अ.भा.समे.कृ.प्र.अ.परि.

AICRP-IFS

वार्षिक प्रतिवेदन
Annual Report
2012-13

कृषि प्रणाली अनुसंधान परियोजना निदेशालय
(भारतीय कृषि अनुसंधान परिषद्)
मोदीपुरम, मेरठ–250 110 (उ.प्र.), भारत

Project Directorate for Farming Systems Research
(Indian Council of Agricultural Research)
Modipuram, Meerut - 250 110 (U.P.), India

ABOUT PDFSR

Project Directorate for Farming Systems Research (PDFSR) (formerly Project Directorate for Cropping Systems Research -PDCSR), was established by Indian Council of Agricultural Research, New Delhi in April, 1989 at Modipuram, Meerut (Uttar Pradesh). The specific (revised) mandate of PDFSR is, 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 and viii) to develop capacity building of stakeholders in Integrated Farming Systems through training. All India Coordinated Research Project on Integrated Farming Systems is an integral part of PDFSR with 31 on-station IFSR centers, 11 on station CSR centers and 25 'on-farm' research centers; spread throughout the country in five ecosystems, i.e., arid, semi-arid, sub-humid, humid and coastal; to develop location specific system based technologies. In addition, a net work Project on Organic Farming was initiated during 2004 with 13 cooperating centers.

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON
INTEGRATED FARMING SYSTEMS

Annual Progress Report
2012–13

Project Directorate for Farming Systems Research
(Indian Council of Agricultural Research)
Modipuram, Meerut- 250 110, India

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Important Notes:

- This compilation is a joint contribution of all the associated scientists and technical staff of 74 AICRP-IFS centers (data generation), IASRI New Delhi (statistical analysis) and PDFSR Modipuram (report writing, compilation, editing and printing).
- The report is based on experimental data generated during *kharif, rabi* and summer seasons of 2011-12 (period ending June 2012), under 'on-station' and 'on-farm' research programmes of AICRP on Integrated Farming Systems. The other details are relevant to 31st March 2013.
- 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 Project Director, Project Directorate for Farming Systems Research and due credit to the concerned scientists.

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The sincere efforts made by all the associated scientists and technical staff of 74 AICRP-IFS centrs in generating the experimental data deserve a word of appreciation and I am highly thankful to every one of them.

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(B. Gangwar)

Project Director, PDFSR
&
PC, AICRP-IFS

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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 crops 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 centre. Prompted by these suggestions, "Simple Fertilizer Trial at cultivators' Fields" was initiated in 1953 under the Indo-American Technology Cooperation Agreement under "Soil Fertility and Fertilizer Use Project" with the following objectives:

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

ii. To investigate the relative response of different fertilizers in various broad soil groups and to work out the optimum fertilizer combinations for different agro-climate 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 fertilizer.

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 PDFSR, 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.

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.

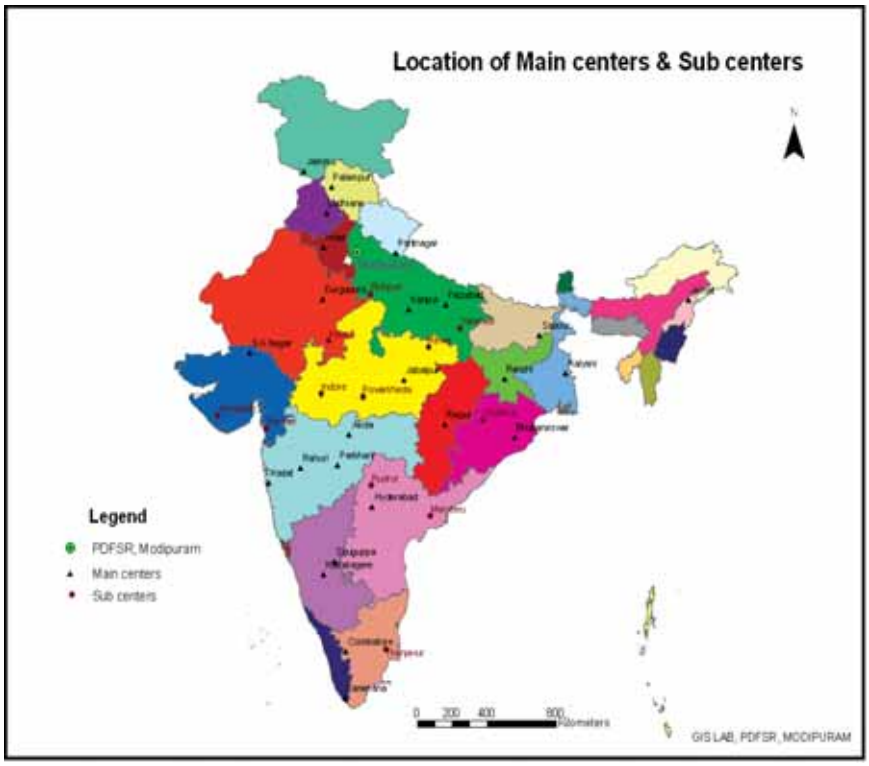
— To undertake on-farm testing and refinement of system-based farm production technologies.

— To optimize on-farm integration of farm enterprises for enhanced farm incomes, resource/ input use efficiencies, and employment opportunities.

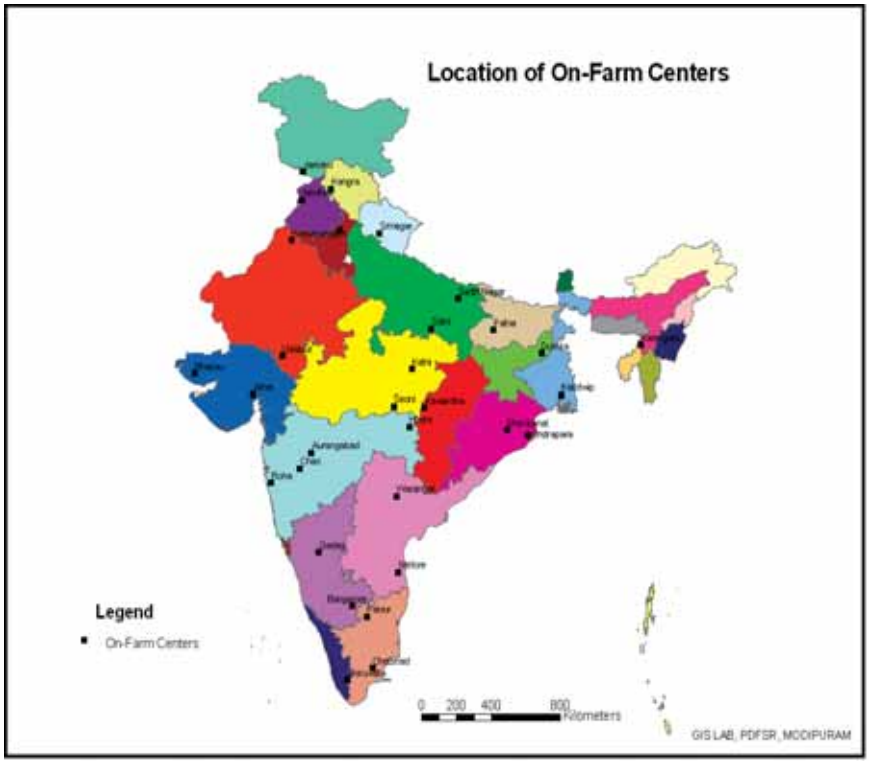
However, component of Integrated Farming Systems Research (On-Station) could be taken up only during financial year 2010-11, in accordance with the recommendations of 'Brain Storming Session – cum – Launching Workshop of Integrated Farming Systems Programme', organized at KAU Cropping Systems Research Centre, Karamana, Thiruvananthapuram (Kerala) on 6-7 March, 2010. Whereas the component of on-farm IFS programme could be initiated only during the year 2011-12.

3. LOCATION

Under the aegis of AICRP-IFS there are 25 main centers, 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 (2011-12) is depicted in Map-1& 2, and details are given in Table-3/1.



Map 1. Locations of on-station research centres of AICRP-IFS during 2011-12



Map 2. Locations of on-farm research centres of AICRP-IFS during 2011-12

Table-3/1: Location of Different AICRP-IFS centres during the year under report (2011-12)

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 Zone (AP-5)
6.		Srikakulam (Dist.)	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 (BI-3)
10.		Purnea	OFR Centre	Sub-Humid	Middle Gangetic Plains Region	North-east Alluvial Plain (BI-2)
11.	Bihar	ICAR Research Complex for Eastern Region Patna	Voluntary Centre	Sub-Humid	Middle Gangetic Plain	South Bihar Alluvial Plain Zone
12.	Chhattisgarh	Raipur	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	Chhattisgarh Plain Zone (CG-1)
13.		Kawardha (Dist. Kabirdham)	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Chhattisgarh Plain Zone (CG-1)
14.	Goa	ICAR Research Complex for Goa	Voluntary Centre	Coastal	West Coast Plains	West Coast Plains
15.	Gujarat	S.K. Nagar (Dist. Banaskantha	Main Centre	Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
16.		Junagadh	Sub-Centre	Semi-Arid	Gujarat Plains and Hills Region/ South Saurashtra Sub-Region	South Saurashtra Zone (GJ-7)

Contd..../-

S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
17.		Navsari	Sub-Centre	Coastal	Gujarat Plains and Hills Region/ Southern Hills Sub-Region	South Gujarat Heavy Rainfall Zone (GJ-1)
18.		Deesa (Dist.)	OFR Centre	Semi-Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
19.		Thasra (Dist.)	OFR Centre	Arid	Gujarat Plains and Hills Region/ North west Sub-Region	Middle Gujarat Zone (GJ-3)
20.	Haryana	Hisar	Main Centre	Arid	Trans –Gangetic Plains Region/ Arid Sub-Region	Western Zone (HR-2)
21.		Sirsa	OFR Centre	Semi-Arid	Trans –Gangetic Plains Region	Western Zone (HR-2)
22.	Himachal Pradesh	Palampur	Main Centre	Humid	Western Himalayan Region/ High Altitude Temperate Sub-Region	Mid-Hill Sub-Humid Zone (HP-2)
23.		Kangra	OFR Centre	Humid	Western Himalayan Region	Sub-Montane and Low Hills Sub-Tropical Zone (HP-1)
24.	J & K	Chatha (Jammu)	Main Centre	Humid	Western Himalayan Region/High Altitude Temperature Sub-Region	Mid to High Altitude Plain Zone (JK-1)
25.		Samba	OFR Centre	Humid	Western Himalayan Region	Low altitude Sub-Tropical Zone (JK-1)
26.	Jharkhand	Kanke (Ranchi)	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Chhota Nagpur, South and West Bengal Hills & Plateau Sub-Region	Western Plateau Zone (JH-2)
27.		Jamtara	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Central and North Eastern Plateau Zone (JH-1)
28.	Karnataka	Kathalgere (Dist. Davangere)	Main Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Transition Zone (KA-7)
29.		Kolar	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Eastern Dry Zone (KA-5)
30.		Siruguppa (Dist. Bellary)	Main Centre	Arid	Southern Plateau and Hills Region/Northern Dry Region of Karnataka	Northern Dry Zone (KA-3)

Contd..../-

S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
31.		Gadag	OFR Centre	Arid	Southern Plateau and Hills Region	Northern dry Zone (KA-3)
32.	Kerala	Karamana (Dist. Thiruvananthapuram)	Main Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)
33.		Pathinamthitta	OFR Centre	Coastal	West Coast Plains and Ghats Regions	Problem Areas Zone (KE-5)
34.	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)
35.		Indore	Sub-Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Malwa Plateau Zone (MP-10)
36.		Powarkheda (Dist. Hoshangabad)	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Central Narmada Valley Sub-Region	Central Narmada Valley Zone (MP-6)
37.		Rewa	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
38.		Dindori	OFR Centre	Semi-Arid	Eastern Plateau and Hills Region	Northern hill zone of Chattisgarh (CG-3)
39.		Katni	OFR Centre	Semi-Arid	Central Plateau & Hills Region	Kymore Plateau and Satpura Hills Zone (MP-1)
40.	Maharashtra	Akola	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Central Plateau Sub-Region	Western Vidarbha Zone(MH-8)
41.		Amravati	OFR Centre	Semi-Arid	West Coast Plains and Ghats	Central Maharasthra Plateau (MH-7)
42.		Karjat (Dist. Raigad)	Main Centre	Coastal	Western Plains & Ghat Regions/ Coastal Hilly Sub-Region	North Konkan Coastal Zone (MH-2)
43.		Raigad	OFR Centre	Coastal	West Coast Plains and Ghats	North Konkan Coastal Zone (MH-2)
44.		Parbhani	Main Centre	Semi-Arid	Western Plateau &Hills Region/ Central Plateau Sub-Region	Central Maharashtra Plateau Zone (MH-7)

Contd..../-

S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
45.		Aurangabad	OFR Centre	Semi-Arid	Western Plateau &Hills Region	Central Maharashtra Plateau Zone (MH-7)
46.		Rahuri (Dist. Ahemadnagar)	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Scarcity Sub-Region	Scarcity Zone (MH-6)
47.	Mehghalaya	ICAR Research Complex for NEH Umiam	Voluntary Centre	Humid	Eastern Himalayan Region	North Eastern Plain Zone
48.		Ganeshkhind (Dist. Pune)	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Western Maharashtra Plain Zone (MH-5)
49.	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)
50.		Chiplima (Dist. Sambalpur)	Sub-Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	West-Central Table Land Zone (OR-9)
51.		Angul	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Mid-Central Table Land (OR-10)
52.		Kendrapara	OFR Centre	Coastal	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South –Eastern Coastal Plain Zone (OR-4)
53.	Punjab	Ludhiana	Main Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
54.		Amritsar	OFR Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
55.	Rajasthan	Durgapura (Jaipur)	Main Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Semi-Arid Eastern Plain Zone (RJ-5)
56.		Hanumangarh	OFR Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Transitional Plain Zone of Inland Drainage (RJ-3)
57.		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)
58.		Chittorgarh	OFR centre	Semi-Arid	Central Plateau & Hills Region/ Southern Plains of Rajasthan	Sub-Humid Southern Plain & Aravali Hills Zone (RJ-7)

Contd..../-

S.No.	State	Centre/ District	Status	Ecosystem	Agro-Climatie Region/Sub-Region of Planning	NARP Zone
59.	Tamil Nadu	Coimbatore	Main Centre	Semi-Arid	Southern Plateau and Hills Region/ Central Plateau of Tamil Nadu Sub-Region	Western Zone (TN-3)
60.		Thanjavur	Sub Centre	Coastal	East Coast Plains and Hills Region/ Thanjavur Sub-Region	Cauvery Delta Zone (TN-4)
61.		Paiyur	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	North-Western Zone (TN-2)
62.		Chettinad	OFR Centre	Semi-Arid	East Coast Plains and Hills Region	Southern Zone (TN-5)
63.	Uttar Pradesh	Kanpur	Main Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-4)
64.		Saini (Dist. Kaushambi)	OFR Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-4)
65.		Kumarganj (Faizabad)	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-7)
66.		Sant Kabir Nagar	OFR Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-7)
67.		Bichpuri (Dist. Agra)	Sub Centre	Semi-Arid	Upper Gangetic Plains Region/ Western Plains Sub-Region	South-Western Semi-Arid Zone (UP-5)
68.		Varanasi	Sub Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-9)
69.	Uttar Pradesh	PDFSR, Modipuram	Voluntary Centre	Semi-Arid	Upper Gangetic Plain	West Plain Zone
70.	Uttarakhand	Pantnagar (Dist. US Nagar)	Main Centre	Sub-Humid	Western Himalayan Region/ Valley Temperate Sub-Region	Bhawar and Tarai Zone (UP-2)
71.		Jeolikota (Dist. Nainital)	OFR Centre	Sub-Humid	Western Himalayan Region/High hill Temperate Sub-Region	Hill Zone (UK-1)
72.	West Bengal	Kalyani (Dist. Nadia)	Main Centre	Humid	Lower Gangetic Plains Region/ Central Alluvial Plains Sub-Region	New Alluvial Zone (WB-3)
73.		Kakdwip (Dist. 24-Parganas South)	OFR Centre	Humid	Lower Gangetic Plains Region	Coastal Saline 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 2011-12, 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° 59' N	78° 55' E
2.	Maruteru	Chromusterts clayey, medium black soils	16° 38' N	81° 44' E
3.	Rudrur	Chromusterts clayey, deep (90 cm depth), deep black soils	18° 30' N	77° 51' E
4.	Jorhat	Fluaquents/ Udicaquents association, very deep (90 cm depth), alluvial sandy clay loam soils	26° 47' N	94° 12' E
5.	Sabour	Eutrochrepts (Very deep), low and clay soils	25° 23' N	87° 07' E
6.	Raipur	Ochraquals association, deep black soils	21° 16' N	81° 36' E
7.	S.K. Nagar	Haplaquals, deep medium black soils	24° 19' N	72° 19' E
8.	Junagadh	Ustochrepts deep medium black soils	21° 30' N	70° 30' E
9.	Navsari	Vertic Ustochrepts deep black soils	20° 57' N	72° 54' E
10.	Hisar	Ustochrepts, very deep silty alluvial soils	29° 08' 55"N	74° 41'16" E
11.	Palampur	Udic Haplustalfs, red soils	32° 06' N	76° 03' E
12.	Chatha (Jammu)	Eutrochrepts very deep clay soils	32° 05' N	74° 04' E
13.	Ranchi	Ultic Palustalfs, very deep (90 cm) red soils	23° 17' N	85° 19' E
14.	Kathalagere	Alfisols, dark reddish brown sandy clay loam	13° 02' N	76° 15' E
15.	Siruguppa	Type Chromusterts, very deep (90 cm) black soils	15° 38' N	76° 54' E
16.	Karamana	Typic Tropofluvents, very deep (90 cm depth)	11° N	77° E
17.	Jabalpur	Chromusterts, very deep (90 cm depth), medium to deep black soils	23° 10' N	79° 57' E
18.	Indore	-	22° 04' N	79° 57' E
19.	Powarkheda	-	23° 25' N	73° 98' E
20.	Rewa	Ustochrepts-Vertic Ustochrepts association, fine loamy soils	24° 41' N	81° 15' E
21.	Akola	Medium deep black clayey soil	20° 42' N	77° 02' E
22.	Karjat	Haplustults Udic-Fluvents, red soils	18° 33' N	75° 03' E
23.	Parbhani	Chromusterts, deep (90 cm depth), deep black soils	19° 08' N	76° 05' E
24.	Rahuri	Chromusterts, fine clayey soils	19° 47' N	74° 18' E
25.	Bhubaneswar	Haplustalfs, very deep (90 cm depth), medium textured lateritic soils	20° 15' N	85° 52' E
26.	Chiplima	Haplaquents, very deep (90 cm depth) clay, ill-drained soils	20° 21' N	80° 55' E

Contd..../-

S.No.	Centre	Soil Type	Latitude	Longitude
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
38.	PDFSR, Modipuram			
39.	ICAR-RC, Patna		25^0 50' N	84^0 45' E
40.	ICAR-RC, Umiam			
41.	ICAR-RC, Goa		15^0 29'22'' N	73^0 55'10'' E
42.	CARI, Port Blair			

Weather Conditions at Different Farming Systems Research Centres During 2011-12

The annual conditions of important weather parameters e.g., rainfall, monthly average maximum temperature and minimum temperature prevailed during the reporting period (2011-12) at the various farming systems research centres of the AICRP on IFS are depicted in figures 4/1-4/3 and described below.

Akola: During the reporting period, rainfall was too scares (511 mm) as compared to normal annual rainfall. Out of this 96% rainfall was contributed by the S-W monsoon. Onset of monsoon occurred in June as usual but monsoon remained weak throughout the season and only 492 mm rain was received from the S-W monsoon. The distribution of rainfall was fairly good throughout the season. The highest (40.5 ^{o}C) and the lowest (29.9 ^{o}C) monthly average temperatures were recorded during May and December, respectively, whereas, December was observed as the coldest (12.0 ^{o}C) month of the year.

Bhubaneswar: The total rainfall received during the reporting year was 1388 mm, out of which 1188 mm (86%) was received through the S-W monsoon. Distribution of rain was good during monsoon season and a sizable amount of rain

occurred during April. The monthly average maximum temperature ranged between 28.7-38.3 °C. The monthly average minimum temperature dropped to 15.5 °C in the month of December. Winter season was also moderately warm where monthly average minimum temperature remained above 18.7 °C.

Bichpuri: Comparatively poor rain (472.0 mm) was received with 91% contribution from the S-W monsoon during July and August, whereas June and September received a meager amount of rain. The highest monthly average maximum temperature (40.1°C) was recorded during the May whereas lowest monthly average maximum temperature (21.2°C) was recorded in January. January was reported as the coldest month when mercury dropped down to 4.1°C.

Chiplima: During the reporting period good rain (1233.0 mm) was received at the centre, at which 87% contribution was from S-W monsoon. The distribution of rain was good throughput the monsoon season. May was observed as hottest (41.7°C) month during the year, whereas, December was very cool and dry with 9.1 °C monthly minimum temperature.

Coimbatore: The total rainfall (764 mm) received during the reporting year was about 20% lower than the previous year out of which a major amount (560 mm) was contributed by N-E monsoon and distribution of rain was fairly good during N-E monsoon season. The summer season, i.e., March, April and May were hot and monthly average maximum temperature was the highest (35.2°C) during April, whereas it was lowest in November. The winter season also remained moderately warm where monthly average minimum temperature remained above 18.4°C.

Durgapura: A late onset of monsoon but well distributed rainfall occurred at the centre which was only 72% of the previous year. Highest monthly average maximum temperature (40.6°C) was recorded during June, whereas the lowest average monthly maximum temperature (20.4°C) and minimum (7.1 °C) temperature were recorded during January.

Faizabad: The total rainfall received during the reporting year was much higher (1045 mm) than the previous year (716 mm). S-W monsoon contributed 92% to the annual rainfall. June remained dry but distribution of the rainfall was satisfactory during July-September. More than 80 mm rain was received through western disturbances during January-March, whereas remaining six months were dry. The summer season was hot and dry and the highest monthly average maximum temperature (41.2°C) was recorded during May, whereas winter was cool and mercury dropped down to 7.9°C during December.

Goa: The rainfall received during reporting period was 3613 mm. A very high percentage (98%) of the total precipitation was contributed by the S-W monsoon and one third of total rain poured in the month of July. The overall distribution of rain was excellent. The highest monthly average maximum temperature (37.5°C) was recorded in April. However, average minimum temperature (18.2°C) was observed during the month of January.

Hisar: S-W monsoon contributed 81% rainfall to the total (717 mm) rainfall during the report period at this centre which was lower than the preceding year. A good amount of rain received from the receding monsoon during September. As usual summer was very hot and monthly maximum temperature (41.6°c) was reported highest during the June and winter was severe during which average monthly minimum temperature dropped below 4.8°C in January.

Jabalpur: The total rainfall (900 mm) recorded during the reporting period was drastically lower than the previous year (<50%) out of which 97% was contributed by the S-W monsoon. The distribution of the rainfall was almost smooth throughout the monsoon season. Summer season was hot and maximum temperature reached up to 45.0°C during June whereas, winter was severe

and monthly mean minimum temperature was dropped to 5.0°C in January.

Junagadh: The rainfall received during reporting period was 925 mm and these were July, August and September which poured all the rain at the centre remaining other nine months were dry. The highest monthly average maximum temperature (39.0°C) was observed during April whereas, lowest minimum temperature (11.6°C) was recorded during January.

Kalyani: The reporting period received 1483 mm rainfall with 80% contribution from the S-W monsoon. Every months of the report period observed rainy days except December and March. The distribution pattern of rain was also good during the monsoon season with 30% higher rain than the previous year. The highest monthly mean maximum temperature (36.7°C) was observed during May whereas lowest monthly mean minimum temperature (11.8°C) was recorded during December.

Kanpur: The total rainfall of 714 mm was recorded during the reporting year which was about 25% lower than the previous year. S-W monsoon contributed about 90% rain to the total annual rainfall at the centre. The rainfall was evenly distributed during the monsoon season while October, November, December and March were deprived of the rains. The highest (43.6°C) and lowest (19.5°C) monthly average maximum temperature was observed during June and January respectively. Winter season was moderately cold and average monthly minimum temperature dropped below 6.9°C during January.

Karjat: The rainfall received during reporting period was lower than the preceding year. A very high percentage (93%) rainfall was contributed to the total precipitation (4082 mm) by the S-W monsoon and it can be deduced that all the rain was poured at the centre during June to October evenly. The highest monthly average maximum temperature (39.6°C) was recorded in the month of April however, average minimum night temperature (12.2°C) was observed during the month of January.

Karmana: During the reporting period, the total rainfall (847 mm) was received at this centre which was about three and half time higher than the preceding year however contribution of the S-W monsoon was remained stable (42%). The distribution of rain was good throughout the year and only it was the February which was deprived of the rain. The highest monthly average maximum temperature (32.4°C) was observed during October whereas, lowest minimum temperature (20.9°C) was recorded during January.

Kathalagere: Total rainfall received during the reporting period was only 130 mm which was only <20% of the previous year. The highest monthly average maximum temperature (33.0°C) was recorded during March whereas lowest monthly average minimum temperature was reported during January.

Kota: Nearly 100 mm lower rainfall (566 mm) was received during the reporting year than the preceding year at this centre but the S-W monsoon contribution to the total precipitation was higher (96%). The distribution of rain was erratic and period from December to April was deprived of any rain days. The highest monthly average maximum temperature (36.4°C) was recorded during April whereas, lowest monthly average minimum temperature (5.8°C) in January.

Ludhiana: The total rainfall recorded during the reporting year was about 20 percent higher (921.0 mm) than the preceding year. Each and every month of the reporting year was received rain fall except October and March. Higher rainfall was due to better contribution of S-W monsoon (88%) than the preceding year. Summer season was moderately hot and maximum temperature reached up to 40.6°C during the June while winter was severely cold and monthly mean minimum temperature dropped to 5.6°C during January.

Maruteru: The total rainfall (861 mm) received during reporting period was even lesser than the half of the preceding year. Higher precipitation was due to good contribution of the S-W monsoon (85%). Onset of monsoon was normal and rain

was evenly distributed throughout the monsoon season. Highest average monthly maximum temperature (37.0°C) was recorded during the month of May while minimum temperature (16.3°C) was recorded during the month of January.

Palampur: The total rainfall received during the reporting year was lower than the previous year. The S-W monsoon was contributed up to 73 percent to the total rainfall (2281 mm) and August was reported as the wettest month of this crop season during which 872 mm rain water was poured. The distribution of the rainfall during the monsoon season was good. The highest average monthly maximum temperature (33.8°C) was recorded during June whereas lowest minimum temperature (3.0°C) was recorded during January.

Pantnagar: The rainfall received during reporting period was 1529 mm. A very high percentage (98%) rainfall was contributed to the total precipitation by the S-W monsoon and it can be deduced that all the rain was poured at the centre during three months July, August and September. The highest monthly average maximum temperature (37.4°C) was recorded in the month of June however, average minimum temperature (5.6°C) was observed during the month of January.

Parbhani: The total rainfall (159 mm) recorded during the reporting period and up to 93 percent contributed by the S-W monsoon. The highest average monthly maximum temperature (41.5°C) was recorded during May whereas lowest minimum temperature (11.5°C) was recorded during December.

Powarkheda: Total rainfall recorded during the reporting year was 995 mm and 88 percent rainfall was added by the S-W monsoon. September was found wettest month of the season and 353 mm rain was precipitated during this month. May was reported as the warmest month where maximum temperature recorded was 43.5°C whereas, January was observed as coldest month and monthly mean minimum temperature dropped to 6.6°C.

Rahuri: Total annual rainfall precipitated during the reporting period was 481 mm that was too lower than the preceding year whereas contribution of S-W monsoon was almost similar. The distribution of rain was also good throughput the monsoon. The highest average monthly maximum temperature (40.1°C) was recorded during May whereas, lowest minimum temperature (5.9°C) was recorded during January.

Raipur: The total annual rainfall received during the reporting period was 1252 mm rainfall with onset of monsoon in July. Distribution of rainfall was good during the monsoon season but September was observed as very wet and 532 mm rain was precipitated in this month whereas, 94 percent rain was added by the S-W monsoon to the annual rainfall. The highest monthly mean maximum temperature (44.8°C) was observed during June whereas lowest minimum temperature (11.9°C) was recorded during December.

Rajendranagar: Nearly equal amount of rainfall to the preceding year was recorded during the reporting period i.e., 1002 mm out of which 717 mm (72%) rain was contributed by S-W monsoon. The distribution of rain was fairly good during the monsoon season. The maximum temperature recorded was 40.5°C during May whereas minimum temperature was 12.6°C during December.

Ranchi: Agro-climatic sub-zone of Jharkhand received 1599 mm rainfall during the reporting year which is higher than the normal average rainfall for this zone and it was due to higher contribution (92%) of S-W monsoon than the normal. The distribution of the rain was fairly good during the season but August was recorded as wettest month in the year. The highest monthly average maximum temperature (38.7°C) was observed during May whereas lowest minimum temperature (5.8°C) was recorded during December.

Rewa: Total rainfall recorded during the reporting year was 1169 mm and 80 percent rainfall was added by the S-W monsoon. September was

found wettest month of the season and 430 mm rain was precipitated during this month. June was reported as the warmest month where maximum temperature recorded was 38.1°C whereas, February was observed as coldest month and monthly mean minimum temperature dropped to 5.2°C.

Rudrur: The total rainfall (1195 mm) recorded during the reporting period was in the range of mean annual rainfall of this region (900-1200 mm) in normal monsoon years. The distribution of rainfall was good and 95 percent of total rainfall was precipitated during monsoon season. The highest average monthly maximum temperature (42.4°C) was recorded during May whereas lowest minimum temperature (13.9°C) was recorded during January.

Sabour: During the reporting year, the total rainfall received was 906 mm out of which 803 mm (89%) rain was from the S-W monsoon. The distribution of rain was good throughput the monsoon season. May was observed as hottest (37.5°C) during the year whereas, January was very cool and dry with 9.2 °C monthly minimum temperature.

S.K. Nagar: The total rainfall (953 mm) received during reporting period and it the S-W monsoon which contributed 100 percent rain to the total rainfall at this centre. The distribution of the rainfall during the monsoon season was good but September was reported as wettest month of the year. Highest average monthly maximum temperature (34.4°C) was recorded during the month of May while minimum temperature (5.5°C) was recorded during the month of January.

Thanjavur: The total rainfall received during this year was lower than the preceding year and it was 642 mm. As usual contribution of the S-W monsoon is meager amount to the total annual rainfall at this centre only 35% rain water was added by the S-W monsoon season to the total precipitation. The lowest monthly average maximum and minimum temperature recorded during the year was 37.8°C and 21.4°C respectively.

Varanasi: A lower rainfall than the preceding year was observed during the reporting year i.e., 632 mm where S-W monsoon contribute up to 92 percent to the total rainfall. The highest average monthly maximum temperature (42.1°C) was observed during May whereas lowest minimum temperature (9.8°C) was recorded during December.

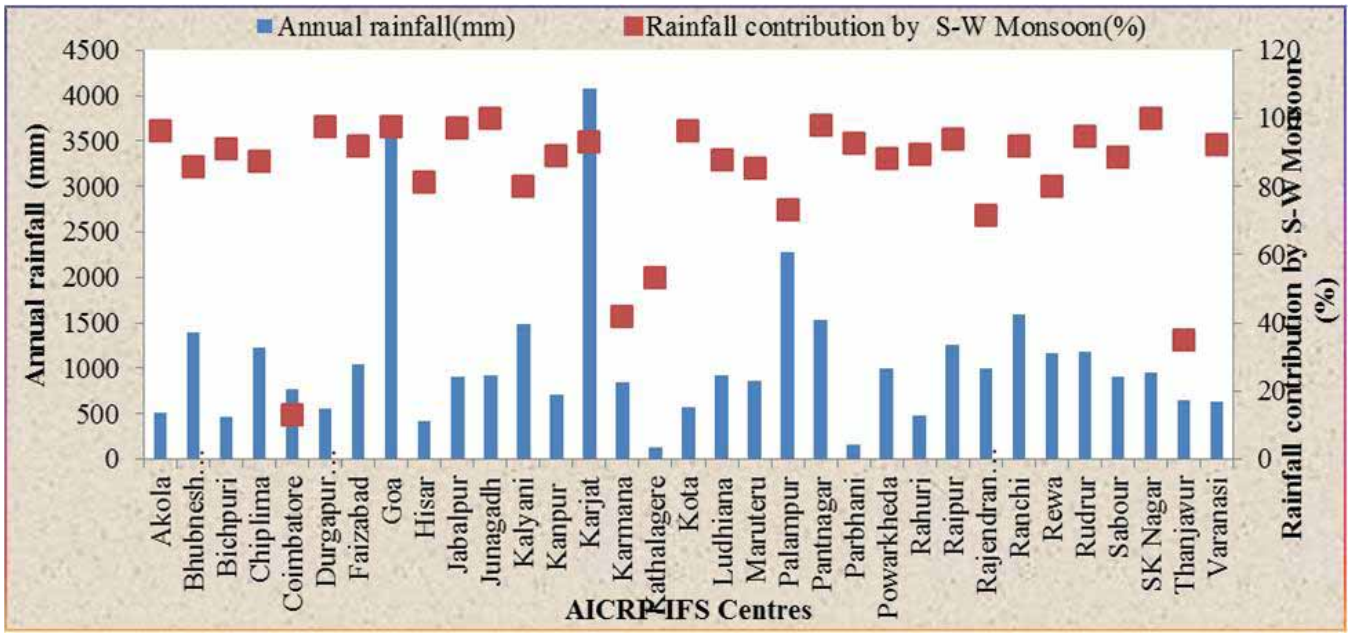


Fig. 4/1 Annual rainfall (mm) and contribution of the S-W monsoon to the total precipitation during the reporting year (2011-12) at various Cropping Systems Research Centres of the AICRP on IFS

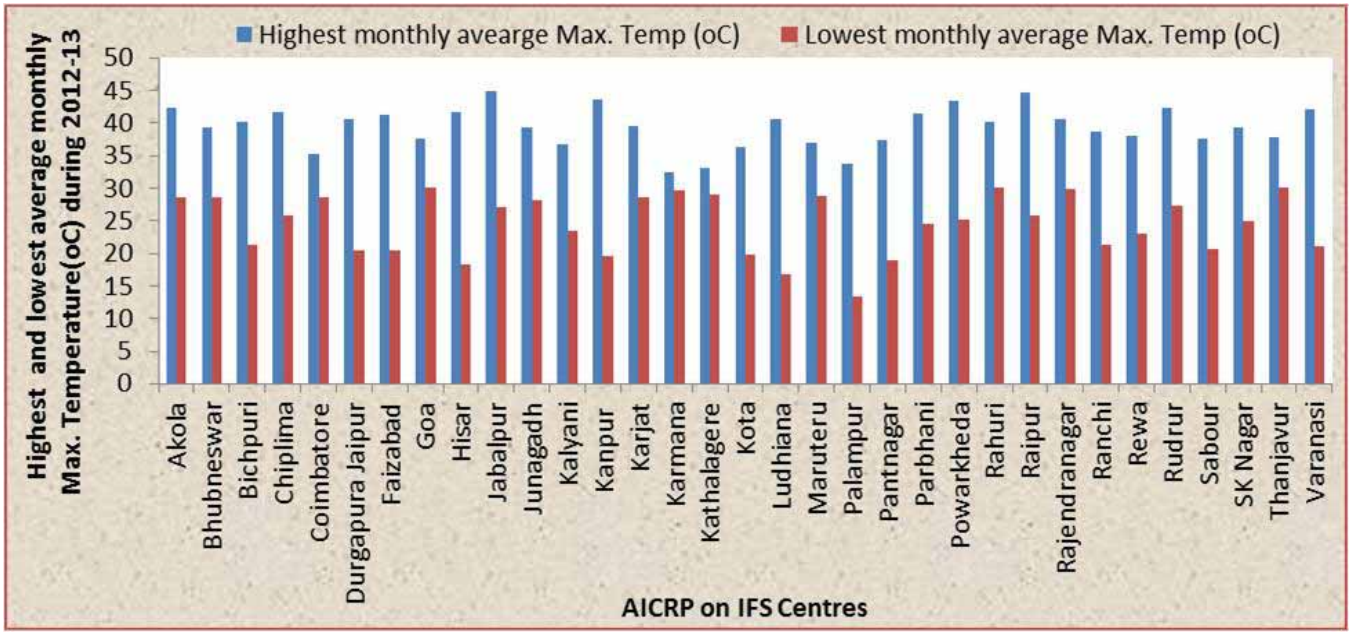


Fig. 4/2 Highest and lowest monthly average maximum (°C) temperature during the reporting year (2011-12) at various Cropping Systems Research Centres of the AICRP on IFS

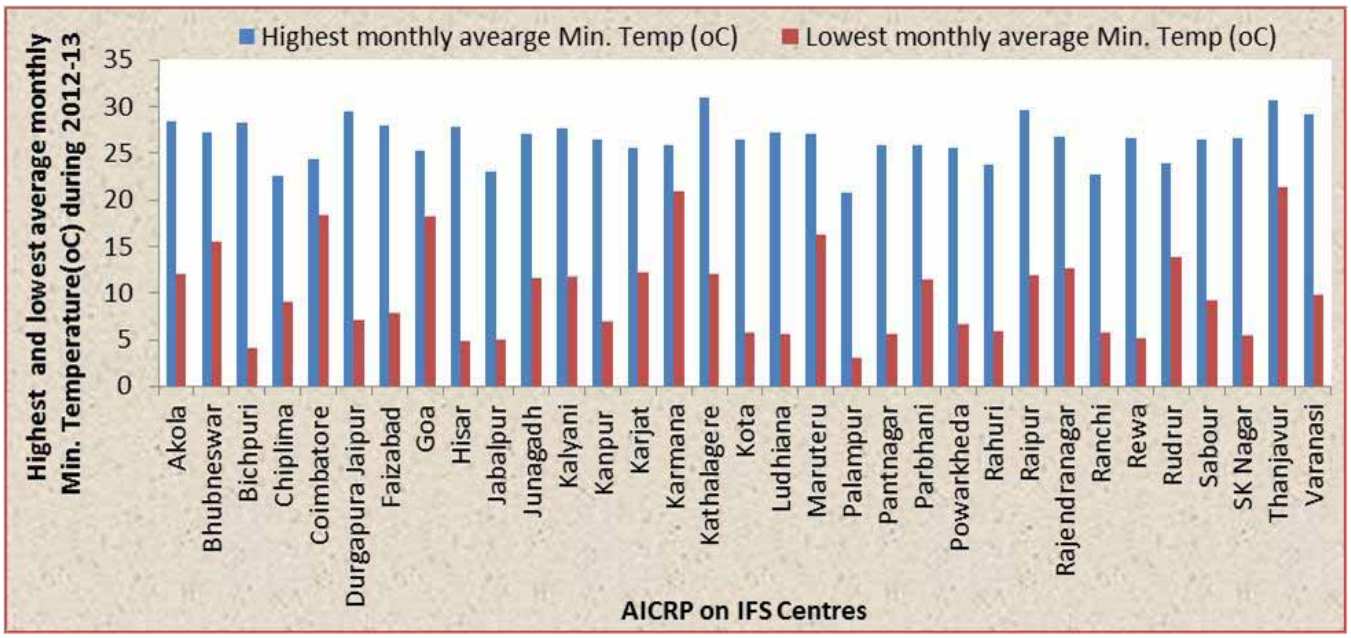


Fig. 4/3 Highest and lowest monthly average minimum (°C) temperature during the reporting year (2011-12) at various Cropping Systems Research Centres of the AICRP on IFS

5. STAFF POSITION

Out of 618 total staff sanctioned for different centers, 503 staff were actually in position as on 31st March 2013, suggesting that 18.6 per cent of total posts were vacant (Table-5/1 and Annexure-V).

Table-5/1: Staff position under AICRP-IFS (university-wise) as on 31.3.2013

S.No.	Name of the University	Scientific		Technical		Administrative		Supporting	
		Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled
1.	ANGR AU, Hyderabad	8	8	23	17	5	3	3	1
2.	AAU, Jorhat	5	3	11	10	2	2	2	2
3.	BAU, Sabour	4	4	11	5	2	2	2	2
4.	IG KV, Raipur	5	4	11	7	2	2	2	2
5.	SDAU, S.K. Nagar	5	5	11	8	2	1	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	1	1	1
9.	CCS HAU, Hisar	5	5	11	9	2	2	2	1
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	5	11	3	2	0	2	1
14.	UAS, Dharwad	1	1	8	7	1	1	1	1
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	8	23	18	5	5	3	1
18.	RVS KVV, Gwalior	1	1	3	3	1	1	-	-
19.	MP KV, Rahuri	5	4	11	10	2	1	2	1
20.	MAU, Parbhani	4	3	11	8	2	1	2	1
21.	DPD KV, Akola	4	4	11	8	2	1	2	2
22.	DBS KKV, Dapoli	4	4	11	11	2	2	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 RAU, Bikaner	4	2	11	7	2	0	2	2
26.	MP UAT, Udaipur	3	3	8	8	2	2	1	1
27.	TNAU, Coimbatore	7	7	22	17	4	4	3	3
28.	CSA UAT, Kanpur	4	4	11	9	2	2	2	2
29.	ND UAT, Faizabad	4	3	11	8	2	2	2	1
30.	SVP UAT, 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	4	2	0	2	1
34.	BC KVV, Kalyani	4	3	11	9	2	2	2	1
	TOTAL	**132**	**121**	**360**	**274**	**69**	**54**	**57**	**43**

6. BUDGET

During F.Y. 2011-12 and 2012-13 a total budget of Rs. 3404.65 lakhs, and Rs. 2660.00 lakhs respectively, was released as ICAR share to different centres. Sub-head wise allocation for different centres is given in Table 6/1.

