60.96	59.14	54.27	46.46		
		K	26.36	42.28	58.85	55.66	61.64	65.95	66.22	52.06	63.08	74.49	53.18	41.2		
Palampur	*Kharif*	N	25.4	41.9	51.5	50.3	51.8	66.9	54.6	40.9	46.4	55.7	51.2	49.1		
		P	11.3	17.5	22	21.1	21.8	27.4	22.7	18.5	19.5	24.7	22.7	20.3		
		K	26.1	39.4	55.4	49.3	54.5	65.8	61.5	47	55.9	58.2	58.7	45.9		
	Rabi	N	23.7	36.7	45.7	50.36	56.2	62.4	48.5	49.1	52.4	40.6	40	38.7		
		P	5.4	7.2	8.7	10.1	11.7	13	9.9	9.6	11.1	8.7	8.4	8.3		
		K	12.1	20.2	19.9	24	23.3	34.2	25.9	24.4	23.9	19.7	23.4	19.6		

Table E : Soil fertility Status (kg/ha) in Organic farming

Name of CSR centre	Season	Nut./Treat.	T1	T2	T3	T4	T5	T6	T7	T8
Rajendra nagar	*Kharif*	OC(%)	0.63	0.7	0.64	0.71	0.64	0.7	0.52	0.66
		Avail. N	187.7	196.3	188.5	206.5	201.4	195.6	173.6	205
		Avail. P	57.2	38	56	39.7	30.5	57.7	47.1	43.4
		Avail. K	499.5	478.2	433.4	508.5	445.8	611.5	359.5	406.6
	Rabi	OC(%)	0.75	0.78	0.63	0.73	0.73	0.72	0.49	0.75
		Avail. N	202.7	206.4	186.7	199.4	200.1	198.6	168.9	202.7
		Avail. P	66.9	55.7	45.2	51	31	61.5	42.6	54.6
		Avail. K	435.7	443.5	333.8	542.1	406.6	541	258.7	376.3
Navsari	*Kharif*	OC%	0.602	0.677	0.665	0.693	0.626	0.675	0.624	0.653
		N	263	256	254	242	248	256	240	258
		P	28.33	28.31	27.26	27.62	33.52	28.89	27.12	28.84
		K	286	287	289	259	291	270	259	271
Rewa	*Rabi*	OC%	0.59	0.62	0.61	0.6	0.63	0.61	0.58	
		N	225	238	235	230	240	238	240	
		P	8.45	8.6	8.5	8.5	8.65	8.6	8.7	
		K	290	295	290	295	300	298	310	
Kathalagera	Summer	OC%	0.52	0.52	0.54	0.54	0.55	0.52	0.52	0.53
		P	26.67	27	27.33	27.1	28.17	27.5	27.83	28.5
		K	178.67	178.57	175.17	174.5	177.5	175.67	175	178.33
Kalyani	Summer	OC%	0.78	0.89	0.58	0.41	0.65	0.64	0.58	
		N	202.24	282.24	248.58	188.8	208.98	182.25	215.65	
		P	60.25	62.25	55.68	57.72	52.58	60.35	66.38	
		K	72.28	92.54	75.58	80.28	76.62	100.88	75.62	
Junagadh	*Rabi*	OC%	0.97	0.89	0.97	0.98	0.95	0.9	0.84	-
		N	278	239	261	271	269	272	246	-
		P	32.42	28.48	30.32	40.56	40.57	41.85	38.98	-
		K	230	224	236	276	248	289	228	-
Karmana	Summer	OC %	1.23	1.24	1.31	1.4	1.39	1.35	0.89	
		N	288.51	292.69	271.77	265.51	267.61	255.06	271.79	
		P	20.75	19.39	22.1	17.25	24.96	23.74	19.28	
		K	164.45	206.75	169.68	156.02	153.03	159.11	158.22	
Hisar	*Kharif*	OC%	0.49	0.47	0.43	0.48	0.5	0.47	0.51	0.47
		N	147	134.4	141.4	147	147	141.4	151.2	140
		P	19.4	17.2	16	18.8	19	18.4	19.8	17.2
		K	248.8	252.4	246.7	236.5	240.2	235.2	251.9	242.9
	Rabi	OC%	0.5	0.49	0.5	0.5	0.48	0.48	0.51	0.49
		N	169.4	159.6	165.2	165.2	158.2	166.6	170.8	166.6
		P	16.8	16	17.6	16.8	16.4	18.4	17.6	16.8
		K	231.9	228.2	228	223.6	221.8	231.2	239.6	229.9
Palampur	*Kharif*	OC%	3.2	2.7	3	2.7	3.1	2.7	0.9	
		N	357.5	351.2	348.1	330.8	371.6	330.8	280.7	
		P	330.4	237.5	271.8	296.5	347.4	296.5	67.6	
		K	987.4	803.6	931.5	869.6	932	967.2	293.6	
	Rabi	OC%	2.9	2.4	2.8	2.5	2.6	2.9	0.9	
		N	368.7	319.8	373.1	359	377.9	343.4	283.8	
		P	296.6	203.3	237.2	262.6	313.5	262.6	59.1	
		K	934.6	827.4	828.9	839.6	902.8	931.4	317.6	