Table-6/1. Funds (Rs. in lakhs) released during financial years 2011-12 and 2012-13 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	Total
				Fin. Year 2011-12					
1	ANGRAU, Hyderabad	155.00	2.00	4.96	1.25	0.68	2.00	30.00	195.89
2	CSK HPKVV, Palampur	92.06	0.75	4.74	2.25	1.00	4.20	12.00	117.00
3	GBPUAT, Pantnagar	84.00	1.25	4.74	1.75	0.50	4.20	20.00	116.44
4	CSAUT, Kanpur	68.57	1.05	5.75	3.00	1.00	4.20	2.00	85.57
5	NDUAT, Faizabad	123.76	0.75	5.75	3.00	1.00	4.20	1.00	139.46
6	BHU, Varanasi	30.00	0.50	4.25	3.16	0.20	4.40	1.00	43.51
7	BAU, Ranchi	59.80	0.75	3.44	1.25	0.35	2.00	30.00	97.59
8	BAU, Sabour	90.24	0.75	5.50	3.00	1.00	1.00	4.00	105.49
9	BCKVV, Kalyani	55.30	0.75	3.94	2.00	0.50	2.00	13.50	77.99
10	AAU, Jorhat	128.93	1.00	50.50	3.00	1.00	4.20	1.50	190.13
11	PAU, Ludhiana	125.00	0.75	5.25	3.00	1.00	1.90	0.00	136.90
12	CCSHAU, Hisar	100.00	1.00	5.25	3.00	1.00	4.20	2.00	116.45
13	SKRAU, Bikaner	93.00	1.05	5.25	2.50	0.65	4.20	14.40	121.05
14	SDAU, S.K. Nagar	102.13	1.35	5.25	2.50	0.80	3.30	13.90	129.23
15	NAU, Navsari	25.29	0.15	1.50	0.00	0.00	1.50	3.40	31.84
16	JAU, Junagadh	33.18	0.15	1.50	0.00	0.00	1.50	3.40	39.73
17	AAU, Anand	26.52	0.45	1.27	0.00	0.32	0.75	3.90	33.21
18	JNKVV,Jabalpur	115.00	2.00	9.46	2.50	1.03	4.20	14.40	148.59
19	RVSKVV, Gwalior	29.00	0.45	1.50	0.00	0.00	0.75	1.00	32.70
20	IGKV, Raipur	49.78	0.75	5.25	1.75	0.50	4.20	41.50	103.73
21	OUAT, Bhubaneswar	130.00	1.85	6.06	1.25	0.68	1.50	34.00	175.34
22	DPDKV, Akola	53.71	0.75	5.25	1.75	0.55	4.20	13.00	79.21
23	MAU, Parbhani	90.00	0.75	5.25	2.50	0.55	4.20	12.00	115.25
24	MPKV, Rahuri	83.96	1.45	5.25	2.50	0.55	4.20	11.00	108.91
25	KKV, Dapoli	82.99	0.75	5.25	1.75	0.55	4.20	32.00	127.49
26	UAS, Raichur	29.57	0.30	3.56	2.50	0.26	4.20	6.40	46.79
27	UAS, Dharwad	26.34	0.45	2.25	0.00	0.44	0.50	6.40	36.38
28	UAS, Bangalore	106.63	0.75	5.25	2.50	0.60	4.20	10.00	129.93
29	TNAU, Coimbatore	127.58	1.70	9.00	3.00	1.78	4.80	4.00	151.86
30	SKUAST, Jammu	78.24	0.95	5.25	2.50	0.75	4.70	11.00	103.39
31	KAU, Thrissur	85.00	1.30	5.24	3.00	1.10	2.00	0.50	98.14
32	MPUAT, Udaipur	65.69	1.00	3.00	0.00	0.64	1.00	14.00	85.33
33	RBS College, Bichpuri	16.75	0.15	2.00	0.00	0.00	1.50	0.40	20.80
34	PDFSR, Modipuram	0.00	0.30	3.06	5.60	0.15	4.40	0.00	13.51
35	ICAR-RC, Patna	0.00	0.30	2.25	4.00	0.10	1.22	0.00	7.87
36	ICAR-RC, Umiam	0.00	0.30	2.25	4.00	0.10	1.22	2.00	9.87
37	ICAR-RC, Goa	0.00	0.30	2.93	4.00	0.15	4.40	0.40	12.18
38	CARI, Port Blair	0.00	0.30	2.93	2.07	0.20	4.40	10.00	19.90
	Total	**2563.02**	**31.30**	**211.08**	**81.83**	**21.68**	**115.74**	**380.00**	**3404.65**

Contd..../-

S. No.	Name of the University/ ICAR Institute	Pay & Allow.	T.A.	Other Contin-gencies	Contr. services	Vehicle Hiring/ POL	NRC	TSP	Total
				Fin. Year 2012-13					
1	ANGRAU, Hyderabad	115.00	2.06	16.00	3.75	0.75	4.00	4.00	145.56
2	CSKHPKVV, Palampur	65.00	0.87	9.00	3.75	0.50	3.00	2.00	84.12
3	GBPUA&T, Pantnagar	65.00	0.87	9.00	3.75	0.50	3.00	2.00	84.12
4	CSAU&T, Kanpur	60.00	0.87	8.00	3.75	0.55	7.90	2.00	83.07
5	NDUA&T, Faizabad	65.00	0.87	8.00	3.75	0.50	3.00	2.00	83.12
6	BHU, Varanasi	20.00	0.39	3.50	5.00	0.20	1.00	2.00	32.09
7	BAU, Ranchi	45.00	0.87	6.00	3.75	0.50	4.00	5.00	65.12
8	BAU, Sabour	45.00	0.87	7.00	3.75	0.50	3.00	2.00	62.12
9	BCKVV, Kalyani	65.00	0.87	9.00	3.75	0.50	4.00	2.00	85.12
10	AAU, Jorhat	100.00	3.00	23.00	4.00	2.00	38.00	0.00	170.00
11	PAU, Ludhiana	70.00	0.87	7.00	3.75	0.50	3.00	2.00	87.12
12	CCSHAU, Hisar	65.00	0.87	8.00	3.75	0.50	3.00	0.00	81.12
13	SKRAU, Bikaner	60.00	0.87	8.55	3.75	0.50	3.00	3.00	79.67
14	SDAU, S.K. Nagar	65.00	0.87	7.50	3.75	0.50	3.00	2.00	82.62
15	NAU, Navsari	15.00	0.24	4.00	0.00	0.10	2.00	0.00	21.34
16	JAU, Junagadh	15.00	0.24	4.00	0.00	0.10	2.00	0.00	21.34
17	AAU, Anand	20.00	0.39	3.00	0.00	0.25	2.00	2.00	27.64
18	JNKVV,Jabalpur	115.00	2.05	19.50	3.75	0.75	5.00	2.00	148.05
19	RVSKVV, Gwalior	15.00	0.26	2.00	0.00	0.10	2.00	2.00	21.36
20	IGKV, Raipur	45.00	0.87	4.50	3.75	0.50	5.00	5.00	64.62
21	OUAT, Bhubaneswar	115.00	1.80	16.00	3.75	0.75	6.00	5.00	148.30
22	DPDKV, Akola	65.00	0.87	7.50	3.75	0.50	3.00	4.00	84.62
23	MAU, Parbhani	65.00	0.87	6.50	3.75	0.50	3.00	4.00	83.62
24	MPKV, Rahuri	65.00	0.87	7.00	3.75	0.50	3.00	4.00	84.12
25	KKV, Dapoli	60.00	0.87	7.00	3.75	0.50	8.50	4.00	84.62
26	UAS, Raichur	30.00	0.52	3.50	3.75	0.50	3.00	4.00	45.27
27	UAS, Dharwad	30.00	0.39	2.50	0.00	0.25	3.00	2.00	38.14
28	UAS, Bangalore	65.00	0.87	9.00	3.75	0.50	3.00	4.00	86.12
29	TNAU, Coimbatore	115.00	1.80	10.05	3.75	0.75	5.00	5.00	141.35
30	SKUAST, Jammu	65.00	0.87	12.05	3.75	0.50	4.00	5.00	91.17
31	KAU, Thrissur	65.00	0.87	9.30	3.75	0.50	3.00	4.00	86.42
32	MPUAT, Udaipur	35.00	0.64	3.00	0.00	0.38	2.00	6.00	47.02
33	RBS College, Bichpuri	10.00	0.26	3.50	0.00	0.10	2.00	2.00	17.86
34	PDFSR, Modipuram	0.00	0.38	3.50	8.00	0.25	1.08	0.00	13.21
35	ICAR Res. Comp., Patna	0.00	0.38	3.50	4.75	0.25	3.00	1.50	13.38
36	ICAR Res. Comp., Umiam	0.00	2.00	19.00	5.00	1.00	4.52	1.50	33.02
37	ICAR Res. Comp., Old Goa	0.00	0.38	4.00	4.75	0.25	3.00	1.00	13.38
38	CARI, Port Blair	0.00	0.38	8.50	4.93	0.25	3.00	2.00	19.06
	Total	**1915.00**	**34.09**	**301.95**	**126.43**	**18.53**	**164.00**	**100.00**	**2660.00**

7. RESEARCH RESULTS

7.1 CROPPING SYSTEMS MANAGEMENT

7.1.1 CROPPING SYSTEMS DIVERSIFICATION/ INTENSIFICATION

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

Objectives**:** To identify appropriate cropping systems with high productivity and profitability to suit the specific needs of different agro-ecosystems.

Year of start**:** 1990-91, However treatments (cropping systems) are modified every 3-4 years.

Treatments**:** There are no common treatments for all the centres but they vary from location to location. The number of cropping systems – tested at each location – also ranges from 6 to 15. The details of treatments are given in table-7.1/1, along with experimental results.

Locations**:**

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

The details of inputs used, crop sequences evaluated, crop yields, annual gross returns and annual energy output have been presented in table 7.1/1. A brief description of centre-wise results is given below.

Arid Ecosystem

At **Hisar,** among the seven cropping systems evaluated, cotton-wheat system was identified to be distinctly better than other systems by yielding highest gross returns (Rs. 1, 57, 703/ha/year). But, in terms of energy production, existing pearl millet-wheat system was better, which gave highest energy production of 30.47 x10^6 K cal./ha/year. The other sequences were at par with existing pearl millet-wheat system.

At **S.K. Nagar,** among eight cropping systems evaluated, the cropping system of green gram-fennel + cauliflower was noted to be more remunerative with highest gross returns of Rs. 3,12,017/ha/year. It was closely followed by bio-intensive system of (Bt cotton + sunnhemp + castor + bitter gourd)-Bt cotton (contd.) with gross returns of Rs. 2,96,982/ha/year. In terms of energy production, green gram+ sunnhemp (fodder)-castor-green gram sequence was better which gave highest energy output of 31.48 x 10^6 K cal./ha/year.

At **Siruguppa,** among 10 cropping systems evaluated, the cropping system of rice (rasi)-rice (rasi) was noted to be more remunerative with highest gross returns of Rs. 1,53,377/ha/year. It also gave highest energy output (35.96 x 10^6 K cal./ha/year). Another promising treatment, which was found to be superior than existing cropping system, was rice-ridge gourd with gross returns of Rs 1, 34,328 /ha/year.

Semi-Arid Ecosystem

At **Kanpur,** among the ten cropping systems evaluated, maize-garlic-green gram system was identified to be distinctly better than other systems in terms of economics with significantly higher gross returns (Rs. 3,02,490/ha/year). However, the highest energy production (47.37x10^6 K cal./ ha/year) was recorded in rice-wheat-green gram system. Some other sequences like; maize + black gram-potato-onion, hybrid rice-wheat-green gram, and maize+green gram-potato-wheat, maize-mustard-wheat were also found better than existing rice-wheat system, clearly showing the scope for improving the system profitability with gross returns ranging from Rs.2,55,845 to Rs. 1,61,354 /ha/year.

At **Bichpuri (Agra),** among the 10 cropping systems studied, the sequence of sesbania-potato-lady's finger and pearl millet-potato-cluster bean were found to be highly remunerative and both recorded the gross returns of Rs. 1,60,307/ ha/year. The pearl millet-potato-cluster bean showed the highest energy production (35.80x10^6 K cal./ha/year), followed by sesbania-potato-lady's finger (31.76x10^6 K cal./ha/year).

At **Junagadh,** among 10 crop sequences evaluated, groundnut-onion-sorghum (fodder) sequence was found to be distinctly better than others with highest gross returns (Rs. 2,89,802/ ha/year) and energy production (25.14x10^6 K cal./ ha/year). Other promising sequences in order of merit for economic returns were; onion-wheat-green gram and onion-chickpea-maize; which gave gross returns of Rs. 1,88,114 and 1,68,345/ ha/year and energy production of 22.02 and 15.24x10^6 K cal./ha/year, respectively. The other sequences were at par with or inferior to existing groundnut-wheat system in terms of economic returns.

At **Durgapura (Jaipur),** among the nine cropping systems evaluated, the system of green gram-isabgol was found to be distinctly better with annual gross returns of Rs. 1,53,757/ha/year followed by pearl millet- garlic sequence (Rs.1,51,528/ha/year). However, the highest energy production was recorded in the conventional sequence of pearl millet-wheat (13.10 x10^6 K cal./ha/year) followed by cluster bean-barley (11.69 x10^6 K cal./ha/year).

At **Kota,** among the eight cropping systems evaluated, maize-garlic system gave the highest gross returns (Rs. 3,28,733/ha/year) with energy production of 23.65x10^6 K cal./ha/year. It was followed by maize+soybean-garlic+wheat (Rs. 1, 96,303/ha/year). The other sequences which were found superior than existing soybean-wheat system were; maize+black gram-chickpea+ linseed-cowpea, cotton+black gram-green gram and cotton+cluster bean-green gram with gross annual returns of Rs.1,49,201, Rs. 96,484 and Rs.96,484; respectively.

At **Indore,** among nine cropping systems evaluated, the sequence of soybean+maize-chickpea-green gram was found to be distinctly better than other sequences and gave highest gross returns (Rs. 3,93,290/ha/year) with energy production of 52.38x10^6 K cal./ha/year. The other sequences which were superior than existing soybean-wheat system were soybean+maize-onion-green gram, soybean+maize-pea-green gram, soybean+maize-cauliflower-green gram, soybean+maize-green gram with gross annual returns of Rs.3,07,933, Rs.2,12,931, Rs. 1,97,934 and Rs.1,67,613; respectively.

At **Rajendranagar,** seven cropping systems were compared with existing maize-groundnut system. The performance of soybean-maize system was recorded to be distinctly better than other systems with gross returns of Rs. 94,067/ ha/year and energy production of 29.04x10^6 K cal./

ha/year. Other systems were either at par or inferior to the existing system.

At **Rudrur,** among the 10 cropping systems evaluated, the existing rice-rice system was found to be better in terms of gross returns (Rs. 1,27,314/ha/year) but the system of rice-maize gave the highest energy production (39.79x10^6 K cal./ha/year). Other systems were comparatively inferior.

At **Rahuri,** among 14 crop sequences evaluated, soybean-onion was found to be significantly better and gave highest gross returns (Rs. 3,07,639/ha/year), whereas sequence of soybean-potato showed highest energy production (38.31 x10^6 K cal./ha/year). Some other systems like; pearl millet-onion, pearl millet+soybean-onion and soybean-cabbage were also significantly better than the existing pearl millet-wheat system in that order of merit with gross returns ranging from Rs. 2,52,545 to 1,88,899/ha/ year.

At **Parbhani,** among the 11 sequences evaluated, turmeric+castor-fallow system proved to be significantly better than other systems tried, by giving highest gross returns (Rs. 3,20,757/ha/year) and energy production (52.04x10^6 K cal./ha/year). All the cropping systems tried were significantly superior over existing cropping system of sorghum-wheat, except soybean-sunflower-maize which was found at par with sorghum-wheat cropping system.

At **Coimbatore,** among nine crop sequences evaluated, green chillies-maize sequence was noted to be more profitable, as compared to other systems and recorded gross returns of Rs.2,29,422/ha/year and energy production of 28.37x10^6 K cal./ha/year. The next best sequences in the order of merit, in terms of gross returns were; beet root-green gram and onion-cotton; which yielded gross returns of Rs. 1,76,445 and 1,40,224/ha/year, respectively.

Sub-Humid Ecosystem

At **Pantnagar,** among eight crop sequences evaluated, rice-rapeseed-green gram sequence was found to be distinctly better than other systems tried, and recorded the highest gross returns (Rs. 1,46,815/ha/year) and energy production (32.76x10^6 K cal./ha/year). Other systems, *viz*; rice-wheat-green gram, rice-mustard-green gram, rice-veg. pea-green gram and rice-veg. pea-wheat were also significantly better than existing rice-wheat system, in that order of merit, and gave gross returns ranging from Rs. 1,37,785 to 1,27,533/ha/year.

At **Varanasi,** 10 crop sequences were evaluated. Among them sequence of rice-veg. pea-lady's finger gave the highest gross returns (Rs. 2,06,093/ha/year). Two sequences, namely; rice-potato-green gram and rice-toria-lady's finger were also found to be equally good and recorded gross returns ranging from Rs. 1,82,788 to 1,78,943/ha/year. The rice-potato-green gram recorded the highest energy production (39.54 x10^6 K cal./ha/year).

At **Masodha (Faizabad),** eight cropping systems were evaluated. All the systems were found at par with control (rice-wheat system). The rice-linseed-black gram sequence gave the highest gross returns (Rs. 1,47,937/ha/year) and sequence of rice-potato-green gram recorded the highest energy production (32.31x10^6 K cal./ha/year).

At **Sabour,** 12 crop sequences were evaluated. Among them, bio-intensive system of rice-cabbage+radish-lady's finger+green gram was observed to be distinctly better than others and produced gross returns of Rs. 4,43,022/ha/year. The highest energy output of 65.95x10^6 K cal/ha/year was obtained in rice-maize+potato-sorghum sequence. Three other cropping systems, namely; rice-garlic+coriander (green leaf)-maize, rice-potato+radish-onion+maize and rice-maize+potato-sorghum were found to be better than existing rice-wheat system, in that order of merit, and produced gross returns ranging from Rs. 3,22,614 to 2,11,868/ha/year.

At **Ranchi,** seven crop sequences were evaluated. Among them, rice-potato+wheat-green gram sequence outperformed other systems with significantly higher gross returns of Rs. 2,05,134/ha/year and energy production of 48.17x10^6 K cal./

ha/year. It was followed by rice-potato-green gram sequence with gross returns of Rs.1,79,836/ha/year and energy output of 39.72x10^6 K cal./ha/year.

At **Raipur,** eight crop sequences were compared. All the crop sequences were found to be significantly superior over existing rice-wheat-cowpea cropping system. Among them, the sequential cropping of rice-sunflower+lentil-cowpea recorded highest gross returns (Rs. 2,32,180/ha/year) and energy production (40.09x10^6 K cal./ha/year). Two other systems, *viz*; rice-wheat+fenugreek-cowpea and rice-onion+coriander-veg. cowpea were also found at par with rice-sunflower+lentil-cowpea sequence with gross returns of Rs.2,28,938 and Rs. 2,24,606/ha/year, respectively.

At **Rewa,** 10 crop sequences were evaluated. Among them, rice-toria-onion system performed distinctly better than others by giving the highest gross returns (Rs. 3,00,919/ha/year) followed by rice-berseem-berseem for seed (Rs.2,86,146/ha/year). The highest energy production (47.25x10^6 K cal./ha/year) was recorded in rice-veg. pea-wheat sequence.

At **Jabalpur,** 12 cropping systems were evaluated. Among them the system of rice-marigold-sesame was found significantly superior over others with highest gross returns of Rs 3,27,142/ha/year, followed by rice-berseem-berseem(S) with gross returns of Rs. 3,14,819/ha/year. The highest energy production (42.76x10^6 Kcal./ha/year) was observed in rice-wheat sequence.

At **Powarkheda,** eleven sequences were evaluated and the system of soybean-potato-lady's finger was found to be distinctly better than others with gross returns of Rs. 2,25,908/ha/year, followed by soybean-sugarcane and sugarcane-sugarcane sequence with gross returns of Rs. 1,53,458 and 1,50,236/ha/year, respectively. The highest energy production (35.22x10^6 Kcal./ha/year) was observed in sugarcane-sugarcane sequence.

At **Chiplima**, ten cropping systems were evaluated. The performance of rice-groundnut-bottle gourd was found to be distinctly better than others with annual gross returns of Rs. 1,57,347/ha/year. Three other systems, *viz*; rice-groundnut-green gram, rice-radish-green gram and rice-radish-cowpea; were also found better than existing system with gross returns ranging from Rs. 1,52,558 to Rs.1,49,292/ha/ year. The highest energy production (33.22 x 10^6 K cal./ha/year) was observed with rice-maize-cowpea sequence.

Humid Ecosystem

At **Chatha (Jammu),** ten crop sequences were evaluated. All the systems performed distinctly better than existing rice-wheat cropping system by giving better gross returns ranging from Rs.3,42,404/ha/year to Rs.1,60,421/ha/year. Among these, rice-marigold-french bean system gave highest gross returns (Rs.3,42,404/ha/year) whereas rice-potato-maize recorded highest energy production (48.21x10^6 K cal./ha/year).

At **Palampur,** out of ten cropping systems evaluated, maize-radish-onion was found to be significantly better than others with gross returns of Rs. 2,26,222 /ha/year but at par with maize-pea-summer squash system. The system of maize-cauliflower-buckwheat gave the highest energy production (26.93x10^6 K cal./ha/year).

At **Jorhat,** eight rice-based cropping systems were evaluated. Among them, rice-cabbage-green gram was significantly superior to all other systems with gross returns of Rs. 1,44,754/ha/year and energy production of 17.02x10^6 K cal./ha/year. However, rice-knol khol + french bean-cowpea, rice-radish + french bean-black gram, rice-capsicum-cowpea, rice-green chili-cowpea and rice-cauliflower-black gram system were also better than existing rice-rice system, in terms of economics with gross returns ranging from Rs.1,17,060 to 83,979/ha/ year.

At **Kalyani,** total ten cropping systems were evaluated. Among them, elephant foot yam-

dolichos bean-ginger+turmeric sequence recorded the highest gross returns (Rs. 3,33,358/ha/year), whereas rice-rice-rice sequence gave the highest energy production (89.30x10^6 K cal./ha/year). It was followed by rice-rice-rice, cauliflower-raddish+amaranths-lady's finger, and amaranths-brinjal+coriander-bitter gourd systems with gross returns of Rs. 2,86,493, Rs. 2,21,300 and Rs. 1,97,717/ha/year, respectively.

Coastal Ecosystem

At **Bhubaneswar,** also, ten rice-based cropping systems were evaluated. Among them, rice-tomato-cowpea (veg.) was found to be distinctly better than others with highest gross returns (Rs. 1,73,516 /ha/year) except than rice-french bean-bitter gourd (Rs. 1,65,682 /ha/year). The system of rice-groundnut-cucumber gave the highest energy production (22.49x10^6 K cal./ha/year).

At **Thanjavur,** nine cropping systems were evaluated. However, existing cropping system (rice-rice-brinjal) was better than other systems in terms of gross returns (Rs. 2,01,357/ha/year) whereas rice-rice-maize system was better than others in terms of energy production (55.32x10^6 K cal./ha/year)

At **Maruteru,** six crop sequences were evaluated. On comparison, the system of rice-pillipesara was found to be better than all other systems with the highest gross returns (Rs.1,28,188/ha/year) and energy production (26.43x10^6 K cal./ha/year). Remaining cropping systems were found to be at par with or inferior to existing rice-green fodder sequence, both in terms of gross returns as well as energy production.

At **Karjat,** 11 rice-based cropping systems were compared. The rice-brinjal cropping system was found to be more remunerative with highest gross returns of Rs. 1,87,587/ha/year. However, in terms of energy production, rice-rice system was the highest producer (26.28x10^6 K cal./ha/ year). The other cropping systems, viz; rice-cabbage and rice-dolichos bean also performed reasonably well with gross returns of Rs. 1,05,420/ ha/year for each sequence.

At **Navsari,** ten alternative cropping systems were compared with existing rice-wheat system. Among them, the system of rice-maize-black gram was found to be significantly superior over existing rice-wheat cropping system, with gross returns of Rs. 1,66,690/ha/year. The other systems, which were also found superior to control were; rice-chickpea+mustard-sweet corn, rice-sorghum-groundnut, rice-fenugreek-green gram, rice-green gram-sorghum+black gram with gross returns ranging from Rs. 1,37,474 to Rs. 1,35,201/ ha/ year. The energy production was found to be highest in rice-sorghum-sorghum sequence (39.04x10^6 /ha/year).

Diversification of cotton-based cropping systems at S.K. Nagar

Intercropped pigeonpea+black gram at Thanjavur

Table-7.1/1: Crop productivity, energy yield and gross returns* under different crop sequences (2011-12).

***Note:** Monetary returns given here are indicative only for comparison purpose and not absolute, as prices of different commodities may vary to a great extent, from location to location, season to season and even according to time of harvest especially in case of vegetables, spice crops, fodder crops etc. The average price considered are given in Annexure-III.

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)*	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
A. ARID ECOSYSTEM							
HISAR (HARYANA)							
Pearl millet (HHB-197; 77) 125-62.5-0	Wheat (PBW-502;162) 150-60-0	-	3016	5633	-	1,02,203	30.47
Cotton (H-1226; 153) 175-60-0	Wheat (PBW-502; 162) 150-60-0	-	2582	5560	-	1,57,703	28.06
Pearl millet (HHB-197; 77) 125-62.5-0	Barley (BG-75;127) 60-30-0	Green gram (Asha;74) 20-40-0	3162	3218	378	76,524	23.47
Cluster bean (HG-365; 97) 20-40-0	Broccoli (Green Head; 84) 100-50-0	Onion (Hisar-2;101) 125-50-25	1075	1790	12308	1,51,140	7.39
Green gram (Asha; 77) 20-40-0	Mustard (RH-30;149) 80-30-0 + Kasni (NR)	-	988	2375 + 148	-	95,990	15.94
Pearl millet (HHB-197; 77) 125-62.5-0	Wheat (C-306;160) 60-30-0	Cowpea (veg) (Pusa Komal; 77) 25-40-0	3244	2944	923	77,177	22.27
Pearl millet (HHB-197; 77) 125-62.5-0	Wheat (PBW-502;162) 150-60-0 + Mustard (RH-30;149)	-	2466	4964	- + 146	91,197	26.76
S.E.±						4,940	1.01
CD at 5%						11,257	2.29
S.K. NAGAR (GUJARAT)							
Pearl millet (GHB-558; 94) 80-40-0	Mustard (GM-2; 121) 50-50-0	-	1972	2050	-	70,583	18.21
Green gram (GM-4; 77) 20-40-0 + Sunhemp (F) (Local; 77) + Castor (GCH-7: 222) 120-25-0	Castor (cont.)	Green gram (GM-4;77) 20-40-0	794 + 7785	5044	1615	2,05,075	31.48

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Green gram (GM-4; 77) 20-40-0 + Sunhemp (F) (Local; 77) + Castor (GCH-7: 222) 120-25-0	Castor (cont.)	Sorghum (F) (GC-4; 66) NR	745	4770		1,16,402	23.48
Green gram (GM-4; 77) 20-40-0 + Sunhemp (F) (Local; 77) + Castor (GCH-7; 222) 120-40-0 + Bottle gourd (Local;122) 20-40-0	Castor (Cont.)	Pearl millet (GHB-558;81) 120-60-0	800 + 7675 + 7230	5702	NR	1,92,157	29.85
Bt Cotton (Hy-8;220) 160-00-00 + Sunhemp (F) (Local;77) 160-40-0 + Castor (GCH-7;222) 160-0-0 + Bitter gourd (Local;122) 20-40-0	Bt Cotton (Cont.)		- 14802 3782 5976	2944		2,96,982	30.28
Green gram (GM-4; 77) 20-40-0	Fennel (GF-11; 179) NR + Cauliflower (Snowball-1; 78) NR	-	1253	1625 + 27366	-	3,12,017	22.75

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Green gram (GM-4; 77) 20-40-0	Mustard (GM-2; 123) 50-50-0 + Lucerne seed (Anand-2,199)	-	1232	1886 + 679	-	1,98,310	14.47
Bt. cotton (Hy-8; 220) 160-0-0 + Green gram (GM-4; 77)	Bt. cotton (Contd.)	Castor (GCH-7; 222) 20-40-0	-	2785	3837	1,93,809	28.82
S.E.±						22,337	1.98
CD at 5%						47,914	4.25
		SIRUGUPPA (KARNATAKA)					
Rice (BPT-5204;126) 150-75-75	-	Rice (BPT-5204;126) 150-75-75	5771	-	3905	1,07,418	33.48
Rice (M. Siri-1253;126) 150-75-75	-	Ridge gourd (J. long; 108) 50-50-0	6785	-	5365	1,34,328	24.38
Rice (M. Siri-1253;126) 150-75-75	-	Mustard (Varuna; 134) 100-60-40	6895	-	248	82,738	25.19
Rice (M. Siri-1253;126) 150-75-75	-	Indian Beans (Local; 121) 60-20-20	6548	-	1040	91,279	22.92
Rice (M. Siri-1253;126) 150-75-75	-	Cumin (Local; 134) 50-20-20	6476	-	285	81,292	23.42
Rice (M. Siri-1253;126) 150-75-75	-	Ashwagandha (Jowahar; 113) 75-30-30	6726	-	491	1,17,895	23.49
Rice (Rasi; 126) 150-75-75	Spinach (Local; 98) 25-0-0	Black gram (T-9; 98) 12.5-25-0	5010	3525	NR	90,512	19.06
Rice (Rasi; 126) 150-75-75	Fenugreek (NR; NR) 100-0-0	Green gram (C. Mung; 98) 12.5-25-0	4917	3982	NR	94,011	30.27
Rice (Rasi; 126) 150-75-75	-	Rice (Rasi; 126) 150-75-75	5373	-	5021	1,53,377	35.96

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Rasi; 126) 150-75-75	Sesbania (GM) (Local) 0-0-0	Rice (Rasi; 126) 150-75-75	4923	-	4918	1,09,235	34.04
S.E.±						4,304	1.31
CD at 5%						9,042	2.75
B. SEMI-ARID ECOSYSTEM							
KANPUR (UTTAR PRADESH)							
Rice (Pant Dhan-12;102) (NR)	Wheat (PBW-343;143) (NR)	-	6492	5809	-	1,10,033	31.92
Rice (PHB-71;102) (NR)	Wheat (PBW-343;143) (NR)	-	10572	6111	-	1,46,906	43.29
Rice (PHB-71;102) (NR)	Wheat (PBW-343;143) (NR)	Green gram (Samrat; 89) (NR)	11023	6238	1031	1,82,834	47.37
Maize (Azad Uttam; 96) NR	Wheat (PBW-343;143) (NR)	-	3936	6411	-	90,715	26.73
Maize (Azad Uttam; 96) NR	Mustard (Kanti;122) (NR)	Onion (N. Red; 118) (NR)	4063	2284	16666	1,75,817	25.94
Maize (Azad Uttam; 96) NR	Mustard (Kanti; 122) (NR)	Green gram (Samrat; 89) (NR)	3841	2707	1190	1,14,710	23.82
Maize (Azad Uttam; 96) NR + Green gram (K-851; 84) NR	Potato (K. Bahar; 106) (NR)	Wheat (K-7903;93) (NR)	3873 + 477	27825	4444	1,61,354	42.9
Maize (Azad Uttam; 96) (NR) + Black gram (NR; 0)	Potato (K. Bahar; 90) (NR) NR	Onion (N. Red ;114) (NR)	3936 + NR	30377	17237	2,55,845	42.08
Maize (Azad Uttam; 96) (NR)	Garlic (Local; 176) (NR)	Green gram (Samrat; 89) (NR)	3206	10364	1316	3,02,490	22.79
Rice (Sugandha;102) (NR)	Wheat (K-7903; 93) (NR)	Lady's finger (Azad Bhindi; 64) (NR)	5682	5984	4603	1,39,156	31.48
S.E.±						11,806	1.68
CD at 5%						24,227	3.46

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
BICHPURI (UTTAR PRADESH)							
Pearl millet (Shakti-7173, NR) 80-40-40	Wheat (HD-2687,121) 120-60-40	-	2640	4612	-	85,149	25.49
Pearl millet (Shakti-7173, NR) 80-40-40	Wheat (HD-2687,121) 120-60-40	Green gram (K-851; NR) 25-50-0	2450	4117	1199	1,24,898	27.09
Pearl millet (Shakti-7173, NR) 80-40-40	Lentil (DPL-15, 134) 25-50-0	-	2551	1596	-	69,703	14.68
Soybean (PK-1092, NR) 20-80-40	Wheat (HD-2687, 121) 120-60-40 + Mustard (Rohini, 121)	-	1112	3619 + 518	-	77,824	20.13
Pigeon pea (UPAS-120, NR) 30-60-30	Wheat (HD-2687, 121) 120-60-40	-	1730	4001	-	1,15,452	19.64
Green gram (K851, NR) 25-50-0	Mustard (Rohini, 143) 80-40-40	-	1550	2410	-	1,22,258	18.21
Sesbania (GM) (Local , NR) NR	Potato (K. Bahar;143) 150-80-60	Lady's finger (Arka Anamika; NR) 120-60-60	NR	30120	4526	1,60,307	31.76
Pearl millet (Shakti-7173, NR) 80-40-40	Potato (K. Bahar;143) 150-80-60	Cluster bean (Amul-51;NR) 20-40-0	2480	26044	4526	1,60, 307	35.8
Sesame (Guj-1, NR) 30-15-15	Barley (PL-172, 135) 60-30-20	Green gram K-851; 0 25-50-0	750	3959	1640	1,29,934	23.01
Sorghum (Fodder) (Samrat, NR) 30-30-0	Oat (Fodder) (Local,140) 60-30-20	Cowpea (Fodder) (Local; NR) 20-40-0	24056	20120	1410	73,829	7.29
S.E.±						8,360	0.97
CD at 5%						17,154	1.99
JUNAGADH (GUJARAT)							
Groundnut (GG-20; 120) 12.5-25-0	Wheat (GW-366; 104) 120-60-00	-	1310	4016	-	86,986	21.32

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Groundnut (GG-20;120) 12.5-25-0	Onion (Agri. Dark Red; 94) 75-60-50	Sorghum (F) (Gundari; 53) 80-40-0	1226	27345	28251	2,89,802	25.14
Groundnut (GG-20;120) 12.5-25-0	Potato (K. Badshah;120) 220-110-220	Sesame (GT-2; 88) 25-25-0	1254	8868	803	93,377	20.23
Sorghum (Gundari;108) 80-40-0	Cumin (GC-4;103) 30-15-0	Green gram (GM-4; 69) 20-50-0	1637	779	913	78,656	11.54
Sorghum (Fodder) (Gundari; 64) 80-40-0	Castor (GCH-7; 206) 75-50-0	Castor (Contd.)	25514	-	2067	65,598	13,18
Onion (Agri. Dark Red; 94) 75-60-50	Wheat (GW-366; 104) 120-60-0	Green gram (GM-4; 69) 20-50-0	13786	3738	658	1,88,114	22.02
Onion (Agri. Dark Red; 94) 75-60-50	Chickpea (GG-1;104) 25-50-0	Maize (F) (Ganga-5; 61) 100-80-0	12386	1213	29238	1,68,345	15.24
Sesame (G-2; 91) 25-25-0	Potato (K. Badshah; 89) 220-110-220	Maize (F) (Ganga-5;61) 80-40-0	1062	11316	27942	1,07,942	21.43
Cotton (BT-134;174) 160-0-0	Cotton (Cont.) 25-50-0	Groundnut (GG-20;120)	-	1997	1280	90,495	13.89
Pigeon pea (BDN-2; 212) 25-50-0	Pigeon pea (Contd.) 80-40-0	Pearl millet (GHB-558;82)	-	1211	2530	69,608	13.19
S.E.± CD at 5%						9,997 21,005	1.6 3.36
		DURGAPURA (RAJASTHAN)					
Pearl millet (Raj-171;94) 40-30-0	Wheat (Raj-4077;130) 45-30-0	-	839	2910	-	45,628	13.1
Cluster bean (RGC-1003;105) 20-40-0	Barley (RD-2715;129) 45-30-0	-	1336	3310	-	44,685	11.59
Green gram (RMG-492; 84) 15-40-0	Chandrasur (Local;130) 30-40-0	-	601	1811	-	53,961	7.44
Pearl millet (Raj-171;94) 40-30-0	Lentil (NR;129) 20-40-0	-	856	1527	-	51,171	8.33

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Cluster bean (RGC-1003;105) 20-40-0	Onion (R-059;132) 50-50-100	-	1498	11423	-	1,07,974	6.23
Green gram (RMG-492;84) 15-40-0	Isabgol (GI-2;131) 22.5-40-0	-	596	1984	-	1,53,757	4.45
Cluster bean (RGC-1003;105) 20-40-0	Barley (RD-2715;129) 45-30-0	-	1371	3339	-	45,286	11.69
Pearl millet (Raj-171;94) 40-30-0	Garlic (Local;151) 60-40-100	-	839	4652	-	1,51,528	9.77
Pearl millet (Raj-171;94) 40-30-0	Lentil (NR;151) 20-40-0	-	775	1464	-	48,594	7.82
S.E.±						2,225	0.25
CD at 5%						4,593	0.52
		RAJENDRANAGAR (ANDHRA PRADESH)					
Maize (DHM-117;107) 180-60-60	Groundnut (K-6;130) 30-40-50	-	4967	1202	-	81,133	23.8
Maize (DHM-117;107) 180-60-60	Sunflower (Agsun; 100) 90-60-30	-	5287	1315	-	88,654	26.23
Maize (DHM-117;107) 180-60-60	Castor (PCH-111;140) 90-40-30	-	4935	1109	-	68,491	21.75
Maize (DHM-117;107) 180-60-60	Wheat (Local; 100) 120-60-40	-	4941	1899	-	72,839	23.47
Soybean (JS-335; 93) 80-60-40	Maize (DHM-117;120) 180-60-60	-	2630	5170	-	94,067	29.04
Soybean (JS-335; 90) 80-60-40	Wheat (TMV-2; 110) 30-40-50	-	2474	1917	-	65,454	17.32
Soybean (JS-335; 93) 80-60-60	Castor (PC-111;140) 90-40-30	-	2647	1116	-	63,936	16.34
Soybean (JS-335; 93) 80-60-60	Sunflower (Agsun; 100) 90-60-30	-	2586	1349	-	80,461	19.54
S.E.±						4,481	1.31
CD at 5%						9,611	2.82

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer ($N:P_2O_5:K_2O$, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
			KOTA (RAJASTHAN)				
Soybean (RKS-24; 92) 40-40-0	Wheat (Raj-3765;146) 120-40-0	-	1701	4316	-	83,538	22.28
Maize (PEHM-2; 84) 60-30-0 + Soybean (RKS-24 ; 92)	Garlic (Local;159) 120-40-100 + Wheat (Raj-3765;180)	-	1859 + 508	5158 + 842	-	1,96,303	18.94
Maize (PEHM-2; 84) 60-30-0	Mustard (Pusa Bold;141) 80-40-0	Green gram (AKM-8802; 88) 20-40-0	2596	1754	473	88,249	19.95
Maize PEHM-2; 84) 60-30-0 + Black gram (Ku-96-3;84)	Chickpea (Samrat;149) 20-40-0 + Mustard (Pusa Bold;141)	Green gram (AKM-8802; 88) 20-40-0 -	1994 + 438	842 + 526	438 -	89,509	15.34
Maize (PEHM-2; 80) 90-30-0 + Black gram (Ku-96-3;84)	Chickpea (Samrat; 149) 20-40-0 + Linseed (Meera; 149)	Cowpea (Veg.) (Local; 88) 20-40-0	2982 + 754	1263 + 386	4736	1,49,201	21.68
Maize PEHM-2;84) 60-30-0	Garlic (Local;159) 120-40-100	-	2666	9824	-	3,28,733	23.65
Cotton (H-8;201) 100-50-0 + Black gram Ku-96-3;84)	Cotton (Contd.) (AKM-8802;95) 20-40-0	Green gram	- + 701	1912	824	96,484	9.48
Cotton (H-8;201) 100-50-0 + Cluster bean (Pusa Bahar;42)	Cotton (cont.) 20-40-0	Green gram (AKM-8802;95)	- + 1088	1912	824	96,484	9.48
S.E.± CD at 5%						3,286 7,049	0.41 0.89

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
INDORE (MADHYA PRADESH)							
Soybean	Wheat	-	3078	8309	-	1,18, 182	31.53
(JS 95-60 ;94)	(HI-1544 ;120)						
20-60-20	120-60-40						
Soybean	Chickpea	-	2964	1158	-	61,004	12.73
(JS 95-60 ;94)	(JG-412;90)						
20-60-20	20-60-20						
Soybean	Chickpea	Green gram	1820	16090	1057	3,93,290	52.38
(JS 95-60 ;94)	(JG-412;90)	(TJM-3 ;68)					
20-60-20	20-60-20	20-50-0					
Soybean	Pea	Green gram	1950	10634	991	2,12,931	34.32
(JS 95-60;94)	(Ruchi ;120)	(TJM-3 ;68)					
20-60-20	30-75-40	20-50-0					
Soybean	French bean	Green gram	2100	71	987	57,702	9.68
(JS 95-60 ;94)	(Contender;120)	(TJM-3 ;68)					
20-60-20	120-60-40	20-50-0					
Soybean	Potato	Green gram	2029	22819	692	1,08,980	25.25
(JS 95-60 ;94)	(LoukarKufri;103)	(TJM-3 ;68)					
20-60-20	120-100-100	20-50-0					
Soybean	Onion	Green gram	2127	41202	852	3,07,933	24.86
(JS 95-60 ;94)	(AFLR ;118)	(TJM-3 ;68)					
20-60-20	100-50-100	20-50-0					
Soybean	Cauliflower	Green gram	2077	27859	1108	1,97,934	23.67
(JS 95-60 ;94)	(Snowball-1 ;68)	(TJM-3 ;68)					
20-60-20	120-60-40	20-50-0					

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Soybean (JS 95-60 ;92) 20-60-20	Sweet corn (Sugar-75;130) 150-80-60	Green gram (TJM-3 ;68) 20-50-0	1876	15714	461	1,67,613	22.28
S.E.±						17,482	2.21
CD at 5%						36,083	4.56
		RUDRUR (ANDHRA PRADESH)					
Rice (MTU-1010;125) NR	Rice (MTU-1010;135) NR	-	5505	5964	-	1,27,314	39.68
Rice (MTU-1010;125) NR	Maize (30V92; 105) NR	-	5486	6086	-	1,20,541	39.79
Rice (MTU-1010;125) NR	Sunflower (DRSF-108;105) NR	-	5586	1806	-	1,12,574	30.52
Rice (MTU-1010;125) NR	Mustard (Kranthi; 95) NR	-	5436	994	-	85,198	24.18
Soybean (JS-335 ;95) NR	Sunflower (DRSF-108;105) NR	-	1902	1904	-	84,701	20.02
Soybean (JS-335 ;95) NR	Sesame (Sweta-T-11;85) NR	-	1980	864	-	62,055	13.42
Maize (30V92; 105) NR	Sunflower (DRSF-108;105) NR	-	3486	1917	-	87,844	23.8
Soybean (JS-335 ;95) NR	Maize (30V92; 105) NR	-	1912	6112	-	91,455	29.16
Maize (30V92; 105) NR	Chickpea (JG-11;105) NR	-	3535	1786	-	84,658	18.52
Sunflower DRSF-108;105) NR	Maize (30V92; 105) NR	-	1864	5824	-	1,09,272	31.47
S.E.±						742	0.183
CD at 5%						1,559	0.38

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
			RAHURI (MAHARASHTRA)				
Pearl millet (Sharddha;73) NR	Wheat (Trimbak;120) NR	-	3361	3410	-	76,759	23.93
Pearl millet (Sharddha;73) NR	Onion (N-24-1;120) NR	-	3491	26464	-	2,52,545	25.83
Pearl millet (Sharddha;73) NR	Potato (K Jyoti:100) NR	-	3481	23152	-	1,81,164	35.02
Pearl millet (Sharddha;73) NR	Chickpea (Virat; 115) NR	-	3308	2216	-	94,472	19.92
Pearl millet (Sharddha;73) NR	Cabbage (Kranthi; 95) NR	-	3611	21271	-	1,52,382	18.77
Soybean (JS-335;NR) NR	Wheat (Trimbak;120) NR	-	3170	3732	-	1,00,266	26.6
Soybean (JS-335: NR)	Onion (NR; NR) NR	-	3449	30390	-	3,07,639	30.09
Soybean (JS-335;NR) NR	Potato (K Jyoti:100) NR	-	3344	24603	-	1,44,498	38.31
Soybean (JS-335;NR) NR	Chickpea (Virat; 115) NR	-	3253	2532	-	1,24,585	23.17
Soybean (JS-335 ;NR) NR	Cabbage (Kranthi; 95) NR	-	3464	23953	-	1,88,899	21.43
Pearl millet (Sharddha;73) NR + Soybean (JS-335 ;NR) NR	Wheat (Trimbak;120) NR	-	2701 + 979	3498	-	87,589	26.08
Pearl millet (Sharddha;73) NR + Soybean (JS-335 ;95) NR	Onion (N-241; 120) NR	-	2845 + 982	20933	-	2,16,785	24.98

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Pearl millet (Sharddha;73) NR + Soybean (JS-335 ;95) NR	Chickpea (Virat; 115) NR		2716 + 997	2381	-	1,09,759	22.68
Pearl millet (Sharddha;73) NR + Soybean (JS-335 ;95) NR	Cabbage (Kranti; 95) NR		3048 + 1013	22344	-	1,69,489	21.41
S.E.±						27,450	0.184
CD at 5%						56,218	3.77
		PARBHANI (MAHARASHTRA)					
Sorghum (CSH-16 ;111) 80-40-40	Wheat (HD-2189 ;119) 100-50-50	-	3735	3974	-	88,425	26.78
Bt. Cotton (Bt.Malika;151) 125-62.5-62.5	Bt. Cotton (Cont.) 25-50-0	Groundnut (TAG-24;121)	-	2459	2148	1,39,175	20,346
Soybean (MAUS-71;104) 30-60-30	Onion (AFLR;123) 100-50-50	-	2246	20051	-	2,02,498	19.73
Soybean (MAUS-71;105) 30-60-30	Wheat (HD-2189 ;119) 100-50-50	Cowpea (Veg.) (NR ;61) 100-50-50	2239	4066	17799	2,59,020	32.29
Pigeon pea (BSMR-853;182) 25-60-30	Pigeon pea (Cont.)	Groundnut (TAG-24;121) 25-50-0	-	2158	2051	1,35,250	18.86
Maize (Maharaja;118) 30-60-60	Wheat (HD-2189 ;119) 100-50-50	Green gram (BPMR-145;68) 25-50-0	6448	4125	1316	1,68,883	40.72
Bt. Cotton (Bt.Malika;151) 125-62.5-62.5	Wheat (HD-2189 ;119) 100-50-50	Coriander (Multicut; 45) 50-50-50	2519	4106	3727	1,72,820	33.3
Maize (Maharaja;118) 120-60-60	Chickpea (Digvijay ;119) 25-50-0	Lady's finger (Anamika; 85) 50-50-50	6561	2173	4304	1,67,788	31.77
Soybean (MAUS-71;104) 30-60-60	Chickpea (Digvijay ;119) 25-50-0	Coriander (Multicut; 45) 50-50-50	2291	2140	3756	1,34,936	28.42

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Turmeric (Salem;238) 100-50-50 + Castor (DCH-9;177)	-	-	13947 + 766	-	-	3,20,757	52.04
Bt. Cotton (Bt.Malika;151) 125-62.5-62.5	Chickpea (Digvijay ;119) 25-50-0	-	2461	1972	-	1,36,466	15.27
Soybean (MAUS-71;104) 30-60-30	Safflower (PBNS-12;120) 60-40-30	Maize (F) (African tall;68) 100-50-50	2169	1670	16556	95,782	17.97
S.E.± CD at 5%						4,463 9.258	0.74 1.54
COIMBATORE (TAMIL NADU)							
Green gram (Vamban-2;80) 25-50-25	Cotton (Bunny Bt.Hy;150) 150-75-75 + Sunnhemp(F) (Local; 0) 150-75-75	-	1028	2657 + NR	-	1,15,561	12.25
Sorghum(F) (CO-26;50) 60-40-20	Cotton (Bunny Bt.Hy;150) 150-75-75 + Onion (NR; 0) 150-75-75	-	30625 + 1170	2791	-	1,21,491	14.75
Onion (Local; 80) 30-60-30	Cotton (Bunny Bt.Hy;150) 150-75-75	-	7853	2694	-	1,40,224	12.87
Maize (NK-6240;110) 150-62.5-50	Cowpea(S) (CO-CP-7;85) 25-50-25	-	7432	903	-	89,777	28.33
Maize (NK-6240;110) 150-62.5-50 + Cowpea (CO-7; 0)	Sunflower (Sunbreed;90) 60-90-60	-	7196 + 922	1911	-	1,32,846	36.9
Beet root (Ruby queen;120) 60-160-100	Green gram (Vamban-2;75) 25-50-25	-	10660	893	-	1,76,445	7.56

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Cowpea (CO-2; 90) 25-50-25	Maize (NK-6240;110) 150-62.5-50 + Cowpea(F) (Local; 0)	-	2638 + 2018	7172	-	99,895	26.11
Sunflower (Sunbreed;100) 60-90-60	Pigeon pea (VBN(Rg)-3;110) 25-50-25	-	1911	1105	-	94,424	15.55
Green Chillies (K-2;135 120-60-30	Maize (NK-6240;110) 150-62.5-50	-	9452	7496	-	2,29,422	28.37
S.E.±						4,355	28.37
CD at 5%						4,355	0.79
C. SUB-HUMID ECOSYSTEM							
PANTNAGAR (UTTARAKHAND)							
Rice (PR-113;120) 120-60-40	Wheat (PBW-343;155) 150-60-40	-	6791	4559	-	1,00,484	29.45
Rice (PR-113;120) 120-60-40	Veg. Pea (Arkel;116) 20-60-40	Wheat (PBW-343;155) 150-60-40	6800	5791	3393	1,27,533	30.49
Rice (PR-113;120) 120-60-40	Veg. Pea (Arkel;116) 20-60-40	Green gram (PM-2;95) 20-60-40	6660	6194	1145	1,30,679	24.47
Rice (PR-113;120) 120-60-40	Rapeseed (PT-303;72) 100-60-40	Green gram (PM-2;95) 20-60-40	7533	2485	1250	1,46,815	32.76
Rice (PR-113;120) 120-60-40	Mustard (Kranti;109) 100-60-40 20-60-40	Green gram (PM-2;95)	6591	2436	1028	1,31,423	29.56
Rice (PR-113;120) 120-60-40	Potato (K.C.Mukhi;139) 120-60-60	Green gram (PM-2;95) 20-60-40	6683	14022	1192	1,29,593	30.53
Rice (PR-113;120) 120-60-40	Rapeseed (PT-303;72) 100-60-40	French Bean (contender 78) 100-60-40	6816	2236	1024	1,12,406	26.96
Rice (PR-113;120) 120-60-40	Wheat (PBW-343;155) 150-60-40	Green gram (PM-2;95) 20-60-40	6733	5469	967	1,37,785	34.08
S.E.±						7,421	1.44
CD at 5%						15,435	2.99

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
VARANASI (UTTAR PRADESH)							
Rice (PS-4;145) 150-75-75	Wheat (HUW-468;130) 150-75-75	-	3599	4768	-	1,01,230	28.95
Rice (PS-4;145) 150-75-75	Wheat (HUW-468;130) 150-75-75	Green Gram (P.Vishal;78) 25-60-25	3912	4976	1331	1,60,616	35.2
Rice (PS-4;145) 150-75-75	Wheat (HUW-468;130) 150-75-75	-	4432	4826	-	1,11,224	32.03
Rice (PS-4;145) 150-75-75	Wheat (HUW-468;130) 150-75-75 + Mustard (PRP-4001;142) 150-75-75	Black gram (Azad-1;78) 25-60-25	3865	3622 + 486	1215	1,47,794	32.75
Rice (PS-4;145) 150-75-75	Wheat (HUW-468;130) 150-75-75 + Mustard (PRP-4001;142) 150-75-75	Cowpea(F) (CP-4;78) 0-0-0	4259	3726 + 462	4224	1,47,044	32.16
Rice (PS-4;145) 150-75-75	Mustard (PRO- 4001;142) 112-56-56	Green Gram (P.Vishal;78) 25-60-25	4004	1717	1458	1,45,714	28.01
Rice (PS-4;145) 150-75-75	Toria (PT-303;110) 90-45-0	Lady's finger (Mahyco-10;110) 120-60-60	3842	1273	10648	1,78,943	23.91
Rice (PS-4;145) 150-75-75	Veg. Pea (E.Apoorva;92) 25-60-25	Lady's finger (Mahyco-10;110) 120-60-60	3784	4583	12500	2,06,093	21.73
Rice (PS-4;145) 150-75-75	Maize (cob) (Bio-9681;148) 120-60-40 + Veg.pea (Early Apoorva;92)	Cowpea (F) (Local;65) 25-60-25	3831	11728 + 2950	25069	1,32,204	24.93
Rice (PS-4;145) 150-75-75	Potato (K.Sinduri;115) 160-80-80	Green gram (Pusa Vishal;78) 25-60-25	4074	20934	1539	1,82,788	39.54
S.E.±						5,748	0.95
CD at 5%						12,077	1.99

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
FAIZABAD (UTTAR PRADESH)							
Rice (PHB-71;132) 120-60-40	Wheat (PBW-343 ;131) 120-60-40	-	2550	2875	-	65,248	18.77
Rice (PHB-71;132) 120-60-40	Potato (K.Ashoka;92) 150-60-90	Green gram (NDM-1 ;126) 15-40-0	4386	15500	630	1,30,157	32.31
Rice (PHB-71;132) 120-60-40	Linseed (Garima ;117) 120-60-40	Black gram (NDU-1 ;102) 15-40-0	2703	3350	650	1,47,937	29.36
Rice (PHB-71;132) 120-60-40	Mustard (NDR- 8501;117) 100-60-60	Lady's finger (Pusa Sawani;95) 10-40-0	4326	1475	2250	1,7,176	23.73
Rice (PHB-71;132) 120-60-40	Berseem (F) (Vardan ;117) 100-60-60	Barseem (Seed) (Vardan;117) 15-40-0	4646	5600	716	1,26,964	19.43
Rice (PHB-71;132) 120-60-40	Bengal gram (Awarodhi ;126) 120-60-60	Maize (Fodder) (Local;80) 80-40-40	6383	1275	25820	1,34,957	30.8
Rice (PHB-71;132) 120-60-40	Lentil (NDL-1 ;129) 20-80-0	Green Fodder (Local;80) 80-40-40	6516	1010	5800	1,13,375	26.94
Rice (PHB-71;132) 120-60-40	Fenugreek (Leaves) (NR;132) 15-40-0	Fenugreek(S) (NR;132) 15-40-0 + Coriander (NR;132 80-40-40	2603	3200	1650 + 730	1,22,254	18.17
S.E.±						40,033	8.55
CD at 5%						85,871	18.35
SABOUR (BIHAR)							
Rice (Sita;131) 100-40-20	Wheat (HP-2733;137) 120-60-40	-	5113	4740	-	1,17,667	34.09
Rice (Sita;131) 100-40-20	Maize (Shaktiman-3;163) 60-37.5-25 + Potato (k.Ashoka;0)	Maize (Suwan;50) 80-40-20	5340	7516 + 17600	NR	1,96,883	61.25

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Sita;131) 100-40-20	Wheat (HP-2733;137) 120-60-40 + Fenugreek (NR;0)	Green gram (SmL-68;79) 20-50-0	5051	4595 + 321	906	1,54,560	36.51
Rice (Sita;131) 100-40-20	Potato (K.Ashoka;78) 150-90-100 + Radish (NR; 0) 150-90-100	Onion (N.Red;140) 100-80-80	4823	22983 + 7051	8726	2,28,356	44.54
Rice (Sita;131) 100-40-20	Cabbage (P.Mukta;103) 120-80-80 + Radish (P.Chetki; 0)	Lady's finger (P.Kranti;118) 100-60-60 + Green gram (SML,668;78)	4988	43040 + 7133	12065 + 296	4,43,022	35.3
Rice (Sita;131) 100-40-20	Maize (Shaktiman-3;169) 120-75-50 + Potato (NR; 0)	Sorghum (SSG-99;54) 60-30-30	6852	7437 + 17335	NR	2,11,868	65.95
Rice (Sita;131) 100-40-20	Maize (Shaktiman-3;169) 120-75-50 + French bean (NR;0) 120-75-50	Maize(F) (Suwan;44) 80-40-20	7059	7675 + 489	NR	1,62,328	52.36
Rice (Sita;131) 100-40-20	Garlic (Yamuna Safed;140) 100-80-80 + Coriander (NR; 0) 100-80-80	Maize (Suwan;88) 100-60-40	6934	5037 + 5751	3422	3,22,614	59.56
Rice (Sita;131) 100-40-20	Wheat (HD-2733;141) 120-60-40	Mustard (PRO- 4001;142) 112-56-56	6355	4471	816	1,60,644	40.18
Rice (Sita;131) 100-40-20	Maize (Shaktiman-3;168) 120-75-50	Cluster bean (Golden early-36;59) 20-50-0	6251	7755	NR	1,45,392	48.15

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Sita;131) 100-40-20	Oat (JHO-882;141) 80-40-20	Pearl millet (GM-4;62) 60-30-20	6127	NR	NR	68,009	21.19
Rice (Sita;131) 100-40-20	Chick pea (Vaibhav; 140) 20-50-0 + Coriander (NR; 0)	Maize (Suwan;88) 100-60-40	6230	1614 + 436	3445	1,52,458	40.41
S.E.±						7,028	1.34
CD at 5%						14,577	2.77
		RANCHI (JHARKHAND)					
Rice (Lalat;96) 80-40-20	Wheat (K-9107;130) 100-50-25	-	3141	3010	-	73,547	21.28
Rice (Lalat;96) 80-40-20	Mustard (Pusa bold;106) 80-40-20	Green gram (Pusa Vishal;65) 20-40-20	3525	1232	700	97,935	21.2
Rice (Lalat;96) 80-40-20	French bean (HUR-137;123) 120-60-40	Green gram (Pusa Vishal;65) 20-40-20	3722	1200	1000	1,02,777	20.37
Rice (Lalat;96) 80-40-20	Potato (K.Ashoka;89) 120-80-100	Green gram (Pusa Vishal;65) 20-40-20	3955	22020	1400	1,79,836	39.72
Rice (Lalat;96) 80-40-20	Wheat (K-9107;130) 100-50-25 + Mustard (Pusa bold;106) 100-50-25	Green gram (Pusa Vishal;65) 20-40-20	3432	2333 + 262	800	1,06,645	24.04
Rice (Lalat;96) 80-40-20	Wheat (K-9107;130) 100-50-25 + French bean (HUR-137;123) 100-50-25	Green gram (Pusa Vishal;65) 20-40-20	3664	2121 + 500	900	1,12,872	24.75
Rice (Lalat;96) 80-40-20	Potato (NR;NR) 120-80-100 + Wheat (K-9107;130) 120-80-100	Green gram (Pusa Vishal;65) 20-40-20	4304	23618 + 1838	1200	2,05,134	48.17
S.E.±						4,270	1.34
CD at 5%						9,305	2.99

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
RAIPUR (CHHATTISGARH)							
Rice (MTU-1010,112) 80-60-40	Wheat (NR,125) 100-60-40	Cowpea (S) (NR,85) 20-50-0	5258	3229	1329	1,24,793	33.66
Rice (MTU-1010,112) 80-60-40	Castor (NR,138) 80-50-30 + Lentil (NR,0) 80-50-30	Cowpea (NR,85) 20-50-0	5358	191 + 1219	10833	2,03,326	28.72
Rice (MTU-1010,112) 80-60-40	Mustard (NA,126) 80-50-30 + Lentil (NR,0)	Cowpea (F) (NR,85) 20-50-0	5150	842 + 1500	36708	2,00,987	33.39
Rice (MTU-1010,112) 80-60-40	Wheat (NR,125) 100-60-40	Green gram (NR; 76) 20-50-0	5229	3250	1425	1,56,812	34.09
Rice (Mahamaya,127) 100-60-40	Sunflower (NR,126) 80-50-30 + Lentil (NR,0) 80-50-30	Cowpea (NR,85) 20-50-0	6116	1848 + 896	9167	2,32,180	40.09
Rice (Mahamaya,127) 100-60-40	Wheat (NR,125) 100-60-40 + Fenugreek(S) (NR,0) + Fenugreek (NR,0)	Cowpea (Veg.) (NR,85) 20-50-0	6052	2198 + 958 + 2167	36563	2,28,938	38.64
Rice (Indira Sona,128) 120-60-40	Wheat (NR,125) 100-60-40 + Lentil (NR,NR) 30-50-30	Cowpea (Veg.) (NR,85) 20-50-0	6666	894 + 1161	9916	2,12,586	34.9

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Indira Sona,128) 120-60-40	Onion (NR,115) 80-60-30 + Coriander (Leaves/seed) (NR,0) 80-60-30	Cowpea (S) (NR,85) 20-50-0	6513	350 + 10407 + 842	992	2,24,605	58.31
S.E.±						5,999	0.99
CD at 5%						12,869	2.13
		REWA (MADHYA PRADESH)					
Rice (Danteswari;98) (120-60-40)	Wheat (GW-273;128) (NR)	-	4324	6439	-	1,30,748	37.24
Rice (Danteswari;98) (120-60-40)	Chickpea (JG-322;122) (NR)	-	4269	2053	-	1,04,882	22.16
Rice (Danteswari;98) (120-60-40) (NR)	Berseem (Local;156) (NR)	Berseem (S) (NR;0) (NR)	4695	85227	528	2,86,146	31.7
Rice (Danteswari;98) (120-60-40)	Potato (NR;113) (NR)	Wheat (HD-2864;0) (NR)	4285	11474	4908	1,52,288	42.93
Rice (Danteswari;98) (120-60-40)	Garlic (G-1;145) (NR)	-	3961	6512	-	2,44,542	23.14
Rice (Danteswari;98) (120-60-40)	Toria (T9;138) (NR)	Onion (NR;0) (NR)	4237	648	28867	3,00,919	32.6
Rice (Danteswari;98) (120-60-40)	Lentil (Jl-1;115) (NR)	Green Fodder (NR; 0) (NR)	4348	1657	55265	2,16,249	29.57
Rice (Danteswari;98) (120-60-40)	Green pea (Arkel:106) (NR)	Wheat (HD-2864; 0) (NR)	4427	3716	5847	1,97,875	47.25
Rice (Danteswari;98) (120-60-40)	Chickpea (NR;122) (NR) + Linseed (NR;0) (NR)	-	4545	1657 + 702	-	1,16,402	25415

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Danteswari;98) (120-60-40)	Mustard (P.bold;130) (NR)	Green Fodder (NR; 0) (NR)	4569	1294	8161	1,01,027	24.11
S.E.±						8,273	1.11
CD at 5%						19,977	2.28
		JABALPUR (MADHYA PRADESH)					
Rice (Kranti ;123) 120-60-40	Wheat (GW-273 ;NR) 120-60-40	-	5114	7245	-	1,49,869	42.76
Rice (Kranti ;123) 120-60-40	Chickpea (JG-322 ;NR) 20-60-20	-	5309	2819	-	1,37,869	28.51
Rice (Proagro-6444 ;135) 120-60-40	Onion (P.Red ;NR) 100-60-20	Green gram (P.Vishal ;NR) 20-60-20	4580	14514	714	1,99,162	25.49
Rice (Pusa Sudhandh-5; 135) 120-60-40	Berseem (F) (JB-5 ;NR) 20-60-20	Berseem (S) (JB-5;NR) 20-60-20	4242	77857	580	3,14,819	29.13
Rice (JRH-5 ;115) 120-60-40	Potato (Kufri sinduri ;NR) 120-60-40	Sesame (TKG-55;NR) 20-60-20	4400	13719	523	1,16,449	31.48
Rice (JRH-5 ;115) 120-60-40	Gobhi sarson (Terriuttam ;NR) 60-30-30	Black gram (NR;NR) 20-60-20	4542	1852	2566	1,78,523	34.64
Rice (JRH-5 ;106) 120-60-40	Veg. pea (Arkel ;NR) 20-60-20	Sesame (TKG-55;NR) 20-60-20	4600	5676	571	1,82,877	37.01
Rice (JRH-5 ;106) 120-60-40	Potato (Kufri sinduri ;120) 120-60-40	Groundnut (Jyoti ;NR) 120-60-40	4757	14133	590	1,20,051	33.51
Rice (JRH-5 ;106) 120-60-40	Gobhi sarson (Terriuttam ;123) 60-30-30	Sorghum(F) (NR;NR) 120-60-40	4571	1933	86400	1,77,682	40.1
Rice (JRH-5 ;106) 120-60-40	Gobhi sarson (Terriuttam ;NR) 60-30-30	Lady's finger (P.Kranti;NR) 60-30-30	4757	1757	18500	2,64,947	32.44
Rice (JRH-5 ;115) 120-60-40	French bean (Arka komal ; 0) 20-60-40 + Cowpea (NR; NR) 20-60-40	Sorghum(F) (NR;NR) 20-60-40	4876	2515	65755 + 8914	2,56,451	32.32

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Proagro-6444 ; 135) 120-60-40	Marigold (A. Giant ;NR) 100-805-40	Sesame (TKG-55;NR) 20-60-20	4421	15638	589	3,27,142	19.24
S.E.±						3,364	0.58
CD at 5%						6,850	1.867
		POWARKHEDA (MADHYA PRADESH)					
Soybean (JS-95-60;91) 20-60-20	Wheat (GW-273;116) 120-60-40	-	1083	4152	-	71,238	19.04
Soybean (JS-95-60;91) 20-60-20	Black gram (JG-130;110) 20-60-40	-	1027	1666	-	63,625	10.44
Sugarcane (Co 86032:91) 300-80-60	Sugarcane (Cont.) + Garlic (NR; 0)	-	-	103611 + NR	-	1,50,236	35.22
Soybean (JS-95-60;91) 20-60-20	Sugarcane (Co 86032:110) 300-80-60	-	NR	105833	-	1,53,458	35.98
Rice (Pusa Sug-5;111) 100-40-25	Wheat (GW-273;116) 120-60-40	Green gram (PDM-54;67) 20-60-20	3930	4347	666	1,26,157	30.86
Soybean (JS-95-60;91) 20-60-20	Potato (Chip Sona;93) 120-100-75	Lady's finger (P.Kranti;NR) 80-60-20	1152	22902	12500	2,25,908	31.57
Soybean (JS-95-60;91) 20-60-20 + Pigeon pea (ICPL 87-119; 183)	Maize (F) (African Tall;0) 120-60-40	-	1055 + 1875	39861	-	1,30,639	17.21
Rice (Pusa Sug-5;111) 100-40-25	Linseed (Kiran;110) 75-50-25	Green gram (PDM-54;67) 20-60-20	4208	1402	680	1,12,974	24.26
Rice (Pusa Sug-5;111) 100-40-25	Linseed (Kiran;110) 75-50-25	Sesame (TKG-55;84) 50-30-20	4000	1305	652	1,02,928	24.43
Soybean (JS-95-60;91) 20-60-20	Potato (Chipsona;93) 120-100-75	Sesame (TKG-55;84) 50-30-20	1125	22277	777	1,25,875	30.84
S.E.±						9.138	1.9
CD at 5%						18,752	3.91

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
			CHIPLIMA (ODISHA)				
Rice (Naveen;120) 80-40-40	Groundnut (Smruti;125) 20-40-40	-	4196	1977	-	99,962	25.73
Rice (Naveen;120) 80-40-40	Toria (Keshari ;88) 60-30-30	-	3986	1183	-	72,955	20.19
Rice (Naveen;120) 80-40-40	Groundnut (Smruti,125) 20-40-40	Green gram (K-851,65) 20-40-40	4433	2057	1195	1,52,558	30.99
Rice (Naveen;120) 80-40-40	Groundnut (Smruti;125) 20-40-40	Cowpea (NR ; 55) 50-30-50	3993	1862	3921	1,32,012	26.25
Rice (Naveen;120) 80-40-40	Groundnut (Smruti;125) 20-40-40	Bottle gourd (US-15; 55) 50-30-50	4273	1965	10334	1,57,347	27.17
Rice (Naveen;120) 80-40-40	Toria (Keshari ;88) 60-30-30	Green gram (K 851; 65) 20-40-40	4110	1287	1238	1,26,350	25.31
Rice (Naveen;120) 80-40-40	Radish (Pusa chetki;54) 50-50-75	Cowpea (NR;60) 25-50-50	4040	22471	3775	1,42,660	19.61
Rice (Naveen;120) 80-40-40	Radish (pusa chetki;54) 50-50-75	Green gram (K 851; 65) 20-40-40	4410	21137	1055	1,49,292	22.37
Rice (Naveen;120) 80-40-40	French bean (Chitcobra;90) 50-80-80	Green gram (K 851; 65) 20-40-40	4230	2137	1181	1,32,441	25.97
Rice (Naveen;120) 80-40-40	Maize(cob) (Kamal;95) 120-60-60	Cowpea (YB-7 ;60) 25-50-50	4103	41149	3634	1,10,254	33.22
S.E.±						6,864	1.12
CD at 5%						14,422	2.35
			D. HUMID ECOSYSTEM				
			JAMMU (J&K)				
Rice (Jaya;139) NR	Wheat (PBW-343;144) 100-25-25	-	4854	3625	-	1,00,462	29.33
Rice (IET1410;120) NR	Berseem (Mascavi;186) 50-50-0	-	3812	58583	-	1,71,202	22.56

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (IET1410;129) NR	Patato (K. Badshah;95) 120-60-120	Onion (N-53;124) 100-50-50	3562	16395	13770	2,12,670	35.11
Rice (PC19;129) NR	Knol khol (G-40;58) 100-50-50	Tomato (Sonia;122) 120-60-60	4250	10666	9750	1,80,916	21.53
Rice (IET1410;129) NR	Garlic (Local; 202) 100-50-50	Cowpea (F) (Baramasi;56) 50-60-50	3500	6583	NR	2,41,616	21.65
Rice (PC19;129) NR	Marigold (Pusa Narangi;10) 120-100-100	French bean (Shreya;86) 50-100-50	4187	8052	9125	3,42,404	17.18
Rice (PC19;129) NR	Spinach (Local;102) 80-25-25	Lady's finger (Arka Anamika;110) 60-30-30	4229	12831	9708	2,70,085	24.31
Rice (IET1410;129) NR	Broccoli (Evergreen;119) 12-60-60	Black gram (NUL-7;81) 16-40-0	3791	11000	1375	3,36,337	22.84
Rice (IET1410;120) NR	Cabbage (Golden acre;94) 120-60-60	Onion (N-53;124) 100-50-50	3645	15812	12291	2,28,843	23.02
Rice (PC19;129) NR	Potato (K.Sinduri; 123) 120-60-60	Maize (cobs) (Monsanto double;95) 90-60-30 + Green gram (NR;90)	4229	16625	36250 + 666	1,60,421	48.21
S.E.±						7,407	0.74
CD at 5%						15,201	1.44
		PALAMPUR (H.P.)					
Maize (Bajaura Makka;105) 120-30-40	Wheat (HPW-155;179) 120-45-30	-	1098	5639	-	62,421	17.45
Maize(Cob) (Bajaura Makka; 85) 120-30-40 + French bean (Laxmi ;89)	Pea (Palampriya;139) 25-60-60	Summer Squash (Aus. green;65) 100-37.5-55	3724 + NR	2571	26067	2,12,272	10.37
Maize (Bajaura Makka; 10-5) 120-30-40	Garlic (GHC-1;212) 125-56.25-60	-	1167	6336	-	1,62,756	11.93

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
+ Soybean Harit Soya ;126)			+ 631				
Maize(Cob) (Bajaura Makka;105) 120-30-40	Broccoli (P.samridhi;1133) 150-75-55	Potato (Kufri jyoti;91) 120-60-60	3851	7765	15757	1,73,130	15.29
Maize (Bajaura Makka;105) 120-30-40 + Asparagus beans (DP ASB-1;89)	Radish (Early Apoorva;87) 100-37.5-35	Onion (Patna Red;136) 120-56.5-60	1148 + 328	19570	28148	2,26,222	16.11
Maize(Cob) (Bajaura Makka;85) 120-30-40 + Black gram (BRS-11; 102)	Cauliflower (Palam Upahar;144) 125-56.25-70	French bean (Laxmi;88) 50-75-50	2904 + 132	15656	1805	1,04,266	9.35
Maize (Bajaura Makka;105) 120-30-40 + Green Gram (NR;NR)	Cauliflower (Pusa Upahar;144) 125-56.25-70	Buck wheat (Sangla B 1;74) 40-30-20	4545 + 719	15309	2272	1,77,650	26.93
Maize(Cob) (Bajaura Makka;85) 120-30-40 + Asparagus beans (DP ASB-1; 0)	Broccoli (P. Samridhi;133) 150-56.25-55	Radish (Hy-11;56) 100-50-35	1830 + 290	7354	18308	1,62,985	5.49
S.E.±						12,762	2.24
CD at 5%						26,545	4.66
		JORHAT (ASSAM)					
Rice (Suwasini;127) 80-40-40	-	Rice (Disang;115) 80-40-40	3425	-	1350	53,002	16.52
Rice (Suwasini;127) 80-40-40	Toria (TS-38;95) 60-40-40	-	3175	928	-	57,746	16

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Suwasini;127) 80-40-40	Cabbage (Golden Acre;105) NR	Green gram (Pratap;72) 15-35-10	3225	17083	375	1,44,754	17.02
Rice (Suwasini;127) 80-40-40	Cauliflower (Selection-9; 52) 15-35-10	Black gram (PU 31;72) 15-35-10	3500	3959	500	83,979	16.45
Rice (Suwasini;139) 80-40-40	Knol khol (White Viena;52) 15-35-10 + French bean (Annapurna; 0)	Cowpea(F) (EC-4216;82) 20-40-20	3350	5377 + 1830	8000	1,17,060	15.65
Rice (Suwasini;127) 80-40-40	Capsicum (C. wonder; 41) NR	Cowpea(F) (Local;72) 20-40-20	2850	2292	8150	87,383	11.71
Rice (Suwasini;127) 80-40-40	Green Chilli (PK-1092; 75) NR	Cowpea (F) (EC-4216;82) 20-40-20	2950	3518	525	91,947	11.31
Rice (Suwasini;127) 80-40-40	Radish (Pusa Chetki;45) 15-35-10 + French bean (Annapurna; NR)	Black gram (PU 31;72) 15-35-10	3300	11668 + 1040	425	1,3,451	15.14
S.E.±						9,237	1.04
CD at 5%						19,213	2.16
		KALYANI (W.B.)					
Rice (IET4786 ;113) 80-40-40	-	Rice (IET4786 ;113) 100-50-50	3169	-	2611	64,163	20
Rice (BCKV-1 ;114) 80-40-40	Rice (BCKV-1 ;114) 80-40-40-	Rice (BCKV-1 ;114) 100-50-50	2606	4929	2907	2,86,493	89.3
Rice (BCKV-1 ;114) 80-40-40	Potato (Kufri Jyoti ;90) NR	Jute (JRO-524 ;110) NR	1681	8210	2477	89,974	22.45
Rice (BCKV-1 ;114) 80-40-40	Wheat (UP-262; 144) NR	Maize (Datta; 80) NR	2493	2070	2070	74,558	22.86
Rice (IET4786 ;113) 80-40-40	Mustard (B-9;98) NR	Green gram (Sonali; 80) NR	2395	772	649	71,884	14.63

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (BCKV-1 ;114) 80-40-40	Lentil B-67; 120) NR + Mustard (B-9 ;98) NR	Sesame (B-76; 95) NR	2677	254 + 138	593	60,492	14.22
Amaranths (Jabakusam:48) 80-40-40	Brinjal (Muktakeshi; 172) NR + Coriander(L) (Hybrid; 55) NR	Bitter gourd (Megna-2;108) NR	3250	9780 + 3592	2769	1,97,717	14.97
Cauliflower (Raj-171;110) NR	Radish (Kalpin; 65) NR + Amaranths (Jabkushum;48) NR + French bean (Contender;NR) NR	Lady's finger (Mahyco; 90) NR	8107	11705 + 4917 + 722	7748	2,21,300	12.65
Elephant Foot Yarn (Bidhan kusum;175) NR	Dolichos bean (Hybrid;162) NR	Ginger (Garubathan;85) NR + Turmeric (Suranjana; NR)	14587	1350	317 + 4910	3,33,358	29.52
Rice (BCKV-1 ;114) 80-40-40	Wheat (UP-262; 144) NR	Green gram (Sonali; 80) NR	4055	1888	483	88,637	22.18
S.E.± CD at 5%						83,637 1,75,786	25.36 53.29
E. COASTAL ECOSYSTEM							
BHUBANESWAR (ODISHA)							
Rice (Naveen;127) 80-40-40	Groundnut (Smruti;126) 20-40-40	-	3156	2098	-	91,685	22.81
Rice (Naveen;127) 80-40-40	Maize (cob) (Navjyoti;86) 80-40-40	Cowpea (Utkala Manika:58) 25-50-50	3150	46398	3529	1,2,508	32.08

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer ($N:P_2O_5:K_2O$, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield ($x10^6$, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Naveen;127) 80-40-40	Maize(cob) (Navjyoti;86) 80-40-40	Lady's finger (BO-2;76) 80-40-40	3167	47841	4817	1,17,776	32.73
Rice (Naveen;127) 80-40-40	Mustard (Parbati;60) 60-30-30	Lady's finger (BO-2;76) 80-40-40	2933	910	4684	1,01,002	16.71
Rice (RGL-2538;124) 80-40-40	Mustard (Parbati;60) 60-30-30	Cowpea (Utkala Manika:58) 30-30-30	3022	954	4140	96,192	17.6
Rice (Naveen;127) 80-40-40	French bean (Selection-9;57) 80-40-40	Bitter gourd (N.Local;66) 80-40-40	3179	4140	3418	1,65,682	12.93
Rice (Naveen;127) 80-40-40	Groundnut (Smruti;126) 20-40-40	Cucumber (S.Queen;68) 80-40-40	3100	1987	3874	1,22,150	22.49
Rice (Naveen;127) 80-40-40	Tomato (BT-10;69) 80-40-40	Cowpea (Utkala Manika:58) 30-30-30	3179	13675	3452	1,73,516	15.8
Rice (Naveen;127) 80-40-40	Radish (Chetki;59) 80-40-40	Sesame (Uma;77) 60-30-30	2992	15839	799	1,03,951	17.54
Rice (Naveen;127) 80-40-40	French bean (Selection-9;57) 80-40-40	Sesame (Uma;77) 60-30-30	2991	4328	788	1,37,360	15.91
S.E.±						5,769	0.94
CD at 5%						12,121	1.98
		THANJAVUR (TAMIL NADU)					
Rice (ADT-43;118) 150-50-50	Rice (CORH-3;114) 175-60-60	Brinjal (Local;152) 100-50-30	5260	5650	9120	2,01,357	39.93
Rice (ADT-43;118) 150-50-50	Rice (CORH-3;114) 175-60-60	Maize (NK-6240;105) 135-62.5-50 + Black gram (ADT-5;NR)	4845	5674	5265 + 265	1,78,431	55.32
Rice (ADT-43;118) 150-50-50	Rice (CORH-3;114) 175-60-60	Groundnut (VRI-3;92) 17-35-50 + Pigeon Pea VBN(Rg)-3;NR	5076	5745	1480 + 381	1,74,170	47.1

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Maize (NK-6240;105) 135-62.5-50 + Black gram (ADT-5;NR)	Rice (CORH-3;114) 175-60-60	Black gram (ADT-5;66) 25-50-25 + Pigeon Pea VBN(Rg)-3;NR	5420 + 285	5405	966 + 374	1,74,494	42.83
Sunflower (Sungold;104) 60-90-60	Rice (CORH-3;114) 175-60-60	Green gram (KM-2; 70) 25-50-25 + Pigeon Pea VBN(Rg)-3;NR	1815	5385 + 367	860	1,58,572	33.98
Black gram (ADT-5;67) 25-50-25 + Pigeon Pea VBN(Rg)-3;NR 25-50-25	Rice (CORH-3;114) 175-60-60	Pigeon Pea (VBN(Rg)-3;107) 25-50-25	870 + 374	5708	1285	1,57,809	28.32
Green gram (KM-2; 68) 25-50-25 + Pigeon Pea VBN(Rg)-3;NR 25-50-25	Rice (CORH-3;114) 175-60-60	Sesamum (TMV-4;91) 35-23-23	780 + 365	5820	828	1,37,459	28.62
Pigeon pea VBN(Rg)-3;NR 25-50-25	Rice (CORH-3;114) 175-60-60	Onion (local;75) 30-60-30	1120	5689	4205	1,39,286	25.54
Daincha (g.m.) (GM-3;50) NR	Rice (CORH-3;114) 175-60-60	Sunflower (Sungold;105) 60-90-60	-	6334	1968	1,59,446	36.59
S.E.±						10,840	1.69
CD at 5%						22,982	3.59
MARUTERU (ANDHRA PRADESH)							
Rice (MTU-1075; 140) 60-40-40	Green fodder (Local; 90) NR	-	6371	19762	-	1,14,198	25.2
Rice (MTU-1075; 140) 60-40-40	Green fodder (Local; 90) NR	-	6010	8066	-	84,456	22.08

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (MTU1001; 140) 60-40-40	Green fodder (Local; 90) NR	-	5970	6157	-	79,812	21.64
Rice (MTU1001; 140) 60-40-40	Cowpea fodder (Local; 105) NR	-	6221	17857	-	1,08,338	24.38
Rice (MTU1001; 140) 60-40-40	Pillipesara (Local; 120) NR	-	6452	25714	-	1,28,188	26.43
Rice (MTU1001; 140) 60-40-40	Sorghum fodder (Local; 122) NR	-	6106	12380	-	95,012	23.1
S.E. (CD 5%)						3,175 7.075	0.734 1.63
		KARJAT (MAHARASHTRA)					
Rice (Palghar-1 ;131) 100-50-50	Groundnut (SB-XI ;105) 25-50-00	-	4371	2714	-	91,366	22.88
Rice (Palghar-1 ;131) 100-50-50	Mustard (Varuna;95) 90-50-00	-	5458	994	-	64,090	18.2
Rice (Palghar-1 ;131) 100-50-50	Sunflower (Modern;90) 60-30-30	-	5234	1390	-	72,782	20.05
Rice (Palghar-1 ;131) 100-50-50	Brinjal (Manjari Gota ;140) 150-50-50	-	5580	21384	-	1,87,587	18.32
Rice (Palghar-1 ;130) 100-50-50	Cabbage (Golden Acre ;90) 120-60-60	-	5301	14857	-	1,05,420	16.76
Rice (Palghar-1 ;131) 100-50-50	Maize(F) (African Tall ;85) 120-50-50	-	5189	49678	-	84,186	19.42
Rice (Palghar-1 ;130) 100-50-50	Cowpea (Konkan Sadabahar ;65) 25-50-00	-	6176	1652	-	63,235	16.62

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Palghar-1 ;130) 100-50-50	Dolichos bean (Konkan Bhusan ;105) 90-60-30	-	5821	4570	-	1,05,024	16.75
Rice (Palghar-1 ;130) 100-50-50	Lady's finger (Arka Anamika ;95) 100-50-00	-	5621	6512	-	95,149	16.29
Rice (Palghar-1 ;130) 100-50-50	Chilli (Pusa Jwala ;125) 60-40-40	-	4904	3808	-	87,749	13.55
Rice (Palghar-1 ;130) 100-50-50	Rice (KJT-3;140) 120-50-50	-	5162	4965	-	84,315	26.28
S.E.±						5,763	1.65
CD at 5%						11,768	3.38
		NAVSARI (GUJARAT)					
Rice (Jaya;135) 100-30-0	Wheat (NR;106) 120-60-0	-	4641	2126	-	78,837	23.41
Rice (Jaya;135) 100-30-0	Fenugreek(S) (NR;112) NR	Green gram (NR;90) NR	4115	983	1429	1,35,279	22.28
Rice (Jaya;135) 100-30-0	Green gram (NR;NR) NR	Groundnut (NR;120) NR	4458	757	1543	1,21,441	26.7
Rice (Jaya;135) 100-30-0	Indian bean (NR;132) NR	Sorghum(F) (NR;75) NR	4367	743	NR	61,751	15.3
Rice (Jaya;135) 100-30-0	Sorghum(F) (NR;86) NR	Groundnut (NA;120) NR	4515	NR	3235	1,37,474	33.96
Rice (Jaya;135) 100-30-0	Sorghum(G) (NR;122) NR	Sorghum (NR;110) NR	4298	3509	3417	1,16,977	39.04
Rice (Jaya;135) 100-30-0	Maize (Sweet corn) (NR;89) NR	Black gram (NR;90) NR	4035	8573	726	1,66,690	27.19
Rice (Jaya;135) 100-30-0	Sorghum (NR;122) NR	Soybean (NR;90) NR	4481	2937	840	92,979	29.38

Contd..../-

Cropping system (variety; duration in days)/ Fertilizer (N:P_2O_5:K_2O, kg/ha)			Yield (kg/ha)			Annual gross returns (Rs/ha)	Energy yield (x10^6, K Cal)
Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Rice (Jaya;135) 100-30-0	Green gram (NR; 90) NR	Sorghum (NR;110) NR + Black gram (NR;90)	4618	1331	2069 + 263	1,35,201	28.55
Rice (Jaya;135) 100-30-0	Chickpea (NR;106) NR + Mustard (NR;106)	Sweet corn (NR ;80) NR	4447	771 + 1137	4332	1,47,061	29.73
S.E.±						23,062	4.7
CD at 5%						48,454	9.88

Diversification through cotton+pigeonpea intercropping at Akola

Raised & Sunken beds, A promising option for crop diversification in waterlogged situations

An overview of experiment on diversification of rice-rice cropping system at Jorhat

Broadbed-Furrow - A desirable option for crop intensification in upland conditions

7.1.2 RESOURCE CONSERVATION TECHNOLOGIES

Title of the Experiment : **Tillage and planting management in different cropping systems**

Objective: To study the effect of different tillage and planting management techniques in different cropping systems to improve crop productivity and soil health.

Treatments: There are no common cropping systems and treatments for all the centers but they vary from center to center. The details of treatments evaluated are given in table 7.1.2 along with yield data.

Location, year of start and cropping system

Location (Ecosystem)	Year of start	Cropping system
Palampur (Sub-Humid)	2008-09	Rice - Wheat
Akola (Semi-Arid)	2007-08	Soybean based
Hisar (Arid)	2008-09	Pearl millet based
Coimbatore (Semi-Arid)	2009-10	Cotton - Maize

Experimental design: Strip plot / split plot

Results: Centre - wise results are given in Table 7.1.2/1 and briefly discussed below

Palampur

In rice – wheat cropping system at Palampur, during *kharif*, the experiment failed. During *rabi*, all the treatments gave similar yields and the multi-crop planter provided maximum wheat yield (2.97 t ha^{-1}). The rice planting methods did not affect wheat yields.

Akola

In soybean based cropping systems at Akola, during *kharif*, soybean – rabi sorghum, soybean – mustard and soybean – chick pea systems yields (2.26 to 2.04 t ha^{-1}) were at par but 15.3% more than soybean – safflower system. During *rabi,* soybean –rabi sorghum system gave numerically maximum soybean equivalent yield (2.12 t ha^{-1}) that was at par with all the systems. Among tillage treatments, during *kharif*, conventional tillage gave maximum soybean yield (2.21 t ha^{-1}) that was at par with zero tillage and broad bed – furrow system but 17 % more than minimum tillage. During rabi, the BBF method gave maximum soybean equivalent yield (1.95 t ha^{-1}) that was, respectively, 23.4, 39.2 and 134.9% more than minimum, zero and conventional tillage sowings. Soybean – rabi sorghum and broad bed furrow sowing system was the best treatment combination for maximizing both the yields of soybean and *rabi* crops.

Hisar

In pearl millet based cropping systems at Hisar, during kharif, conventional tillage gave maximum yield of pearl millet (2.98 t ha^{-1}) that was at par with minimum and zero tillage but 17.3% higher than bed planting. During rabi all the treatments were at par but conventional tillage gave numerically maximum wheat yield (3.99 t ha^{-1}). The cropping systems did not affect yield of pearl millet in kharif, while pearl – millet – wheat system gave 5.33 t ha^{-1} wheat equivalent yield which was 2.5 times that of pearl – millet – mustard system.

Coimbatore

In cotton – maize cropping system at Coimbatore, during *kharif*, minimum tillage (MT) once and planting on FIRB gave maximum cotton yield (2.88 t ha^{-1}) that was at par with CT-permanent FIRB, and CT-FIRB but 12.9, 19.0, 25.2 and 41.1 % higher than MT-permanent FIRB, MT-flat, CT-flat and zero tillage, respectively. During rabi, CT-permanent FIRB gave maximum maize yield (8.08 t ha^{-1}) that was at par with MT-FIRB, MT-permanent FIRB, CT-FIRB and CT-flat but 15.9 and 21.8% more than MT-flat and zero tillage respectively. Minimum tillage and planting on FIRB gave maximum cotton – maize system yield.

Table 7.1.2/1. Grain yield (kg/ha) under different tillage and planting treatments at different locations.