Contd..../-

Name of CSR centre	Season	Nut./Treat.	T1	T2	T3	T4	T5	T6	T7	T8
	Summer	OC%	2.8	2.6	2.8	2.5	2.7	2.3	0.9	
		N	326.2	307.3	352.8	332.4	357.3	340.2	341.8	
		P	262.6	211.7	220.2	245.6	296.5	271	50.6	
		K	889.4	869.2	936.6	897.6	894.6	924.6	313.7	
Parbhani	*Kharif*	OC%	0.61	0.62	0.48	0.62	0.59	0.54	0.64	0.54
		N	186	158.33	152.32	165.3	161	166	195	157.3
		P	16.35	11.8	14.74	14.28	15.13	15.9	16.9	15.7
		K	362.15	345.38	357.72	346.26	357.62	361.85	373.96	326
	Rabi	OC%	0.6	0.62	0.47	0.61	0.58	0.52	0.62	0.52
		N	185	157.5	151.3	164	158	162	190	155
		P	16	11	13.2	14	14.8	15	15.5	15
		K	360	340	351	140.2	351.6	358.7	370	312
Coimbatore	*Kharif*	OC%	0.62	0.64	0.64	0.64	0.62	0.62	0.6	
		N	295	285	286	284	266	280	273	
		P	22.8	22.9	21.8	21.9	21.6	22.8	21.7	
		K	476	485	488	465	462	458	462	
	Rabi	OC%	0.68	0.7	0.7	0.7	0.68	0.7	0.65	
		N	298	290	295	292	285	292	290	
		P	20.5	21.5	22	22.3	23.1	23.5	21.8	
		K	498	490	502	506	498	485	492	
	Summer	OC%	0.59	0.62	0.61	0.64	0.59	0.61	0.58	
		N	323	305	321	280	293	303	305	
		P	19.34	21.24	19.04	19.64	18.14	21.04	18.04	
		K	519	530	483	528	520	486	466	
Bhuban-eshwar	Summer	OC%	0.9	1	1.1	1	0.9	1.1	0.6	0.9
		N	310.4	349.4	270.6	342.6	328.4	359.8	212.4	297.6
		P	21.8	22.6	21.2	20.8	21.7	22.9	13.4	19.3
		K	178.2	200.6	196.6	193.2	186.6	210.4	132.4	188.4
Chiplima	Summer	OC%	0.92	1.03	1.12	1.06	1.01	1.15	0.68	0.93
		N	337.2	372.4	380.6	373.6	343.6	370.4	266.6	333.4
		P	12.7	13.6	13.2	13.9	12.7	14.3	8.2	10.9
		K	144.4	158.6	160.2	156.6	149.4	157.6	110.2	153.4
Siruguppa	Summer	OC%	0.75	0.82	0.84	0.8	0.76	0.85	0.63	0.75
		N	205	219	224	224	235	224	195	205
		P	22	26	21	25	26	23	17	22
		K	362	354	387	362	375	365	342	362

Table F : Nutrient uptake (kg/ha) in Organic Farming

Name of CSR centre	Season	Nut./ Treat.	T1	T2	T3	T4	T5	T6	T7	T8
Rajendra nagar	*Kharif*	N	119.7	113.7	100.6	106.9	90.5	97	125.6	106.8
		P	40.5	43.7	35.8	45.9	32.3	34.4	46.3	42.4
		K	93.1	72.4	57.8	82.8	70.1	70.9	75.5	67.8
	Rabi	N	29.1	28.6	24.3	25	22.2	26.4	31.4	27.4
		P	6.7	7.5	5.6	5.3	4.5	4.6	7.9	6.2
		K	30.6	31.7	25.1	24.8	28.5	30.9	40.5	33.3
	System	N	148.8	142.4	120.1	132	112.6	123.4	157	134.2
		P	39.7	42.6	37.3	43.9	35.4	37.7	46.3	46
		K	111	90.7	79.2	97.4	99.5	106.7	109	101.2
Navsari	*Kharif*	N	51.02	44.14	39.67	44.02	34.69	44.17	46.78	38.72
		P	16.3	14.22	13.67	15	10.91	14.48	16.51	10.45
		K	92.76	79.07	78.36	82.01	64.73	82.02	80.03	74.92
Rewa	*Rabi*	N	54.9	67.01	65.11	68.13	74.05	73.28	115.53	
		P	13.56	18.33	19.01	17.69	26.93	22.61	41.91	
		K	66.98	107.98	100.3	97.25	105.68	97.03	157.38	
Kathalgere	*Kharif*	N	83.91	65.22	71.94	75.37	71.29	62.57	73.76	62.55
		P	26.1	27.92	23.26	27.77	28.14	27.19	27.72	29.88
		K	53.83	63.32	66.4	70.24	56.81	57.8	48.73	52.75
	Summer	N	66.4	63	35.1	59.4	33.5	154.8	33.8	60.9
		P	33.1	34.3	19.5	27.6	14	70.3	16	27.1
		K	96.8	99.8	27.8	72.7	21.9	139.9	40.1	63.4
Kalyani	*Kharif*	N	46.23	29.46	24.25	34.13	31.45	36.25	40.91	
		P	13.1	7.96	6.81	8.46	9.58	10.51	11.58	
		K	87.31	59.02	65.12	66.95	78.43	88.34	67.99	
	Rabi	N	164.73	96.27	62.24	82.75	78.44	202.24	141.75	
		P	46.12	24.8	16.83	21.79	23.26	60.24	44.98	
		K	167.37	96.53	67.74	57.62	57.45	167.3	91.13	
	Summer	N	294.28	257.73	229.74	254.28	275.88	277.15	305.84	
		P	55.46	36.02	39.97	45.26	52.78	56.84	75.51	
		K	304.57	252.45	244.09	260.85	275.58	279.73	320.37	
Junagadh	*Kharif*	N	94.8	78.1	84.27	85.48	102.85	85.9	82.4	-
		P	147.12	124.13	138.44	132.82	141.14	141.35	139.36	-
		K	9.54	6.84	7.08	7.42	8.97	9.52	9.29	-
	Rabi	N	23.71	16.77	17.93	16.89	20.7	21.81	17.9	-
		P	34.27	28.55	29.69	29.74	34.36	29.93	29.78	-
		K	73.67	64.67	60.35	57.08	65.45	65.22	66.56	-
Karmana	*Kharif* (rice)	N	91.58	56.07	80.05	79.85	59.9	57.86	51.42	
		P	56.48	43.76	52.08	47.25	50.3	45.45	45.96	
		K	72.05	64.74	76.29	63.39	66.43	85.3	49.92	
	Rabi (cucumber)	N	3.24	4.77	3.21	4.49	4.68	3.6	2.27	
		P	1.25	1.06	1.13	1.2	1.2	1.09	1.05	
		K	1.87	1.68	1.49	1.43	1.85	1.92	1.23	
	Summer (bhindi)	N	20.96	22.37	18.46	19.72	15.16	22.73	15.48	
		P	6.37	6.2	5.9	6.41	6	6.38	4.9	
		K	11.36	10.66	9.64	6.2	6.26	13.15	12.06	
Hisar	*Kharif*	N	102.5	83.5	74.9	92.2	45.1	68	117.3	95.8
		P	17.4	14.1	13.5	16.8	8.8	12.4	20.9	16.4
		K	56	45.1	52.5	50.7	25.1	36.9	63.1	53.2

Contd..../-

Name of CSR centre	Season	Nut./ Treat.	T1	T2	T3	T4	T5	T6	T7	T8
	Rabi	N	74.3	64.2	64.4	64.9	40.8	65.2	91.2	66.2
		P	14.3	12.2	12.6	12.5	8.7	13.1	18.3	20.9
		K	134	123.7	123	122.9	79.2	132.4	161.2	135.2
Palampur	*Kharif*	N	113.6	69.1	54.7	72.5	86.6	79.5	92.3	66.3
		P	55.5	39.7	27.9	43	36.8	45.8	49.96	39.7
		K	255.8	176.8	100.8	160.2	158.3	156.4	181	154.8
	Rabi	N	59	34.4	70.6	45.7	62.8	36	40.4	51.7
		P	7	4.2	8	5.3	7.4	4.5	3.4	6
		K	43	21.1	49.9	32.1	43	29.3	24.9	33.8
	Summer	N	7.4	2.1	2	4	4.8	2.7	1.7	3.3
		P	2.4	0.7	0.6	1.2	1.6	0.8	0.4	0.9
		K	8.8	2.9	2.6	4.9	6	3.1	1.7	3.9
Parbhani	*Kharif*	N	62.84	48.34	50.76	55.6	45.92	58.02	67.68	45.92
		P	10.7	8.23	8.64	9.46	7.82	9.88	11.52	7.52
		K	41.98	32.29	33.91	37.15	30.68	38.76	45.22	30.68
	Rabi	N	95.05	76.48	79.04	79.93	69.97	93.32	102.4	75.18
		P	24.89	20.03	20.7	20.93	18.33	24.44	26.82	19.69
		K	47.52	38.24	39.52	39.96	34.99	46.66	51.2	37.59
Coimbatore	*Kharif*	N	192	134	121	133	103	144	144	
		P	36.5	27.4	28.2	29.2	19.5	28.6	31.7	
		K	129.5	105.6	95.3	107.9	63	105.7	106.9	
	Rabi	N	108.5	72.3	73.3	70	62.7	71.6	72.6	
		P	30.3	28.8	31.9	30.9	31.1	31.8	33.3	
		K	138.2	133	137.4	123.5	128.9	118.3	133.4	
	Summer	N	203.5	120	103	120	94	124	127	
		P	65.9	35.6	32	35.6	25.5	37.9	42.8	
		K	328.5	164.3	157.3	171.7	126.9	178.8	203.4	
Bhuban-eshwar	*Kharif*	N	57.3	52.9	62.1	52.2	57.1	57.6	62.8	55.1
		P	15.4	16.8	19.1	15.1	17.2	18.1	17.7	14.4
		K	60.1	67.7	73.3	58.5	71.5	71.4	71.1	58.6
	Rabi	N	159.3	144.3	137.1	123.1	153.4	156.6	160.3	149.4
		P	14	12.3	12.4	11	13.1	14.5	13.8	12.5
		K	161.1	146	138.4	124.3	154.6	156.8	161.9	150.9
	Summer	N	128.4	105.3	105.6	109.3	112.1	120	134.1	110.7
		P	28.3	23.7	24.3	25.2	25.1	28.1	29.5	24.9
		K	174.6	143.3	142.1	148	151.8	161.8	182.7	150.2
Chiplima	*Kharif*	N	57.3	52.9	62.1	52.2	57.1	57.6	62.8	55.1
		P	15.4	16.8	19.1	15.1	17.2	18.1	17.7	14.4
		K	60.1	67.7	73.3	58.5	71.5	71.4	71.1	58.6
	Rabi	N	159.3	144.3	137.1	123.1	153.4	156.6	160.3	149.4
		P	14	12.3	12.4	11	13.1	14.5	13.8	12.5
		K	161.1	146	138.4	124.3	154.6	156.8	161.9	150.9
	Summer	N	128.4	105.3	105.6	109.3	112.1	120	134.1	110.7
		P	28.3	23.7	24.3	25.2	25.1	28.1	29.5	24.9
		K	174.6	143.3	142.1	148	151.8	161.8	182.7	150.2
Siruguppa	*Kharif*	N	55.8	63.8	57.9	48.5	49.3	68.9	58.4	55.8
		P	12.6	14.5	12.5	14.1	12.1	16.3	16.2	12.6
		K	71.5	74.4	70.1	66.8	60.3	84.4	74	71.5
	Summer	N	25.4	22.3	21.7	24.5	23	24.2	25.3	25.4
		P	3.3	4.2	3.2	4	3.6	4.2	3.7	3.3
		K	17	17	17.3	16.4	16.4	18.2	18.2	17

ANNEXURES

Annexure I

CURRENT ADDRESSES OF CONTACT PERSONS

ICAR-IIFSR Modipuram

1. **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

2. **Dr N .Ravisankar**, Pr. Scientist, PI (OFR) & In-charge PF(CU),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.
Tel: (Mob.) 08755195404, (Fax) 0121-288 8546
Email: agrosankar2002@yahoo.co.in, ifsofr@gmail.com, ifsofr@rediffmail.com

3. **Dr M.P. Singh**, Pr Scientist & PI, FSC & Bankable Project,
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.
Tel: (Mob.) 09917371208; (Fax) 0121-288 8546
Email: mpspdfsr@gmail.com

4. **Dr Prem Singh**, Programme Facilitator (CSRM),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.
Tel: (Mob.) 09412628440; (Fax) 0121-288 8546
Email: psfsrd@gmail.com

5. **Dr L.R. Meena**, Pr Scientist & Programme Facilitator (IFS),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.
Tel: (Mob.) 09410034958; (Fax) 0121-288 8546
Email: lrmeena63@gmail.com