Treatment	*Kharif*					*Rabi*				
	B_1	B_2	B_3	B_4	Mean	B_1	B_2	B_3	B_4	Mean
Palampur										
Cropping system: Rice (cv. Giriza)-wheat (cv. HPW 155), Fertilizer (N, P_2O_5 & K_2O kg/ha): Rice – 120:60:40, Wheat – 120:60:30										
A_1						2853	2301	2520	2937	2653
A_2			- Crop failed-			3311	2958	2947	2645	2965
A_3						2770	3457	2988	3061	3069
A_4						2832	3166	3270	2624	2973
Mean						2942	2970	2931	2817	
S.Em±						A means = 118.86 (NS), B means = 183.42				
(CD at 5%)						(NS), A within B = 1663.3 (NS) B within A=1832.2 (NS)				

A_1 / B_1 = Sowing by power tiller operated zero-till drill, A_2 / B_2 = Sowing by power tiller operated multi-crop planter,

A_3 / B_3 = Sowing by manually operated seed drill, A_4 / B_4 = Sowing by conventional method (behind hand plow)

Akola

Cropping system: Soybean (cv. TAMS-38)- Chickpea (cv. Jaki-9218), Safflower (cv. AKS/207), Mustard (cv. Pusa Gold), Rabi Sorghum (cv. PKV Kranti); Fertilizer (N, P_2O_5 & K_2O kg/ha): Soybean- 30:75:0, Chickpea- 25:50:0, Safflower- 40:40:0, Mustard- 50:40:0, Sorghum – 50:25:25

	M_1	M_2	M_3	M_4	Mean	M_1	M_2	M_3	M_4	Mean
S_1	1973	2053	2281	2482	2197	1073	1140	1731	1651	1399
S_2	1825	1825	1825	2094	1892	1163	1042	1840	2278	1581
S_3	2010	2241	2268	2335	2213	591	537	966	1208	826
S_4	2035	2026	1986	2134	2045	846	2094	1530	3341	1953
Mean	1961	2036	2090	2261		918	1203	1517	2119	
M means = 67.26 (NS), S means = 129.24 (361.48), S within M = 258.48 (NS), M within S = 233.74 (NS)										
M means = 77.78 (288.38), S means = 126.88 (354.88), S within M = 253.77 (NS), M within S = 233.13 (NS)										
S.Em± (CD at 5%)										

M	Soybean-Safflower	S	No tillage-Direct sowing, chemical weed control
M^1	Soybean-Chickpea	S^1	Minimum tillage- one hand weeding
M^2	Soybean-Mustard	S^2	Conventional tillage- two hand weeding
M^3	Soybean-rabi Sorghum	S^3	BBF sowing-one harrowing and two hand weeding
M_4		S_4	

Hisar

Cropping system: Pearlmillet (cv. HHB-197)-wheat (cv. WH-711), Raya (cv. RH-30) Fertilizer (N, P_2O_5 & K_2O kg/ha): Pearlmillet- 125:62.5:0, wheat -145:60:0, Raya – 80:30:0

	M_1	M_2	M_3	M_4	Mean	M_1	M_2	M_3	M_4	Mean
S_1	2812	2852	2966	2596	2806	5226	5317	5604	5162	5327
S_2	2826	2877	2987	2487	2794	1916	2126	2374	1882	2074
Mean	2819	2864	2977	2541		3571	3722	3989	3522	

M means = 68 (167), S means = 84 (NS)M within S = 137 (NS), S within M = 169 (NS) M means = 145 (NS),

S means = 114 (262.5), M within S = 216.7 (NS), S within M = 227.6 (NS)

S.Em± (CD at 5%)

Main plots

M_1	Zero tillage
M_2	Minimum tillage
M_3	Conventional tillage
M_4	Bed planting

Sub plots

S_1	Pearl millet – wheat
S_2	Pearl millet - mustard

Coimbatore

Cropping system: Cotton (cv. MCU-5) - Maize (cv. NK-6240),

Fertilizer (N, P_2O_5 & K_2O kg/ha): Cotton – 80:40:40, Maize 35:62.5:50

	Kharif	Rabi
CT- flat	2307	7419
CT- FIRB	2698	7687
CT- Permanent FIRB	2746	8084
MT- flat	2423	6968
MT- FIRB	2887	7610
MT- Permanent FIRB	2546	7463
Zero tillage- planting	2039	6630
Mean	2521	7409
CD (5 %)	247	848

7.2 SUSTAINABLE RESOURCE MANAGEMENT

7.2.1 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 fertilizers.
T_{11}	75% rec. NPK dose through fertilizers + 25% N through GM	75% rec. NPK dose through fertilizers.
T_{12}	Farmer's conventional practice	Farmer's conventional practice

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

Rice-Rice Cropping System

At **Rajendranagar,** the highest yield of rice was recorded under T_{11} (4.15 t/ha) during *kharif* and under T_5 during *rabi* (3.85 t/ha). The increase in crop yield under highest yielding treatment over 100% RDF was 5.7 % during *kharif.* It was statistically at par with T_5 and T_{10} whereas during *rabi* treatment T_5 was at par with T_{10}.

At **Chiplima,** the highest grain yield of rice was achieved under T_{10} during *kharif* (4.69 t/ha) and *rabi* (5.14 t/ha). The increase in crop yield under

Locations

Cropping System	Ecosystem/ Centre (State)
Rice-rice	**Semi-arid**: Rajendranagar(A.P.); **Sub-humid:** Chiplima (Orissa); **Humid**: Jorhat (Assam); **Coastal:** Maruteru (A.P.), Bhubaneswar (Orissa), Karjat (Maharashtra), Karamana (Kerala)
Rice-wheat	**Semi-arid**: Ludhiana (Punjab), Kanpur (U.P.); **Sub-humid:** Jabalpur (M.P.), R.S. Pura (J & K), Varanasi (U.P.), Pantnagar (Uttarakhand), Faizabad (U.P.), Sabour (Bihar), Raipur (Chhattisgarh), **Humid**: Kalyani (W.B.), **Coastal:** Navsari (Gujarat).
Rice-maize	**Semi-arid**: Kathalgere (Karnataka)
Rice-mustard	**Semi-arid**: Rudrur (A.P.)
Maize-wheat	**Sub-humid:** Ranchi (Jharkhand)
Pearl millet-wheat	**Arid**: S.K. Nagar (Gujarat), Hisar (Haryana), Junagadh (Gujarat), Bichpuri (U.P.)
Sorghum – wheat	**Semi-arid**: Akola (Maharashtra), Parbhani (Maharashtra), Rahuri (Maharashtra)

Year of start, crop varieties and fertilizer doses:

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 dose ($N:P_2O_5:K_2O$, kg/ha)		Farmers' practice ($N:P_2O_5:K_2O$, kg/ha) + FYM, t/ha	
		Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Rice-Rice Cropping System							
Rajendranagar	1988	PNR-23064	PNR-23064	120:60:60	120:60:60	80:50:20	120:60:40
Chiplima	1983	Pratiksha	Pratiksha	80:40:40	100:50:50	40:20:20 +4 .5	50:25:25
Jorhat	1987	Ranjit	Dishang	87:12.5:34	NR	NR	NR
Maruteru	1989	MTU1001	MTU 1010	60:40:40	120:60:40	60:40:0	120:60:0
Bhubaneswar	1983	Pratiksha	MTU 1001	80:0:40	100:50:50	20:0:0+2.0	20:0:0+2.0
Karjat	2007	Palghar-1	Karjat-3	100:50:50	120:50:50	NR	NR
Karamana	1985	Aiswarya	Aiswarya	90:45:45	90:45:45	90:22.5:22.5 +3.0	90:22.5: 22.5
Rice-Wheat Cropping System							
Ludhiana	1983	PR-116	PBW-343	NR	120:60:30	NR	NR
Kanpur	1983	P. Dhan-12	PBW-343	120:60:60	120:60:60	80:30:0	80:30:0
Jabalpur	1985	Kranti	GW 273	160:60:40	120:60:40	40:20:0	40:20:0
R.S. Pura	1985	Jaya	PBW-343	100:60:30	100:50:25	34:25:22	56:25:0
Palampur	1990	HPR-2143	HPW -184	90:40:40	120:90:30	36:16:16 +5.0	48:36:12 +5.0
Varanasi	1985	NDR-359	HUW 234	120:60:60	120:60:60	50:0:0	60:0:0
Pantnagar							
Faizabad	1984	Sarju 52	HUW 234	120:60:60	120:60:60	90:40:0	90:40:0

Centre	Year of start	Crop variety		Recommended fertilizer dose (N:P_2O_5:K_2O, kg/ha)		Farmers' practice (N:P_2O_5:K_2O, kg/ha) + FYM, t/ha	
		Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Sabour	1984	Sita	PBW-343	80:40:20	100:50:25	60:30:15	68:33:0
Raipur	1988	Mahamaya	GW-273	80:60:40	100:50:30	60:40:20	90:40:20
Kalyani	1986	IET 4094	UP 262	80:40:40	100:60:40	50:30:20	60:20:20
Navsari	1987	GR 3	GW 496	100:50:0	100:60:40	50:0:0+2.5	60:30:0
Rice-Maize Cropping System							
Kathalgere	1988	IR 64	Hy. Maize	46:16:60	46:16:60	NR	NR
Rice-Mustard Cropping System							
Rudrur	1984	RDR-763	GM-1	120:60:40	80:40:30	150:40:0	60:0:0
Maize-Wheat Cropping System							
Ranchi	1983	Suwan	K 9107	100:50:25	100:50:25	23:0:0	23:0:0
Pearl millet-Wheat Cropping System							
S.K. Nagar	1986	GHB 558	GW-496	80:40:0	120:60:0	40:0:0	80:0:0
Hisar	1985	HHB 197	PBW 343	125:62.5:0	150:60:0	NR	NR
Junagadh (With K)	1987	GHB 558	GW366	80:40:25	120:60:25	80:40:0	120:60:0
Junagadh (Without K)	1987	GHB 558	GW366	80:40:0	120:60:0	80:40:0	120:60:0
Bichpuri	1990	Bio. 8510	UP 2338	80:40:40	120:60:40	40:0:0	40:0:0

highest yielding treatment over 100% RDF was 6.42% and 7.47% during *kharif* and *rabi*, respectively. It was statistically at par with T_5, T_6, T_7, T_9, and T_{11} during *kharif*, and statistically at par with T_5, T_6, T_7 and T_8 during *rabi*.

At **Jorhat,** the highest yield of rice was recorded under T_9 during *kharif* (5.90 t/ha) and *rabi* (2.30 t/ha). The increase in crop yield under highest yielding treatment over 100% RDF was 15.1% and 15% percent, during *kharif* and *rabi*, respectively. During *kharif* yields treatment T_9 was statistically at par with T_5 and T_7 whereas during *rabi* it was found at par with treatment T_5 only.

At **Bhubaneshwar,** also, during both *kharif* (4.85 t/ha) and *rabi* (4.28 t/ha) seasons, the highest grain yield of rice was recorded under treatment T_{10} which was statistically at par with T_5, T_6, T_7 and T_{11} in *kharif* and at par with treatments T_5, T_6, T_7, T_8 and T_{11} during *rabi* season.

At **Karjat,** during both *kharif* (5.61 t/ha) and *rabi* (6.02 t/ha) seasons highest grain yield of rice was recorded under treatment T_5. It was found at statistically at par with treatment T_{10} during kharif and at par with treatment T_6, T_7, T_8 and T_{10} during *rabi* season.

At **Karamana,** the highest yield of rice was recorded under T_7 during *kharif* (5.19 t/ha), and under T_8 during *rabi* (3.68 t/ha). The increase in crop yield under highest yielding treatment over 100% RDF was 20.8 and 7.3 percent, during *kharif* and *rabi*, respectively. The yield under highest yielding treatment during *kharif*, i.e., T_7, was at par with T_4, T_6,T_8, T_9, T_{10} and T_{11} whereas during *rabi* treatment T_8 was at par with all the treatment except treatment T_1, T_2 and T_{12}.

Table 7.2/1(a): Grain yield (kg/ha) of rice-rice crop sequence under different integrated nutrient management treatments.

Treatment	Rajendranagar		Chiplima		Jorhat		Bhubaneswar		Karjat		Karmana	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	1697	1687	2357	2443	2350	900	2845	1920	3850	3824	3059	1227
T_2	2230	2278	3313	3840	3200	1250	3765	2335	4136	4610	4040	3178
T_3	2572	3371	3557	4643	4000	1500	3840	3830	4325	4963	3679	3206
T_4	3190	3527	3933	4073	4260	1600	3715	3690	4976	5325	4703	3485
T_5	3928	4114	4407	4780	5125	2000	4365	3915	5612	6023	4299	3429
T_6	3347	3418	4643	4903	4350	1650	4605	4175	5056	5865	4747	3596
T_7	3526	2993	4487	4823	5000	1600	4525	3920	4925	5655	5194	3485
T_8	2920	3240	4193	4843	4500	1700	3905	3865	4810	5718	4819	3680
T_9	3279	2895	4370	4720	5900	2300	3960	3650	4649	5422	5050	3568
T_{10}	4033	3853	4690	5137	4120	1250	4845	4275	5436	5567	4819	3234
T_{11}	4150	3731	4643	4623	4675	1400	4425	3990	4717	4747	4790	3317
T_{12}	3422	3400	3307	3690	2700	1050	3560	3190	4272	4350	4155	3122
CD at 5%	**467**	**322**	**460**	**366**	**1090**	**584**	**401**	**443**	**193**	**471**	**579**	**501**

Rice-Wheat cropping system

At **Varanasi,** the treatment T_6 gave the maximum yield of rice (5.55 t/ha) and wheat (4.61 t/ha) which was 9.04 and 9.11 per cent higher over recommended dose of fertilizer (T_5).

At **Kanpur,** the highest yield of rice and wheat was recorded under T_6 during *kharif* (4.49 t/ha) and during *rabi* (4.62 t/ha) season which was 1.17 and 1.85 percent higher than recommended dose of fertilizer. The yield under highest yielding treatment during both *kharif* and *rabi* was at par with$T_{5.}$

At **Kalyani,** the treatment T_8 recorded maximum yield (3.87 t/ha) for rice during *kharif* and treatment T_{10} maximum yield (3.27 t/ha) of wheat during *rabi* season. The treatment T_{10} recorded 21.3 % and 36.7 % higher yield over recommended dose of fertilizer for rice and wheat crop respectively. It was also found that treatment T_{10} was at par with T_6 T_7 T_8 T_9 and T_{11} during *kharif* season and at par with T_6 during *rabi* season.

At **Jabalpur,** the highest yield of rice was recorded under T_9 (4.12 t/ha) during *kharif* and under T_{10} during *rabi* (2.84 t/ha). The increase in crop yield under highest yielding treatment over 100% RDF was 11.4 and 7.7 percent, during *kharif* and *rabi*, respectively. The yield under highest yielding treatment during *rabi* (i.e T_{10}) was at par withT_5.

At **Kumarganj,** treatment T_6 recorded maximum yield of rice (5.38 t/ha) during *kharif* and maximum yield (3.68 t/ha) of wheat during *rabi* season. The increase in crop yield under highest yielding treatment over 100% RDF was 13.1 and 7.7 percent, during *kharif* and *rabi*, respectively. During *kharif* T_6 was statistically at par with T_7, T_{11} and T_{12} while during *rabi* it was statistically at par with$T_{5,}$ T_8 and T_{10}.

At **Navasari,** treatment T_6 recorded maximum yield of rice (3.39 t/ha) during *kharif* and maximum yield (2.21 t/ha) of wheat during *rabi* season. The increase in crop yield under highest yielding treatment over 100% RDF was 2.8 and 2.1 percent, during *kharif* and *rabi*, respectively. During *kharif* T_6 was statistically at par with T_5, T_7, T_8, T_9, T_{10} and T_{11} while during *rabi* it was statistically at par with all the treatment except $T_{1,}$ T_2 and T_4.

At **Sabour,** treatment T_6 recorded maximum yield of rice (5.30 t/ha) during *kharif* and maximum yield (4.75 t/ha) of wheat during *rabi* season. The increase in crop yield under highest yielding treatment over 100% RDF was 11.3 and 12.6 percent, during *kharif* and *rabi*, respectively. During *kharif* T_6 was statistically at par with T_5, T_7, T_8, T_{10} and T_{11} while during *rabi* it was statistically at par with T_5, T_7, T_9, T_{10} and T_{11}.

At **Raipur,** the highest yield of rice was recorded under T_5 (6.60 t/ha) during *kharif,* and under T_{10} during *rabi* (2.73 t/ha). The increase in crop yield during *rabi* under highest yielding treatment over 100% RDF was 1.7 percent. The treatment during *kharif* (i.e T_5) was at par with T_6, T_7, T_8, T_9, T_{10} and T_{11} whereas during *rabi* (i.e T_{10} it was at par with T_5, T_6, T_8, T_9 and T_{11}.

Rice-Mustard cropping system

At **Rudrur,** treatment T_{11} recorded maximum yield of rice (5.63 t/ha) during *kharif* and maximum yield (0.90 t/ha) of mustard during summer season. The increase in crop yield under highest yielding treatment over 100% RDF was 10.1 and 6.9 percent, during *kharif* and *rabi*, respectively. During *kharif* T_{11} was statistically at par with T_7 and T_9 while during *rabi* it was significantly superior over remaining treatment.

Maize-wheat cropping system

At **Kanke (Ranchi),** the treatment T_6 recorded maximum yield (3.83 t/ha) of maize and maximum yield (5.33 t/ha) of wheat during *kharif* and *rabi* season respectively. The increase in crop yield under highest yielding treatment over 100% RDF was 23.4 and 12.3 percent, during *kharif* and *rabi*, respectively. During *kharif* T_6 was statistically at par with T_5, T_7 and T_8 while during *rabi* it was at par with T_5 only.

Table 7.2/1(b): Grain yield (kg/ha) of rice-wheat crop sequence under different integrated nutrient management treatments

Treatment	Varanasi		Pura Farm (Kanpur)		Kalyani		Jabalpur		Kumarganj		Navsari		Sabour		Raipur	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	2555	1775	1019	647	1403	652	1643	1296	1464	698	2016	1599	604	787	1344	552
T_2	4345	3415	3188	3075	2272	1308	2917	1882	3075	2146	2553	1725	2544	1952	4386	1885
T_3	4600	4120	3463	3496	2605	2060	3164	2131	3091	3246	2577	1909	2720	4073	5750	2061
T_4	4875	3950	3375	3404	2583	1667	3740	2320	4444	2729	2646	1817	3402	3125	5833	2438
T_5	5085	4225	4438	4532	3173	2389	3699	2636	4760	3416	3302	2162	4766	4217	6604	2683
T_6	5545	4610	4490	4616	3818	3092	3370	2537	5384	3680	3394	2208	5303	4747	6500	2504
T_7	5350	4390	4238	4382	3803	2718	3616	2420	5148	3139	3152	2082	4919	4421	6313	2388
T_8	4480	4280	4132	4288	3871	2611	3328	2439	4583	3413	3026	2128	5081	3623	6042	2629
T_9	4755	4045	3840	4213	3735	2364	4120	2396	4849	2872	3118	2047	4858	4273	6208	2440
T_{10}	5310	4385	4319	4475	3848	3266	3397	2839	5070	3543	3164	2139	5226	4691	6313	2729
T_{11}	5205	4225	4206	4344	3677	2901	2815	2513	5170	3204	3072	2116	4874	4305	6438	2584
T_{12}	4515	3680	2894	2819	3273	1840	1643	1507	4253	2413	2680	2059	2769	2835	4927.	1877
CD at 5%	**388**	**363**	**165**	**101**	**438**	**311**	**144**	**297**	**498**	**344**	**575**	**371**	**444**	**956**	**646**	**234**

Table 7.2/1(c): Grain yield (kg/ha) of rice–mustard crop sequence under different integrated nutrient management treatments.

Treatment	Rudrur	
	Kharif	*Summer*
T_1	2796	284
T_2	3796	536
T_3	3840	640
T_4	4617	596
T_5	5111	844
T_6	4605	816
T_7	5617	872
T_8	4600	884
T_9	5592	842
T_{10}	4626	864
T_{11}	5627	902
T_{12}	4921	664
CD at 5%	**66**	**16**

Table 7.2/1(d): Grain yield (kg/ha) of maize–wheat crop sequence under different integrated nutrient management treatments.

Treatment	Ranchi	
	Kharif	*Rabi*
T_1	338	999
T_2	2112	2914
T_3	2195	3703
T_4	2228	3596
T_5	3102	4743
T_6	3828	5326
T_7	3475	4494
T_8	3265	4028
T_9	2431	3661
T_{10}	2991	4036
T_{11}	2420	3578
T_{12}	271	1331
CD at 5%	**752**	**808**

Pearl millet-wheat cropping system

At **S.K. Nagar,** the highest yield of pearlmillet was recorded under T_{11} (1.50 t/ha) during *kharif,* and under T_6 during *rabi* (3.17 t/ha). The increase in crop yield under highest yielding treatment over 100% RDF was 67.3 and 52.7 percent, during *kharif* and *rabi*, respectively. The yield under highest yielding treatment during *kharif* (i.e T_{11}) was at par with T_6, T_7 and T_{10} whereas during *rabi* (i.e T_6) it was significantly superior over remaining treatment.

At **Junagadh,** (With Potash) the highest yield (2.22 t/ha) of pearl millet and maximum yield (2.65 t/ha) of wheat recorded in treatment T_6 during both *kharif* and *rabi* season respectively. The increase in crop yield under highest yielding treatment over 100% RDF was 15.5 and 17.7 percent, during *kharif* and *rabi*, respectively. During *kharif* the crop yield was statistically at par with all the treatment except T_1, T_2 and T_3 whereas during *rabi* it was statistically at par T_7, T_8, T_9 and T_{11}.

At **Bichpuri,** the maximum yield (2.52 t/ha) of pearl millet was recorded under treatment T_8 during *kharif* and maximum yield (4.74 t/ha) of wheat recorded in treatment T_{11} during *rabi* season. The increase in crop yield under highest yielding treatment over 100% RDF was 2.7 and 4.0 percent, during *kharif* and *rabi*, respectively. The yield under highest yielding treatment during both *kharif* (i.e T_8) and *rabi* (i.e T_{11}) was statistically at par with all the treatment except T_1, T_4, T_7 and T_{10}.

Sorghum-wheat cropping system

At **Akola,** during *kharif* season maximum yield (2.97 t/ha) of sorghum was recorded under treatment T_7 which was 4.71% higher yield than the recommended dose of fertilizers (T_5). During *rabi* season wheat also presented same trend of sorghum crop and recorded maximum yield (3.18 t/ha) under treatment T_7 which was 6.25% higher than the recommended dose of fertilizers (T_5). During *kharif* treatment T_7 was at par with T_5, T_6, T_9 and T_{11} whereas during *rabi* T_7 was at par with T_3, T_5 and T_{10}.

At **Rahuri,** during *kharif* season treatment T_6 resulted into highest yield (3.57 t/ha) of sorghum. The yield under treatment T_6 was 4.8% higher yield than the recommended dose of fertilizers (T_5). It was at par with treatment T_5 and T_{10}. During *rabi*

Table 7.2/1(e): Grain yield (kg/ha) of pearl millet-wheat crop sequence under different integrated nutrient management treatments

Treatment	S K Nagar		Junagadh(P)		Bichpuri	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	33	87	1105	1648	1569	3000
T_2	526	794	1748	2106	2385	4567
T_3	552	1004	1652	2160	2160	4068
T_4	649	1253	1973	2222	1553	3129
T_5	896	2073	1926	2249	2449	4554
T_6	1400	3165	2225	2647	2160	4129
T_7	1467	2904	2073	2512	1538	3106
T_8	1221	2737	2020	2392	2516	4562
T_9	1338	2689	1955	2500	2146	4126
T_{10}	1387	2811	1968	2296	1539	3132
T_{11}	1499	2763	1781	2458	1865	4738
T_{12}	545	1225	1922	2176	2209	4133
CD at 5%	**137**	**235**	**467**	**280**	**747**	**1238**

season the highest yield (4.30 t/ha) was obtained with treatment T_6 and showed 12.6 % higher yield than the recommended dose of fertilizers (T_5). During *rabi* treatment T_6 was significantly superior over the remaining treatments.

At **Parbhani,** during *kharif* season treatment T_5 resulted into highest yield (2.69 t/ha) of sorghum. It was at par with treatment T_6, T_{10} and T_{14}. During *rabi* season the highest yield (2.71 t/ha) was obtained with treatment T_6 which yielded 3.6 % higher yield than the recommended dose of fertilizers (T_5). During *rabi* treatment T_6 was at par with treatment T_5, T_{10} and T_{14}.

Table 7.2/1(f): Grain yield (kg/ha) of sorghum-wheat crop sequence under different integrated nutrient management treatments.

Treatment	Akola		Rahuri		Parbhani	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
T_1	598	440	125	658	273	316
T_2	1843	1910	2521	2910	1872	1826
T_3	2123	2943	2768	3406	1955	2001
T_4	2511	2208	3149	3322	2217	2222
T_5	2844	2993	3413	3820	2690	2613
T_6	2573	2465	3576	4302	2670	2706
T_7	2977	3180	3171	3603	2413	2305
T_8	2377	1653	3073	3695	2269	2294
T_9	2741	2068	2878	3483	1996	2022
T_{10}	2552	2865	3301	3757	2577	2572
T_{11}	2812	2215	3189	3515	1800	2011
T_{12}	2083	1713	2170	2617	1595	1682
T_{13}	-	-	-	-	2233	2341
T_{14}	-	-	-	-	2577	2634
CD at 5%	**412**	**408**	**326**	**172**	**250**	**184**

7.2.2 LONG-TERM FERTILIZER APPLICATION

Title of the experiment: Long range effect of continuous cropping and manuring on soil fertility and yield stability (Expt. No.2b)

Objectives:

To study the long range effects of graded fertilizer levels on yield stability and soil fertility under cereal – cereal cropping with high yielding varieties.

Year of start: 1977-78

Treatments:

Eighteen combinations of 3 levels of N (40,80 and 120 kg ha^{-1}), 3 levels of P_2O_5 0,40 and 80 kg ha^{-1} and two levels of K_2O (0 and 40 kg ha^{-1}) with one absolute control plot in each block.

Locations:

Crop Sequence	Ecosystem/center
Rice-wheat	Semi-Arid/ Faizabad, Rewa
Maize-wheat	Arid/Siruguppa, Sub-Humid/Kanke

Results:

The centre –wise results are presented in table 7.2/2 (a-c) and their brief description is given below.

Rice – Wheat Cropping System

The data presented in Table 7.2/2 (a) indicated that increased levels of N, P and K resulted into significantly higher grain yield over remaining treatments. During *kharif* season treatment applied with 120 kg N in rice resulted into highest grain yields of 3.07 and 4.11 t ha^{-1} and during *rabi* season wheat grain yield was recorded 2.02 and 3.54 t ha^{-1} at Faizabad and Rewa, respectively. Similar trend was observed with treatment applied with 80 kg P_2O_5 and 40 kg K_2O which recorded highest yield of rice and wheat crop over remaining treatments. At Faizabad, during *kharif* season in rice, interaction between NP [Table 7.2/2 (b)] was found significant whereas during *rabi* season in wheat interactions among NP and PK [Table 7.2/2 (b&c)] were found significant at both Faizabad and Rewa.

Maize- Wheat Cropping System

The results [Table 7.2/2(a)] indicated that increased levels of N, P and K resulted into significantly higher grain yield over remaining treatments. During *kharif* season treatment applied with 120 kg N in maize recorded highest grain yields of 1.79 t ha^{-1} and during *rabi* season wheat grain yield was recorded 2.86 and 2.18 t ha^{-1} at Kanke and Siruguppa, respectively. Similar trend was observed with treatment applied with 80 kg P_2O_5 and 40 kg K_2O which recorded highest yield of maize and wheat crops over remaining treatments. An interaction between NP [Table 7.2/2 (b)] was found significant at Kanke during both *kharif* and *rabi* whereas at Siruguppa interaction between NP was significant during *rabi* season only.

Table 7.2/2(a): Average yield (kg/ha) of crops in different crop rotations as affected by different levels of N,P and K fertilizers during 2011-12.

Crop sequence / Centre	Variety	Av. yield of unfertilized plot	Av. yield with N (kg/ha) 40	80	120	S.E.(d) C.D.(5%)	Av.yield with P_2O_5 (kg/ha) 0	40	80	S.E.(d) C.D.(5%)	Av.yield with K_2O(kg/ha) 0	40	S.E.(d) C.D.(5%)	G.M.	C.V (%)	Remarks
RICE – WHEAT																
							***Kharif* - Rice(I)**									
Faizabad	Sarjoo-52	944	1695	2556	3071	60 (121)	1737	2572	3014	60 (121)	2283	2598	49(99)	2227	8	(N,P,K,NP)**
							***Rabi* - Wheat(I)**									
	HUW-234	552	1348	1715	2021	50 (101)	227	2249	2609	50 (101)	1563	1826	41(82)	1531	10	(N,P,K,NP,PK)**
							***Kharif* - Rice(I)**									
Rewa	IR-36	1738	3417	3707	4113	61 (122)	3387	3904	3977	61 (122)	3656	3855	50(100)	3468	6	(N,P,K,)**
							***Rabi* - Wheat(I)**									
	WH-147	1090	2914	3328	3537	55 (110)	2929	3255	3594	55 (110)	3167	3352	45(90)	2949	7	(N,P,K,)** , NP*
MAIZE – WHEAT																
Siruguppa							NR									
							***Rabi* - Wheat(I)**									
	DWR-162	295	1458	1655	2181	83 (166)	1176	1877	2242	83 (166)	1672	1858	67 (135)	1555	16	(N,P,K)**,NP*
							***Kharif* - Maize(I)**									
Kanke	HQPM-1	728	1262	1627	1792	58 (117)	651	1752	2278	58 (117)	1438	1682	48 (95)	1441	13	(N,P,K,NP)**
							***Rabi* - Wheat(I)**									
	K-9107	555	2194	2569	2861	144 (288)	728	3344	3552	144 (288)	2409	2673	117(235)	2258	20	(N,P,NP)**,K*

Note :Data not received of experiment Karamana (Kharif &Rabi) and Siruguppa (Kharif).

Summary: Following treatments are significant.Karamana(Kharif) NIL Rewa (Kharif) (N,P,K,)** Siruguppa (Kharif) NIL Karamana(Rabi) NIL, Rewa (Rabi) (N,P,K,)**,NP)* Siruguppa (Rabi) (N,P,K)**,NP* Faizabad (Kharif) (N,P,K,NP)** Kanke (Kharif) (N,P,K,NP)** Faizabad (Rabi) (N,P,K,NP)** Kanke (Rabi) (N,P,NP)**,K*

Table 7.2/2(b): Average yield (kg/ha) as affected by N and P interaction (2011-12)

Crop sequence/ Centre	Levels of P_2O_5(kg/ha)	N (kg/ha)			CD at 5%
		40	80	120	
RICE-WHEAT					
		***Kharif* - Rice(I)**			
Faizabad	0	1320	1719	2089	121
	40	1833	2740	3214	
	80	1928	3234	3890	
		***Rabi* - Wheat(I)**			
Faizabad	0	315	209	193	187
	40	1762	2199	2735	
	80	2009	2716	3112	
Rewa	0	2491	3075	3187	204
	40	2846	3368	3615	
	80	3357	3584	3813	
MAIZE-WHEAT					
		***Kharif* - Maize(R)**			
Kanke	0	727	733	505	217
	40	1305	1776	2209	
	80	1743	2425	2619	
		***Rabi* - Wheat (I)**			
Siruguppa	0	741	1074	1793	307
	40	1685	1613	2296	
	80	1937	2291	2453	
Kanke	0	807	685	646	533
	40	2732	3568	3855	
	80	3068	3509	4002	

Table 7.2/2(c): Average yield (kg/ha) as affected by P and K interaction (2011-12)

Crop sequence/ Centre	Levels of K_2O (kg/ha)	P_2O_5 (kg/ha)			CD at 5%
		0	40	120	
RICE-WHEAT					
		***Rabi* - Wheat(I)**			
Faizabad	0	220	2076	2394	143
	40	234	2421	2823	
Rewa	0	2942	3095	3463	156
	40	2917	3416	3724	

7.2.3 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 nutrients management packages for system based high value crops

ii. To recycle farm waste to value added compost

iii. 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:

T_1: 50% recommended NPK+50% as FYM

T_2: Recommended N each equivalent to 1/3 of total N requirement of crop as FYM, vermin compost and Neem cake

T_3: T_2+inter crop/Trap cropping

T_4: T_2+agronomic practices for weed and pest control

T_5: 50%N as FYM + seed treatment with Azotobactor and PSB +rock phosphate

T_6: T_2 + Azotobacter + PSB

T_7: 100% NPK= micronutrients as per soil test

T_8: Dummy plot (T_2)

Results:

The centre wise results are presented in table 7.2/3 (a-h) and their brief description is given below.

Rice-based cropping systems

Bhubaneswar

In rice- cabbage- lady's finger system, highest crop yield 4.12 , 14.35 and 8.33 t ha^{-1} was recorded in rice, cabbage and lady's finger during *kharif*, *rabi* and summer seasons, respectively, under treatment T_6 which received 1/3 N each equivalent N as FYM , Vermicompost(VC) and neem oil cake. Percentage yield increase over RDF (recommended dose of fertilizers) was 29.9, 11.1, and 29.8 % in *kharif*, *rabi* and summer, respectively. As far as mean crop yield performance over the years is concerned, highest grain yield of crops were recorded at 5.30, 15.73 and 7.74 t ha^{-1} during *kharif*, *rabi* and summer, respectively, in rice – cabbage - lady's finger system under T_6 which received 1/3 N each equivalent in form of FYM, vermi compost, neem cake and bio-fertilizer containing N and P carrier. Percentage yield increase over RDF (recommended dose of fertilizers) was 14.6. 18.4, and 21.4% in *kharif*, *rabi* and summer, respectively, in this treatment (Table 7.2/3 a & c).

Jabalpur

In rice-potato system, the highest rice yield 4.55 t ha^{-1} was recorded during *kharif* and 3.85 t ha^{-1} of potato yield during *rabi* under treatment T_7 (RDF). As mean crop yield over years is concerned, highest grain yield of crops were recorded at 4.10 and 3.78 t ha^{-1} under treatment T_7 during *kharif* and *rabi* season, respectively (Table 7.2/3 a & c).

Chiplima

In rice - tomato- lady's finger system the highest crop yield at 4.55, 17.40 and 6.41 t ha^{-1} was recorded in rice, tomato and lady's finger under treatment T_6 during *kharif*, *rabi* and summer

Table 7.2/3 (a). Effect of organic nutrient management package on crop yield (kg ha^{-1}) in rice based cropping systems during 2011-12

Treatment	Season	Bhubaneswar	Chiplima	Jabalpur	Rewa	Sabour	Raipur
		Rice-cabbage-lady's finger	Rice-tomato-lady's finger	Rice-potato-fallow	Rice-wheat	Rice-potato-onion	Rice-onion
T_1: 50% rec. NPK+ 50%N as FYM	*Kharif*	3870	4460	4057	4107	4950	4454
	Rabi	12180	16260	3520	3944	23600	11250
	Summer	6120	5410	-	-	11060	-
T_2: FYM+ Neem oil cake +VC	*Kharif*	3570	4150	3743	2899	4720	4167
	Rabi	12150	16070	2680	2080	23890	9271
	Summer	6000	4550	-	-	11250	-
T_3:T_2+ Inter crop	*Kharif*	3620	4400	3910	3140	4875	4667
	Rabi	12230	16200	2835	2999+190	23320+7360*	9760
	Summer	6240	4920	-	-	10900+6580**	-
T_4:T_2+ Org. Pract.	*Kharif*	3420	4450	4043	3322	4870	4140
	Rabi	12020	17180	3133	2899	23720	9406
	Summer	6570	5160	-	-	11320	-
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	3270	4420	3562	3986	4520	3438
	Rabi	12450	16270	2711	2132	19230	5281
	Summer	7070	5240	-	-	9140	-
T_6: T_2 + Bio Fertilizer	*Kharif*	4120	4550	3345	3382	4980	4325
	Rabi	14350	17400	2677	2065	24160	9667
	Summer	8330	6410	-	-	11420	-
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	3170	4230	4552	4650	4760	4552
	Rabi	12920	15750	3845	3533	22370	10667
	Summer	6420	5590	-	-	10250	-
Highest recorded yield	*Kharif*	4120	4550	4552	4650	4980	4666
	Rabi	14350	17400	3845	3944	24160	11250
	Summer	8330	6410	-	-	11420	-
Increase over T_7 (%)	*Kharif*	29.77	7.56	-	-	4.62	2.51
	Rabi	11.06	10.48	-	11.63	8.00	5.46
	Summer	29.75	14.67	-	-	11.41	-

Table 7.2/3 (b). Effect of organic nutrient management packages on crop yield (kg ha^{-1}) in rice based cropping system during 2011-12

Treatment	Season	Kalyani	Jorhat	Navsari	Karjat	Maruteru	Siruguppa
		Rice-potato-g.nut	Rice-toria-black gram	Rice-fallow-groundnut	Rice-maize	Rice-rice	Rice-fallow-sesame
T_1: 50% rec. NPK + 50%N as FYM	*Kharif*	2520	2800	2472	4161	5790	2903
	Rabi	15111	555	-	8315	4722	368
	Summer	1350	500	1653	-	-	-
T_2: FYM+ Neem oil cake +VC	*Kharif*	1608	3000	2218	3476	5340	2540
	Rabi	11556	600	-	5620	3896	354
	Summer	1100	700	1921	-	-	-
T_3:T_2+ Inter crop	*Kharif*	1224	3200	2170	3429	5174	2412
	Rabi	7111+3933*	480+800*	-	5730	3985	368
	Summer	713+4137*	450+1000**	1698	-	-	-
T_4:T_2+ Org. Pract.	*Kharif*	1356	2800	2051	3580	5091	2408
	Rabi	10667	700	-	5945	3724	356
	Summer	1140	620	1997	-	-	-
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	900	2700	2000	3528	4874	2511
	Rabi	10889	500	-	5230	3980	378
	Summer	950	475	1366	-	-	-
T_6: T_2 + Bio Fertilizer	*Kharif*	1512	2500	2649	3616	5523	2455
	Rabi	13844	450	-	5755	4036	367
	Summer	1000	400	1743	-	-	-
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	648	2800	2254	4675	5590	3096
	Rabi	22667	500	-	10725	4567	449
	Summer	1275	550	1614	-	4884	-
Highest recorded yield	*Kharif*	2047	4350	4173	4261	5428	3096
	Rabi	17933	304	-	7085	-	449
	Summer	1755	408	2825	-	-	-
Increase over T_7 (%)	*Kharif*	12.5	62.3	-	-	2.5	-
	Rabi	-	15.6	-	-	-	-
	Summer	1.2	-	6.5	-	-	-

Table 7.2/3 (c). Mean performance of organic nutrient management packages on crop yield (kg ha^{-1}) in rice-based cropping system over the years

Treatment	Season	Bhubaneswar	Chiplima	Jabalpur	Rewa	Sabour	Raipur
		Rice-cabbage-lady's finger	Rice-tomato-lady's finger	Rice-potato-fallow	Rice-wheat	Rice-potato-onion	Rice-onion
T_1: 50% rec. NPK +50%N as FYM	*Kharif*	4746	4460	3779	3396	4831	6083
	Rabi	13620	14601	3484	3120	24474	13197
	Summer	6358	5793	-	-	13549	-
T_2: FYM+ Neem oil cake+VC	*Kharif*	4554	4588	3114	2530	4446	5366
	Rabi	12210	14661	2673	1793	22865	11215
	Summer	6338	5720	-	-	12119	-
T_3:T_2+ Inter crop	*Kharif*	4970	4678	3218	2740	4619	5687
	Rabi	12910	14802	2858	1665 + 162*	22483	11532
	Summer	6502	5590	-	-	11254	-
T_4:T_2+ Org. Pract.	*Kharif*	4618	4733	3251	2643	4276	5154
	Rabi	11956	15134	3183	1925	20352	11365
	Summer	6386	5840	-	-	10937	-
T_5: 50% N as FYM + R. Phos + BF	*Kharif*	4616	4747	2987	2782	4550	4781
	Rabi	13472	14643	2482	1724	23238	8604
	Summer	6812	5779	-	-	12396	-
T_6: T_2 + Bio Fertilizer	*Kharif*	5304	5090	2998	2855	4550	5471
	Rabi	15730	16089	2365	1860	23238	11520
	Summer	7740	6664	-	-	12396	-
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	4532	4603	4102	3497	4918	5920
	Rabi	12834	15012	3784	3640	23483	13405
	Summer	6080	5927	-	-	13557	-
Highest recorded yield	*Kharif*	5304	5090	4102	3497	4918	6083
	Rabi	15730	16089	3784	3640	24474	13405
	Summer	7740	6664	-	-	13557	-
Increase over T_7 (%)	*Kharif*	14.6	9.6	-	-	-	2.7
	Rabi	18.4	6.7	-	-	4.0	-
	Summer	21.4	11.1	-	-	-	-

Table 7.2/3 (d). Mean performance of organic nutrient management packages on crop yield (kg ha^{-1}) in rice-based cropping system over years

Treatment	Season	Kalyani	Jorhat	Navsari	Karjat	Maruteru	Siruguppa
		Rice-potato-g.nut	Rice-toria-black gram	Rice-rice	Rice-fallow-groundnut	Rice-maize	Rice-fallow-sesame
T_1: 50% rec. NPK+50%N as FYM	*Kharif*	2047	1894	4859	4121	3865	2903
	Rabi	14512	282	5428	-	5611	368
	Summer	1681	260	-	2825	-	-
T_2: FYM+ Neem oil cake +VC	*Kharif*	1682	1925	4373	3878	3232	2540
	Rabi	12432	274	4269	-	3789	354
	Summer	1403	295	-	2664	-	-
T_3:T_2+ Inter crop	*Kharif*	1852	4350	4242	3862	3302	2412
	Rabi	11640+2113*	225+ 595*	4321	-	3893	368
	Summer	888+5858*	220+ 925**	-	2667	-	-
T_4:T_2+ Org. Pract.	*Kharif*	1781	1828	4004	3572	3408	2408
	Rabi	11814	304	4062	-	4020	356
	Summer	1755	380	-	2451	-	-
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	1698	1671	3920	3510	3135	2511
	Rabi	10960	209	4076	-	3673	378
	Summer	1455	310	-	2389	-	-
T_6: T_2 + Bio Fertilizer	*Kharif*	1686	1611	4192	3978	3345	2455
	Rabi	11948	207	4346	-	3932	367
	Summer	1593	286	-	2644	-	-
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	1791	1641	4884	4173	4261	3096
	Rabi	17933	256	5294	-	7085	449
	Summer	1733	408	-	2640	-	-
Highest recorded yield	*Kharif*	2520	3200	5790	2649	4675	3096
	Rabi	22667	700	4722	-	10725	449
	Summer	1350	700	-	1997	-	-
Increase over T_7 (%)	*Kharif*	288.88	14.28	3.58	17.52	-	-
	Rabi	-	40.00	3.40	-	-	-
	Summer	5.88	27.27	-	23.73	-	-

seasons, respectively. Percent yield increase in this treatment were 7.6, 10.5 and 14.7% respectively, in respective seasons. As mean crop yield over years is concerned, highest grain yield of crops were recorded at 5.09, 16.09 and 6.67 t ha^{-1} respectively, under treatment T_6, which received 1/3 of recommended N each as FYM, vermi-compost, neem cake and bio-fertilizers containing N and P carrier. Percent yield increase in this treatment were 9.6, 6.7 and 11.4%, respectively, in respective seasons (Table 7.2/3 a & c).

Rewa

In rice-wheat system, highest grain yield of rice (4.65 t ha^{-1}) was recorded under RDF, whereas during *rabi*, highest wheat yield was recorded at 3.95 t ha^{-1} under treatment T_1 (Integrated nutrient management). During *rabi* season, yield increase under T_1 was 11.6% compared to RDF. As the mean crop performance over years is concerned, highest grain yield of crops was recorded at 3.64 and 3.49 t ha^{-1} under treatment T_7 during *kharif* and *rabi* seasons, respectively (Table 7.2/3 a & c).

Sabour

In rice-potato-onion system, highest crop yields (4.98, 24.16 and 11.42 t ha^{-1}) were recorded in rice, potato and onion during *kharif, rabi* and summer seasons under treatment T_6 respectively. Percent yield increase of crops over RDF were 4.62, 80 and 11.41%, respectively. As mean yield of crops over years is concerned, highest grain yield of crops were recorded at 4.92, 23.5, 13.56 and t ha^{-1} under treatment T_7 in rice, potato and onion during *kharif*, *rabi* and *summer* seasons, respectively. Percent yield increase in T_7, during *rabi* in potato was 4.0% over RDF (Table 7.2/3 a &c).