6. **Dr R.P. Mishra**, Programme Facilitator (OAS),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.
Tel: (Mob.) 09412578625; (Fax) 0121-288 8546
Email: rp_min@yahoo.co.in

ICAR-IASRI, New Delhi

1. **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@yahoo.co.in

2. **Dr (Mrs) Cini Varghese,** Principal Scientist,
Division of Design of Experiments, IASRI, Library Avenue, Pusa, New Delhi – 110012
Tel: (Off.) 011-25847121 (Ext-4154)

Chief Agronomists at Main Centres

1. **Dr Ajit Baishya**, Chief Agronomist (AICRP-IFS),
Department of Agronomy, Assam Agricultural University, Jorhat-785 013 (Assam)
Tel.: (Off.) 0376-2311379, (Mob.) 09954451094, (Fax) 0376-2310831
Email:baishya.ajit@gmail.com

2. **Dr Sanjay Kumar**, Chief Agronomist (AICRP-IFS),
Bihar Agricultural, University, Sabour, Dist. Bhagalpur-813 210 (Bihar)
Tel.: (Off.) 0641-2451263, (Mob.) 09431310417, (Fax) 0641-2451400
Email: sushil62.2009@rediffmail.com

3. **Dr G.P. Pali**, Chief Agronomist (AICRP-IFS), Indira Gandhi Krishi Vishwavidyalaya, Krishak Nagar, Raipur-492 012 (Chhattisgarh)
Tel: (Off.) 0771-2442177, (Mob.) 09425524749 (Fax) 0771-2442131
Email:ifs_igkvraipur@rediffmail.com, gppali@rediffmail.com,

4. **Dr A.M. Patel**, Chief Agronomist (AICRP-IFS), Sardar Krushinagar-Dantiwada Agricultural University, Sardar Krushinagar, Dist. Banaskantha –385 506 (Gujarat)
Tel.: (Off.) 02748-278434, (Mob.) 09925587387, (Fax) 02748-278433
Email: ampatel_rs@yahoo.com

5. **Dr Pawan Kumar**, Chief Agronomist (AICRP-IFS),
Department of Agronomy, CCS Haryana Agricultural University, Hisar-125 004 (Haryana)
Tel.: (Off.) 01662-289151, (Mob.) 09466007435, (Fax) 01662-289268
Email: nanwal2005@hau.ernet.in

6. **Dr S.C. Negi**, 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, (Fax) 01894-230392
Email: drscnegi@yahoo.in, ranass_dee@yahoo.com

7. **Dr N.P. Thakur**, I/C Chief Agronomist (AICRP-IFS),
Sher-E-Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu-180 012 (J&K)
Tel.: (Off.) 0191-2262026, (Mob.) 09419332934, (Fax) 0191-2262026
Email:npthakur08@gmail.com, dileepkachroo@ediffmail.com

8. **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, 09470362975; (Fax) 0651-2450850, 2450073
Email: caifsbau@gmail.com

9. **Dr O. Kumara**, I/C Chief Agronomist (AICRP-IFS),
Agricultural Research Station, Kathalagere, (UAHS, Navile, Shimoga), Dist. Davanagere-577 219 (Karnataka)
Tel.: (Off.) 08180-273555, (Mob.) (Fax) 08180-273827
Email: mccsrk@yahoo.co.in, kumarabar@gmail.com

10. **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, (Fax) 08396-220249
Email: bma_68@rediffmail.com, basavanneppa6@gmail.com

11. **Dr Jacob John,** Chief Agronomist (AICRP-IFS),
CSRC, Karamana, Thiruvananthapuram-695 002 (Kerala)
Tel.: (Off.) 0471-2343586, (Mob.) (Fax) 0471-2343586
Email:csrc@kau.in

12. **Dr V.K. Shukla**, Chief Agronomist (AICRP-IFS),
Department of Agronomy, JNKVV, Adhartal, Jabalpur-482 004 (M.P.)
Tel.: (Off.) 0761- 2681771, (Mob.) 09424306503
Email: drvkshuklaifs@gmail.com

13. **Dr L.S. Chavan**, Chief Agronomist (AICRP-IFS),
DBSKKV Agricultural Research Station, Karjat, Dist. Raigad -410 201 (Maharashtra)

Tel.: (Off.) 02148-222072, (Mob.) 09850971545, (Fax) 02148-222035
Email: lschavan@gmail.com

14. **Dr A.S. Karle,** Chief Agronomist (AICRP-IFS),
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani-431 402 (Maharashtra)
Tel.: (Off.) 02452-230089, (Mob.) 09822992864, (Fax) 02452-220121
Email:csrc_maupbn@rediffmail.com,

15. **Dr. B.V. Saoji,** Chief Agronomist (AICRP-IFS),
Department of Agronomy, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar, Akola-444 104 (Maharashtra)
Tel.: (Off.) 0724-2800628 (Mob.) 09960716342 (Fax) 0724-2258218
Email: cacsr@pdkv.ac.in

16. **Dr M.B. Dhonde,** Chief Agronomist (AICRP-IFS),
Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar-413 705 (Maharashtra)
Tel.: (Off.) 02426-243106, (Mob.) , (Fax) 02426-243223, 243216
Email: fsrahuri@gmail.com

17. **Dr Rabindra Kumar Paikaray,** Chief Agronomist (AICRP-IFS),
Odisha University of Agriculture & Technology, Bhubaneswar-751 003 (Odisha)
Tel.: (Off.) 0674-2397176, (Mob.) 09437301524 (Fax) 0674-2397780, 2397692
Email: ifsouat@gmail.com,
rkpaikaray@rediffmail.com

18. **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, (Fax) 0161-2400945
Email: sohanwalia72@yahoo.co.in

19. **Dr Rakesh Sammauria,** Chief Agronomist (AICRP-IFS),
SKNAU Rajasthan Agricultural Research Institute , Durgapura, Jaipur-303 329 (Rajasthan)
Tel.: (Off.) 0141-2720160, (Mob.) 09829611123, (Fax) 0141-2550229, 2550262
Email: ifsdurgapura@gmail.com,
rsamrau@yahoo.co.in

20. **Dr K.R. Latha,** Chief Agronomist (AICRP-IFS),
Department of Agronomy, TNAU, Coimbatore-641 003 (T.N.)
Tel.: (Off.) 0422-6611254, (Mob.) 09487507182, (Fax) 0422-6611246
Email: palaniappan_latha@yahoo.co.in

21. **Dr M. Goverdhan,** 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.) 94404 67091, 99896 33306, (Fax) 040-24017463
Email:aicrpcshyd@gmail.com

22. **Dr Rohitashav 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; (Fax) 05944-233608, 233473
Email: rohitash_1961@rediffmail.com,
singh.rohitash5@gmail.com

23. **Dr Karam Husain,** 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.) 09795138237, 8004839935, (Fax) 0512-253808
Email:husainkaram@rediffmail.com,
ifskanpur@gmail.com

24. **Dr N.B. Singh**, Chief Agronomist (AICRP-IFS),
Department of Agronomy, ND University of Agriculture & Technology, Kumarganj, Faizabad-224 229 (U.P.)
Tel.: (Off.) 05270-262053, (Mob.) 09415720277, (Fax) 05270-262917
Email:nbsnduat@gmail.com

25. **Dr Swapan Kumar Mukhopadhyay**, Chief Agronomist (AICRP-IFS),
Agri. Research Complex Building, BCKVV, Kalyani, Nadia-741 235 (W.B.)
Tel.: (Mob.) 0 9477231319, (Fax) 033-25828407
Email: skmbckv@gmail.com

Agronomists of CSR Sub-Centres

1. **Dr M. Srinivas**, Agronomist (AICRP-IFS) ANGRAU, A.P. Rice Research Station, RARS, Maruteru-534 122, Dist. W. Godavari (AP)
Tel.: (Off.) 08819-246283, (Mob.) 09949599965, (Fax) 08819-247583
Email: aicrpifsmtu@gmail.com

2. **Dr Sahana**, Agronomist (AICRP-IFS), PJTSAU, Regional Sugarcane & Rice Res. Stn., Rudrur-503188 (AP)
Tel.: (Off.) 08467-284024, (Mob.) 09010104998, (Fax) 08467-284333
Email: aicrpifsrdr@gmail.com

3. **Dr P.J. Gohil**, Agronomist (AICRP-IFS), Farming System research Centre, Department of Agronomy, Junagadh Agricultural University, Junagadh-362 001 (Gujarat).
Tel.: (Off.) 0285-2670139, (Mob.) 09428188120 (Fax) 0285-2670139
Email: pjgohil@jau.in, gohelparesh@rediffmail.com

4. **Dr L.J. Desai**, Agronomist (AICRP-IFS), N.M. College of Agriculture, Navsari Agricultural University, Navsari-396 450 (Gujarat)
Tel.: (Off.) 02637-282771-75, Ext. 1207, (Mob.) 09429310273, (Fax) 02637- 282766
Email: ljdesai.sdau@yahoo.com, agronomynau@ymail.com

5. **Dr S.K. Choudhary**, Agronomist (AICRP-IFS),
RVSKVV College of Agriculture, Indore-452 001(M.P.).
Tel.: (Off.) 0731-2702911, (Mob.) 09424083624; (Fax) 0731-2496989
Email: dr.sharad.786@gmail.com

6. **Dr Vinod Kumar**, Agronomist (AICRP-IFS), Zonal Agricultural Research Station, Powarkheda, Dist. Hoshangabad-461 110 (M.P.)
Tel.: (Off.) 07547-227257, (Mob.) 09425044950, (Fax) 07547-227257
Email: vinodkumar.agronomy@gmail.com

7. **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, (Fax) 07662-220857
Email: amitbds567@gmail.com

8. **Dr J.P. Tetarwal**, 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, (Fax) 0744-2844306
Email: jptetarwal@gmail.com

9. **Mr Debashis Swain**, Agronomist (AICRP-IFS),
RRTTS Campus Chiplima, Dist. Sambalpur-768 025 (Orissa)
Tel.: (Off.) 0663-2460507, (Mob.) (Fax) 0663-2460523
Emai: drdebashishswain@gmail.com

10. **Dr S. Porpavai**, Agronomist (AICRP-IFS), Soil & Water Management Research

Institute, Kattuthottam, Thanjavur-613 501 (T.N.).
Tel.: (Off.) 04362-267680, (Mob.) 09751241522, (Fax) 04362-267619
Email: porpavaiswmri@yahoo.co.in

11. **Dr S.B. Singh**, I/C Agronomist (AICRP-IFS), Department of Agronomy, RBS College, Bichpuri, Agra - 283 105 (U.P.)
Tel.: (Off.) 0562-2636615, (Mob.) 09451113256, (Fax) 0562-2520075
Email: csragra@gmail.com

12. **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, (Fax) 0542-2368993
Email: jsbohra2005@rediffmail.com

PIs at Voluntary Centres

1. **Dr L.R. Meena**, Pr Scientist & Programme Facilitator (IFS),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.,
Tel: (Mob.) 09410034958, (Fax) 0121-288 8546
Email: lrmeena63@gmail.com

2. **Dr T.P. Swarnam,** Pr. Investigator (AICRP-IFS),
Natural Resource Management Division, Central Agricultural Research Institute, PB No. 181, Port Blair-744 101 (A & N Islands)
Tel.: (Off.) 03192-250341, (Mob.) 09679541781, (Fax) 03192-251068, 233281
Email: swarna_8@yahoo.com

3. **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, (Fax) 0612-2223956
Email: shiv_sanjeev@yahoo.co.in

4. **Dr. Subhash Babu**, 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.) 08900527308 (Fax) 0364-2570257, 2570355
Email: subhiari@gmail.com

5. **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, (Fax) 0832-2285649
Email: paramesha.v@icar.gov.in

6. **Dr Anil Kumar,** Pr. Investigator (AICRP-IFS), Indian Agricultural Statistics Research Institute, New Delhi-110 012
Tel: (Off.) 011-25847121 (Ext-4154); (Mob.) 09868891600, (Fax) 011-25841564
Email: akumar@iasri.res.in, akumarchi72@yahoo.co.in