Raipur

Highest rice yield 4.67 t ha^{-1} was recorded under treatment T_3 whereas during *rabi* highest wheat yield of 11.25 t ha^{-1} was recorded under treatment T_1 (integrated nutrient management package). The percent yield increase under these treatment were 2.51 and 5.47 % respectively. As mean yield is concerned highest grain yield of crops were recorded at 6.08 and 13.4 t ha^{-1} for rice and onion under treatment T_1 and T_7 during *kharif* and *rabi* season respectively. Percent yield increase under T_1 during *kharif* in rice was 2.7% over RDF (Table 7.2/3 a & c).

Kalyani

During *kharif* season, highest grain yield of rice was recorded under T_1 at 2.52 t ha^{-1}, potato yield 22.67 t ha^{-1} under treatment T_7 (RDF) and during *summer* groundnut yield 1.35 t ha^{-1} under treatment T_1 in rice-potato- groundnut system. Percent yield increase under these treatments over RDF were 288.89 and 5.88 % respectively. As mean crop yield performance over years is concerned, highest grain yield of rice were recorded at 2.05 t ha^{-1} during *kharif* under treatment T_1 which received 50% recommended N.P.K. and 50% FYM as nutrient sources. During *rabi* highest grain yield of potato 17.93 t ha^{-1} was recorded under RDF (T_7) and 1.76 t ha^{-1} in groundnut under T_4 during *summer.* The percentage yield increase during *kharif* and *summer* seasons compared to RDF was 12.5 and 1.2 % respectively (Table 7.2/3 b & d).

Jorhat

In rice-toria-blackgram system highest rice yield during *kharif* was recorded at 3.2 t ha^{-1} under treatment T_3 during *rabi*, toria yield was highest 0.70 t ha^{-1} under T_4 and during *rabi* and black gram yield was highest 0.70 t ha^{-1} under T_2. Percent yield increase in crops over RDF were 14.29, 40 and 27.2% respectively during *kharif, rabi* and *summer* seasons respectively. As mean yield of crops over years is concerned, highest grain yield of 4.40, 0.30 and 0.41 t ha^{-1} were recorded during *kharif*, *Rabi* and *summer* seasons under treatment T_3, T_4 and T_7 respectively. The percentage yield increase in rice and toria during *kharif* and *rabi* over RDF where 62.3% (T_3) and 15.6% in (T_4) respectively (Table 7.2/3 b & d).

Navsari

During *kharif,* highest rice grain yield 2.65 t ha^{-1} was recorded under T_6 whereas during *summer* highest groundnut grain yield 1.99 t ha^{-1} was recorded under T_4 in rice-fallow- groundnut system. Percent yield increase in these two treatments over RDF were 17.52 and 23.73% respectively. As mean yield is concerned highest grain yield of rice during *kharif* was recorded at 4.2 t ha^{-1} under RDF where as during *summer* highest yield of groundnut was recorded at 2.82 t ha^{-1} under T_1 and 6.5 % yield increase over RDF(Table 7.2/3 b & d).

Karjat

In rice-maize system highest grain yield of rice and maize during *kharif* and *rabi* were recorded 4.68 and 10.73 t ha^{-1} under treatment T_7 respectively. As mean crop yield performance over years is concerned, highest grain yield of rice during *kharif* was recorded 4.2 t ha^{-1} under RDF where as during *rabi* highest maize grain yield 7.1 t ha^{-1} was recorded under T_7 (Table 7.2/3 b & d).

Maruteru

In rice-rice-system highest crop yield during *kharif* and *rabi* were recorded 5.79 and 4.72 t ha^{-1} under T_1. Compared to RDF, percent yield increase of rice during *kharif* and *rabi* were 3.58 and 3.39 respectively. As mean crop yield performance over years is concerned, highest rice grain yield 4.89 t ha^{-1} was recorded under RDF whereas during *rabi,* the highest rice grain yield of 5.4 t ha^{-1} recorded under T_1 and 2.5 % yield increase over RDF (Table 7.2/3 b & d).

Siruguppa

Highest rice yield 3.09 t ha-^{1} was recorded under T_7 during *kharif* and also sesame 0.45t ha-^{1} during *rabi* in rice-fellow- sesamum cropping system. As mean yield is concerned highest grain yield of rice and sesamum were recorded 3.10 and 0.45 t ha-^{1} under RDF system during *kharif* and *rabi* season respectively (Table 7.2/3 b &d).

Maize based cropping system

Indore

Maize-potato- onion system recorded highest maize and potato yield of 0.931 and 3.94 t ha^{-1} under T_7 during *kharif* and *rabi* seasons respectively. The yield of onion during summer has not been reported. But over years, the performance of T_7 was superior in attaining highest crop yield at 5.76 and 10.67 t ha^{-1} for maize and potato respectively and during summer, onion yield was highest at 8.0 t ha^{-1} under treatment T_1 (IPNS)and 4.0% increase in crop yield over T_7. All the organic nutrient management packages were inferior to T_7 during the entire study (Table 7.2/3 e & f).

Kathalgere

In maize-fallow- groundnut system, highest maize yield (5.78 t ha^{-1}) was record under T_7 during *kharif* whereas during *rabi* highest groundnut yield (1.60 t ha^{-1}) was recorded under T_1. The percent yield increase over T_7 being 6.70%. As mean yield of crops over years is concerned, highest maize yield (5.8 t ha^{-1}) was recorded under T_7 and highest groundnut yield (1.6 t ha^{-1}) was recorded under T_1 and it was 6.69 % higher over T_7 (Table 7.2/3 e & f).

Kanpur

In maize – potato - onion system, highest yield of maize and potato was recorded at 82,091 cobs and 28.5 t ha^{-1} during *kharif* and *rabi* seasons respectively under T_1. The percent yield increase of crops under this treatment was 1.99 and 6.74 % respectively over T_7. The yield of *summer* crops has not been reported. The mean performance of crops over years was also highest under this treatment (Table 7.2/3 e & f).

Akola

In maize – rajmah - onion system, highest maize and onion yield at 13.84 and 11.11 t ha^{-1} were recorded under T_7 during *kharif* and *summer* seasons respectively whereas during *rabi*, highest rajmah yield (0.54 t ha^{-1}) was recorded under T_6.

Table 7.2/3 (e). Effect of organic nutrient management packages on crop yield (kg ha^{-1}) in maize based cropping system 2011-12

Treatment	Season	Indore	Kathalgere	Kanpur	Akola	Rajendra nagar	Thanjavure	Kumarganj
		Maize (cob)-potato - onion	Maize-fallow-G. nut	Maize (cob)-potato-onion	Maize-rajma-onion	Maize-Onion	Maize-rice-green gram	Maize-potato-onion
T_1: 50% rec. NPK +50%N as FYM	*Kharif*	731	3078.5	82091	12938	5613	4915	2415
	Rabi	2379	459	28497	243	10666	6591	1782
	Summer	-	-	-	9753	-	926	700
T_2: FYM+ Neem oil cake +VC	*Kharif*	133	2990.2	78845	10627	5170	4454	2445
	Rabi	1742	726	25031	313	10400	6116	1540
	Summer	-	-	-	7037	-	839	610
T_3:T2+ Inter crop	*Kharif*	113	2663	77758	12628+185	4926+2830	4521	2370
	Rabi	1616	466	20764	337+1111*	8533+4233	6174	1431
	Summer	-	-	-	6173+988*	-	852+205	580+150*
T_4:T2+ Org. Pract.	*Kharif*	110	2952.6	268*	9124	4809	4506	2530
	Rabi	1597	554	1067*	406	10133	6183	1645
	Summer	-	-	-	7284	-	848	720
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	121	2300.7	79732	12072	4500	3738	2060
	Rabi	1514	611	24398	387	10366	5164	1210
	Summer	-	-	-	8766	-	731	605
T_6: T2 + BF	*Kharif*	206	3088.3	81108	12638	5216	4608	2130
	Rabi	1654	630	26064	536	10566	6251	1436
	Summer	-	-	-	9753	-	858	690
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	931	3439.6	80492	13839	5837	5120	2650
	Rabi	3935	611	26697	377	10633	6795	1660
	Summer	-	-	-	11111	-	905	810
Highest recorded yield	*Kharif*	931	3439.6	82091	13839	5837	5120	2650
	Rabi	3935	726	28497	536	10666	6795	1782
	Summer	-	-	-	11111	-	926	810
Increase over T_7 (%)	*Kharif*	-	-	1.986	-	-	-	-
	Rabi	-	18.8216	6.7423	42.175	0.310	-	7.349
	Summer	-	-	-	-	-	0.232	-

Table 7.2/3 (f). Effect of organic nutrient management packages on mean crop yield (kg ha^{-1}) in Maize based cropping systems over years

Treatment	Season	Indore	Kathalgere	Kanpur	Akola	Rajendra nagar	Thanjavure	Kumarganj
		Maize (cob)-potato - onion	Maize-fallow-G. nut	Maize (cob)-potato-onion	Maize-rajma-onion	Maize-onion	Maize-rice-green gram	Maize-potato-onion
T_1: 50% rec. NPK +50%N as FYM	*Kharif*	5196	4981	82091	31501	4420	5210	3488
	Rabi	9096	1559	28497	871	13374	5193	22346
	Summer	8001	-	-	8892	-	975	10975
T_2: FYM+ Neem oil cake +VC	*Kharif*	3848	4116	78845	29192	3869	4690	3428
	Rabi	6759	1407	25031	579	13662	4722	23660
	Summer	5491	-	-	6637	-	865	12202.5
T_3:T2+ Inter crop	*Kharif*	4261	4633+405	77758	30639+ 243*	3797+2130	4558	3173
	Rabi	6683	1248+292	20764	655+ 1852*	8484+7777	4626	19083
	Summer	5244	-	-	6081+ 1282*	-	800+105	10195+150
T_4:T2+ Org. Pract.	*Kharif*	4010	3899	268*	27349	3669	4466	3590
	Rabi	7260	1323	1067*	596	13242	4665	22911
	Summer	6295	-	-	6954	-	796	12480
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	3119	3889	79732	29899	3263	3994	2703
	Rabi	5941	1332	24398	744	11992	4212	20303
	Summer	4641	-	-	7802	-	600	10401
T_6: T2 + BF	*Kharif*	3659	5036	81108	29969	3777	4440	3357
	Rabi	6697	1509	26064	718	12833	4626	22809
	Summer	5267	-	-	8580	-	790	12423
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	5755	5785	80492	32352	4773	3774	3617
	Rabi	10671	1461	26697	802	14555	4048	21540
	Summer	7683	-	-	7368	-	648	11753
Highest recorded yield	*Kharif*	5254.51	5785.04	82091	32352.25	4772.5	5209.65	3616.66
	Rabi	10670	1558.79	28497	870.75	14554.75	5193.25	23660
	Summer	8000.93	-	-	8891.5	-	974.75	12480
Increase over T_7 (%)	*Kharif*	-	-	1.986	-	-	38.055	-
	Rabi	-	6.6951	6.742	8.640	-	28.307	9.842
	Summer	4.143	-	-	-	-	50.325	6.190

The percent yield increase of rabi crop was 42.18% over RDF. But as the mean performance of treatments over years is concerned, highest maize yield of 32352 cobs was recorded under T_7 whereas during *rabi* and *summer* seasons, crop yield were highest under T_1 at 0.87 and 8.89 t ha^{-1} respectively. The percent yield increase over T_7 was 8.64 for rajmah (Table 7.2/3 e &f).

Rajendranagar

In maize - onion system, highest maize yield (5.84 t ha^{-1}) was recorded under T_7 during *kharif* whereas during *rabi,* highest onion yield 10.66 t ha^{-1} were recorded under T_1 and T_7 which were at par with each other. But as the mean performance of treatments over the years is concerned, T_7 recorded highest yield at 4.77 and 14.56 t ha^{-1} respectively (Table 7.2/3 e & f).

Thanjavur

At Thanjavur in maize-rice-green gram system, highest crop yield during *kharif* and *rabi* were recorded at 5.12 and 6.80 t ha-¹ under T_7 whereas during *summer*, highest crop yield (0.95 t ha^{-1}) was recorded under T_1 being numerically almost at par with T_7. But as the mean performances of crops over years is concerned the performance of T_1 was superior in attaining highest yield of crops at 5.2 , 5.2 and 0.974 t ha-¹ during *kharif, rabi* and *summer* seasons respectively. Percent yield increase in crops over RDF was 38.06, 28.31and 50.33% respectively (Table 7.2/3 e & f).

Kumarganj

In maize-potato-onion system, highest maize and onion yield were recorded at 2.65 and 0.81 t ha^{-1} in T_7 during *kharif* and *summer* whereas during *rabi*, highest potato yield (1.78 t ha^{-1}) was record under T_1. The percent yield increase over T_7 being 7.35 %. But as the mean performance of treatments over years is concerned, T_7 recorded highest maize yield (3.62 t ha^{-1}), T_2 recorded highest potato yield (23.66 t ha^{-1}) and T_4 recorded highest onion yield (12.48 t ha^{-1}) during *kharif, rabi* and summer seasons respectively. The percentage yield increase in potato and onion under T_2 and T_4 over T_7 (RDF) were 9.84 and 6.19% respectively (Table 7.2/3 e & f).

Chatha

Highest crop yield of onion, French bean and French bean recorded at 3.70, 13.36 and 3.98 t ha^{-1} under T_6 in onion- French bean- French bean system. The percent yield increase in crops under this treatment over T_7 was 28.22, 6.92and 8.62% respectively. But as the mean performance of crops over years is concerned, highest crop yield during *kharif* and *rabi* were recorded at 4.13 and 14.64 t ha^{-1} respectively in treatment T_6 and during *summer*, T_7 recorded highest crop yield (3.69 t ha^{-1}). The mean yield increase under T_6 over T_7 was recorded at 1.84 and 31.06% respectively (Table 7.2/3 g & h).

Coimbatore

In Chillies – bangal gram-baby corn system, highest crop yield 11.72 and 8.84 t ha^{-1} was recorded under the treatment T_3. The percent yield increase in crops under this treatment over T_7 were 14.73 and19.59 % respectively. The yield of summer crop during 2011-12 was not reported. But as the mean performances of crops over years is concerned, highest crop yield during *kharif* and *rabi* were recorded at 8.8 and 1.11 t ha^{-1} respectively and during *summer*, T_2 recorded highest crop yield (6.7 t ha^{-1}). The mean yield increase under these treatments over T_7 was recorded at 16.18, 1.97 and 6.19 % respectively (Table 7.2/3 g & h).

Palampur

Highest crop yield of was recorded 1.08, 11.34 and 25.94 t ha^{-1} under treatment T_1 and T_2, the percent yield increase in crops under this treatment over T_7 were 41.34 and 72.60% respectively. But as the mean performances of crops over years is concerned, highest crop yield during *kharif, rabi* and *summer* were recorded at 2.6 and 9.8 and 90.46 t ha^{-1} respectively under T_1.

Table 7.2/3 (g). Effect of organic nutrient management package on crop yield (kg ha^{-1}) in various cropping system 2011-12

Treatment	Season	Chatha	Coimbatore	Palampur	Powerkheda	Rahuri
		Onion-frenchbean-frenchbean	Chillies-bengal gram-babycorn		(Soyabean-wheat-fallow)	Soybean-onion
T_1: 50% rec. NPK+50%N as FYM	*Kharif*	3037	8058	1077	916	2993
	Rabi	12596	1079	11338	3457	24012
	Summer	3586	-	25794	-	-
T_2: FYM+ Neem oil cake +VC	*Kharif*	3555	7212	255	741	2849
	Rabi	12259	903	10346	2282	23836
	Summer	3759	-	25935	-	-
T_3:T2+ Inter crop	*Kharif*	3370	8835	992	783	2786
	Rabi	12644	1172	6519	2291	23446
	Summer	3774	-	20550	-	-
T_4:T2+ Org. Pract.	*Kharif*	3148	7402	886	808	2811
	Rabi	12932	984	6604	2332	23620
	Summer	3798	-	19841	-	-
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	3259	5919	1027	658	1901
	Rabi	9096	810	6944	2166	23194
	Summer	3389	-	15590	-	-
T_6: T2 + BF	*Kharif*	3703	7440	383	733	3168
	Rabi	13365	992	9177	2083	24239
	Summer	3932	-	18141	-	-
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	2888	7701	762	1049	3302
	Rabi	12500	980	6569	4249	24833
	Summer	3620	-	7370	-	-
Highest recorded yield	*Kharif*	3703	8835	1077	1049	3301.75
	Rabi	13365	1172	11338	4249	24832.75
	Summer	3932	-	25935	-	-
Increase over T_7 (%)	*Kharif*	28.22	14.725	41.33	-	-
	Rabi	6.92	19.59	72.59	-	-
	Summer	8.61	-	-	-	-

Table 7.2/3 (h). Mean performance of organic nutrient management package mean crop yield (kg ha^{-1}) in various cropping system over years

Treatment	Season	Chatha	Coimbatore	Palampur	Powarkheda	Rahuri
		Onion-frenchbean-frenchbean	Chillies-bengal gram-babycorn		(Soyabean-wheat-fallow)	Soybean-onion
T_1: 50% rec. NPK+50%N as FYM	*Kharif*	3936	8398	2623	1468	2496
	Rabi	9918	1077	9769	3816	23393
	Summer	3500	6487	30379	-	-
T_2: FYM+ Neem oil cake+VC	*Kharif*	4079	8617	1924	1232	2048
	Rabi	12915	1069	7744	2796	22456
	Summer	3635	6704	25918	-	-
T_3:T2+ Inter crop	*Kharif*	3964	8771	1937	1242	2327
	Rabi	12505	996	9065	2774	22466
	Summer	3161	6592	24217	-	-
T_4:T2+ Org. Pract.	*Kharif*	3910	8270	1556	1240	2326
	Rabi	13506	1106	8296	2763	22579
	Summer	3120	6288	23128	-	-
T_5: 50% N as FYM+ R Phos + BF	*Kharif*	3976	7273	1713	1171	1939
	Rabi	11335	953	9068	2659	21715
	Summer	3005	5952	26626	-	-
T_6: T2 + BF	*Kharif*	4128	7931	2045	1205	2556
	Rabi	14636	992	7927	2667	22910
	Summer	3264	6088	-	-	26135
T_7:100%NPK + Micronutrients as per soil test	*Kharif*	4053	7549	2003	1634	2931
	Rabi	11167	1084	4606	4523	27037
	Summer	3685	6313	1471	-	-
Highest recorded yield	*Kharif*	4127.95	8770.78	2622.63	1634.40	2931.07
	Rabi	1436.1	1105.53	9768.87	4523.10	27037.23
	Summer	3685	6703.97	30379.14	-	26134.7
Increase over T_7 (%)	*Kharif*	1.842	16.179	30.947	-	-
	Rabi	31.064	1.96	112.068	-	-
	Summer	-	6.191	-	-	-

The mean yield increase under T_1 was recorded at 30.95and 112.07% respectively (Table 7.2/3 g & h).

Powarkheda

Highest crop yield in soybean-wheat -fallow system was recorded at 1.05 and 42 t ha^{-1} under treatment T_7 during the reported period. Over years, the performance of T_7 was also superior in attaining the highest crop yield, 1.6 and 4.5 t ha^{-1}, respectively (Table 7.2/3 g & h).

Rahuri

Highest crop yield of soybean and onion was recorded at 3.3 and 24.8 t ha^{-1} under treatment T_7 in soybean – onion system and over years, the performance of T_7 was also superior in attaining the highest crop yield, 2.9 and 27 t ha^{-1}, respectively (Table 7.2/3 g & h).

Comparative performance of sorghum under recommended fertilizer (T5) and INM (T6) treatments at Akola

An overview of INM experiment at SK Nagar

Control plot in LTINM experiment at Ludhiana

Performance of onion in T-3 under organic package expt. in maize-potato-onion cropping system at Ludhiana

7.3 CONSERVATION AGRICULTURE AND CLIMATE CHANGE

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

Objectives:

I. To design and identify economically viable and efficient farming practices for resource conservation and counteracting adverse effects of climate change.

II. 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

T_1 = No tillage/ minimum tillage/ bed planting/ and other suitable seed drill/planter

T_2 = Conventional tillage

II. Cropping systems (location specific) - 4

CS_1 = Predominant cropping system of the region

CS_2 = Best identified cropping system from expt. 1(a)

CS_3 and CS_4 = New cropping systems designed by involving C_4 plants (as they are known to perform better under enhanced CO_2 and higher ambient temperatures), low water requiring and physiologically more efficient crops.

B. *Sub – plots (Mulch x Fertilizer)* – 4

I. Mulch -2

M_1 = No mulch

M_2 = 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 seedling establishment)

II. Fertilizer rates - 2

F_1 = Recommended Dose of Fertilizer (RDF)

F_2 = 75 % RDF + 25 % N through Organic Manure

Experimental design: Split Plot with three replications

Results: Centre - wise results are given in Tables 7.3/1-7 and discussed below:

S.K. Nagar

Among tillage treatments, conventional tillage showed better pearl millet equivalent yield (PEY) (166 q ha^{-1}), gross return(Rs 1,99,249) and net return (Rs. 1,34,449) over minimum tillage (Table 7.3/1). In case of cropping system castor + green gram – summer pearl millet gave better PEY (227.4 q ha^{-1}), gross return(Rs 2, 72, 875) and net return (Rs. 2, 03, 466) over remaining cropping system. Among mulch and no mulch treatments, incorporation mulch resulted into highest PEY (168.1q ha^{-1}), gross return (Rs 2, 01, 730) and net return (Rs. 1, 34, 437). Between fertilizers treatments, treatment applied with 25 % higher recommended dose of fertilizer (RDF) gave highest PEY (169.1 q ha^{-1}), gross return (Rs 2, 02, 862) and net return (Rs. 1, 34,478) over RDF.

Junagadh

Among tillage treatments, conventional tillage showed better Groundnut equivalent yield (GEY) (42.54 q ha^{-1}), gross return (Rs 1, 88, 080) and net return (Rs. 83,397) over minimum tillage (Table

Table 7.3/1. Effect of different innovative farming practices on yield and economics at S.K.Nagar

Treatments	Grain Yield (q/ha)			System PEY (q/ha/yr)	Gross return (Rs/ha)	Cost of production (Rs./ha)	Net return (Rs/ha/yr)
	Kharif	*Rabi*	Summer				
Crop establishment method							
Minimum tillage	-	-	-	156.0	1,87,176	62,962	1,24,214
Conventional tillage	-	-	-	166.0	1,99,249	64,800	1,34,449
C.D. (5%)	-	-	-	6.3	7,560	-	-
Cropping systems (3)							
Pealmillet-Mustard	12.58 (29.74)	19.71 (51.28)		87.9	1,05,434	50,932	54,502
Castor +green gram-summer green gram	7.10 (19.39) +41.41 (36.45)	- -	16.36 (38.44)	227.4	2,72,875	69,409	2,03,466
Green gram-mustard- summer Pearl millet	11.72 (22.05)	20.94 (54.45)	39.03 (55.76)	167.8	2,01,323	71,300	1,30,023
C.D. (5%)				6.3	7,560	-	-
Mulch							
No mulch	-	-	-	153.9	1,84,691	60,468	1,24,223
Crop residue mulch	-	-	-	168.1	2,01,730	67,293	1,34,437
C.D. (5%)	-	-	-	5.9	7,080	-	-
Fertilizer rates							
RDF	-	-	-	153.0	1,83,560	63,378	1,20,182
25% higher over RDF	-	-	-	169.1	2,02,862	64,384	1,38,478
C.D. (5%	-	-	-	5.9	7,080	-	-

7.3/2). In case of cropping system groundnut – onion – green gram gave better GEY (58.26 q ha^{-1}), gross return (Rs 2, 57, 820) and net return (Rs. 1,16, 803) over remaining cropping system. Among mulch and no mulch treatments, incorporation of mulch resulted into highest GEY (42.85 q ha^{-1}), gross return (Rs 1, 88, 864) and net return (Rs. 82,537). Between fertilizer treatments, there was no significant difference was observed in GEY, gross return and net return.

Navsari

No significant difference was observed in different tillage practices (Table 7.3/3). Among cropping system, paddy – sorghum – summer green gram showed highest rice equivalent yield (REY) (166.68 q ha^{-1}), gross return (Rs. 1, 81,512) and net return (Rs. 1, 25,648). Between Mulch and no mulch treatment, incorporation of mulch resulted into highest REY (139.57 q ha^{-1}), gross

Table 7.3/2. Effect of different innovative farming practices on yield and economics at Junagadh

Treatments	Groundnut GEY(q/ha/yr)	Gross return (Rs/ha)	Cost of production (Rs./ha)	Net return (Rs/ha/yr)
Crop establishment method				
Minimum tillage	39.73	1,76,724	83,550	75,354
Conventional tillage	42.54	1,88,040	86,750	83,397
C.D. (5%)	2.47	10,461	-	-
Cropping systems (3)				
Groundnut-Wheat	32.48	1,29,936	59,948	69,987
Groundnut –Onion-Green gram	58.26	2,57,820	1,16,252	1,16,803
Cotton-Pearl millet	32.65	1,59,390	79,250	51,336
C.D. (5%)	3.03	12,812	-	-
Mulch				
No mulch	39.41	1,75,900	81,425	76,214
Crop residue mulch	42.85	1,88,864	88,875	82,537
C.D. (5%)	1.925	8,261	-	-
Fertilizer rates				
RDF	41.77	1,84,219	85,999	81,098
25% higher over RDF	40.49	1,80,545	84,301	77,652
C.D. (5%)	NS	NS	-	-

return (Rs 1, 51, 993). Among different fertilizer treatments, application of 25% higher recommended dose of fertilizer (RDF) gave better REY (166.05 q ha^{-1}), gross return (Rs. 1, 54, 398) and net return (Rs 96,662) over RDF.

Pantnagar

Data presented in Table 7.3/4 showed that interaction of DSR/ Zero tillage with rice- potato-maize cropping system performed better over remaining interaction for rice equivalent yield (REY). This interaction also showed highest total system productivity (33.64 t ha^{-1} $year^{-1}$ and 92.18 kg $ha^{-1}day^{-1}$). Among fertility -mulch interaction, interaction between 100 % RDF with mulch resulted into highest REY of 45.19 q ha^{-1}, 135.93 q ha^{-1} and 56.70 q ha^{-1} during kharif rabi and summer respectively. This interaction also resulted into highest total system productivity (23.78 t ha^{-1} $year^{-1}$ and 65.15 kg $ha^{-1}day^{-1}$).

Kalyani

Among cropping system rice + potato – maize gave better REY (142.02 q ha^{-1}) whereas rice - potato – jute showed highest net return (Rs 99,473) and B: C ratio (1.78) over rice - rice cropping system (Table 7.3/5). Between tillage treatments, there was no significant difference was observed. Among mulch and no mulch treatments, incorporation mulch resulted into highest PEY (121.4 q ha^{-1}). Between fertilizers treatments, treatment applied with recommended dose of fertilizer (RDF) gave highest net return (Rs. 84, 384) and B: C ratio (1.75) over RDF.

Table 7.3/3. Effect of different innovative farming practices on yield and economics at Navsari

Treatments	Grain Yield (q/ha)			System REY (q/ha/yr)	Gross return (Rs/ha)	Cost of production (Rs./ha)	Net return (Rs/ha/yr)
	Kharif	*Rabi*	Summer				
Crop establishment method							
Minimum tillage	-	-	-	131.46	1,43,165	55,781	87,383
Conventional tillage	-	-	-	139.56	1,51,986	56,199	95,787
C.D. (5%)	-	-	-	NS	NS	-	NS
Cropping systems (3)							
Paddy-Summer Groundnut	29.28	-	19.74	143.18	1,55,093	60,492	95,439
Paddy-Rabi Castor	32.68	24.13	-	96.68	1,05,258	51,616	53,669
Paddy-Sorghum-summer Greengram	31.79	27.58	7.68	166.68	1,81,512	55,864	1,25,648
C.D. (5%)	-	-	-	17.58	19,150	—	19,150
Mulch	-	-	-				
No mulch	-	-	-	131.46	1,43,158	54,533	88,625
Crop residue mulch	-	-	-	139.57	1,51,993	57,240	94,545
C.D. (5%)	-	-	-	5.86	6,383	—	NS
Fertilizer rates	-	-	-				
RDF	-	-	-	155.64	1,40,753	54,245	86,508
25% higher over RDF	-	-	-	166.05	1,54,398	57,736	96,662
C.D. (5%)	-	-	-	5.90	6,383	-	6,383

Sabour

Among tillage treatments, conventional tillage showed better rice equivalent yield (REY) (207.60 q ha^{-1}) and net return (Rs. 1,06,583) over minimum tillage (Table 7.3/6). In case of cropping system rice – potato - onion + maize gave better REY (270.20 q ha^{-1}) and net return (Rs. 1, 13, 232) over remaining cropping system. Treatment applied with mulch and no mulch found at par with each other Between fertilizer treatments, 75% RDF + 25% N VC showed significant superiority in REY (221.0 q ha^{-1}) and net return (Rs. 5,520).

Varanasi

At Varanasi there was no significant difference observed between economic yields under different tillage practices (Table 7.3/7). Among cropping system highest economic yield was observed under rice – potato – moong with 40.3, 176.8 and 14.4 q ha^{-1} respectively. Mulch treatment was found at par with no mulch treatment and fertilizer treatment applied with 125 % RDF showed significant superiority over 100% RDF.

Table 7.3/4. Effect of different innovative farming practices on yield and economics at Pantnagar

Treatments		Rice Equivalent Yield (q/ha)			Total System Productivity (TSP)	
		Kharif	*Rabi*	Spring/ summer	TSP t/ha/year	TSP Kg/ha/ day
Tillage x Cropping system						
Dry seeding /	CS1(Rice-Wheat)	45.12	45.80	00	9.09	24.91
Reduce tillage/	CS2(Rice-Vegetable Pea-Moong)	44.93	152.49	17.23	21.46	58.81
Zero tillage	CS3(Rice-Potato-Maize)	44.04	157.27	135.14	33.64	92.18
Conventional	CS1(Rice-Wheat)	41.96	40.92	000	8.29	22.71
tillage	CS2(Rice-Vegetable Pea-Moong)	41.05	162.14	17.59	22.08	60.49
	CS3(Rice-Potato-Maize)	38.97	138.74	101.52	27.92	76.50
CD (5%)		1.68	6.60	3.82	8.92	2.44
Fertility x Mulch						
100% RDF	M0(No Mulch)	43.44	107.39	39.70	19.05	52.20
	M1(Mulch)	45.19	135.93	56.70	23.78	65.15
75% of RDF	M0(No Mulch)	40.39	96.81	36.94	17.41	47.71
	M1(Mulch)	41.69	123.76	47.65	21.31	58.38
CD (5%)		1.07	3.02	1.51	4.37	1.99

Table 7.3/5. Effect of different innovative farming practices on yield and economics at Kalyani

Treatments	System REY(kg/ha/yr)	System net return(Rs/ha/yr)	System B: C
CS1(rice-rice)	83.63	39393.45	1.400
CS2(rice-potato-jute)	125.41	99472.83	1.778
CS3(rice-potato-maize)	142.01	70926.90	1.550
C.D. (5%)	7.63	11799.11	0.10
T1(reduced tillage)	114.12	66582.36	1.557
T2(normal tillage)	119.91	73279.76	1.595
C.D. (5%)	6.23	9633.94	0.08
M1(non mulch)	112.65	66349.61	1.558
M2(mulch)	121.39	73512.51	1.594
C.D. (5%)	6.23	9633.94	0.08
F1(RDF)	118.76	84384.82	1.749
F2(Higher RDF)	115.28	55477.30	1.403
C.D. (5%)	6.23	9633.94	0.08

Table 7.3/6. Effect of different innovative farming practices on yield and economics at Sabour

Treatments	System REY (q/ha/yr)	Cost of production (Rs./ha)	System net return (Rs/ha/yr)	B: C ratio
Crop establishment method				
Minimum tillage	207.60	1,09,943	98,878	0.97
Conventional tillage	221.70	1,15,198	1,06,583	0.98
C.D. (5%)	8.50	-	5,825	NS
Cropping systems (3)				
Rice-wheat-mung bean	154.40	73,479	91,007	1.25
Rice-potato-onion + maize(cob)	270.20	1,44,589	1,13,232	0.78
Rice-potato+maize-Cowpea(f)	232.70	1,20,516	1,07,774	0.91
Rice-cabbage-mung bean	201.30	1,01,190	98,909	0.96
C.D. (5%)	9.60	-	7,240	0.06
Mulch				
No mulch	212.80	1,11,053	1;02,311	0.97
Crop residue mulch	216.50	1,14,088	1,03,150	0.98
C.D. (5%)	NS	-	NS	NS
Fertilizer rates				
RDF	208.40	1,08,956	99,916	0.97
75%RDF+25%N VC	220.90	1,16,185	1,05,545	0.98
C.D. (5%)	9.80	-	5,520	NS

Table 7.3/7. Effect of different innovative farming practices on yield and economics at Varanasi

Treatments	Economic yield(q/ha)			Straw/stover yield (q/ha)		
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer
Crop establishment method						
Tillage practices (T)						
Reduced tillage (RT)	34.0	65.4	8.8	50.4	89.8	-
Conventional tillage (CT)	32.8	68.8	9	9.1	55.8	88.4
C.D. (5%)	NS	NS	NS	NS	11.63	
Cropping system (3)						
CS1 (Rice-Wheat)	38.5	37.0	0.0	57.4	52.2	-
CS2 (Rice-Potato-Moong)	40.3	176.8	14.4	60.6	165.8	-
CS3 (Maize-mustard-moong)	20.9	13.4	13.4	51.6	38.9	-
CS4(DSR-maize-green gram)	33.9	41.2	8.03	42.7	99.3	-
C.D. (5%)	2.79	9.37	0.95	8.94	16.45	-
Mulching						
No mulch	33.9	66.6	8.8	52.4	87.3	-
Mulching in rabi	32.9	67.6	9.1	53.8	90.8	-
C.D. (5%)	1.77	1.00	NS	2.24	3.55	-
Fertilizer rates						
RDF	32.7	65.0	8.7	50.9	86.4	-
25% higher over RDF	34.1	69.2	9.2	55.3	91.7	-
C.D. (5%)	1.77	2.84	0.40	2.24	3.55	-

7.4 INTEGRATED FARMING SYSTEMS RESEARCH

7.4.1 DEVELOPMENT OF REGION-SPECIFIC IFS RESEARCH MODELS

Development of region-specific integrated farming systems models was initiated in the year 2010-11 at 31 AICRP-IFS centres, representing almost all the 15 agro-climatic regions of the country. The annual progress report 2011-12 contains data (Tables 7.4/1-3) mainly on production and returns of IFS models.

Pantnagar (Uttarakhand)

At Pantnagar (Uttrakhand), IFS model is established on an area of 1.0 ha. The results of very first year (2011-12) revealed that diversification of existing farming system (crop + hort. or crop + dairy) by proper integration of all the three farm components; i.e., crops + horticultural crops (fruits & vegetables) and livestock; along with vermicomposting as value addition practice (Table 7.4/1) produced total yield of 19.0 t/ha/year in terms of rice equivalent (REY). Unit realised significantly higher gross and net returns of Rs. 2,85,665 and Rs. 82,585 per hectare as compared to prevailing farming systems (Rs.75,764 and Rs. 46,000, respectively) adopted by the farmers of the region. Among different component enterprises of the IFS model, the maximum net returns of Rs. 42,610 (51.7%) was obtained from livestock, including vermicompost, followed by Rs. 21,040 (25.5%) from crop component. Production of sufficient quantities of cereals (4030 kg), pulses (386 kg), oilseeds (183 kg), vegetables (833 kg), green fodder (22640 kg) and dry fodder (11198 kg) etc. fulfilled the demand of household's food and fodder needs and simultaneously reduced market dependency for domestic items.

Jammu (J & K)

In IFS model of 1.5 ha developed at Chhata (J & K) Centre wherein interventions of horticultural crops, fishery, poultry, apiary ,vermicomposting and boundary plantations were added in to the prevailing farming system of the region (Crop + Dairy), gross and net returns as high as Rs. 3,46,242 and Rs. 1,51,803 per hectare per year with production of 16.64 t/ha/year (REY) were reported. The maximum net return of Rs. 80,059 (52.7%) was obtained from Livestock cum vermicompost module followed by Rs. 26,177 (17.24%) from crop enterprise. Diversification/ intensification in the prevailing farming system (Crop + Dairy) produced more than sufficient quantities of cereals (8094 kg), pulses (1050 kg), oilseeds (952 kg), milk (5856 litre), vegetables (14566 kg), eggs (1500 nos.), green fodder (10115 kg) and dry fodder (2292 kg) etc. not only to meet out annual food and fodder requirements but improving nutritional status of daily meal of an average seven member family in the region. The total cost of production of different farm components/enterprises of IFS model was Rs. 2,42,226, out of which only Rs. 1,45,729 (60%) was invested for purchase of external inputs from market and rest of the expenditure Rs. 32,910 (13.58%) from recycling within the system and Rs. 63,587 (26.26%) as farm labour was managed at farm itself.

Palampur (HP)

Crop + Livestock/horticulture is the predominant farming system in hilly areas of Himachal Pradesh. Scientific management of crops and proper feeding of dairy animals and intervention of horticultural crops & value addition of farm produces etc. In an on station IFS model at Palampur (HP) produced as high as 21.54 t/ha/year (REY) and earn gross income of Rs. 2,58,447 from an area of 1.0 hectare much more than the existing farming system (Rs.1,70,387) from the same acreage. In different farm components maximum gross return of Rs. 1,03,329 was obtained from cropping system module which contributes 40% of total farm income followed by

Rs. 99,071 (38.3%) from Livestock cum vermicompost module. Looking in to the different farm produces produced under diversified system of farming (cereals - 5985 kg , pulses - 685 kg , oilseeds - 150 kg , milk - 3254 litre , vegetables - 2330 kg , green fodder -10750 kg and dry fodder - 6610 kg), it is clearly visualized that IFS approach is not only efficient way of fulfilling demand of food and fodder of a family but besides improving nutritional status of daily meal can earn additional money for meeting other liabilities of the family. The results of the study further envisage that proper recycling of farm main and by products and use of family labour, cost of production can be minimised or met out at farm itself by 45% or more.

2. Trans Gangetic Plains Region

Trans Gangetic Plains Region is represented by the states of Punjab and Haryana. Under AICRP-IFS, two independent centers one in PAU, Ludhiana (Punjab) and another one in CCSHAU, Hisar are given the responsibility of development of "Region specific IFS models" at respective centers. Composition of IFS models developed and performance and effectiveness in very first year of establishment of the models is given here under;

Ludhiana (Punjab)

Punjab is a rich state in natural heritage and well endowed with fertile soils and sufficient irrigation water. Crop + dairy with 82% farm families is the dominate farming system of the region with an average annual returns of Rs.91, 400. IFS model developed at PAU, Ludhiana comprised of crops +dairy + hort. + fishery + mushroom along with kitchen gardening and boundary plantations as mandatory enterprises which produced 29.17 t/ha/year of REY with gross and net returns of Rs. 2,82,692 and Rs. 1,55,207/ha/year respectively, showing that IFS approach doubled gross return (209%) above and over farmer practices in a very first year of its establishment. Maximum contribution in farm income was from crop components (44%) closely followed by Livestock cum vermicompost module (38%). Total production cost of different farm components/enterprises of IFS model (1.0 ha) was Rs. 1,27,485, however, only Rs. 29,975 (23.51%) was purchased from the market and rest of the amount ie., Rs. 26,510 (20.79%) met from recycled inputs and Rs. 71,000 (55.69%) value of farm labour engaged were managed within the system.

Hisar (Haryana)

At CCSHAU, Hisar (Haryana), the targeted activities could not be initiated /completed yet and the data submitted by the center neither found proper and hence not included.

3. Upper Gangetic Plains Region

In this Agro Climatic Region two AICRP-IFS centers namely PDFSR, Modipuram, Meerut (U.P.) a voluntary ICAR institute and CSAUA&T, Kanpur (U.P.) both in Uttar Pradesh are working on the aspect of "Development of Region Specific IFS Models". The findings of very first year (2011-120 of the study are described below;

Modipuram (UP)

The results of the very first year of establishment of the IFS Model at PDFSR, Modipuram revealed that production from even a small area of 3800 sq.m. is sufficient to meet the household annual food and fodders demand of a six member family and their animals. A small area of 0.7 ha (Marginal Farm conditions) land produced 20.42 tonnes in term of rice equivalent yield (REY) and gross and net returns to the tune of Rs.3,67,498 and Rs. 1,32,514, respectively. IFS approach increased gross returns manifold (500% or more) as compared to farmer practice. Scientific management of dairy animals and their products and by products enabled to give higher share in net income as compared to crops and other enterprises. The income will further increase in ensuing years when perennial fruit crops mandarin (kinnow)& banana and boundary plantations karonda& guava will also start fruiting. The total cost of production of different farm components/ enterprises of IFS Model (0.70 ha) was Rs. 2, 35,084. However, out of total cost of production

Rs.2,35,084 more than 58 % part of cost of production could be saved by proper recycling of farm products and by products (Rs.72,923) plus family labour-531 Man Days costing Rs.63,720 and farmer has to invest only 42% of it on external inputs, thus economising the production cost to a great extent .

Kanpur (UP)

One hectare model developed at CSAU, Kanpur comprising of crops (0.72ha), dairy (1 cow + 1 buffalo) and horticultural components (0.2 ha) alongwith value addition aspects realized a gross return of Rs. 2,35,791 and a net return of Rs. 1,33,987 in its first year of establishment. Contribution of crops and dairy in total gross return being similar, net returns were very low (just half) in dairy because of initial investments on purchase of animals and other necessities of the enterprise. The total input cost involved for the system was Rs. 1,01,804. Most of the input cost was met from on farm resources. Out of total input cost of Rs.1,01,804, about 32.98 % was met through resource recycling of on farm products and by products while another 46.97 % was saves through use of on farm labour generating an family employment of 398 man days. Profitability of the system will be further enhanced in coming years with increasing contribution of horticultural sector.

4. 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 engaged in 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 region as reflected in the results of very first year of the programme is summarized hereunder;

Sabour (Bihar)

At Sabour district Bhagalpur(Bihar), one hectare IFS model land was allotted in different farm componentS consisting crops (0.70ha), livestock (2 cow) + 11 goats + hort. (0.14ha) + fishery (0.08ha) + mushroom/kg/bp (0.03ha). The results of 1st year have shown a very encouraging trend of total production (24.94 t/ha/annum) and gross & net returns of Rs. 2,61,880 and Rs. 1,03,684. Maximum gross return of Rs. 1,16,742 was obtained from cropping system module which contributes 44.6% of farm enterprises followed by Rs. 91,575 (23.5%) from livestock cum vermin - compost module. Production of more than sufficient quantities of cereals (5634 kg), pulses (80 kg), oilseeds (130 kg), milk (2223 litre) vegetables (2940 kg), green fodder (20695 kg), dry fodder (11275 kg) and fuel wood (1725 kg) etc. not only fulfilled household food and fodder demands but besides improving economic condition of the family also helped in maintaining nutritional status of daily food. Market dependency for domestic food items as well as farm inputs also minimised. This may be visualised from reduced cost of external farm inputs (23.7% only) and increased contribution of recycled farm products and by products (28.1%) within the system. Farm labour engaged amounted 48.2% of total cost of cultivation emphasizing the increased role of farm labour in diversified agriculture than existing farming system.

Patna (Bihar)

Crop+dairy (70%) and crop+fishery (20%) are the major farming systems of the eastern region of Bihar with an average land holding ranging from 0.3 ha (Marginal farmers) to 1.21 ha (Small farmers) and family size of 7 members. IFS studies conducted at AICRP-IFS Centre RCER, Patna revealed that diversified farming system consisting a combination of crops (0.60ha) + livestock(1 cow,700 broilers,20 goats) + horticultural crops (0.38ha) + fishery (0.10ha) + other supplementary things like vermicompost/kg/bp etc. besides producing significantly higher annual production in term of rice equivalent yield (50.86 t/ha/year) realized gross and net returns as high as Rs. 5,95,059 and Rs. 2,40,273, respectively. Gross returns in IFS approach were 7.8 times more as compared to prevailing farming system crop + dairy (Rs. 6,33,03/ha) of the region. Integration of the components like poultry, fishery and horticultural

crops in to prevailing farming system crop+ dairy animal cow contributed almost in same preposition (30%) as of crops and dairy. When considering household food, fodder and nutritional security, diversification/intensification could produce sufficient quantities of cereals (5020 kg), pulses (1340 kg), oilseeds (310 kg), milk (7302 litre), fruits (2892 kg), vegetables (6910 kg), eggs (6300 nos.) green fodder (20440 kg) and dry fodder (7440 kg) mushroom (106 kg) etc. enabling the family self sufficient and lesser dependency on outside purchases. Proper recycling of farm produces and crop residues, farm wastes etc. within the system brought a reduction of 40.28% in total cost of cultivation (Rs. 3,54,786) of 1.2 ha land under IFS model thus economised crop production and increased farm profits.

Varanasi (UP)

For livelihood improvement and ensured food, fodder and nutritional security of a seven member family under small farm conditions, an one hectare IFS model is developed at AICRP-IFS Centre BHU, Varanasi consisted crops (0.81ha), dairy animal (4 cows), Poultry (400 broiler + 800 croiler), horticultural crops (0.06ha), fishery (0.1ha) and mushroom (0.01ha). In vary first year of the study total farm production in term of rice equivalent yield (REY) was 43.76 t/ha and gross and net returns as high as Rs. 6,56,481 and Rs. 2,50,465/ha /year, respectively which emphasized the significance of IFS approach. Production of sufficient quantities of cereals (4046 kg), pulses (744 kg), oilseeds (206 kg), milk (10222 litre), fruits (240 kg), vegetables (2219 kg), green fodder (23722 kg), dry fodder (8680 kg) and mushroom (106 kg) etc. much more than annual demand of food and fodder of the family and also improved nutritional status because of additional food products viz; milk,fruits, meat etc. and thereby prevented them market dependency for domestic consumption. When talking of relative contribution, the maximum gross return of Rs. 4,61,924 was obtained from Livestock/ vermicompost model which contributes 39.7% of farm enterprises followed by Rs. 1,44,705 from cropping system model. The total cost of different farm components/enterprises of IFS model (1.0 ha) was Rs. 4,06,016, however, only Rs. 1,95,250 (48%) was invested externally for purchased of inputs from market and other rest amount of Rs. 1,01,389 (25%) and Rs. 1,09,375 (27%) were generated internally from recycled farm produces and engaging family labour respectively.

Faizabad (UP)

Crop + dairy is the prevalent farming system with 90% farm families in Faizabad and adjoining districts representing Middle Gangetic Plain Region. Scientific management and integration of horticultural crops in to prevalent farming system in an IFS study initiated in 2011-12 at Kumarganj, Faizabad revealed that production from the 7000 m^2 crop component is sufficient to meet the household annual food demand for a 7 member family along with fodder demand for the dairy animals (2 cow and their youngones. On farm production of cereals, pulses, oil seeds, fruits, vegetables not only reduced the dependency on market but also provided nutritional security. Year round production of green fodder provided for sustainability of the dairy component. Total farm production 22.37 t/ha/year with gross return of Rs. 2,46,175 and a net return of Rs. 1,42,406 could be realized indicating that IFS approach besides livelihood security and nutritional improvement enabled to get 2 to 3 times higher returns than prevailing farming practices adopted by the farmers. The total input cost for the system was Rs. 1,03,769 of which only 32.20 % was procured from market and rest was generated within the farm through recycling of on farm products and by products (24.04%) and use of 453 man days in the form of farm labour saving 43.65 % part of cost of cultivation.

5. Lower Gangetic Plains Region

Kalyani (WB)

Crop + dairy (70 %) followed by crop + vegetable (20%) are the dominate farming systems in the lower gangetic plain region. Integration of fishery in to existing farming practices, farm produce on farm processing and value addition and

proper land distribution among the farm enterprises could realized total farm production of 6.26 t/ha/year (REY) with gross and net returns of Rs. 75,150 and Rs. 20,665 under IFS study initiated at AICRP-IFS Centre Kalyani, WB. As this was the first and establishment year the production and profits were at lower side and will increase significantly in ensuing years with returns from fishery and horticultural enterprises. The total cost of different farm components/enterprises of IFS model (1.16 ha) was Rs. 54,484.50 and out of which a revenue of Rs. 23,135.50 was generated by utilizing the 149 man days of family labour contributes 42.47% farm input cost, however, only Rs. 31,348.95 (57.53%) was purchased from the market externally.

6. 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.

Umiam (Meghalaya)

One hectare IFS model developed at AICRP-IFS Centre Umiam, Meghalaya consisted Crops (0.70ha), animals (pig-1), Poultry (broilers-600), horticultural/plantation crops (0.22ha), fishery (0.05ha) produced significantly higher farm production in term of rice equivalent yield (REY) of 24.94 t/ha/year with gross and net returns of Rs. 3,68,643 and Rs. 1,88,277. Farm production consisting cereals (1444 kg), pulses (208.5 kg), oilseeds (473 kg), fruis (175 kg), vegetables (8051.5 kg), and dry fodder (3382kg) etc. helped in fulfilling family food and fodder demands alongwith improving nutritional status of six family members and helped to reduce the market dependency for domestic consumption. Out of total cost of production Rs. 1,80,366/ha/year only Rs. 1,19,239 (66.1%) was spent on the inputs purchased from the market while rest amount of Rs. 28,543 (15.82%) and Rs. 32,583 (18.06%) were generated internally from recycled farm produces and utilizing the cost of family labour respectively.

Jorhat (Assam)

The IFS model developed at AAU, Jorhat comprised of crops, dairy, fishery and apiary components and plantations all along the farm boundaries. Total farm production in term of rice equivalent yield was 14.16 t/ha with gross return of Rs. 2,12,535 and a net return of Rs. 89,120 from integration of these enterprises in a system mode. Highest contribution to the gross return was from dairy component (Rs.1,03,730) followed by crops (Rs.72,300),fishery (Rs.27005). Net returns however was more in crops than dairy. Even in its first year of establishment horticultural component gave a positive net return. Profitability of the system will be further enhanced in coming years as perennial plants bearing fruits.

7. Eastern Plateau and Hills

IGKV, Raipur (Chhattisgarh) 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 (Chhattisgarh)

Crop + dairy (cow and buffaloes) is the most dominate farming system of Chhatisgarh state with 90% farm families adopting it. The farming is mostly of subsistent nature with low profit margins of less than Rs.25,000/ha/annum. An one hectare IFS model was established at IGKV, Raipur (Chhattisgarh) during 2011-12 with composition having crops (0.59ha), dairy (2 cows), poultry (150 birds), horticulture and plantation crops (0.23ha), fishery (0.08ha). The average family size of the district is 5 family members and holding size below 1.42 hectare of land. During first year of establishment of the IFS model the total production of the model in term of rice yield equivalent was 13.13 t/ha/year with gross and net returns of Rs.1,37,876 and Rs.82,613/ha/annum, 2-3 times more than prevailing farming system of the district. The production of different farm commodities

included cereals 9953kg, pulses 513 kg, oilseeds 54 kg, vegetables 3861 kg and milk 1425 litre and 9172 kg green fodder and 5858 kg dry fodder besides fulfilling family domestic consumption needs generated sizable income for other liabilities of the family. The total input cost for the model was Rs. 55,263 of which 45.70 % was saved through use of on farm labour and about 8 % through on farm resource recycling making the model profitable and sustainable. Besides fulfilling household food requirements the system could also generate round the year green fodder for the dairy animals as well as providing substantial amount of dry fodder. Diversified nature of the IFS approach generated an additional 191 man days thus providing more employment to the rural youths. In this way the IFS approach is sustainable, more productive, economic, more employment generative and eco-friendly, simultaneously.

Ranchi (Jharkhand)

The major farming system of Jharkhand state is crops + goat/poultry (60%) and or crops + dairy + poultry (20%) with an average land holding of less than 1.45ha. IFS studies were started at AICRP-IFS centre at Ranchi (Jharkhad) in 2010-11 but because of internal problems could not be established fully in the reported year. The dairy animals were purchased in later phase of the year and thus the income from the component not included this year. The income was mainly from crop component and fishery to some extent and as such is at lower side. The gross and net returns of Rs. 67,470 and Rs. 19,581/ha /annum were mainly from crop component including Rs. 3100 from fishery.

8. Central Plateau and Hills

Jabalpur (MP)

AICRP-IFS Centre Jabalpur(MP), represents ACR Central Plateau and hill Region of the country. Major farming system of the region is crop+dairy with adoption by 80% farmers followed by crop+dairy+horticuture/fishery. Family size of 6 members having average holding of less than 1.45 ha. For livelihood improvement of small land holders of the region an IFS model established at the center comprises crops (0.90ha), dairy animals (3 cows), nutritional garden (24 m^2), fishery (0.06ha) and other supplementary/complementary farm components viz; mushroom, kg and boundary plantations. First year results of this IFS model recorded gross and net return of Rs. 3,00,276 and Rs. 1,34,674, respectively with total farm production of 25t/ha/annum in term of rice equivalent yield. In total farm production, among the different IFS component integrated in to the model, the maximum contribution in gross return (60.4%) was obtained from livestock cum vermicompost module followed by crops (32.9%) model. Production of food and fodder from different component farm enterprises helped in maintaining sufficient food & fodder and nutritional status of family members and thereby prevented them market dependency for domestic consumption. The total cost of different farm components/ enterprises of IFS model (1.0 ha) was Rs. 1,78,628, however, inputs costing only Rs. 69,278 (38.78%) was purchased from the market and other rest amount of Rs. 15,000 (8.38%) from on farm recycling and Rs. 93,900 (52.57%) by utilizing family labour were managed within the system itself. In this way the cost of production was minimized by 60% or more and all the family requirement produced at the farm itself reducing dependency on market for home consumption commodities, thus making system self sustainable.

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 in Table 1 and described below;

Parbhani (Maharashtra)

Crop + dairy (55%) and crop + horticultural crops (fruits and vegetables) 35% are the two major farming systems of the area represented by the district Parbhani (Maharashtra). Average holding size of this region is below 1.42 ha with seven family members. To sustain the livelihood of the small farm holders of the region and improve further, IFS studies were initiated at AICRP-IFS center at Parbhani during 2010-11. After one year of start of the study the farm production reached to the level of 15.76 t/ha/year with gross and net returns of Rs. 1,57,607 and Rs. 64,419. However, among the different component farm enterprises studied, the maximum gross return of Rs. 64,156 was obtained from horticulture/plantation crops system module which contributes 40.7% of farm enterprises followed by Rs. 56,328 (35.7%) from Livestock/vermicompost module. The total cost of different farm components/enterprises of IFS model was Rs. 93,188. By use of farm products and byproducts and recycling of crop residues and farm wastes and also organic means of nutrients a sum of Rs. 32,110 (34.45% of total cost) was saved within farm itself. In addition to this Rs. 40,400 (43.35%) were generated internally by utilizing the cost of family labour which is directly or indirectly is the income of the family.

Akola (Maharashtra)

At AICRP-IFS center Akola, this was the establishment year and the results were also not consistent. Only crop component gave some good results and others will produce significant output in comimg years. The results of this IFS model revealed the gross returns of Rs. 1,10,848 while, negative net return of Rs. 9,758 was recorded which might be due to initial investment on livestock. However, among the different component farm enterprises studied, the maximum net return of Rs. 49,291 was obtained from cropping system model which contributes maximum gross returns by 90.5% of farm enterprises. The total cost of different farm components/enterprises of IFS model was Rs. 1,20,606, however, only Rs. 46,238 (38.33%) was invested externally for purchased of inputs from market and other rest amount of Rs. 3,448 (2.85%) and Rs. 70,290 (58.28%) were generated internally from recycled farm produces and utilizing the cost of family labour respectively.

Rahuri (Maharashtra)

In Rahuri district and its adjoining areas crop + dairy with 85% area coverage is the most dominate farming system. To make the system more diversified and fulfill the domestic food and fodder commodities essential for daily home consumption so that food and feed can be made more nutritious and balanced alongwith overall improvement in livelihood of small and marginal farmers of the region an IFS study was initiated at AICRP-IFS center Rahuri (Maharashtra) in 2011-12. The IFS Model deloped at the center included crops (0.60ha), dairy animals (2C+2B), poultry (400 birds) and horticultural crops (0.20 ha). The results of this IFS model revealed that total production in term of rice equivalent yield was 13.7 t/ha with gross and net returns of Rs. 2,05,624 and Rs. 1,42,068/ ha/annum which was not only sufficient enough to meet the annual food and fodder requirement but helped in improving nutritional status in form of additional quantities of milk, fruits and vegetables for family members and round the year fodder availability for dairy animals. Production of sufficient quantities of cereals (3640 kg), pulses (710 kg), oilseeds (250 kg), milk (5809 litre), fruits (1000 kg), vegetables (10700 kg), green fodder (20670 kg) and dry fodder (5555 kg) etc. in fulfilling the nutritional status of family members and thereby prevented them market dependency for domestic consumption. The total cost of different farm components/enterprises of IFS model (1.0 ha) was Rs. 1,59,410, however, only Rs. 76,730 (48.13%) was invested externally for purchased of inputs from market and other rest amount of Rs. 30,679 (19.2%) and Rs. 52,001 (32.62%) were generated internally from recycled farm produces and utilizing the cost of family labour respectively.

10. Southern Plateau and Hills

Four AICRP-IFS centers namely, ANGRAU, Rajendra Nagar, Hyderabad (A.P.), TNAU,

Coimbatore (Tamilnadu), ARS, Kathalgere (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 are in process of developing region specific IFS models at their respective centers since 2010-11.

Rajendra Nagar (AP)

The results from the IFS model (1.5 ha) at Rajendranagar, AP in its second year of establishment revealed that this IFS model could meet out the household food demand for a five member family and could also provide year round green fodder for milch animals. The system could generate a net return of Rs. 89,452 and gross return of Rs. 2,51,609 with rice equivalent yield of 22 t/ha/year from an one hectare IFS unit containing crops (0.70ha), livestock (dairy – 4 buffaloes, poultry-20 birds, goat-6), and horticultural component (0.20ha). The total cost of production for this IFS model was calculated to be Rs. 1,62,066 of which about 53.3 % was generated within the farm itself. An employment generation of 445 mandays was realized from the system. The profitability of the system is expected to be further enhanced in ensuing years.

Coimbatore (TN)

The area represented by the AICRP-IFS center Coimbatore (Tamilnadu) is having an average land holding below 1.4hectare with 5 member family. The dominate farming system of the region with their area spread are crop+ dairy (60%) and crop + goatary (40%). Results obtained from IFS model (1.2 ha) at TNAU in its initial year of establishment revealed that outputs in terms of cereals (4276 kg), pulses (1282 kg), oilseeds (913 kg) were sufficient to satisfy the needs of an average household. This model could also cater to the nutritional needs of the family through fruits (6995 kg), vegetables (6782 kg) and milk production (4947 litre). Round the year supply of green fodder ensured feed for the animals and reduced market dependency. Total farm production per hectare basis was 25.55 t/ha/year, gross and net return from this 1.2 ha IFS model was Rs. 4,59,934 and Rs. 2,28,070, respectively. Maximum gross and net return was obtained from the livestock component of the IFS model which included dairy and goatary component. In the coming years produce from the boundary plantation will further enhance the income from the model. Total cost of production for this 1.2 ha IFS model was calculated to be Rs. 2,31,864 of which only 34.41 % was procured from the market. Rest of the inputs in terms of resource recycling (28.06 %) and on farm labour (37.52) was generated within the farm. The entire system generated an employment of 580 mandays through diversification.

Kathalgere (Karnataka)

The area represented by the AICRP-IFS center at Kathalgere (Karnataka) having an average land holding below 1.44 hectare with 5 member family. The dominate farming system of the district Davangere with their area spread are crop+dairy (60%) and crop+dairy+horticulture (40%). IFS model (1.0 ha) developed at ARS, Kathalagarh in its first year establishment comprised of crop, dairy and horticulture component. This IFS model could generate total production of 20 t/ha/year (REY) and gross and net returns Rs. 2,80,762 and Rs. 1,95,577/ha/year, respectively. This model could also able to meet the household demand for cereals, pulses, vegetables as well as fodder demand of mulching animals. Total input cost for the IFS model was Rs. 85,185. Out of the total input cost 34.45 % was saved through use of on farm labour while an amount of Rs. 8,500 (9.96 % of input cost) was saved through recycling of on farm products and by products from IFS system. Profiatbility will be further enhanced in coming years with establishment of fishery unit which will also facilitate resource recycling. The system could generate an employment generation of 304 days in its first year of establishment. The most dominate farming system of district Sirruguppa (Karnataka) is Crop+Dairy with 80% spread in the region. Average holding size of the area is below 1.44 hectare with 7 member family size. To diversify the prevailing farming system and getting higher profits alongwith food and fodder security

among small farm holders, an IFS model consisting farm components crops (0.72ha), dairy animals (1 cow+1 buffalo), horticultural crops (0.20ha), fishery (0.03ha) and other subsidery enterprises like mushroom, kitchen gardening and boundary plantations etc in remaining area of 0.055 ha was established in 2011-12. The total farm production from the 1.0 hectare land was 14.67 t/ha/year in term of rice equivalent yield and gross and net returns of Rs. 1,90,764 and Rs. 1,04,324, respectively. Cost of cultivation for the system was observed to be Rs. 86,440 of which only 6.47 % was generated within the farm itself through recycling of products and by products while 45.92 % of the input cost was saved using on farm labour. Dependency on the market was restricted only to 44.43 %. Major portion of the recycling was done in dairy and horticulture component. The system could also meet a major portion of the household requirement for food and fodder demand for animals. An employment generation of 424 mandays was possible through use of on farm labour. The profitability of the system will be further raised when fishery component will start contributing from next year. Similarly as the perennial boundary plantations start bearing fruits, profitability of the system will be further enhanced.

11. East Coast Plain & Hills

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. Crop+dairy (80%) and crop+dairy+fishery (20%) are the major farming system with an average land holdings ranging between 0.5ha to 1.39 ha of land. Average family size is 7 members. The composition of the IFS model developed include crops (0.38ha), dairy animal (2 cows), poultry (80 birds), duckery (20 ducks), hort. (0.09ha), fishery (0.33 ha) and other supplementary enterprises like mushroom, (0.12 ha). The total farm production in term of rice equivalent yield (REY) in very first year of start of the programme reached to 15.0 t/ha with gross and net returns of Rs. 2,87,861 and 55,030/ha/year, the maximum contribution in income being from livestock component (Rs. 1,41,252) followed by cropping systems (Rs. 38,312) followed. Production of varied nature of farm produces included cereals (1324 kg), milk (5298 litre), coconuts (1514 nos.), vegetables (983 kg), eggs (851 nos.) green fodder (25600 kg), dry fodder (1500 kg) and fuel wood (980 kg) not only fulfilled household food and feed consumption but simultaneously improved the nutritional status of family members and thereby prevented them market dependency for household domestic needs. The total cost of different farm components/ enterprises of IFS model (1.25 ha) was Rs. 1,66,039, however, only Rs. 83,603 (50.35%) was invested externally for purchased of inputs from market and other rest amount of Rs. 25,484 (15.35%) and Rs. 56,952 (34.3%) were generated internally from recycled farm produces and utilizing the cost of family labour 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

Average holding size in Goa region is ranging from 0.32 ha (Marginal farmers) to 1.26 ha (Small farmers) with 5 member family size. Crop + dairy in general and plantation crops in particular are the farming scenario of the region. 5.35 t (7400) The IFS model (0.74 ha) at ICAR RC, Goa in its second year of establishment provided gross return of Rs. 80,320 while net return was only Rs. 35,020. The System productivity in term of rice yield equivalent was reported to be 7.23 t/ha/year. Though the crop component provided a positive net return, the net return from poultry component was negative as the input cost for poultry component was higher in terms of feed

concentrate and labour. Total input cost for the system was Rs. 39,269 of which a major portion was from engagement of labour (62.26 %) while dependency on market for procurement of inputs was 29.58 %. The recycling of the on farm products and by products was limited to only 8.14 %. The profitability of the system could be enhanced through diversification and more resource recycling. An employment generation of 163 mandays was achieved through the IFS model. In coming years with contribution of horticultural fruit plants and more resource recycling profitability of the system will be further improved.

Karmana (Kerala)

AICRP-IFS Centre at CSRC, ARS, Karmana, Trivendrum (Kerala) is located in coastal areas of Kerala state. Coconut based homestead farming is the major type of farming in the region with average holding size ranging from 0.14 ha (marginal farmer) to 1.32 ha (small farmer) with a small farm family size of 5 members. IFS model (1.33 ha) being developed at the center consist of crops (0.50 ha), dairy animal (2 cow), hort. (0.06 ha), fishery (0.05 ha) and other subsidiary enterprises like mushroom, etc. The results of this IFS model recorded a farm production in term of rice yield equivalent of 5.59 t/ha/year with gross return of Rs. 1,11,640 (Rs. 83,939/ha/annum) while, a negative net returns of Rs. 49,167 (Rs. 36,967/ha/annum) which might be due to initial investment for purchase of livestock. In the first year of production, among the different IFS component farm enterprises, the maximum gross return of Rs. 69,916 was obtained from Livestock/ vermicompost module which contributes 62.6% gross farm income followed by Rs. 31,175 (27.9%) from cropping system model. Among different farm produces essential food commodities included were cereals (1640 kg), milk (2040.75 litre) and dry fodder (2630 kg) etc. The total cost required for different farm components/enterprises of IFS model (1.33 ha) was Rs. 1,61,007. However, the total expenditure incurred on purchased of inputs from market was Rs. 68,906 (42.8%) while, other rest amount of Rs. 34,000 (21.1%) and Rs. 58,101 (36.1%) were generated internally from recycled farm produces and utilizing the cost of family labour respectively.

Karjat (Maharashtra)

AICRP-IFS center at DBSKKV, ARS, Karjat, Raigarh did not report results during the reporting year and as such not included in the report.

13. Gujarat Plains & Hills

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. Average holding size of the region ranges from 0.53 ha (marginal farmers) to 1.46 ha (Small farmers) with 6 member family. For enhancing farm income and making farming more diversified region specific IFS model is being developed at AICRP-IFS Centre located in S. K. Nagar, Gujarat. The composition of the IFS model constitute crops(0.70 ha), dairy animal (2 buffaloes), horticultural crops (0.25 ha). In very first year of the Model establishment, the total farm production was recorded 22.61 t/ha/annum (REY) along with Gross and net returns of Rs. 339244 and Rs. 1,99,483, respectively. Among the different IFS component farm enterprises, the maximum gross return of Rs. 1,62,485 was obtained from cropping system model which contributes 58.84% net farm income followed by Rs. 1,13,609 (19.8%) from Livestock/vermicompost model. This IFS model system produced sufficient quantities of cereals (1510 kg), pulses (1900 kg), oilseeds (874 kg), milk (3479 litre), vegetables (3515 kg), green fodder (28281 kg) and dry fodder (7807 kg) etc. which besides fulfilling the annual food and fodder requirement of six family members helped in improving nutritional status of the family members. Not only this but farmers become less dependent on market for their domestic consumption. The total cost required for different farm components/ enterprises of IFS model (1.0 ha) was Out of total cost of production Rs. 13,9761 on different farm

enterprises Rs. 29,041 (20.78%) and Rs. 45,260 (32.4%) were generated internally from recycled farm produces and cost of family labour respectively and farmer has to invest only 47% input cost from outside market. In this way cost could be reduced to half in IFS approach.

14. Western Dry Region

Durgapura (Rajasthan)

Crop+dairy 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 (marginal farmer) to 1.44 ha (small farmer) with a family size of 7 members. To improve the livelihood of small land holders of the region an IFS model (1.00ha) with diversified nature of farm components including crops (0.24 ha), dairy animals (2 cows), goatary (11 goats), hort. (018 ha) and other supporting activities including vermicomposting, kitchen gardening and boundary plantations etc. were initiated at SKRAU, Durgapura-Jaipur (Rajasthan) during 2011-12. In very first year of the study the total production of the farm area converted in to rice yield equivalent (REY) was 14.12 t/ha/year with gross returns of Rs. 2,11,843/ha/annum. The IFS model in its first year of establishment provided a negative net return, the reason being huge cost involved in purchase of animals, construction of animal shed and engagement of labour etc. Out of the total input cost of Rs. 2,84,881 (23.04 %) could be generated through recycling on farm produce and about 42.83 % through use of on farm labour. The system produced 759 kg cereals, 106.5 kg pulses, 96 kg oilseeds, 2486.7 kg vegetables and 952 litre of milk. Profitability will be enhanced by optimizing the labour cost in coming years and production through supplementary components.

15. Island

Port Blair (A&N Islands)

Plantation crops + pig (50 %) followed by crop + dairy animal cows + fish (45 %) are two equally important and prevalent farming systems of the region. Pigs are important animal of the region and symbol of social status too. The holding size ranged in between 0.39 ha (marginal farmer) to 1.38 (small farmer) with an average of 7 members in a family. The results of this IFS model developed at AICRP-IFS center at Portblair (A&N), revealed the gross and net returns of Rs. 29,700 and Rs. 9,526 respectively. In this centre among the different component farm enterprises, only cropping system model was practised. The total cost of different farm components/enterprises of IFS model was Rs. 20,174, however, only Rs. 8,099 (40.14%) was invested externally for purchased of inputs from market and Rs. 12,075 (59.86%) were generated internally by engaging 69 man days family labour.

An overview of IFS model at Sabour

Duck unit of rice based wetland IFS model at Karamana

Fish harvest of Rice based wetland IFS model at Karmana

Fodder component (maize+cowpea) of IFS model at Coimbatore

Bittergourd trailed along the fish pond dykes in wetland rice-based IFS model at Karamana

Horticulture unit of IFS Model at Siruguppa

Table 7.4/1: Dominant farming systems in different parts of the country and production and economics potential of diversified farming systems being developed at different AICRP-IFS centre

ACR	AICRP-IFS Centers	State	Composition of IFS Model developed	Area of Model (ha)	Gross Return (Rs./ha)	Net Returns (Rs./ha)	Total Prod. REY (t/ha)	Predominant farming system	Gross Returns (R./ha)
WHR	Pantnagar	Utranchal	Crop (0.52)+dairy (2c)+hort. (0.42)+plantation crops+vermicompsot	1.00	285665	82585	19.04	Crop + livestock + hort./ agroforestry	2,91,733
	Palampur**	H.P.	Crops (0.65)+dairy+hort. (0.175)+fodder (0.10)+ Agroforestry	1.00	258447	60337	21.54	Crop + livestock+ plantation crops /fruits	1,73,354
	Chatha	J&K	Crops (0.45)+dairy (1B+1C)+hort. (0.305)+ V.C. (0.05)+ (B.P.0.10) + Veg. (0.04)+ apiary (0.001) + fish (0.10) + poult. (0.002)	1.50	346242	151803	16.64	Crop + dairy	89,500
TGPR	Ludhiana	Punjab	Crops (0.64)+dairy (2c+2calves)+ fish (0.10)+ hort. (0.20)+ veg.+ agro-forestry (0.03)+ B.P. (all around)+ K.G. (50 sq.m.)	1.00	282692	155207	29.17	Crop + dairy	90,075
	Hisar	Haryana	Crops (0.8)+ hort. (0.16)+ vermicompost	1.00	154050	109276	10.27	Crop + dairy + hort. + veg.	2,13,961
UGPR	Modipuram	U.P.	Crops (0.38)+ dairy (2B+1)C+ hort. (0.30)+ mushroom (0.002)+ V.C. (0.01)+ B.P. (ALL AROUND)+ K.G. (50 sq.m.)	0.70	367498	132414	29.17	Crop + dairy, crop + dairy + horticulture	1,06,558
	Kanpur	U.P.	Crops (0.72)+ hort. (0.192)+ dairy (0.06)	1.00	235791	133987	14.73	Crop + dairy, crop + dairy + hort.	91,143
MGPR	Kumarganj	U.P.	Crops (0.7)+ hort. (0.2)+ dairy (0.1)	1.00	246175	142406	22.37	Crop + livestock	54,670
	Varansi	U.P.	Crops (0.81)+ veg. + dairy (4c+3calves)+ hort. (0.06) + poult. (400B+800C)+ fish(0.1)+ Mushroom(0.002)	1.00	656481	250465	43.76	Crop + dairy, crop + vegetables	
	Sabour	Bihar	Crops (0.70)+ dairy (2C+2K)+ hort. (0.14)+ goat (11)+ fish (0.08)+ V.C. (0.01)+ B.P. (200 sqm.)	1.00	261880	103684	24.94	Crop + dairy	71,550
	Patna	Bihar	Crops (0.6)+ veg. + dairy (1C)+ hort. (0.385)+ goat (20)+ poult. (700) + fish (0.10)+ mushroom + V.C.	1.20	595059	240273	61.03	Crop + dairy, crop + fish	67,763
	Ranchi	Jharkhand	Crop (0.8)+ fish (0.2)	1.00	67470.4	19581	5.397	Crop + livestock	69,250
LGPR	Kalyani	W.B.	Crop (0.44)+ hort. (0.1)	1.16	54484.5	20665	6.26	Crop + dairy, Crop + dairy + poult./duck	3,06387
HER	Umaim	Meghalaya	Crops (0.70)+ veg.+ hort. (0.22) +poult. (100 B)+ pig. (1)+ fishery (0.05)	1.00	368643	188277	24.94	Crops (rice/maize) + pigery	
	Jorhat	Assam	Crops+ dairy (2c)+ hort. + fishery (0.10)+ apiary (5boxes)	1.00	212535	89120	14.16	Crop + dairy, crop + dairy + fishery	88,764

Contd..../-

ACR	AICRP-IFS Centers	State	Composition of IFS Model developed	Area of Model (ha)	Gross Return (Rs./ha)	Net Returns (Rs./ha)	Total Prod. REY (t/ha)	Predominant farming system	Gross Returns (R./ha)
EP&HR	Raipur	Chattisgarh	Crops (0.59)+hort. (0.22)+dairy (2c)+ poultry (150)	1.06	137876.9	82613	13.13	Crop + livestock	1,15,180
CP&HR	Jabalpur	M.P.	Crops (0.9)+dairy (3c)+fishery (0.06)+ vegetables (0.0024)	1.00	300276	134674	25.02	Crop + livestock, crop+ dairy + hort.	62,324
WP&HR	Akola	Maharashtra	Crop + goat (28)+ hort. + BP	1.00	110848	-9758		Crop + dairy, crop + horticulture	1,55,883
	Rahuri	Maharashtra	Crops (0.60)+ dairy (2B+2C)+ hort. (0.2)+ poult. (400)	1.00	205624	142068	13.7	Crop + dairy, crop + horticulture	1,58,823
	Parbhani	Maharashtra	Crops+ hort. + dairy	1.00	157607	64419	15.76	Crop + dairy, crop + horticulture	1,60,559
SP&HR	Rajendrnagar	A.P.	Crops (0.7)+hort. (0.2)+dairy (4B)+ poultary (20) + goat	1.50	251609	89452	22.07	Crop + dairy, C+ goat+poult./hort.	2,26,200
	Coimbatore	Tamilnadu	Crops (1.02)+dairy (20cows)+ hort. (0.16)+ biogas +V.C. (50 m^3)	1.02	459934	228070	30.66	Coconut based + hort.+ dairy/goats	1,10796
	Kathalgere	Karnataka	Crops (0.73)+ hort. (0.07)+ dairy	1.00	280762	195577	20.05	Crop+ dairy, crop + sheep/poultry	
	Siruguppa	Karnataka	Crops (0.72)+ hort. (0.2)+ Dairy (1c+1b+1calf)	1.00	190764	104324	14.67	Crop + dairy, crop + dairy +horticulture	54,013
ECP&HR	Bhubneswar	Orrisa	Crops (0.378)+ dairy (2c)+ hort. (0.0895)+ mushroom (24beds)+ apiary (2boxes)+ poultry (80)+ duck (20)+ fish(0.33)+ K.G. (0.015)	1.25	2,34,827	68,788	18.77	Crop + dairy/goat, crop +vegetables	80,381
WCPHR	Goa	Goa	Crops (0.70)+ hort. + dairy (0.4)	0.74	80320	35026	5.35	Crop + horticulture, crop + dairy	
	Karjat	Maharashtra		1.00				Crop + dairy, crop + horticulture	1,58,823
	Karmana	Kerala	Crops (0.5)+ dairy (2c+1k)+ hort.+ fishery (0.5)	1.33	111640	-49167	7.44	Homested farming, coconut based/ hort.	88,000
GP&HR	S.K.Nagar	Gujrat	Crop (0.7) + dairy (2B) + hort. (0.25) + vermicompost (0.005)	1.00	339244	199483		Crop+dairy, fruit+veg.	82,415
WDR	Durgapura	Rajasthan	Crops (0.24)+ hort. (1.74)+ dairy (2C)	1.45	211843	-72937	14.12	Crop+dairy, crop +goat	58,125
Island	Portblair	A&N	Crop	2.00	29700	9526	2.60		

Data presented in parenthesis represents area in no. for crops, plantation. horticulture etc. whereas for diary it represents the number of animals.

Table 7.4/2: Expenditure involved and percent share of inputs purchased from outside/market or managed within the farm through resources recycling and use of farm labour.

Centre	Size (ha)	Components of IFS Model	Total Cost (Rs)	Inputs from market (%)	Inputs generated and/or recycled within farm (%)	Share of farm labour engaged (%)
Modipuram (U.P.)	0.70	Crops+dairy+hort.+mushroom+V.C.+B.P.+K.G.	2,35,084	42	31	27
Sabour (Bihar)	1.00	Crops+dairy+hort.+goatary+fishery+ V.C.+B.P.	1,58,196	24	28	48
Umiam(Meghalaya)	1.00	Crops+veg.+hort.+poultry+piggery+fishery	1,80,366	66	16	18
Varanasi (U.P.)	1.00	Crops+veg./fruits+dairy+poultry+fish+mushroom	4,06,016	48	25	27
Palampur, (H.P.)	1.00	Crops+dairy+hort.+fodder+agroforestry	1,98,110	55	7	38
Karmana (Kerala)	1.33	Crops+dairy+hort.+fishery	1,61,007	43	21	36
Patna (Bihar)	1.20	Crops+dairy+hort.+goat+poultry+fish+mushroom	3,54,786	31	40	29
Parbhani,Maharastra		Crops+hort.+dairy	93,188	22	34	44
S.K.Nagar(Gujarat)	1.00	Crop+dairy+hort.+V.C.	1,39,761	47	21	32
Akola(Maharashtra)		Crop+goatary+hort.+BP	1,20,606	38	3	59
Port Blair (A&N)**		Crops only	20,174	40	0	60
Ludhiana (Punjab)	1.00	Crops+dairy+fishery+hort.+veg.+A.F.+ B.P.+K.G.	1,27,485	23	21	56
Jabalpur (M.P.)	1.00	Crops+dairy+fishery+vegetables	1,78,628	39	9	52
Pantnagar (U.K.)	1.00	Crop+dairy+hort.+plantation crops+V.C.	2,03,180	43	NR	57
Kalyani (W.B.)	1.16	Crop+hort.	54,484	57	NR	43
Ranchi (Jharkhand)	1.00	Crop+fish	47,888	52	NR	48
Karjat,Maharashtra**		Not Reported	NR	NR	NR	NR
Bhubneswar,Odisha	1.25	Crops+dairy+hort.+apiary+poultry+duck+fishery+KG.	1,66,039	50	15	35
Chhata (J&K)	1.50	Crops+dairy+hort.+veg.+apiary+fishery+poultry+VC	2,42,226	60	13	27

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Centre	Size (ha)	Components of IFS Model	Total Cost (Rs)	Inputs from market (%)	Inputs generated and/or recycled within farm (%)	Share of farm labour engaged (%)
Rahuri,Maharashtra	1.00	Crops+dairy+hort.+poultry	1,59,410	48	19	33
Coimbatore (T.N.)	1.20	Crops+dairy+hort.+biogas+V.C.	2,31,864	34	28	38
Hissar (Haryana)**	1.00	Crops+hort.+V.C.	44,774	56	17	27
Durgapura (Raj.)	1.00	Crops+hort.+dairy	2,11,843	34	23	43
Raipur,Chhatisgarh	1.06	Crops+hort.+dairy+poultry	55,263	46	8	46
Kathalgere,Karnatak	1.00	Crops+hort.+dairy	85,335	55	10	35
Kanpur(U.P.)	1.00	Crops+hort.+dairy	1,01,804	20	33	47
Kumarganj (U.P.)	1.00	Crops+hort.+dairy	1,03,769	32	24	44
Rajendernagar, A.P.	1.50	Crops+hort.+dairy+poultary+goat	1,62,066	47	18	35
Sirugappa,Karnatak	1.00	Crops+hort.+dairy	86,440	44	6	50
Goa**	0.74	Crops+hort.+dairy	39,269	29	8	63
Jorhat (Assam)	1.00	Crops+dairy+hort.+fishery+apiary				

Table 7.4/3: Livelihood security under Integrated Farming System Approach.

Centre	Size (ha)	Components of IFS Model	Production of essential food and fodder commodities at Farm under different IFS Models								Others Eggs, fishes, vermicompost, Mushroom etc.
			Cereals (Kg)	Pulses (Kg)	Oilseeds (Kg)	Milk (Litre)	Fruits (Kg)	Veget. (Kg)	G.F. (Kg)	D.F. (Kg.)	
Annual requirements of a family with average of 6 family members			1550	200	130	1120	200	900	27000	5500	NA
Modipuram (U.P.)	0.70	Crops+dairy+hort.+mushroom+V.C.+B.P.+K.G.	2748	360	176	3080	500	3780	28180	2726	V.C.-22,000kg
Sabour (Bihar)	1.00	Crops+dairy+hort.+goatary+fishery+ V.C.+B.P.	5634	80	130	2223	—	2940	20695	11275	Meat-15 lamb, Fish - 134kg,V.C.- 1290kg
Umiam(Meghalaya)	1.00	Crops+veg.+hort.+poultry+piggery +fishery	1444	208.5	473		175	8051.5		3382.8	Meat-Broil.1049 kg, pig -242kg fish-112 kg,
Varanasi (U.P.)	1.00	Crops+veg./fruits+dairy+poult.+fish+ mushroom	4046	744	206	10222	240	2219	23722	8680	Fish-237kg, poult. Meat-1440kg
Palampur, (H.P.)	1.00	Crops+dairy+hort.+fodder+agroforestry	5985	685	150	3254.5	—	2330	10750	6610	-
Karmana (Kerala)	1.33	Crops+dairy+hort.+fishery	1640			2040.75	Nut-2111			2630	Fish-6kg,
Patna (Bihar)	1.20	Crops+dairy+hort.+goat+poultry+ fish.+mushroom	5020	1340	310	7302	2892	6910	20440	7440	Meat-570kg, Fish-312kg,Eggs-6300
Parbhani,Maharastra		Crops+hort.+dairy	615	1259	—	751.5	—	7828	10695	4040	-
S.K.Nagar(Gujarat)	1.00	Crop+dairy+hort.+vermicompost	1510	1900	874	3479		3515	28281	7807	V.C.-3500kg
Akola(Maharashtra)		Crop+goat+hort.+BP	916	2242	-	-	-	386	1298	7961	-
Port Blair (A&N)**		Crops only	1125	72	NR	NR	NR	700		4175	-
Ludhiana (Punjab)	1.00	Crops+dairy+fishery+hort.+veg.+A.F.+ B.P.+K.G.	890	137	70	1825	180	640	10950	3650	V.C.-15000kg
Jabalpur (M.P.)	1.00	Crops+dairy+fishery+vegetables	3350	80	110	5040	-	990	12937	5755	V.C.-3000kg
Pantnagar (U.K.)	1.00	Crop+dairy+hort.+plantation crops+ V.C.	4030	386	183	NR	-	833	22640	11198	-
Kalyani (W.B.)	1.16	Crop+hort.	2315	70	180	—	198	2030	-	3005	Jute-200 bundles

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Centre	Size (ha)	Components of IFS Model	Production of essential food and fodder commodities at Farm under different IFS Models								Others Eggs, fishes,
			Cereals (Kg)	Pulses (Kg)	Oilseeds (Kg)	Milk (Litre)	Fruits (Kg)	Veget. (Kg)	G.F. (Kg)	D.F. (Kg.)	vermicompost, Mushroom etc.
Ranchi (Jharkhand)	1.00	Crop+fish	1780	456	410	-	-	-	7700	3175	Fish-100kg
Bhubneswar,Odisha	1.25	Crops+dairy+hort.+apiary+poult.+ duck+fish+KG.	1324	22	19	5298	Nut—1514	983	25600	1500	Eggs-851
Chhata (J&K)	1.50	Crops+dairy+hort.+veg.+apiary+fish.+ poult.+VC	8094	1050	952	5856	-	14566	10115	2292	Egg-1500, V.C.-3465kg
Rahuri,Maharashtra	1.00	Crops+dairy+hort.+poultry	3640	710	250	5809	1000	10700	20670	5555	Meat-835
Coimbatore (T.N.)	1.20	Crops+dairy+hort.+biogas+ VC	4276	1282	913	4947	6995	6782	2145	4661	Cotton-550kg
Hissar (Haryana)**	1.00	Crops+hort.+VC	3282	—	473	—	—	—	10010	—	Cotton-492kg
Durgapura (Raj.)	1.00	Crops+hort.+dairy	759	106.5	96	952	—	2486.7	—	1673	-
Raipur,Chhatisgarh	1.06	Crops+hort.+dairy+poultry	9953	513	54	1425	—	3861	9172	5858	Eggs-69
Kathalgere,Karnatak	1.00	Crops+hort.+dairy	8380	180	—	1350	830	1302	2500	7000	-
Kanpur(U.P.)	1.00	Crops+hort.+dairy	5068	175	263	4846	—	813	14370	3758	-
Kumarganj (U.P.)	1.00	Crops+hort.+dairy	3178	497	245	2037	40	4412	24950	3880	-
Rajendernagar, A.P.	1.50	Crops+hort.+dairy+poultary+goat	2873	301	415	2577	—	544	9450	4470	Meat Goat-141kg, Poult. -55kg
Sirugappa,Karnatak	1.00	Crops+hort.+dairy	4273	—	927	2000	—	629	4000	7923	-
Goa**	0.74	Crops+hort.+dairy	3764	75	214	—	—	970	—	3200	-
Jorhat (Assam)	1.00	Crops+dairy+hort.+fishery+apiary	-	-	-	3662	-	-		-	270kg fish

7.5 TECHNOLOGY TRANSFER AND REFINEMENT

7.5.1 ON-FARM RESEARCH

7.5.1.1 On-farm crop response to application of nutrients

Title of the experiment: **On farm crop response to application of major plant nutrients in pre dominant cropping systems**

Objective: To assess the response of major crops to application of N, P_2O_5 and K_2O at recommended rates in predominant cropping systems in different agro-eco systems under farmers field condition.

Year of start: 1999-2000, treatments are modified in 2010-11.

Treatments: There are five common treatments at various locations. They are control ($N_0P_0K_0$), N, $N+P_2O_5$, $N+K_2O$ and $N+ P_2O_5+ K_2O$ and all the nutrients are applied as per the recommended rates of the crops/cropping system evaluated at particular location. Two more treatments namely $N+ P_2O_5+ K_2O$ +supplementation of deficient micro nutrient based on soil test and farmers practice was added during 2010-11.

Locations: Various cropping systems evaluated along with locations and number of trials in each system are given below.