Agronomists at On-Farm Research Centres

1. **Dr D Nagarajajuna**, OFR Agronomist (AICRP-IFS),
ANGRAU Agricultural Research Station, Gajularega, Vizianagaram -535001, (A.P.)
Tel.: (Off.) 08941-238628, (Mob.) 09493146263
Email:ars.vzm@gmail.com

2. **Mr Ajoy Sankar Bora**, Jr. Agronomist (OFR) AICRP on IFS, Livestock Research Station, Hekera, Mondira-781 127, Dist. Kamrup (Assam)
Tel.: (Mob.) 09508408214
Email: ajoy_sb@yahoo.com

3. **Dr D.K. Mahto**, OFR Agronomist (AICRP-IFS),
Department of Agronomy Bhola Paswan Shatri Agricultural College, Purnea City Farm, Kasba Road, Purnea-854 302 (Bihar)

Tel.: (Mob.) 09431720807, (Fax) 06454-243114

4. **Dr Anil Kumar Netam,** OFR Agronomist (AICRP-IFS),
Sant Kabir College of Agriculture and Research Station, Kawardha, Dist. Kabirdham- 491 995 (Chhattisgarh)
Tel.: 07868-241467 (Mob.) 07587173412 (Fax) 07741-233500
Email: anilbhumit2014@gmail.com

5. **Dr R.R. Patel,** I/C OFR Agronomist (AICRP-IFS),
SDAU Centre On Farm Research Centre, Agricultural Research Station Adiya-384 255 Dist. Patan (Gujarat)
Tel.: (Mob.) 09824071873
Email: ofrsdauguj@gmail.com

6. **Dr. Girish J. Patel,** OFR Agronomist (AICRP-IFS),
Tribal Research Cum Training Centre, Anand Agricultural University, Devgadh Bariya-389 380 (Gujarat)
Tel.: (Off.) 02676-235528;(Mob.) 9825930039
Email: trtedbaau@gmail.com, girish_agri2005@aau.in

7. **Dr Anil Mehta,** OFR Agronomist (AICRP-IFS),
CCS HAU Cotton Research Centre, Sirsa-125 055 (Haryana)
Tel.: (Mob.) 09416310043
Email: akmehta66@gmail.com

8. **Dr S.K. Sharma,** OFR Agronomist (AICRP-IFS),
Shivalik Agricultural Research and Extension Centre (CSK HPKV), Kangra-176 002 (H.P.)
Tel.: (Mob) 09418167556
Email: s.suresh0061@gmail.com

9. **Dr A.K. Gupta,** OFR Agronomist (AICRP-IFS),
Farming Systems Research Centre, DLRSS, Dhiansar, Jammu-181 133 (J & K)
Tel.: (Off.) 0191-2106409, (Mob.) 09419100401, (Fax) 0191-2106409
Email: ashokgupta1970@rediffmail.com

10. **Dr. Shambhu Saran Kumar,** OFR Agronomist (AICRP-IFS),
Zonal Research Station, Darisai, P.O., Bara Khurshi, District East Singhbhum-832 304 (Jharkhand)
Tel.: (Off.) 06434-222052, (Mob.) 09431194519
Email: ofreastsinghbhum@gmail.com

11. **Dr M.T. Sanjay,** I/C OFR Agronomist (AICRP-IFS),
1st Floor, Directorate of Extn. Office Building, University of Agricultural Sciences, Hebbal Campus, Kolar, Bangalore-560 024 (Karnataka)
Tel.: (Off.) 080-65325146, (Mob.) 09243075082, (Fax) 080-23516836
Email: ecfschemebangalore@rediffmail.com

12. **Dr V V Angadi,** OFR Agronomist (AICRP-IFS),
Institute of Organic Farming (2nd Floor), Main Agricultural Research Station Yettinagudda campus, Krishinagar, Dharwad-580 005 (Karnataka)
Tel.: (Off.) 08372-231110

13. **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 (Fax) 0663-2460523
Email: ecfthiruvalla@kau.in, jacob.d@kau.in,

14. **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: dnswheat@gmail.com

15. **Dr B.D. Ghode,** Agronomist (OFR I/C), AICRP on IFS, Krishi Vigyan Kendra, (JNKVV) Piprondh, Katni-483 442 (M.P.)
Tel.: (Off): 07662-268515 (Mob) 09424677473, 09926350772 (Fax) 07662-268575
Email: bhauraoghode74@gmail.com

16. **Dr Varsha Tapre,** OFR Agronomist (AICRP-IFS), Regional Research Centre, Morshi Road, Amravati -444 603 (Maharashtra)
Tel.: (Mob.) 09890093610
Email: drvarshatapre@rediffmail.com, ecfhiwra@gmail.com

17. **Dr S.B. Bhagat,** OFR Agronomist (AICRP-IFS),
Agricultural Research Station, Nandishala, Valan Naka, Palghar, Dist. Thane-401 404 (Maharashtra)
Tel.: (Off.) 02525-241048; (Mob.) 09423296139
Email: sbbhagat1791@gmail.com, ecfdbskkv@gmail.com

18. **Dr A.S. Jadhav,** OFR Agronomist,
Regional Sugarcane Research Station, Basmathnagar, Dist Hingoli, Maharashtra

19. **Prof. M.M. Desai,** OFR Agronomist (AICRP-IFS),
Entomology Section, Central Sugarcane Research Station, Padegaon, Tal: Phaltan Dist. Satara-415 521 (Maharashtra)
Tel.: (Off.) 020-25693750, (Mob.) 09822295851, 08275201107, (Fax) 020-25698734
Email: ofrgpune@rediffmail.com

20. **Dr. Tushar Ranjan Mohanty,** OFR Agronomist, On-Farm Research Centre (AICRP-IFS),
Kendujhar RRTTS Campus, Judia Farm PO.- Kendujhar, Dist. Kendujhar-758 002 (Odisha)
Email: tusharranjan70@gmail.com

21. **Dr Dr. Bhawani Sankar Nayak,** OFR Agronomist (AICRP-IFS),
RRTTS,Campus,Kalahandi, Bhawnipatna - 766001
Email: ofrkalahandi@gmail.com

22. **Dr Amit Salaria,** I/c OFR Agronomist, AICRP-IFS,
School of Organic Farming, Punjab Agricultural University, Ludhiana-141 004 (Punjab)
Tel.: 0183-2501989 (Mob.)