Cropping system	OFR district (State)	No. of trials
Rice-rice	Warangal, Srikakulam (A.P.), Pathinamthitta (Kerala) Sivagangai & Pudukottai (Tamil Nadu), Raigadh (Maharashtra)	120
Rice-wheat	Purnea (Bihar), Kawardha (Chattisgarh), Samba (J& K), Jamtara (Jharkhand) , Katni, Dindori (M.P.), Amritsar (Punjab) Santkabirnagar & Kaushambi (Uttar Pradesh) Nainital (Uttarakhand)	222
Rice-chickpea	Amravati (Maharashtra)	12
Rice-greengram	Kendrapara (Odisha)	24
Rice-groundnut	Angul (Odisha)	24
Rice-cabbage	Dharmapuri & Krishnagiri (Tamil Nadu)	12
Rice-tomato	Dharmapuri & Krishnagiri (Tamil Nadu)	12
Pearlmillet-wheat	Kheda (Gujarat),Pune (Maharashtra)	36
Pearl millet-mustard	Banskantha and Pathan (Gujarat)	8
Maize-wheat	Kangra (Himachal Pradesh), Chittorgarh (Rajasthan), Samba (J& K)	56
Maize-Chickpea	Gadag (Karnataka)	7
Cotton-wheat	Sirsa (Haryana), Aurangabad (Maharashtra)	36
Cotton-chickpea	Aurangabad (Maharashtra)	12
Cotton-pearl millet	Banskantha and Pathan (Gujarat)	8
Castor	Banskantha and Pathan (Gujarat)	8
Clusterbean -wheat	Hanumangarh (Rajasthan)	20
Tobbaco- pearlmillet	Kheda (Gujarat)	12
Chilli+ onion-cotton	Gadag (Karnataka)	7
Fingermillet-tomato	Kolar (Karnataka)	12
Tomato-cabbage	Kolar (Karnataka)	12
Total		**660**

Results: The centre wise details of varieties, nutrients used, crop yield and crop response to NP_2O_5 K_2O application in terms of yield, yield difference among various practices along with initial soil nutrient status are presented in Table 7.5.1/1. Brief description of system wise results are given below.

Rice-rice: A total of 120 trials were conducted at five locations comprising of five NARP zones. In southern telangana zone (Warangal) of Andhra Pradesh, application of 120:60:40 kg N, P_2O_5 and K_2O ha^1 each to *kharif* and *rabi* along with 50 kg of Zn to both the crops in the system resulted in higher system yield (13181 kg ha^{-1}) which is 7.2 and 21.2% higher than application of N, P_2O_5 and K_2O alone and farmers practice respectively. The yield difference between recommended N, P_2O_5 and K_2O and control was found to be 8578 kg ha^{-1}. In the north coastal zone (Srikakulam) of Andhra Pradesh, application of 120:60:40 kg N, P_2O_5 and K_2O ha^{-1} along with 50 kg Zn to BPT 5204 variety in *kharif* and MTU 1010 in *rabi* resulted in higher system yield of 12999 kg ha^{-1} which is 23 and 7.6% higher than farmers practice and N, P_2O_5 and K_2O alone. In this zone, farmers are using 25% higher N, 15% higher P_2O_5 and 6% higher K_2O than recommended dose. In the problem zone of (Pathinamthitta) of Kerala , application of 90:45:45 kg N, P_2O_5 and K_2O & along with 25 kg $ZnSo_4$ ha^{-1} resulted in system yield of 10757 kg ha^{-1} which is 9 and 3% higher than farmers and recommended package of nutrient application. Farmers are using 55% higher K_2O than recommended level. In the southern zone (Sivagangai and Pudukottai) of Tamil Nadu, the yield difference between recommended NPK and farmer's package was found to be only 439 kg ha^{-1}. However, application of 25 kg $ZnSo_4$ ha^{-1} resulted in additional yield of 609 kg ha^{-1} in rice-rice system. Around 1919 kg ha^{-1} of yield difference exista between recommended nutrient and farmer package in north konkan coastal zone (Raigadh) of Maharashtra. Application of 10 kg of $ZnSo_4$ ha^{-1} to both *kharif* and *rabi* contributed additional system yield of 348 kg ha^{-1}.

In rice-rice system, across the NARP zone, mean system yield difference of 2233 kg ha^{-1} exists between farmers and recommended nutrient practice. Additional yield of 1053 kg ha^{-1} is possible through supplementation of required quantity of Zn to the system in addition to recommended level of NPK nutrients.

Rice-wheat: A total of 222 trials were conducted in 11 NARP zones at 11 locations. In north east alluvial plain zone of Bihar (Purnea), wider nutrient application gap exists between farmers and recommended package for both rice and wheat and it was found that farmers are applying 25 % lesser N and P_2O_5 and 50% lesser K_2O to rice and 33, 50 and 75% N, P_20_5 and K_2O to wheat which is also reflected in terms of yield registering system yield gap of 1209 kg ha^{-1} on the basis of rice equivalent yield. Application of 25 kg $ZnSo_4$ ha^{-1} resulted in additional yield of 268 kg ha^{-1} in the system. In Chattisgarh plain zone (Kawardha), wider nutrient application gap in terms of N, P_2O_5 K_2O and Zn between farmers and recommended package resulted in system yield gap of 3057kg ha^{-1} between recommended and farmer package. In central and north eastern plateau zone of Jharkhand (Jamtara), the yield gap of 1639 and 982 kg ha^{-1} exists in rice and wheat respectively between farmers and recommended package which is mainly due to wider nutrient application gap (50% each in N, P_2O_5 and 100% in K_2O) in both rice and wheat. However, application of 5 kg Zn ha_{-1} to rice and wheat did not increase the yield significantly. In keymore plateau and satpura hill zone of Madhya Pradesh (Katni), it was observed that yield difference of 1384 and 1124 kg ha^{-1} exists in rice and wheat respectively owing to the 66% lesser application of each N and P_20_5 and no application of K_2O to both rice and wheat in farmers package. Application of 25 kg $ZnSo_4$ to rice and 20 kg $ZnSo_4$ to wheat ha^{-1} resulted in additional yield of 510 and 376 kg ha^{-1} respectively. In northern hill zone of Chattisgarh (Dindori in Madhya Pradesh), it was observed that yield difference of 1625 and 1530 kg ha^{-1} exists in rice and wheat respectively mainly due to application of 40:20:20 kg N, P_2O_5 and K_2O ha^{-1} each to rice and wheat in farmers package against the recommended dose of 120:60:40 kg N, P_2O_5 and K_2O ha^{-1} each to both the crops. Application of 25 kg of $ZnSo_4$ ha^{-1} to

both the crops resulted in non significant yield difference. In eastern vidharba zone of Maharashtra (Gondia), higher yield difference of 1162 kg ha^{-1} in rice and relatively lower yield difference of 454 kg ha^{-1} in wheat was observed between recommended and farmers package which was mainly attributed to wider gap in nutrient dose to rice in both the packages. Application of 25 kg $ZnSo_4$ ha^{-1} to both the crops resulted in significant yield increase (213 and 246 kg ha^{-1} in rice and wheat respectively).In the central plain zone of Punjab (Amritsar), the yield difference was low between recommended and farmers package (only 647 and 242 kg ha^{-1} respectively in rice and wheat) compared to other states. Application of 25% higher N under farmers package was observed in both rice and wheat compared to the recommended package. Application of 25 kg $ZnSo_4$ ha^{-1} to rice resulted in significantly higher yield of 308 kg ha^{-1}. However; micronutrient (Mn) application to wheat did not influence the yield significantly. Significantly higher yield difference of 1395 and 1061 kg ha^{-1} was observed in rice and wheat between recommended and farmer's package in north eastern plain zone of Uttar Pradesh (Santkabirnagar) owing to the lower application of P_2O_5 and K_2O in farmers package. Application of 25 kg $ZnSo_4$ each to rice and wheat ha^{-1} influenced the yield significantly (440 and 387 kg ha^{-1} respectively). In the central plain zone of Uttar Pradesh (Kaushambi), yield difference of 1219 and 1027 kg ha^{-1} was observed in rice and wheat respectively with recommended and farmers package which was mainly due to gap in nutrient application to the level of 10 % in N and no application of K_2O to rice and 21, 25 and 12.5% in N, P_2O_5 and K_2O to wheat in farmers package. Application of 25 kg $ZnSo_4$ ha^{-1} resulted in additional grain yield of 310 and 330 kg ha^{-1} in rice and wheat respectively. In the hill zone of Uttarakhand (Nainital), it was observed that, the yield difference of 1768 and 905 kg ha^{-1} exists in rice and wheat respectively between recommended and farmers package which was clearly due to lower nutrient application (120:40:0 kg N, P_2O_5 and K_2O ha^{-1}) in farmers package compared to recommended (150:60:40 kg ha^{-1} each to both rice and wheat). Additional application of 20 kg of Zn ha^{-1} to both rice and wheat did not influence the yield significantly. In the low altitude subtropical zone of Jammu and Kashmir (Samba), it was observed that the yield difference in rice and wheat was found to be only 164 and 552 kg ha^{-1} in rice and wheat respectively between recommended and farmers' package. Application of micronutrient also did not increase the yield significantly in both the crops.

Across the location, analysis of yield gap reveals that additional yield of 1240 and 864 kg ha^{-1} of rice and wheat can be realized by ensuring application of recommended quantity of N, P_2O_5 and K_2O to the rice-wheat system. The lower yield in farmers package can be mainly attributed to lower application of nutrient (30, 32, 86 and 89% lower dose in rice and 46, 47, 72 and100% lower dose of N, P_2O_5 and K_2O and micronutrient in wheat). Additional yield of 246 and 173 kg ha^{-1} in rice and wheat can be obtained through addition of micronutrients based on soil test.

Rice-chickpea: The yield difference between recommended and farmers package in rice and chickpea was found to be 1300 and 367 kg ha^{-1} in eastern vidarbha zone of Maharashtra (Gondia) due to the lower application of nutrient in both the crops. Application of 25 kg $ZnSo_4$ ha^{-1} resulted in additional yield of 246 and 187 kg in rice and chickpea respectively.

Rice-greengram: In east and south eastern coastal plain zone of Odisha (Kendrapara), application of 80:40:40 kg N, P_2O_5 and K_2O ha^{-1} resulted in additional yield of 771 kg in rice compared to 30:25:20 kg N, P_2O_5 and K_2O ha^{-1} in farmers package. Similarly, the yield difference in green gram was found to be 184 kg ha^{-1} which is 29% higher than the farmer's nutrient package (7.5:15:0 kg N, P_2O_5 and K_2O ha^{-1} against recommended dose of 35:20:20 kg ha^{-1} respectively). Application of $ZnSo_4$ and molybdenum to rice and green gram respectively resulted in additional yield 293 and 46 kg ha^{-1} of rice and green gram in the same zone. In the coastal saline zone of West Bengal (24 South Paragnas) application of micro nutrient to rice green gram system resulted in additional rice equivalent yield of 329 kg ha^{-1}.

Rice – groundnut: Additional yield of 734 and 358 kg ha $^{-1}$ in rice and groundnut can be realized respectively through addition of 80:40:40 and 20:40:40 kg N, P_2O_5 and K_2O ha^{-1} compared to 35:20:20 and 7.5:15:0 kg ha^{-1} in farmers package in mid central table land of Odisha (Angul). Application of 25 kg $ZnSo_4$ ha^{-1} to rice and 250 kg gypsum ha^{-1} to groundnut resulted in additional yield of 292 and 121 kg ha^{-1}.

Rice- cabbage: Rice and cabbage yield can be increased by 11 and 18 % respectively through application of 150:50:50 and 100:125:25 kg N,P_2O_5 and K_2O ha^{-1} compared to farmers package in north western zone of Tamil Nadu (Krishnagiri and Dharmapuri). Application of 25 kg $ZnSo_4$ to rice and boron as borax to cabbage resulted in significantly higher additional yield of 300 kg and 1512 kg ha $^{-1}$ respectively. Rice equivalent system yield was found to be significantly higher in recommended N,P_2O_5 , K_2O + micronutrient package compared to farmers package.

Rice – tomato: Farmers package of applying 110:40:45 and 150:115:110 kg N, P_2O_5 and K_2O to rice and tomato respectively compared to recommended package of 150 :50:50 kg to rice and 200:300:200 kg to tomato resulted in 12 and 8 % lower yield of rice and tomato in north western zone of Tamil Nadu (Krishnagiri and Dharmapuri). Further, application of 25 kg $ZnSo_4$ ha^{-1} to rice and Ca as $CaNo_3$ to tomato in addition to recommended N,P_2O_5 and K_2O resulted in significantly higher additional yield (457 and 5196 kg ha^{-1} of rice and tomato respectively).

Pearlmillet – wheat: Application of 80: 40: 40 kg ha^{-1} of N, P_2O_5, K_2O to pearlmillet and 120:60:60 kg ha^{-1} to wheat resulted in additional yield of 995 and 1178 kg ha^{-1} respectively compared to farmers package in middle Gujarat zone (Kheda). Though application of 25 kg $ZnSo_4$ ha^{-1} to pearlmillet recorded significantly higher yield, it did not increase the yield of wheat significantly. In western Maharashtra plain zone (Pune), the yield difference between recommended and farmers package was found to be more in wheat (291 kg ha^{-1}) than pearlmillet (1149 kg ha^{-1}). Additional yield of 317 and 411 kg ha^{-1} in pearlmillet and wheat can be realized with application of 20 kg Fe application ha^{-1}.

Pearlmillet – mustard: In north Gujarat zone (Banaskantha and Pathan), the yield difference between recommended and farmers package was found to be only 174 and 138 kg ha^{-1} in pearlmillet and mustard. Application of 25 kg $ZnSo_4$ ha^{-1} to each crop resulted in additional yield of 128 and 157 kg ha^{-1} respectively in this zone.

Maize- wheat: In the sub montane and low hills sub tropical zone of Himachal Pradesh (Kangra), application of recommended N,P_2O_5, K_2O to maize and wheat resulted in additional yield of 1305 and 1507 kg ha^{-1} respectively compared to farmers package of nutrient application. Further, application of 25 kg $ZnSo_4$ ha^{-1} resulted in additional yield of 240 and 189 kg ha $^{-1}$ in maize and wheat. In the sub humid southern plain and Aravali hills of Rajasthan (Chittorgarh), it was observed that significantly higher yield difference exists in both maize and wheat (1132 and 1617 kg ha $^{-1}$ respectively) with recommended package registering higher yield. Application of 25 kg $ZnSo_4$ ha^{-1} resulted in significantly higher yield of 366 kg ha^{-1} in maize and 119 kg ha^{-1} in wheat. Comparatively lower yield difference was observed in low altitude sub tropical zone of Jammu and Kashmir (Samba) as the difference in yield was found to be only 554 and 504 kg ha $^{-1}$ in maize and wheat respectively. The yield difference due to micronutrient application was also found to be lower (114 and 70 kg ha^{-1}) in both the crops. Across the locations, the yield difference of 997 and 1209 kg ha^{-1} was observed in maize and wheat between recommended N, P_2O_5 and K_2O and farmer package. Application of micronutrient in the form of $ZnSo_4$ resulted in additional yield of 240 and 126 kg ha^{-1} in maize and wheat respectively irrespective of the locations.

Maize-chickpea: Under varying fertility levels, two set of equipments were conducted in northern dry zone of Karnataka (Gadag). The yield difference between recommended and farmers nutrient package was found to be 1241 and 338 kg ha^{-1} in

maize at recommended N, P_2O_5 and K_2O level of 100:50:25 and 150:75:37.5 kg ha^{-1} respectively. Similarly in chickpea, 264 and 289 kg ha^{-1} was observed with 10:25:0 and 15:35:0 kg N, P_2O_5 and K_2O ha^{-1} compared to farmer practice of 0:25:0 and 15:35:0 kg N, P_2O_5 and K_2O ha^{-1}. Application of $ZnSo_4$ to maize and chickpea resulted in additional yield to the level of 327 and 99 kg ha^{-1} respectively in this zone.

Cotton-wheat: The yield difference in cotton–wheat system was found to be significantly higher in western zone of Haryana (Sirsa) as farmer's package recorded 9 and 4 % lower yield of cotton and wheat than recommended nutrient dose. Addition of 5.25 kg of $ZnSo_4$ ha^{-1} recorded 146 and 201 kg ha^{-1} as additional yield in cotton and wheat. Similarly in central Maharashtra plateau zone (Aurangabad), application of 37% lower dose of N and 33 % lower P_2O_5 and K_2O to cotton and 25 % lower dose of N P_2O_5 and K_2O to wheat was observed in farmers package which resulted in lower yield to the level of 418 and 491 kg ha^{-1} respectively. Application of $MnSo_4$ to cotton and $ZnSo_4$ to wheat was found to increase the yield significantly in this zone. Irrespective of the locations, yield difference of 332 and 335 kg ha^{-1} exists in cotton and wheat respectively between recommended and farmers package of nutrient application.

Cotton- chickpea: In the central Maharashtra plateau zone (Aurangabad), farmers are applying 40 % lesser N, P_2O_5 and K_2O to cotton and 20 % lesser N and P_2O_5 and no K_2O to chickpea against the recommended dose both these crops which leads to reduction in the yield to the level of 305 and 136 kg ha^{1} respectively. Application of 20 kg of $MnSo_4$ ha^{-1} did not influence the yield significantly in both the crops.

Cotton-pearlmillet: In the north Gujarat zone (Banaskantha and Pathan), the yield reduction due to farmers package was not significant in pearlmillet while cotton recorded 187 kg ha^{-1} in terms of additional yield with recommended nutrients of 200:40:40 kg N, P_2O_5 and K_2O ha^{-1}. Application of 15 kg $ZnSo_4$ ha^{-1} recorded additional yield of 372 kg ha^{-1} in pearlmillet while 15 kg $MnSo_4$ ha^{-1} to cotton registered additional yield of 155 kg ha^{-1}.

Castor: The yield difference observed with recommended (120:25:25 kg N, P_2O_5 and K_2O) and farmers package (95:45:0 kg N, P_2O_5 and K_2O) was found to be only 233 kg ha^{-1} in north Gujarat Zone (Banaskantha and Pathan). However, application of 25 kg $ZnSo_4$ ha^{-1} to castor resulted in additional yield of 502 kg ha^{-1} which is 15% higher than recommended application of N, P_2O_5 and K_2O ha^{-1} alone.

Clusterbean-wheat: The yield difference in clusterbean and wheat in recommended and farmers package was found to be only 85 and 284 kg ha^{-1} and addition of 12 kg of $ZnSo_4$ ha^{-1} also did not influence the yield significantly in the irrigated north western plain zone of Rajasthan.

Tobacco-Pearlmillet: In the middle Gujarat zone (Kheda), significantly higher yield difference was observed between recommended and farmers package. The yield difference observed was found to be 1193 and 904 kg ha^{-1} in tobacco and pearl millet respectively. However, the additional yield obtained with 25 kg $ZnSo_4$ ha^{-1} was not significant.

Chilli+onion-cotton: Yield difference observed between recommended and farmers package was found to be 250, 1842 and 338 kg ha^{-1} in chilli, onion and cotton respectively in the northern dry zone of Karnataka (Gadag). Application of Zn to chilli and cotton did not increase the yield significantly. However 15 kg $ZnSo_4$ ha^{-1} resulted in additional onion yield of 694 kg ha^{-1}. It was also observed that farmers were applying lesser nutrient to all the crops than recommended dose.

Fingermillet-tomato: The yield difference in finger millet was found to be only 140 kg ha^{-1} between recommended (100:50:50 kg N, P_2O_5 and K_2O ha^{-1}) and farmers (60:20:15 kg N, P_2O_5 and K_2O ha^{-1}) package in the eastern dry zone of Karnataka (Kolar). Addition of 20 kg $ZnSo_4$ resulted in 228 kg ha^{-1} of additional yield in fingermillet. In case of tomato, application of 20 kg $ZnSo_4$ ha^{-1} resulted in

additional yield of 344 kg ha^{-1}. In terms of fingermillet equivalent yield of the system, farmers package resulted in 3% increase in yield than recommended nutrient dose.

Tomato- cabbage: In both the crops, farmers package resulted in higher yield (38422 and 67250 kg ha^{-1} in tomato and cabbage) compared to recommended N, P_2O_5 and K_2O ha^{-1} (32648 and 59439 kg ha^{-1}) in eastern dry zone of Karnataka (Kolar). However application of 20 kg $ZnSo_4$ to both the crops resulted in significant increase in yield of both the crops (4350 and 4477 kg ha^{-1} of additional yield in tomato and cabbage respectively).

The results of response of predominant cropping systems to applied nutrients in various NARP zones are summarized as below.

- Across the various NARP zones and cropping systems, farmer's package resulted in lower yield compared to recommended package owing to the 36.2, 20.5, 67.8 and 80.1 % lower application of N, P_2O_5 and K_2O and micronutrients.
- On-farm system yield gap between recommended dose of N, P_2O_5 and K_2O + micronutrient and farmer's package was found to be 1933, 2215, 2996, 1790 and 727 kg ha^{-1} in rice- rice, rice- wheat, maize- wheat, pearlmillet – wheat and rice greengram systems respectively.
- Application of micronutrients based on soil test resulted in additional yield of 535, 286, 393, 243 and 345 kg ha^{-1} in rice – rice, rice- wheat, maize- wheat, pearlmillet – wheat and rice - green gram systems respectively.
- In all the NARP zones and systems, application of recommended N, P_2O_5 and K_2O alone or N, P_2O_5 and 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.

OFR nutrient response studies in rice-wheat system in Amritsar District

Nutrient response studies in 24 Parganas South district of West Bengal

Scientists and technical staff of other centres visiting OFR experiments in Kangra district (H.P.)

Farmers' day in Nainital district

Table 7.5.1/1. Yield potential of different cropping systems under researcher and farmer managed conditions - (2011-12)

State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Rice-rice																						
Andhra Pradesh	Southern Telangana / Warangal/24	NA	BPT-5204/ 120- 60-40/ Zinc(50) 140- 80-40	8.3	0.7	188	22	229	1735	3391	4651	4208	5878	6407	5270	137	97	192	10.5	4143	529	608
			MTU-1010/ 120- 60-40/ Zinc(50) 160- 57.5-45	—	—	—	—	-	1979	3230	3781	4413	6414	6774	5604	118	83	164	8.88	4435	360	810
Andhra Pradesh	North coastal/ Srikakulam/ 24	Red Soil	BPT-5204/ 120- 60-40/ Zinc(50) 140- 80-40	9.5	1.5	145	25	455	1713	3359	4536	4146	5830	6395	5312	212	150	297	16.4	4117	565	518
			MTU-1010/ 120- 60-40/ Zinc(50) 160- 57.5-45	—	—	—	—	-	1971	3195	3844	4488	6245	6604	5257	184	130	257	14.1	4274	359	988
Kerala	Problem Areas Zone/ Pathinamthitta/ 24	Alluvial	Uma/ 90- 45 -45 / ZnSO4(25) 90- 45 -70	5.7	0.8	480	15	230	1687	2486	4103	4176	5302	5491	4979	88	62	123	7.59	3615	189	323
			Uma/ 90- 45 -45 / ZnSO4(25) 90- 45 -70	—	—	—	—	-	1753	2431	4111	4218	5146	5266	4846	88	62	123	7.68	3393	120	300
Tamil Nadu	Southern/ Sivagangai, Pudukottai/ 24	Sandy Loam	ADT-39/ 150- 50-50/ ZnSO4(25) 160- 50-35	6.6	0.4	224	10	237	2842	4122	4643	4388	6091	6420	6013	53	37	73	3.71	3249	329	78

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
			ADT-36/ 120- 38 -38 / ZnSO4(25) 130- 35 -27	—	—	—	—	–	3935	4246	4795	4589	6239	6597	6253	399	282	558	26.4	2304	358	-14
Maha-rashtra	North Konkan Coastal / Raigad/24	NA	Shyadri/ 120- 50-50/ ZnSO4(10) 90- 30 -30	0	0	0	0	0	1574	2322	2671	2791	3055	3264	1862	35	24	47	4.79	1481	209	1193
			Not Available/ 120- 50-50/ ZnSO4(10) 90- 30 -30	—	—	—	—	-	1439	1851	2108	2082	2339	2478	1613	30	22	43	5.3	900	139	726
									Rice-wheat													
Bihar	North-east Alluvial Plain/ Purnea/24	Alluvial	R-Sweta/ 80- 40-20 / ZnSO4(25) 60- 30 -10	6.8	0.4	209	17	195	2069	2916	3599	3444	4158	4416	3356	89	63	125	8.99	2089	258	802
			PBW-343/ 120- 60-40/ ZnSO4(25) 80- 30 -10	—	—	—	—	-	1402	2720	3496	3305	3848	3906	3280	46	32	63	5.04	2446	58	568
Chhattis garh	Chattisgarh Plain/ Kawardham/ 24	Clay Loam	MTU-1010/ 100- 60-40/ ZnSO4(25) 50- 30 -20	0	0	0	0	0	2120	3013	5194	3151	5702	6060	3866	70	49	97	5.81	3582	358	1836
			Kanchan/ 100- 60-40/ ZnSO4(25) 50- 30 -20	—	—	—	—	-	1110	1971	3229	2335	3564	3797	2499	40	29	57	5.28	2454	233	1065

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Jharkhand	Central and North Eastern Plateau/ Jamtara/24	NA	Naveen/ 100- 50-25/ Zn (5) 50- 25-0	5.1	0.6	294	4	160	988	1693	3163	2006	3698	3708	2059	133	94	186	18.6	2710	10	1639
			K-9107/ 100- 50-25/ Zn (5) 50- 25-0	—	—	—	—	-	683	1521	2509	1834	3168	3199	2186	77	54	107	12.3	2485	31	982
Madhya Pradesh	Kymore Plateau and Satpura Hill /Katni/24	Medium Black Soil	Danteshwari/ 120- 60-40/ ZnSO4(25) 40- 20 -0	6.5	0.5	280	150	600	2468	2826	3720	3385	4216	4726	2832	78	55	109	7.87	1748	510	1384
			GW-273/ 120- 60-40/ ZnSO4(20) 40- 20 -0	—	—	—	—	-	2378	2826	3322	3057	3781	4157	2657	50	35	69	5.44	1403	376	1124
Madhya Pradesh	Northern hill zone of Chattisgarh/ Dindori/10	Medium Black Soil	IR-36/ 120- 60-40/ ZnSO4(25) 40- 20 -20	0	0	0	0	0	1075	1545	2220	1620	2600	2645	975	73	52	104	9.01	1525	45	1625
			JW-3020/ 120- 60-40/ ZnSO4(25) 40- 20 -20	—	—	—	—	-	1180	1955	2175	1980	2705	2735	1175	90	64	128	10.2	1525	30	1530
Maha- rashtra	Eastern Vidharba/ Gondia/12	NA	PKV-Khanang/ 100- 50-50/ ZnSO4(25) 60- 45-10	0	0	0	0	0	1833	2113	2829	2492	3208	3421	2046	54	39	78	5.21	1375	213	1162

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
			AKW-3722/ 100- 50-50/ ZnSO4(25) 70- 40-5	—	—	—	—	-	900	1088	1683	1358	2033	2279	1579	42	30	60	6.63	1133	246	454
Punjab	Central Plain Zone /Amritsar, Tamtara/24	NA	PR 120/ 120- 30 -30 / ZnSO4(25) 150- 40-0	8.2	2.4	173	38	123	4744	6364	7317	6885	7771	8079	7124	113	80	158	5.69	3027	308	647
			PBW 621/ 120- 60-30 / MnSO4 (1%) 150- 60-0	—	—	—	—	-	2967	4338	4909	4589	5247	5296	5005	88	62	123	6.57	2280	49	242
Uttar Pradesh	North Eastern Plain /Sant Kabirnagar/20	Alluvial	NDR-359/ 120- 60-40/ ZnSO4(25) 90-30-0	7.2	0.5	0	15	166	2055	3031	4250	3543	4889	5329	3494	64	45	89	5.3	2834	440	1395
			PBW-343/ 120- 60-40/ ZnSO4(25) 90- 30-0	—	—	—	—	-	1616	2449	3547	2988	4067	4454	3006	43	30	59	4.28	2451	387	1061
Uttar Pradesh	Central Plain/ Kaushambi/24	NA	Pant - 12/ 100- 50-50/ ZnSO4(25) 110- 70-0	7.8	0.4	0	10	167	1469	2701	3753	3175	4409	4719	3190	153	108	212	15.9	2940	310	1219
			PBW-343/ 120- 60-40/ control 95- 45 -35	—	—	—	—	-	1964	2913	3707	3191	4166	4496	3139	68	48	94	7.01	2202	330	1027

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Uttara- khand	Hill/Nainital/ 24	Hilly	NPH-567/ 150- 60-40/ Zinc(20) 120- 40-0	6.8	0.8	285	23	197	4290	5768	7455	6969	8155	8250	6387	159	112	222	8.14	3865	95	1768
			UP-2572/ 150- 60-40/ Zinc(20) 120- 40-0	—	—	—	—	-	2693	3983	4703	4389	5094	5078	4189	87	61	121	6.97	2401	-16	905
J & K	Low altitude Sub-Tropical Zone/Samba/ 12	NA	Pusa-1121/ 50- 30 -20 / Zinc(20) 30 - 25-0	7.1	0.5	203	14	128	1800	2538	3234	2819	3559	3721	3395	73	52	104	5.98	1759	162	164
			PBW550/ 100- 50-25/ control 55- 46-0	—	—	—	—	-	1615	2187	2880	2471	3233	3421	2681	90	63	126	8.3	1618	188	552
									Rice-chickpea													
Maha- rashtra	Eastern Vidarbha / Gondia/ 12	NA	PKV-Khanang/ 100- 50-50/ ZnSO4(25) 85- 40-20	0	0	0	0	0	2067	2242	3004	2938	3375	3621	2075	88	62	124	7.8	1308	246	1300
			AKG-46/ 20 - 40-20 / ZnSO4(25) 20-30-0	—	—	—	—	-	583	758	1088	900	1438	1625	1071	30	21	42	6.96	855	187	367

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Rice-green gram																						
Orissa	East & South Eastern Coastal Plain /Kendrapara/ 24	NA	Pratikshya/ 80- 40-40/ ZnSO4(25) 30 - 25-20	5.9	0.6	274	75	149	3042	3707	3963	4115	4508	4801	3737	55	39	77	4.82	1466	293	771
			Local/ 20 - 40-20 / Molybdnum 7.5 - 15-0	—	—	—	—	-	601	674	717	748	816	862	632	17	12	24	8.09	215	46	184
West Bengal	Coastal saline/ 24 South Paragnas/24	NA	Pratikshya/ 80- 40-40/ ZnSO4(25) 80 - 30-30	5.3	1.2	130	48	302	3186	3557	3952	4131	4448	4609	4156	38	27	53	3.25	1262	161	292
			Local/ 20 - 40-40 / Molybdnum 7.5-20-20	—	—	—	—	-	896	965	1046	1099	1174	1239	1307	20	14	27	6.28	278	65	-133
Rice-groundnut																						
Orissa	Mid Central Table Land/ Angul/24	NA	Lalat/ 80- 40-40/ ZnSO4(25) 35- 20 -20	5.8	0.6	265	12	131	3622	4407	4809	4877	5278	5570	4544	74	52	103	5.4	1656	292	734
			Devi/ 20 - 40-40/ Gypsum(250) 7.5 - 15-0	—	—	—	—	-	1551	1860	2144	2020	2376	2497	2018	33	23	46	5.45	825	121	358

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Rice-cabbage																							
Tamil Nadu	North-Western/ Dharmapuri, Krishnagiri/12	Sandy Clay Loam	Sona Mussorie/ 150- 50-50/ ZnSO4(25) 100- 40-40	7.5	0.5	278	29	243	3572	4855	6327	6072	7411	7711	6704	72	51	102	2.88	3839	300	707
			Hari Rani/ 100- 125-25/ Bo as Borax (1) 100-90-25	—	—	—	—	-	27237	34722	46161	42372	55191	56703	46901	821	581	1162	4.55	27954	1512	8290
Rice-tomato																							
Tamil Nadu	North-Western/ Dharmapuri, Krishnagiri/12	Clay Loam	White Ponni/ 150- 50-50/ ZnSO4(25) 110- 40-45	7.8	0.5	268	33	205	3373	4428	5717	5378	6823	7280	5998	102	72	143	4.5	3450	457	825
			US 618/ 200 - 300-200 / Ca as CaNO3 (2kg) 150-115-110	—	—	—	—	-	26005	37248	53367	49051	63676	68872	58362	1380	976	1932	6.63	37671	5196	5314
Pearlmillet-wheat																							
Gujarat	Middle Gujarat / Kheda/12	Alluvial	GHB-30/ 80- 40-40/ ZnSO4(25) 50- 30 -0	7.8	0.5	234	23	196	1563	2136	2980	2380	2853	2998	1858	73	52	104	7.49	1290	145	995
			GW-496/ 120- 60-60/ ZnSO4(25) 85- 50-0	—	—	—	—	-	1610	2375	3427	2584	3344	3417	2166	111	79	158	10.1	1734	73	1178

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Maha- rashtra	North-east Alluvial Plain/ Pune/24	Light Soil	Manik/ 60- 30 -30 / Fe (20) 40 - 0-0	8	0.7	209	16	370	2912	3678	4085	4351	4412	4729	3263	77	54	107	6.81	1500	317	1149
			NIAW-301/ 120- 60-40/ Fe (20) 75- 0-0	—	—	—	—	-	4971	6063	7011	7827	8285	8696	5367	47	33	65	2.38	3314	411	2918
									Pearlmillet-mustard														
Gujarat	North Gujarat / Banaskantha, Patan/8	NA	86 M 52/ 80- 40-40/ Znso4(15) 70- 30 -0	7.7	0.4	200	18	238	1171	1824	2117	2188	2378	2506	2204	58	41	83	5.67	1207	128	174
			GM-3/ 50- 50-25/ ZnSO4(25) 45- 50 -0	—	—	—	—	-	954	1479	1852	1895	2167	2324	2029	73	52	105	8.06	1213	157	138
									Maize-Wheat														
Himachal Pradesh	Sub-Montane and Low Hills Sub-Tropical zone /Kangra/20	Submontan- eous Decalb/	Hyb. Double 90- 45 -30 / ZnSO4(25) 55- 0-0	5.8	3.1	263	23	147	1780	2122	2669	2413	3179	3419	1874	31	22	44	3.95	1399	240	1305
			HPW-184/ 80- 40-40/ ZnSO4(25) 50-30-15	—	—	—	—	-	1809	2171	2716	2531	3349	3538	1842	47	33	65	5.82	1540	189	1507

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Rajasthan	Sub-humid Southern Plain and Aravalli Hills / Chittorgarh/24	NA	PEHM-2/ 90- 35 -30 / ZnSO4(25) 70- 20 -0	7.8	0.7	568	22	469	894	1569	2335	1963	2790	3156	1658	68	48	95	11.5	1896	366	1132
			RAJ-4037/ 120- 40-30 / ZnSO4(25) 90- 25 -0	—	—	—	—	-	1760	2313	4144	3616	4844	4963	3227	62	43	85	6	3084	119	1617
J & K	Low altitude Sub-Tropical Zone/ Samba/12	NA	Kanchan/ 90- 60-30 / ZnSO4(10) 40 - 35 -0	7	0.6	206	14	125	1437	2149	2833	2482	3232	3346	2678	51	36	72	4.8	1795	114	554
			PBW175/ 100- 50-25/ control 40- 33-0	—	—	—	—	-	1822	2381	2988	2590	3327	3397	2823	73	52	104	6.47	1505	70	504
			Maize-chickpea																				
Karnataka	Northern Dry / Gadag/7	NA	M900/ 100- 50-25/ ZnSO4(10) 80- 57.5-0	7.5	0.7	113	18	325	1189	1764	2594	2141	3365	3728	2124	194	137	277	15	2176	363	1241
			JG-11/ 10- 25-0/ ZnSO4(10) 0- 25-0	—	—	—	—	-	309	356	550	399	657	755	393	26	18	36	9.83	348	98	264
Karnataka	Northern Dry / Gadag/7	Black Cotton Soil	M900/ 150- 75-37.5 / ZnSO4(25) 100- 57.5-0	7.8	0.7	118	24	422	2891	3257	3238	3180	3337	3629	2999	164	116	234	9.5	446	292	338

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
			BGD 103/ 25- 50-0/ Znso4(15) 15- 35 -0	—	—	—	—	-	384	499	857	692	961	1061	672	45	32	65	11.4	577	100	289
			Cotton-wheat																			
Haryana	Western Zone/ Sirsa/24	Alluvial	Bio6488/ 175- 60-60/ ZnSO4(5.25) 150- 60-30	8.4	0.3	131	11	143	1011	2063	2386	2270	2729	2875	2483	71	50	99	10.9	1718	146	246
			HD2851/ 150- 60-60/ ZnSO4(5.25) 150-60-0	—	—	—	—	-	1691	4722	5176	4828	5448	5649	5268	98	70	139	7.28	3757	201	180
Maha- rashtra	Central Maharashtra Plateau/ Aurangabad/12	Not Available	Bramha/ 150- 75-75/ MnSO4(20) 95-50-50	0	0	0	0	0	1279	1742	1971	2016	2223	2328	1805	36	25	50	4.57	944	105	418
			LOK - 1/ 120- 60-60/ ZnSO4(25) 90-45-45	—	—	—	—	-	1614	2297	2575	2593	2743	2873	2252	52	37	74	5.22	1129	130	491
			Cotton-chickpea																			
Maha- rashtra	Central Maharashtra Plateau / Aurangabad/12	Not Available	Bramha/ 150- 75-75/ MnSO4(20) 90- 45-45	0	0	0	0	0	1119	1527	1634	1656	1787	1827	1482	37	26	52	5.78	668	40	305

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
			BDNG-797/ 25- 50-30 / MnSO4(20) 20 - 40-0	—	—	—	—	-	927	1277	1442	1555	1668	1704	1532	29	20	40	4.85	741	36	136
Cotton-pearlmillet																							
Gujarat	North Gujarat / Banaskantha,	Not Available	Krushi Dhan-2/ 200 - 40-40/ MnSo4(15) 130- 55-0	7.7	0.4	245	27	314	1286	2225	2507	2661	2851	3006	2664	101	71	143	8.22	1565	155	187
			86 M 52/ 120-60-60/ ZnSO4(15) 70-30-0	—	—	—	—	-	1991	3052	3662	3839	4251	4623	4080	140	99	200	7.69	2260	372	171
Castor																							
Gujarat	North Gujarat / Banaskantha, Patan/8	Not Available	GCH-7/ 120- 25-25/ ZnSO4(25) 95- 45 -0	7.7	0.4	235	22	315	1649	2537	2924	2973	3461	3963	3228	137	97	196	9.26	1812	502	233
Clusterbean-wheat																							
Rajasthan	Irrigated North-Western Plain/ Hanumangarh/20	Sandy Loam	RGC-936/ 20 - 40-20 / ZnSO4(12) 10- 20- 0	8.6	0.3	210	31	283	1057	1217	1318	1292	1397	1434	1312	27	19	38	6.71	340	37	85
			RAJ-3077/ 120- 40-20 / ZnSO4(12) 80- 30 -5	—	—	—	—	-	3190	4271	4529	4415	4943	5023	4659	88	62	123	6.26	1753	80	284

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
Tobacco-pearlmillet																						
Gujarat	Middle Gujarat / Kheda/12	Alluvial	GTH-1/ 220- 45 -45 / ZnSO4(25) 150- 80-0	7.7	0.5	249	19	304	1965	3852	3826	3673	3789	3972	2596	111	79	158	8.05	1824	183	1193
			GBH-558/ 80- 40-40/ ZnSO4(25) 100- 50-0	—	—	—	—	-	1728	2339	3196	2654	3242	3341	2338	87	61	122	7.87	1514	99	904
Chilli+onion-cotton																						
Karnataka	Northern dry / Gadag/7	Black Cotton Soil	Byadegi dabbi/ 100- 50-50/ Znso4(15) 23- 38 -0	7.9	0.4	101	21	416	310	452	614	544	679	725	429	37	26	53	13.1	369	46	250
			Arkakaye/ 62.5 - 25-62.5 / Znso4(15) 15- 40-0	—	—	—	—	-	1603	3454	4490	4054	5039	5733	3197	277	196	396	13.2	3436	694	1842
			Jayadhar/ 7.5 - 3.75 -3.75 / control 0- 0-0	—	—	—	—	-	237	423	546	447	607	711	269	29	20	40	11.6	370	104	338
Fingermillet-tomato																						
Karnataka	Eastern Dry / Kolar/12	Red Soil	GPU-66/ 100- 50-50/ ZnSO4(20) 60- 20 -15	6.9	0.4	150	10	163	1173	2210	3098	2905	3671	3899	3531	103	73	145	8.58	2498	228	140

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State	NARP Zone	Soil Type	Variety/ Recommened Fertilizer Micro. FP (Fert.)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg/ ha)	P (kg/ ha)	K (kg/ ha)	Control	N	NP	NK	NPK	NPK+ M. Nut.	F. Pract	SE(d)	SE (M)	CD (5%)	CV	Yield differ- ence RF vs Control (kg/ ha)	Yield differ- ence RF+ vs RF (kg/ ha)	Yield differ- ence RF vs FP (kg/ ha)
			US-3140/ 250 - 250 -250 / ZnSO4(20) 150- 100-125	—	—	—	—	-	13426	23637	31863	32121	38186	41627	39635	1480	1047	2073	11.51	24760	3441	-1449
									Tomato-cabbage													
Karnataka	Eastern Dry / Kolar/11	Red Soil	NA/ 250-250-250/ ZnSO4(20) 150- 100 -125	6.9	0.4	135	9	143	10877	18219	27102	25995	32648	36998	38422	1613	1140	2280	13.92	21771	4350	-5774
			NA/ 150- 100-125/ ZnSO4(20) 75- 125-100	—	—	—	—	-	28054	37688	50078	44332	59439	63916	67250	2048	1448	2896	9.59	31385	4477	-7811

7.5.1.2 On-farm evaluation of diversified cropping systems

Title of the experiment: **On farm evaluation of new diversified cropping system under irrigated /rainfed conditions**

Objectives: To assess the on–farm performance of alternative crops and cropping systems for increasing intensity as well as yield potential, calorific values and net returns in different agro climatic zones.

Year of start: 1999-2000

Treatments: Four to seven best crop sequences involving three to four crops (cereals, pulses, oil seeds, vegetables and fodder crops) suited for specific requirement of different regions have been evaluated at all the centers. The cropping system evaluated and crop cultivars used are given in Table 7.5.1/2.