23. **Dr Babu Lal Meena,** OFR Agronomist (AICRP-IFS),
SKNAU College of Agriculture, Didwana, Lalsot, Dausa-303 511 (Rajasthan)

24. **Dr L.N. Dashora,** OFR Agronomist (AICRP-IFS),
Department of Agronomy, Rajasthan College of Agriculture, MPUA&T, Udaipur- 313 001 (Rajasthan)
Tel.: (Off.) 294-2417374, (Mob.) 07568507410, (Fax) 0294-2420447
Email: lndashora@gmail.com

25. **Dr. S.R. Venkatachalam,** I/C OFR Agronomist (AICRP-IFS),
Tapioca and Castor Research Station, Yethapur, P.G. Oakatan PO)-636 293526 Salem District (T.N.)
Email: ntselvan@gmail.com

26. **Dr N. Sathish Kumar,** OFR Agronomist (AICRP-IFS),
Dryland Agricultural Research Station, Chettinad, Dist. Sivagangai-630 102 (T.N.)
Tel.: (Off.) 04565-283080, (Mob.) 098945 63397
Email: nsatheesh2000@gmail.com

27. **Dr Md. Latheef Pasha**, OFR Agronomist (AICRP-IFS),
Regional Agricultural Research Station, Mulugu Road, Warangal-506 007 (Telangana)
Tel.: (Off.) 0870-2100236; (Mob.) 09951997861; (Fax) 0870-2424337
Email: lateef_pasha@rediffmail.com, lateefpasha@gmail.com

28. **Dr Dinesh Kumar Singh,** I/C OFR Agronomist (AICRP-IFS),
Department of Agronomy, College of Agriculture, G.B.P.U.A.&T, Pantnagar-263 145 District Udham Singh Nagar (Uttarakhand)
Tel.: (Off.) 05944-233034, (Mob.) 09410187299
Email: dkonweb@gmail.com

29. **Dr. Alok Kumar**, I/C OFR Agronomist (AICRP-IFS),
Department of Agronomy, ND University of Agriculture & Technology, Kumarganj, Faizabad-224 229 (U.P.)
Tel.: (Off.) 05270-262053, (Fax) 05270-262917

30. **Dr Jitendra Singh**, OFR Agronomist (AICRP-IFS),
Department of Agronomy, CS Azad University of Agriculture & Technology, Kanpur-208 002 (U.P.)
Tel.: (Off.) 0512-253456; (Fax) 0512-253808
Email: ifskanpur@gmail.com

31. **Dr Manabendra Ray,** Agronomist (AICRP-IFS),
BCKVV, Regional Research Station, Akshayanagar, Kakdwip-743 347, Dist. 24-Parganas (South) (West Bengal)
Tel.: (Mob.) 09432960882, (Fax) 033-25828460
Email: manabbckv@gmail.com

32. **Dr L.R. Meena**, Principal Scientist & Agronomist (AICRP-IFS,OFR),
ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut-250 110, U.P.,
Tel: (Mob.) 09410034958, (Fax) 0121-288 8546
Email: lrmeena63@gmail.com

Annexure-II

PRICES (RS./Q) & CALORIE PER 100 GM FOR 2015-16

Crops	Price (Rs. q^{-1}) 2014-15	Price (Rs. q^{-1}) 2015-16	Cal./ 100 gm
All Fodders	138	150	16
All green manuring	247	250	16
Amaranthus	1188	1250	49
Arhar/Pigeonpea/ Redgram	**4350**	**4625**	335
Ashwagandha	**11182**	**12500**	45
Baby Corn		**2000**	125
Barley	**1150**	**1225**	336
Beetroot	**1677**	**1700**	25
Berseem (seed)	**11182**	**12500**	344
Bitter Gourd	**350**	**500**	25
Blackgram/Urad	**4350**	**4625**	347
Bottle gourd (Lauki)	**698**	**725**	12
Brinjal	**1116**	**1150**	24
Broccoli	**2794**	**3500**	45
Bt. cotton			332
Buck Wheat	**3270**		346
Cabbage	**650**	**725**	27
Capcicum	**2000**	**2200**	24
Carrot	**650**	**700**	48
Cassava	**1200**	**1350**	134
Castor	**3200**	**3500**	440
Cauliflower	**785**	**820**	66
Chandrasur	**2060**	**2275**	300
Chillies(green)	**2200**	**2400**	29
Clusterbean / Gaur	**1250**	**1375**	35
Coleus	**1775**	**1800**	86
Coriander(S)	**3915**	**4200**	288
Coriander(L)	**1265**	**1325**	49
Cotton(F-4/1180)	**3900**	**4250**	332
Cotton (H-1380)	**4200**	**4500**	332
Cowpea/Lobia(S)	**2230**	**2400**	323

Crops	Price (Rs. q^{-1}) 2014-15	Price (Rs. q^{-1}) 2015-16	Cal./ 100 gm
Cowpea (Veg.)pod	**1200**	**1400**	48
Cucumber	**1150**	**1300**	13
Cumin/SiyaZeera	**4215**	**4600**	356
Dolichosbean(pod)/ LabLab	**2015**	**2220**	48
EFY(Kalyani)	**1650**	**1800**	79
Fennel grain	**5900**	**6400**	31
Fennugreek (seed)	**3925**	**4300**	333
Fennugreek leaves/ spinach	**1150**	**1200**	49
Field bean	**2200**	**2400**	48
Fieldpeas/Veg.peas	**1250**	**1500**	93
Frenchbeans	**2200**	**2400**	26
Garlic	**3900**	**4300**	145
Ginger	**3900**		67
Gram/Chickpea/ Bengalgram	**3425**	**3500**	360
Greengram/Moong	**4850**	**4850**	334
Groundnut	**4000**	**4030**	567
Guar			93
Horsegram	2670	2850	321
Indian bean			26
Isabgol	8316	8500	124
Jute stalk**	**2300**	**2500**	350
Kalongi			656
Kasni	**2400**	**2550**	33
Knolkhol	**650**	**875**	43
Ladyfinger	**1250**	**1300**	35
Lentil /Masur	**3075**	**3400**	343
Linseed	**3350**	**3475**	530
Lucerne grain	**18000**		23
Maize(Grain)	**1325**		342

Crops	Price (Rs. q^{-1}) 2014-15	Price (Rs. q^{-1}) 2015-16	Cal./ 100 gm
Maize (green cobs)	0.80/cob or 300/q	0.80/cob or 300/q	125
Maize Sweet Corn	**1325**	**1450**	342
Marigold	**2050**	**2100**	4
Mentha			48
Methi			333
Mothbean			334
Rapeseed& Mustard	**3350**	**3350**	541
Gobi sarson/Hayola	**2050**	**2275**	541
Niger Seed	**3600**	**3900**	515
Oat	**1145**	**1260**	374
Onion (big)	**1050**	**1175**	50
Pea	**2400**	**2650**	315
Pea (veg.)	**1300**	**1500**	93
Pearlmillet/Bajra	**1250**	**1350**	361
Potato	**450**	**525**	97
Pumpkin	**800**	**875**	25
Radish (White)	**350**	**370**	17
Ragi/Fingermillet	**1550**	**1650**	328
Rajgira	**3900**	**4275**	319
Rajmash/Rajmah	**2750**	**3025**	346
Rice(coarse)*	**1360**	**1410**	346

Crops	Price (Rs. q^{-1}) 2014-15	Price (Rs. q^{-1}) 2015-16	Cal./ 100 gm
Ricebean fodder	**135**	**170**	16
Ridge /Round gourd	**1300**	**1450**	17
Safflower	**3050**	**3300**	356
Sesamum/Gingely/ Til	**4600**	**4700**	563
Sorghum/Jowar	**1530**	**1570**	349
Soyabean (b)	**2500**	**2575**	432
Soyabean (y)	**2560**	**2600**	432
Sugar beat	**525**	**625**	48
Sugarcane*	**230**	**230**	34
Summer Squash	**1050**	**1125**	16
Sunflower	**3750**	**3800**	620
Rice Basmati	**2550**	**2800**	346
Sweet Potato	**850**	**900**	120
Tomato (green)	**900**	**1000**	23
Toria/Raya/Ridgeguard	**3350**	**3350**	541
Turmeric	**2600**	**2750**	349
Wheat	**1450**	**1525**	346
White gingely	**6100**	**6500**	563
Yam	**1550**	**1700**	79
Yardlong/Asaparagus bean	**1550**	**1625**	85

*** Fair and remunerative price**
Prices in bold are minimum support prices (MSP)

Annexure-III

BOTANICAL AND HINDI NAMES OF DIFFERENT CROPS BEING GROWN AT AICRP-IFS CENTRES IN DIFFERENT EXPERIMENTS

S.N.	Common name	Botanical name	Hindi Name
1	Ajwain/ Ajowan/ caraway	*Trachyspermum copticum*	Ajwain
2	Ashwagandha/ Indian 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.	Baigan
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.	Lehsun
27	Green gram	*Phaseolus radiatus (L.) Wilczek.*	Moong/ Moong bean
28	Groundnut	*Arachis hypogea* L.	Moongfali
29	Hyacinth bean/ indian bean	*Dolichos lablab* L./ *D. purpureus/ Lablab purpureus*	Seim
30	Indian Mustard	*Brassica juncea Coss.*	Sarson/ Raya
31	Indian rape	*Brassica campestris* L. var. Toria	Toria

S.N.	Common name	Botanical name	Hindi Name
32	Lady's finger/ Okra	*Abelmoschus esculantus*Moench.	Bhindi
33	Lentil	*Lens culinaris* Medikus	masoor
34	Linseed/ Flax/ Flax seed	*Linum usitatissinum L.*	Alsi
35	Maize/ Corn	*Zea mays* L.	Makka
36	Marigold	*Calendula officinalis* L.	Gainda
37	Mustard	*Brassica campestris* L. var. Yellow sarson/ Brown sarson	Sarson
38	Oat	*Avena sativa* L.	Jaee
39	Onion	*Allium cepa* L.	Pyaz
40	Pearl millet	*Pennisetum americanum L.*	Bajra
41	Pea/ Vegetable Pea	*Pisum sativum* L.	Matar
42	Pigeon pea	*Cajanus cajan* (L) Milsp.	Arhar/ Tuar
43	Potato	*Solonum tuberosum* L.	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.	Chaulai/ Ramdana/ Rajgira
49	Rice/ Paddy	*Oryza sativa* L.	Dhan
50	Ridge gourd/ Sponge gourd	*Lufa acutangula/ L. aegyptica/ L. cylindrica*	Torai
51	Sesame	*Sesamum indicum* L.	Til
52	Sorghum	*Sorghum bicolor (*L.) Moench.	Jowar
53	Soybean	*Glycine max* L. (Merr.)	Soybean
54	Spinach	*Spinacia oleracea* L.	Palak
55	Sugar 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 lycopersicum L./ Lycopersicon esculantum/ L. lycopersicum*	Tamatar
61	Turmeric	*Curcuma longa* L.	Haldi
62	Wheat	*Triticum aestivum* L. emend. Fiori & Paol.	Gehun

CONTACT / सम्पर्क सूत्र

Dr. A.S. Panwar
Director
ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut-250 110, Uttar Pradesh, India
Tel: (Off.) 0121-288 8711, 288 8811
(Mob.) 09412078001
(Fax) 0121-288 8546
E-mail: director.iifsr@icar.gov.in

Dr. N. Ravisankar
Principal Scientist (Agronomy) & Programme Facilitator
Coordination Unit
ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut-250 110, Uttar Pradesh, India
Tel: (Off.) 0121-288 8548; (Fax) 0121-288 8546
E-mail: pcaicrpifs.iifsr@icar.gov.in

Website:
www.iifsr.res.in







भाकृअनुप
ICAR

हर कदम, हर डगर
किसानों का हमसफर
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