Results

Performance of various cropping system in terms of grain yield, total calories and net returns are presented in table 7.5.1/2. Existing rice- rice system can be diversified by introducing *rabi* maize as rice-maize recorded rice equivalent yield of 13.8 t ha^{-1} which is 9% higher than existing system at Warangal. The diversified system also recorded an increase of 8.2 and 21% in terms of total calories and net returns respectively over existing system. In coastal telangana also, rice- maize registered 8% higher system yield, 7% higher calories and 28% higher net returns indicating the scope of expanding rice-maize area in Srikakulam district. In the middle gangatic plain zone (Purnea), rice-potato-green gram recorded rice equivalent yield of 16.3 t ha^{-1} which is 112% higher than existing rice-wheat system (7.7 t ha^{-1}). Among the various system evaluated, rice-potato-green gram registered 133% higher net returns, however the total calories was higher (57%) in rice-winter maize system compared to existing rice-wheat system. Soybean-tomato- vegetable cowpea system recorded higher system yield and net returns (2.87 lakhs/year/ ha) compared to soybean-chickpea system in Chattisgarh plains (Kawardha). However, soybean- potato-vegetable cowpea recorded 136% higher calories. At Kheda district in Gujarat, though tobacco equivalent yield was higher in tobacco-pearlmillet (3.5 t ha^{-1}), net return was higher with tobacco –multicut fodder sorghum (2.28 lakhs/ha/ year) compared to sole tobacco. At Deesa in North Gujarat, greengram-fennel recorded higher pearlmillet equivalent yield (8.2 t ha^{-1}) and 17% higher net returns over existing pearlmillet – mustard system. However, all the alternative systems evaluated recorded reduced total calorific

Ecosystem	OFR district (state)	No. of trials
Arid	Banaskantha & Pathan (Gujarat)	16
Semiarid	Warangal (A.P.) Kawardha (Chattisgarh) ,Kheda (Gujarat), Gadag & Kolar (Karnataka), Katni, Dindori (M.P.) Aurangabad, Pune , Raigad , Gondia (Maharashtra) , Amritsar (Punjab), Hanumangarh & Chittorgarh (Rajasthan), Sivagangai, Pudukottai, Dharmapuri and Krishnagiri (Tamil Nadu)	339
Sub-humid	Purnea (Bihar), Sirsa (Haryana), Samba (J&K), Jamtara (Jharkhand) , Angul and Kendrapara (Odisha) Kaushambi & Santkabirnagar (Uttar Pradesh) , Nainital (Uttarakhand)	212
Humid	Kangra (H.P.), 24 South Paragnas (W.B.)	52
Coastal	Pathinamthitta (Kerela), Srikakulam (A.P.)	48
Total		**667**

value. Similarly in the same situation, the other predominant system hybrid cotton- pearlmillet can be diversified by intercropping cowpea in hybrid cotton followed by pearlmillet which recorded 3.6 t ha^{-1} of cotton equivalent yield and 9% higher net returns over existing system. In western alluvial zone of Haryana (Sirsa), existing system cotton-wheat recorded higher system yield and net returns compared to all the other alternate systems evaluated. However in terms of calories, greengram–wheat recorded 25% higher calories than cotton-wheat system due to the presence of pulse crop in the system. At Kangra, alternative system evaluated for existing rice –wheat and maize – wheat system indicated that these systems can be profitably diversified with rice-potato-onion system. The increase in net returns over existing system was found to be 155 and 176% respectively. In terms of total calories, rice-potato-onion recorded higher value (34%) compared rice-potato-frenchbean (11%). Similarly in sub tropical low altitude condition of Jammu and Kashmir, rice-potato-onion can replace rice-wheat system due to higher rice equivalent system yield (18.3 t ha^{-1}), higher net returns (16.3%) and higher calorific value (83%). In the same situation, maize-wheat can be diversified with maize+ okra-potato-onion system as it recorded system yield of 24.8 t ha^{-1} with 153 and 59% higher net returns and total calories over existing system. In Jamtara district of Jharkhand, it was found that, alternative system evaluated failed to record higher yield net returns and total calories compared to existing rice-wheat system. In the northern dry region of Karnatka (Gadag), existing system of hybrid maize-chickpea recorded higher system yield and net returns, though Bt cotton with higher N, P_2O_5 and K_2O dose of 150:75:75 kg ha^{-1} registered marginally higher net returns (Rs 45378 ha^{-1}), its yield was lesser than hybrid maize-chickpea system. The other existing system chilli-onion-cotton also registered higher chilli equivalent system yield (1.06 t ha^{-1}) compared to other systems evaluated. However in terms of net returns, sunflower-chickpea and ground nut-sorghum recorded 31 and 32% higher net returns than the chilli + onion-cotton system. In the eastern dry region of Karnataka (Kolar), existing system of tomato-cabbage recorded higher tomato equivalent system yield (75 t ha^{-1}) than other systems. However, 163% higher total calories was observed in cabbage-coriander-okra than tomato-cabbage system. Tomato-coriander-beet-root registered fingermillet equivalent yield of 93.9 t ha^{-1} with 106 % increase in net returns than existing fingermillet-tomato system in the same region from other set of experiments. In this also, cabbage-coriander-beet root recorded 233% higher calories than existing system. In the problem zone of Kerala (Pathinamthitta), higher rice equivalent system yield of 34 t ha^{-1} was observed with rice-rice-yardlong bean system which is 254% higher than existing rice-rice system. However the net returns and total calories were higher with rice-rice-okra (258%) and rice-rice-amaranthus (144%) respectively. Soybean-wheat recorded 1.2 t ha^{-1} of green gram equivalent system yield which is 8% higher than green gram-wheat system at Dindori in Madhya Pradesh. The alternate system also registered 11% increase in net returns and 28% increase in total calories. The kymore plateau and satpura hills zone of Madhya Pradesh (Katni), the alternate systems evaluated failed to improve the system yield, net returns and calories compared to existing rice-wheat system. In the central Maharashtra plateau region (Aurangabad), cotton + greengram-wheat and cotton –greengram-chickpea recorded higher cotton equivalent system yield of 3.2% and 3 t ha^{-1} against existing system cotton-wheat (2.3 t ha^{-1}) and cotton chickpea (2.2 t ha^{-1}). Higher net returns and calories were recorded in cotton + green gram-wheat and cotton+ greengram-chickpea systems although cotton-chickpea recorded marginally higher net returns. In the deccan plateau region of Maharashtra (Pune), pearlmillet-onion was found to be better in terms of pearl millet equivalent yield (15.3 t ha^{-1}) and increase in net returns (128 %) compared to existing pearlmillet-wheat system. In terms of calories, pearl millet-fenugreek recorded 58.3% higher value than pearl millet wheat system. In the north konkan coastal area of Maharashtra (Raigad), out of 6 alternative systems evaluated, rice- chilli was found to be better in terms of rice equivalent system yield (26 t ha^{-1}) and increase in net returns (116%) than existing rice-cowpea system. However in terms of calories, rice maize was found

to be better as it registered 63% increase in calories over existing system. Alternate systems were evaluated for rice – wheat and rice – chickpea in eastern vidharbha high rain fall zone of Maharashtra at Gondia. Crop intensification through rice-wheat- cowpea was found to record 56% higher system yield, 344% higher net returns and 12% higher calories. Similarly rice - chickpea - cowpea was found to be better diversified system for rice-chickpea as it recorded 5.2 t ha^{-1} of system yield, 218% increase in net returns and 10% increase in total calories.

In mid central table land of Odisha (Angul), rice-onion recorded better rice equivalent system yield (16 t ha^{-1}) and net returns (Rs 90239/ha/year) than rice-greengram system (7.7 t ha^{-1} and Rs 42463/ ha/year respectively). The total calories was also higher in rice-onion system (25040 x 1000 Kcal/ ha). Rice – bittergourd was found to be better in east and south eastern coastal plain zone of Odisha (Kendrapara) as it recorded 15.1t ha^{-1} of system yield and 169% higher net returns than existing rice- greengram system. However, the total calories was found to be higher (54%) in rice-groundnut. Among the alternate systems evaluated for central region of Punjab (Amritsar), though rice-gobhisarsan-greengram, rice-greenpeas-green-gram and rice-greenpeas-mash recorded higher system yield (16, 16 and 15.6 t ha^{-1} respectively) than existing rice –wheat system , net returns and total calories was found to be higher in existing system.

Clusterbean-wheat was found to record 208% higher green gram equivalent system yield and 189% higher net returns than greengram-wheat system in irrigated north western plane zone of Rajasthan (Hanumangarh). However, in terms of total calories, greengram-wheat was found to be better among the various systems evaluated. In sub humid southern plain and Aravali hills of Rajasthan (Chittorgarh) also, clusterbean-wheat was found to be better alternative system to maize-wheat as it recorded 10.2 t ha^{-1} of system yield and 23% higher net returns. Around 13% higher calories was recorded with maize-wheat system by changing the maize hybrid from PEHM-2 to Pro-4640. In southern zone of Tamil Nadu,(Sivagangai & Pudukottao), although existing rice-rice system recorded higher system yield of 11.7 t ha^{-1}, rice-sesame recorded better in terms of profitability (20% higher than rice-rice system). However, in term of calories, rice-rice was found to be better. In north western dry zone of Tamil Nad (Krishnagiri and Dharmapuri) different packages consisting of farmers package, system of rice intensification + recommended practice of criss cross cono-weeding in rice, application of pre and post emergence herbicide (pendimethalin and propaquizafop 10% EC) to cabbage and tomato was evaluated . Among the package evaluated, SRI with criss cross cono weeding to rice and application of pendimethalin @1 kg ha^{-1} followed by hand weeding recorded 44.5 t ha^{-1} of rice equivalent yield with 21% higher net returns and 24% total calories in rice-cabbage system compared to farmers' package. Similarly, in rice-tomato system, 36 t ha^{-1} of system yield with 23 and 14% increase in net returns and total calories was observed with brown manuring followed by conoweeding to rice and application of pendimethalin @ 1 kg ha^{-1} as pre emergence and propaquizafop @ 75 g ha^{-1} as post emergence herbicide to tomato.

Sesame-wheat was found to give higher sorghum equivalent system yield (6.2 t ha^{-1}) with 28% higher net returns than sorghum-wheat in central plane zone of Uttar Pradesh (Kaushambi). In terms of calories, existing sorghum-wheat system was found to be better. Similarly in north eastern plain zone of Uttar Pradesh (Santkabirnagar), although rice-lentil recorded higher rice equivalent system yield (10 t ha^{-1}), existing rice-wheat system was found to be better in terms of net returns (Rs 63287/ha/year) and calories (30710x1000 Kcal). In the hills of Uttrakhand (Nainital), rice-tomato-cowpea was found to be more productive (31.5 t ha^{-1} of system yield) and profitable (Rs 2.43 lakhs/ha/year) than existing rice-wheat system which recorded only 13.7 t ha^{-1} and 1.20 lakhs ha^{-1} $year^{-1}$ of net returns. In terms of calories, addition of cowpea in summer to rice –wheat system registered 6.4% increase over rice-wheat alone. In the coastal saline zone

of West Bengal (24 South Paragnas), rice-okra recorded 36 t ha^{-1} of rice equivalent system yield which is 285% higher than existing rice-greengram system. The same system also recorded 626% increase in net profit. However in terms of calories, rice-sunflower recorded higher increase (39%) than rice-okra (149%) system.

Across the locations and systems, the best performing diversified system registered net returns and total calories of Rs. 1, 69, 270 ha^{-1} $year^{-1}$and 35273x1000 Kcal ha^{-1} $year^{-1}$ compared to the existing system (1,00,718 ha^{-1} $year^{-1}$ and 24213x1000 Kcal ha^{-1} $year^{-1}$). On an average, it was found that, the net returns and total calories production per hectare can be increase by 68 and 46% respectively through diversification of existing system with location specific identified alternative systems.

Crop diversification by introducing vegetable crop of tomato in Warangal district (A.P.)

Crop diversification in Kangra district

Diversification of pearl millet based cropping system in Deesa district (Gujarat)

A view of on-farm crop diversification studies in Paiyur district of TN

Table 7.5.1/2. Productivity, caloric value and net return of different crop sequences (2011-2012)

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Andhra Pradesh	Rice (BPT-5204)	Rice (MTU-1010)		5782	6311		41843	78948
Southern Telangana	120-60-40	120-60-40		(7734)	(7858)			
Warangal	Rice (BPT-5204)	Maize (Pinacle)		6006	7158		45260	95250
(24)	120-60-40	120-60-50		(7953)	(9000)			
	Rice (BPT-5204)	Sunhemp (local)		5995	1665		28068	69550
	120-60-40	30-60-60		(7855)	(3408)			
	Rice (BPT-5204)	Blackgram (LBG-752)		6001	1411		25659	38008
	120-60-40	20-50-20		(7914)	(3337)			
	Rice (BPT-5204)	Greengram (LGG-645)		5885	1470		25273	77281
	120-60-40	20-50-20		(7801)	(3386)			
						S.E.(m)	235	1140
						C.D.(5%)	465	2257
						C.V.	3.46	7.78
Andhra Pradesh	Rice (MTU-1001)	Rice (MTU-1010)		4709	4953		33430	49496
North Coastal	120-60-40	120-60-40		(6273)	(6102)			
Srikakulam	Rice (MTU-1001)	Maize (P Hybrid)		4872	5573		35918	63084
(24)	120-60-40	120-60-50		(6452)	(6995)			
	Rice (MTU-1001)	Sesame (YLM-66)		4863	1315		24233	44478
	120-60-40	20-40-20		(6369)	(2657)			
	Rice (MTU-1001)	Blackgram (LBG-752)		4849	1103		20458	41691
	120-60-40	20-50-20		(6424)	(2609)			
	Rice (MTU-1001)	Greengram (LGG-645)		4845	1155		20773	54072
	120-60-40	20-50-20		(6335)	(2650)			
						S.E.(m)	683	2019
						C.D.(5%)	1353	3997
						C.V.	12.41	19.56
Bihar	Rice(R. Shweta)	Wheat(PBW-343)		4187	3520		26666	38740
North east alluvial	80-40-20	120-60-40		(5236)	(4508)			
Plain	Rice(R. Shweta)	Wheat(PBW-343)	Greengram (P. Vishal)	4134	3549	787	29216	67477
Purnea (24)	80-40-20	120-60-40	20-40-0	(5145)	(4543)	(748)		
	Rice(R. Shweta)	W. Maize(Shaktiman-4)		4132	8063		41874	86006
	80-40-20	120-75-50		(5199)	(11984)			
	Rice(R. Shweta)	Mustard (R. Suphalam)		4160	950		19536	35098
	80-40-20	80-40-40		(5220)	(2517)			
	Rice(R. Shweta)	Potato(K.Jyoti)	Greengram (P. Vishal)	4062	19781	907	36270	90373
	80-40-20	150-90-100	20-40-0	(5143)	(1663)	(861)		
						S.E.(m)	264	890
						C.D.(5%)	522	1762
						C.V.	4.21	6.86

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Chattisgarh	Soybean(JS-335)	Chickpea (JG-74)		2177	2096		16952	69930
ChhattisgarhPlain /	20-50-20	20-50-20		(2948)	(2753)			
Kawardha/	Soybean(JS-335)	Wheat(Kanchan)	Cowpea Veg.(Ujjala)	2180	4032	7930	27175	161708
(24)	20-50-20	100-60-40	20-50-20	(2897)	(4384)			
	Soybean(JS-335)	Fieldpea(Ambika)	Okra(JKOH-7315)	2195	2094	7005	13884	144394
	20-50-20	20-50-20	100-60-40	(2917)				
	Soybean(JS-335)	Brinjal(VNR-218)	Cowpea Veg.(Ujjala)	2132	26018	7730	19163	154650
	20-50-20	120-60-40	20-50-20	(2889)				
	Soybean(JS-335)	Tomato(5005)	Cowpea Veg.(Ujjala)	2181	40430	7740	22437	287956
	20-50-20	120-60-40	20-50-20	(2897)				
	Soybean(JS-335)	Potato(Aagra-3797)	Cowpea Veg.(Ujjala)	2194	27545	7765	39923	259906
	20-50-20	150-100-100	20-50-20	(2934)				
						S.E.(m)	183	1537
						C.D.(5%)	363	3043
						C.V.	3.86	4.19
Gujarat	Tabacco(GTH-1)		-	3292				149931
Middle Gujarat	220-45-00							
Kheda	Tabacco(GTH-1)		Pearlmillet (GHB-558)	3191		2418		166728
(12)	220-45-00		80-40-00			(3688)		
	Tabacco(GTH-1)		F-Sorghum(Multicute)	3131				228253
	220-45-00		80-40-00			(31963)		
	Tabacco(GTH-1)		F-Rajka Bajri(Multicute)	3143				209387
	220-45-00		80-40-00			(25490)		
						S.E.(m)	4470	
						C.D.(5%)	9172	
						C.V.	8.21	
Gujarat	Pearl millet(GHB-558)	Mustard(GM-3)	-	1942	1815	-	16829	42741
North Gujarat	80-40-40	50-50-25		(5392)	(2609)			
Banaskantha/Pathan	Pearl millet(GHB-558)	Fennel (GF-11)	-	2027	1156		7445	45003
(8)	80-40-40	90-45-30		(5462)	(1963)			
	Greengram (GM-4)	Fennel (GF-11)		893	1198		3115	49817
	20-50-50	90-45-30		(1348)	(1965)			
	Greengram (GM-4)	Mustard(GM-3)		860	1903		13168	48289
	20-50-50	50-50-25	-	(1439)	(2648)	-		
						S.E.(m)	151	1119
						C.D.(5%)	316	2351
						C.V.	4.2	6.81

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Gujarat	Hy.Cotton(Krushi Dhan 2)		Pearlmillet(86M52)	2332		3506		66788
North Gujarat	200-40-40		120-60-50	(4093)		(6871)		
Banaskantha/Pathan	Hy.Cotton(Krushi Dhan 2)		Pearlmillet(86M52)	2273		3468		72744
(8)	200-40-40		120-60-50	(4010)		(6858)		
	;+			+				
	Cowpea (GC-4)			702				
	20-40-00			(1297)				
	Hy.Cotton(Krushi Dhan 2)		F Rajakabajri(Local)	2304				67998
	200-40-40		150-60-00	(4056)		(40894)		
	;+			+				
	Cowpea (GC-4)			735				
	20-40-00			(1341)				
	Hy. Castor (GCH-7)		F Rajakabajri(Local)	2419				45867
	120-25-25		150-60-00	(4941)		(42031)		
						S.E.(m)	2540	
						C.D.(5%)	5336	
						C.V.	11.34	
Haryana	Cotton (Bio-6488)	Wheat (HD-2851)		2598	5403		18693	116037
Western	175-60-60	150-60-60		(6693)	(5511)			
Sirsa	Guar (HG-365)	Wheat (HD-2851)		1016	5388		18641	100580
(24)	20-40-0	150-60-60		(1005)	(5725)			
	Guar (HG-365)	Raya (RH-30)		1000	2049		11084	102647
	20-40-0	80-30-0		(986)	(4329)			
	Greengram (Satya)	Wheat (HD-2851)		1264	5539		23388	87984
	35-40-0	150-60-60		(1259)	(5765)			
	Cotton (Bio-6488)	Barley (BG-393)		2618	4225		14195	104531
	175-60-60	60-30-15		(6767)	(4351)			
						S.E.(m)	376	2443
						C.D.(5%)	745	4838
						C.V.	10.71	11.69
H.P.	Rice (Kasturi)	Wheat (HPW-211)	-	2805	3498		21810	74002
Sub Mountain and	90-40-40	120-60-30		(4725)	(5015)			
Low Hills Sub-Tropical/	Rice (Kasturi)	Radish (J. White)	Potato (K. Jyoti)	2831	14215	14328	26110	97879
Kangra	90-40-40	100-50-40	120-80-60	(4752)	(3614)	(2577)		
(12)	Rice (Kasturi)	Potato (Pukhraj)	French Bean(Cont-ender)	2795	13544	5273	24179	188537
	90-40-40	120-80-60	50-80-60	(4753)	(2408)	(3990)		

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
	Rice (Kasturi)	Potato (Pukhraj)	Onion (N-53)	2864	13114	13501	29379	143558
	90-40-40	120-80-60	125-75-60	(4832)	(2249)	-		
	Rice (Kasturi)	Berseem+Oat(Local)	-	3011	-		10417	90777
	90-40-40	30-50-00		(4935)	(40702)			
						S.E.(m)	236	4014
						C.D.(5%)	477	8112
						C.V.	3.65	11.69
H.P.	Maize (Hybrid)	Wheat (HPW-184)	-	3086	3212		21665	57483
Sub Mountain and	90-45-30	80-40-40		(6019)	(4427)			
Low Hills Sub-Tropical/	Maize (Hybrid)	Wheat (HPW-184)		2888	3258		23670	75960
Kangra	90-45-30	80-40-40	-	(5509)	(4594)			
(16)	+			+				
	Soybean (Harit Soya)			584				
	-			(928)				
	Maize (Hybrid)	Gram (HC-I)	-	3073	1094		14448	46988
	90-45-30	30-60-30		(5984)	(1400)			
	Maize (Hybrid)	G.Sarson (HPN-1)		3094	1060		18718	39690
	90-45-30	120-60-40	-	(6097)	(1612)			
		+			+			
		Toria (Bhawani)			444			
		-			(594)			
	Maize (Hybrid)	Potato (Pukhraj)		3075	16050		32794	158890
	90-45-30	120-80-60		(6050)	(2316)			
		+			+			
		Onion (N-53)			13418			
		125-75-60						
						S.E.(m)	218	2162
						C.D.(5%)	441	4370
						C.V.	3.93	11.41
J & K	Rice (Pusa-1121)	Wheat (PBW-550)	-	3529	3293	-	23606	79770
Low altitude	50-30-20	100-50-25		(4237)	(4977)			
Sub tropical	Rice (IET-1410)	Garlic (Local)	-	3916	6116	-	22417	156565
Samba (12)	50-30-20	100-50-50		(4710)				
	Rice (IET-1410)	Potato(Sundari)	Onion(N-53)	3863	20913	19204	43254	210097
	50-30-20	120-60-120	100-50-50	(4709)				
	Rice (IET-1410)	Veg. Peas (AP1)	Okra (Ladyluck)	3894	6587	5712	21599	71769
	50-30-20	50-60-50	60-30-20	(4687)				
						S.E.(m)	663	5245
						C.D.(5%)	1360	10763
						C.V.	8.28	14.02

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
J & K	Maize (Kanchan)	Wheat (PBW-175)	-	3103	3463	-	22597	59828
Low altitude	90-60-30	100-50-25		(6232)	(5323)			
Sub tropical	Maize (Kanchan)	Garlic (Local)	-	2994	5465	-	18643	132161
Samba (12)	90-60-30	100-50-50		(6032)				
	+			+				
	Cowpea (Local)			148				
	Maize (Kanchan)	Potato(Sundari)	Onion(N-53)	2971	17152	17000	35959	151811
	90-60-30	120-60-120	100-50-50	(5989)				
	+			+				
	Okra(Ladyluck)			1891				
	Maize (Kanchan)	Veg. Peas (AP1)	Okra (Ladyluck)	3144	5461	4892	18192	87674
	90-60-30	50-60-50	60-30-20	(6395)				
	+			+				
	Blackgram (T-9)			187				
						S.E.(m)	337	3192
						C.D.(5%)	691	6551
						C.V.	4.89	10.25
Jharkhand	Rice (Naveen)	Wheat ((K9107)		3511	6241		33743	108633
Central and North	100-50-25	100-50-25		(4720)	(8904)			
Eastern Plateau/	Rice (Sahbhagi)	Chickpea(Uday)		2265	1837		14452	40582
Jamtara(24)	80-40-20	25-50-25		(3095)				
	Rice (PAC-801)	Mustrad (Shivani)		3948	1364		21039	47035
	120-60-30	80-40-20		(4567)	(3908)			
	Rice (Naveen)	Chickpea(Uday)		2084	1870		13943	39128
	80-40-20	25-50-25		(2834)				
	Rice Hybrid(6444)	Mustard (Shivani)		4815	1200		23155	53620
	120-60-30	80-40-20		(5536)	(3205)			
						S.E.(m)	507	2227
						C.D.(5%)	1004	4409
						C.V.	11.68	18.87
Karnataka	Hybrid Maize (M-900)	Chickpea(BGD-103)		3456	854			36361
Nortrern Dry/	100-50-25+ZnSo4 10kg/ha	10-25-00+ ZnSo4 10kg/ha		(3357)				
Gadag	Sunflower	Chickpea(BGD-103)		1016	901			27389
(7)	(Sunbreed) 35-50-35	10-25-00+ ZnSo4						
	Bt Cotton(Rasi -II)	10kg/ha		906				19237
	80-40-40							
	Groundnut (TMV-2)	Sorghum(M-35-1)		1023	1079			32739
	25-50-25	100-60-40		(1564)				
						S.E.(m)	831	
						C.D.(5%)	1746	
						C.V.	7.60	

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Karnataka	Hybrid Maize (M-900)	Chickpea(BGD-103)		4571	1204			43148
Nortrern Dry/	150-75-37.5+ZnSo4 25kg/ha	25-50-00+ ZnSo4 10kg/ha						
Gadag	Sunflower(Sunbreed)	Chickpea(BGD-103)		1271	1286			43714
(7)	60-25-60	25-50-00+ ZnSo4 10kg/ha						
	Bt Cotton(Rasi -II)			1636				45378
	150-75-75							
	Chilli (Byadagi dabbi)			897				45151
	150-75-75							
						S.E.(m)	1984	
						C.D.(5%)	4168	
						C.V.	11.84	
Karnataka	Chilli (Byadagi dabbi)	Cotton (Jayadhar)		364	453			23831
Nortrern Dry/	100-50-50	7.5-3.75-3.75						
Gadag	+			*				
(7)	Onion (N-53)			2557				
	62.5-25-62.5							
	Sunflower(Sunbreed)	Chickpea(BGD-103)		933	957			31247
	35-50-35	10-25-00+ ZnSo4 10kg/ha						
	Bt Cotton(Rasi -II)			971				26771
	150-75-75							
	Ground Nut(TMV-2)	Sorghum(M-35-1)		986	971			31497
	25-50-25	100-60-40						
						S.E.(m)	1627	
						C.D.(5%)	3418	
						C.V.	15.19	
Karnataka	Tomato (US-3140)	-	Cabbage (Unnati)	34099		61811	24532	523369
Eastern Dry /	250-250-250		150-100-125					
Kolar	Tomato (US-3140)	Coriander (Durga)	Okra (Bhindi-10)	43539	19012	6642	64770	413267
(6)	250-250-250	35-35-35	125-75-63					
	Tomato (US-3140)	Radish (Durga)	Beans(Classic NZ)	43539	18385	8329	13139	534303
	250-250-250	75-38-38	63-100-75					
	Cabbage (Unnati)	Coriander (Durga)	Okra (Bhindi-10)	50700	17695	6412	64652	257909
	150-100-125	35-35-35	125-75-63					
	Cabbage (Unnati)	Radish (Durga)	Beans(Classic NZ)	52510	18395	8144	17305	398072
	150-100-125	75-38-38	63-100-75					
						S.E.(m)	2973	29502
						C.D.(5%)	6201	61540
						C.V.	19.75	16.99

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Karnataka	Finger millet (ML 365)	-	Tomato (US-3140)	3773		41635	21951	366604
Eastern Dry /	100-50-50		250-250-250	(5116)				
Kolar	Tomato (US-3140)	Radish (Durga)	Beans(Classic NZ)	37975	40988	9104	15702	591432
(5)	250-250-250	75-38-38	63-100-75					
	Tomato (US-3140)	Coriander (Durga)	Beetroot(F1 Lalima)	37106	19259	34020	64001	757765
	250-250-250	35-35-35	63-100-63					
	Cabbage (Unnati)	Radish (Durga)	Beans(Classic NZ)	57605	40864	9242	22500	560919
	150-100-125	75-38-38	63-100-75					
	Cabbage (Unnati)	Coriander (Durga)	Beetroot(F1 Lalima)	58494	19901	35190	73109	722485
	150-100-125	35-35-35	63-100-63					
						S.E.(m)	1800	66822
						C.D.(5%)	3815	****
						C.V.	10.20	24.91
Kerala	Rice (Uma)	Rice (Uma)	-	4892	4726	-	33278	73797
Problem area	90-45-45	90-45-45		(6118)	(5872)	-		
Pathinamthitta	Rice (Uma)	Rice (Uma)	Yardlong bean	4933	4769	12408	39526	213210
(24)	90-45-45	90-45-45	(Local)	(6195)	(5945)			
			20-30-10			-		
	Rice (Uma)	Rice (Uma)	Okra (Arka	4920	4769	12669	37958	264887
	90-45-45	90-45-45	Anamika)	(6120)	(5935)			
			50-08-25			-		
	Rice (Uma)	Rice (Uma)	Cucumber	4992	4844	17293	36279	211287
	90-45-45	90-45-45	(Soubhagya)	(6233)	(6035)			
			70-25-25			-		
	Rice (Uma)	Rice (Uma)	Amaranthus (Arun)	4964	4791	17719	81415	149493
	90-45-45	90-45-45	100-50-50	(6182)	(5960)	-		
						S.E.(m)	299	3014
						C.D.(5%)	592	5968
						C.V.	3.20	8.09
M.P.	Greengram (HUM-1)	Wheat(GW-3020)		584	2360		10116	46483
Northern Hill Zone of	20-50-0	120-60-40		(1335)	(5160)			
Chhattisgarh /	Soybean(JS-335)	Wheat(GW-3020)	-	955	2540		12914	51415
Dindori	20-60-20	120-60-40		(1370)	(5640)			
(10)	Maize(Swarna-590)	Chickpea (JG-63)		1955	965		10160	44742
	100-50-40	20-60-20		(4265)	(710)			
	Soybean(JS-335)	Chickpea(JG-63)		755	925		6592	34129
	20-60-20	20-60-20		(1150)	(693)			
						S.E.(m)	355	2406
						C.D.(5%)	732	4967
						C.V.	11.27	17.22

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
M.P.	Rice(Dhanteshwari)	Wheat(GW-273)		3752	3373		24654	67730
Kymore Plataue &	120-60-40	120-60-40			(4426)			
Satpura Hills /	Soybean(JS-97-52)	Wheat(GW-273)	-	907	3576		16288	54582
Katni	20-60-20	120-60-40			(4718)			
(25)	Maize(HQPM-1)	Chickpea (JG-11)		886	1168		7232	36562
	60-40-30	20-60-20			(1292)			
	Greengram (TM-37)	Wheat(GW-273)		412	3742		14322	59966
	20-60-20	120-60-40			(4807)			
						S.E.(m)	263	1309
						C.D.(5%)	526	2618
						C.V.	8.42	11.96
Maharashtra	Cotton (Paras Bramha)	Wheat (Lok-1)		1609	2298		7950	43148
Cent Mah Plateau/	110-50-50	120-60-60		(2865)	(3702)			
Aurangabad	Cotton (Paras Bramha)	Wheat (Lok-1)		2244	2629		9095	69861
(12)	150-75-75	120-60-60		(4055)	(4288)			
	Cotton (Paras Bramha)	Wheat (Lok-1)		1973	2769		10838	74873
	150-75-75	120-60-60		(3560)	(4545)			
	+(1:1)			+				
	Gr. Gram(BM.2003-2)			377				
				(551)				
	Cotton (Paras Bramha)	Wheat (Lok-1)		1956	2720		10468	60217
	150-75-75	120-60-60		(3521)	(4459)			
	+ (1:1)			+		S.E.(m)	118	2009
	Chickpea(TAU-1)			294		C.D.(5%)	242	4122
				(460)		C.V.	4.26	11.22
Maharashtra	Cotton (Paras Bramha)	Chickpea (BDNG-797)		1592	1057		3806	43472
Cent Mah Plateau/	80-40-40	25-50-0		(2146)	(1407)			
Aurangabad	Cotton (Paras Bramha)	Chickpea (BDNG-797)		2000	1514		5450	66929
(12)	150-75-75	25-50-30		(2611)	(2081)			
	Cotton (Paras Bramha)	Chickpea (BDNG-797)		1768	1597		6781	63527
	150-75-75	25-50-30		(2360)	(2070)			
	+(1:1)			+				
	Gr. Gram(BM.2003-2)			309				
				(452)				
	Cotton (Paras Bramha)	Chickpea (BDNG-797)		1784	1593		6734	58493
	150-75-75	25-50-30		(2389)	(2067)			
	+ (1:1)			+		S.E.(m)	93	1801
	Chickpea (TAU-1)			277		C.D.(5%)	190	3696
				(397)		C.V.	5.65	10.74

Contd..../-

State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Maharashtra	Pearlmillet(Manik)	Wheat (NIAW-301)		2252	4145		22470	51463
Western Maharashtra	60-30-30	120-60-40		(4482)	(6325)			
Plain	Pearlmillet(Manik)	Chickpea(Digvijay)		2226	2328		16414	62925
Pune (24)	60-30-30	25-50-30		(4440)	(5851)			
	Pearlmillet(Manik)	Onion (N-2-4-1)		2234	26248		21190	117393
	60-30-30	100-50-50		(4459)				
	Pearlmillet(Manik)	Fenugreek(Kasturi)		2240	8253		35568	65268
	60-30-30	80-40-40		(4464)				
						S.E.(m)	182	1060
						C.D.(5%)	364	2119
						C.V.	3.73	6.99
Maharashtra	Rice (Sahyadri)	Cowpea(Konkan Safed)		5951	1458		25300	56334
North Konkan Coastal/	120-50-50	25-50-00		(8125)	(2245)			
Raigad	Rice (Sahyadri)	G.Nut(Tag-24)		5867	2062		31993	57019
(24)	120-50-50	25-50-00		(8045)	(3412)			
	Rice (Sahyadri)	Maize(Ganga Safed)		5660	6356		41320	62731
	120-50-50	100-50-50		(7681)	(5929)			
	Rice (Sahyadri)	Marigold(Indica Orange)		5850	5120		20445	38069
	120-50-50	150-75-50		(8030)	(4215)			
	Rice (Sahyadri)	Chilli (Sitara)		5733	8451		22288	122056
	120-50-50	90-60-30		(7936)	(6110)			
	Rice (Sahyadri)	G.Nut(Tag-24)		5778	1710		32895	120083
	120-50-50	25-50-00		(8035)	(2952)			
		'+			'+			
		Sweet Corn (Sugar-75)			3729			
		100-50-50			(3070)			
	Rice (Sahyadri)	Cowpea(Konkan Safed)	Okra (Mahyco-10)	5705	1245	11693		
	120-50-50	25-50-00	100-50-50	(7863)	(2471)	(4136)	27853	225703
						S.E.(m)	297	3313
						C.D.(5%)	581	6493
						C.V.	5.03	16.66
Maharashtra	Rice (PKV-Khamang)	Wheat(AKW-3722)		1815	1315		10827	5972
Eastern Vidharbha	100-50-50	100-50-50		(2722)	(1972)			
Gondia	Rice (PKV-Khamang)	Mustard(Pusa Bold)		1819	406		8491	2607
(12)	100-50-100	50-40-00		(2728)				
	Rice (PKV-Khamang)	Wheat(AKW-3722)	Cowpea(Pusa do	1820	1325	2563	12111	26539
	100-50-50	100-50-50	Fasali)	(2706)	(1988)			
			25-50-0					

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State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
	Rice (PKV-Khamang) 100-50-50	Mustard(Pusa Bold) 50-40-00	Cowpea(Pusa do Fasali) 25-50-0	1795 (2692)	416	2554	9685	22992
						S.E.(m)	65	225
						C.D.(5%)	133	462
						C.V.	2.18	5.36
Maharashtra	Rice (PKV-Khamang)	Chickpea(AKG-46)		1766	813		9034	8364
Eastern Vidharbha	100-50-50	20-40-00		(2648)	(731)			
Gondia	Rice (PKV-Khamang)	Mustard(Pusa Bold)		1730	393		8111	2095
(12)	100-50-50	50-40-00		(2595)				
	Rice (PKV-Khamang)	Chickpea(AKG-46)	Cowpea(Pusa do Fasali)	1702	825	2321	9973	26622
	100-50-50	20-40-00	25-50-0	(2553)	(745)			
	Rice (PKV-Khamang)	Mustard(Pusa Bold)	Cowpea(Pusa do Fasali)	1748	405	2325	9356	21102
	100-50-50	50-40-00	25-50-0	(2621)				
						S.E.(m)	43	227
						C.D.(5%)	88	466
						C.V.	1.63	5.41
Odisha	Rice(Lalat)	Greengram(SLM-668)		5182	864		20815	42463
Mid Central Table	80-40-40	20-40-20		(6759)				
Land/	Rice(Lalat)	Cowpea(Utkal Manika)		5285	4353		20377	52687
Angul/	80-40-40	25-50-60		(6854)				
(24)	Rice(Lalat)	Okra (VNR Supergreen)		5363	7702		21252	80434
	80-40-40	80-40-40		(6967)				
	Rice(Lalat)	Onion(Nasik N-53)		5284	13516		25040	90239
	80-40-40	120-60-100		(6817)				
						S.E.(m)	145	1202
						C.D.(5%)	290	2405
						C.V.	3.24	8.86
Odisha	Rice(Pratikshya)	Greengram(Local)		4599	846		18738	35532
East & South Eastern	80-40-40	20-40-20		(5963)				
Coastal Plain/	Rice(Pratikshya)	Sunflower(KBSH-1)		4631	1441		24961	31833
Kendrapara/	80-40-40	60-80-60		(6097)				
(24)	Rice(Pratikshya)	G.Nut(TMV-2)		4652	2239		28794	57660
	80-40-40	20-40-40		(5967)				
	Rice(Pratikshya)	Bittergourd(Greenlong)		4708	7124		17499	95716
	80-40-40	50-30-50		(6112)				
						S.E.(m)	180	987
						C.D.(5%)	360	1974
						C.V.	3.92	8.76

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State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
Punjab								
Central Plain/	Rice (PR-120)	Wheat (PBW-621)	-	7160	4778		41304	93254
Amritsar	120-00-00	120-60-30		(8729)	(6511)			
(24)	Rice (PR-120)	G.Sarson (GSL-1)	-	7065	1545		32804	69647
	120-00-00	100-30-00		(8690)	(3209)			
	Rice (PR-120)	G.Sarson (GSL-1)	Greengram (SML-668)	6969	1572	1080	36228	91356
	120-00-00	100-30-00	12.5-40-00	(8567)	(3235)	(2143)		
	Rice (PR-120)	Gr.Peas (P-89)	Greengram (SML-668)	7050	4939	1121	32728	52181
	120-00-00	50-62,50-00	12.5-40-00	(8550)	(9145)	(2238)		
	Rice (PR-120)	Gr.Peas (P-89)	-	7113	4861		29130	76971
	120-00-00	50-62,50-00		(8611)	(8774)			
	Rice (PR-120)	Gr.Peas (P-89)	Mash (1008)	7114	4846	1077	32848	94905
	120-00-00	50-62,50-00	12,5-24-00	(8745)	(8900)	(2152)		
						S.E.(m)	307	1410
						C.D.(5%)	609	2791
						C.V.	4.41	8.66
Rajasthan	Greengram (S.M.L.668)	Wheat (Raj.3077)	-	989	4794	-	19889	94270
Irrigated North Western	60-40-0	120-40-20		(1200)	(6201)			
Plain/ Hanumangarh	Clusterbean(RGC 936)	Wheat (Raj.3077)	-	1382	4849	-	17593	272855
(20)	60-40-0	120-40-20		(1925)	(6293)			
	Clusterbean(RGC 936)	Mustard (Laxmi)	-	1381	2076	-	12046	253935
	60-40-0	60-40-0		(1920)	(2514)			
	Clusterbean(RGC 936)	Barley (RD 2035)	-	1386	4675	-	16525	268046
	60-40-0	80-40-20		(1933)	(6091)			
						S.E.(m)	447	4705
						C.D.(5%)	894	9409
						C.V.	12.10	9.47
Rajasthan	Maize (PEHM-2)	Wheat (Raj 4037)		2685	4400		24408	69361
Sub Humid Southern	90-35-30	120-40-30		(4010)	(6527)			
Plain & Aravali Hills/	Maize (Aravali-1)	Barley (RD 2035)		2940	4340		24634	54557
Chittorgarh(24)	90-35-30	120-40-30		(4325)	(6492)			
	Maize (Pro-4640)	Wheat (Raj 4037)		3198	4833		27660	82188
	90-35-30	120-40-30		(4748)	(7115)			
	Soybean (JS-335)	Wheat (Raj 4037)		1735	4515		23117	73566
	20-40-0	120-40-30		(2517)	(6746)			
	Clusterbean (RGC-936)	Wheat (Raj 4037)		1031	4002		14012	85579
	20-40-00	120-40-30		(1481)	(6027)			
						S.E.(m)	148	809
						C.D.(5%)	294	1602
						C.V.	3.19	5.43

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State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
T.N.	Rice (ADT-39)	Rice (ADT-39)		5044	5788		37478	84892
Southern/	150-50-50	150-50-50		(6006)	(6887)			
Sivagangai & Pudukottai	Rice (ADT-39)	Blackgram (VBN-5)		5637	962		22969	95123
(24)	150-50-50	25-50-25		(6788)	(2040)			
	Rice (ADT-39)	Greengram(VBN-3)		6069	921		24076	79562
	150-50-50	25-50-25		(7298)	(2046)			
	Rice (ADT-39)	Sesame(SVPR-1)		6574	745		26940	101528
	150-50-50	35-23-23		(7692)	(3165)			
						S.E.(m)	274	1587
						C.D.(5%)	549	3174
						C.V.	4.83	8.61
T.N.	Rice (27P43)	Cabbage(Hari Rani)		6403	51005		35925	328433
North Western/	150-50-50	100-125-25		(8256)				
Dharmapuri & Krishnagiri	Rice (27P43)	Cabbage(Hari Rani)		8383	56880		44362	395893
(12)	150-50-50	100-125-25		(11027)				
	Rice (27P43)	Cabbage(Hari Rani)		7870	54618		41977	373039
	150-50-50	100-125-25		(10255)				
	Rice (27P43)	Cabbage(Hari Rani)		8149	54026		42781	370639
	150-50-50	100-125-25		(10754)				
						S.E.(m)	204	2578
						C.D.(5%)	412	5209
						C.V.	1.71	2.43
T.N.	Rice (27P43)	Tomato (US 610)		6391	57760		35399	206228
North Western/	150-50-50	200-300-200		(8735)				
Dharmapuri & Krishnagiri	Rice (27P43)	Tomato (US 610)		7232	63251		39570	244368
(12)	150-50-50	200-300-200		(10117)				
	Rice (27P43)	Tomato (US 610)		7128	62467		39028	238703
	150-50-50	200-300-200		(9911)				
	Rice (27P43)	Tomato (US 610)		7303	64996		40217	253352
	150-50-50	200-300-200		(10243)				
						S.E.(m)	505	2043
						C.D.(5%)	1020	4128
						C.V.	4.54	3.00

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State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
U.P.	Sorghum (CSV-13)	Wheat(PBW-343)		930	4349		18295	47759
Central Plain/	80-40-20	120-60-40		(3609)	(5406)			
Kaushambi	Blackgram (Shekhar-2)	Wheat(PBW-343)		472	4660		17762	57471
(24)	15-40-0	120-60-40		(237)	(5831)			
	Sesame (Shekhar)	Wheat(PBW-343)		449	4420		17818	61281
	20-15-15	120-60-40			(5551)			
	Sesame (Shekhar)	Pea(KPMR-400)		460	2448		10302	61843
	20-15-15	20-40-20			(1224)			
						S.E.(m)	36	267
						C.D.(5%)	72	528
						C.V.	1.11	2.29
U.P.	Rice(NDR-359)	Wheat(PBW-154)		5028	3848		30710	63287
North Eastern Plain/	120-60-40	120-60-40		(5958)	(4678)			
Sant Kabir Nagar	Rice(NDR-359)	Mustard(NDR-8501)		5012	1669		26369	55894
(20)	120-60-40	120-60-40		(5945)				
	Rice(NDR-359)	Lentil (NDL-1)		5193	1655		23644	62091
	120-60-40	18-46-00		(6008)				
	Rice(NDR-359)	Berseem (Mescavi)		5027	363		17394	59434
	120-60-40	60-60-0		(5885)	(25610)			
						S.E.(m)	263	1282
						C.D.(5%)	525	2564
						C.V.	4.79	9.53
Uttarakhand	Rice(NPH-567)	Wheat (UP-2572)	-	8089	5044		45442	120950
Hill/	150-60-40	150-60-40		(9486)	(5689)			
Nainital(24)	Rice(NPH-567)	Wheat (UP-2572)	Cowpea(Pant Lobia-1)	8094	5047	5962	48332	181839
	150-60-40	150-60-40	15-45-0	(9503)	(5683)			
	Rice(NPH-567)	Tomato(Heem Sona)	Cowpea(Pant Lobia-1)	8073	13750	6212	34078	243071
	150-60-40	150-90-90	15-45-0	(9463)	-	-		
	Rice(NPH-567)	Lentil(PL-6)	F Maize (Vasu-555)	8084	1649	-	33628	61259
	150-60-40	15-45-0	100-60-40	(9498)	-	(26848)		
	Rice(NPH-567)	Pea .(Arkil)	Maize cob (Gaurav)	8116	7695	8187	45471	186965
	150-60-40	30-70-50	100-60-40	(9524)	-	-		
						S.E.(m)	134	4516
						C.D.(5%)	266	8942
						C.V.	1.59	13.93

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State/ NARP Zone/ Centre/No. of trials	Crop sequences/Variety/N-P-K (kg/ha)			Mean grain (straw) yield (kg/ha)			Total Calories (Kcal x1000)	Net return (Rs/ha)
	Kharif	*Rabi*	Summer	*Kharif*	*Rabi*	Summer		
W. B.	Rice (Ranjit)		GGram(Chait Moong)	4542		916	18774	33061
Coastal Saline/	80-40-40		20-40-40	(6512)				
24 South Paragnas	Rice (Ranjit)		Sunflower(GK-2002)	4584		1661	26156	51254
(24)	80-40-40		60-40-40	(6566)				
	Rice (Ranjit)		Sunflower(GK-2002)	4613		435	23630	40743
	80-40-40		60-40-40	(6610)				
			+ (2:4)			'+		
			GGram(Chait Moong)			802		
			20-40-40					
	Rice (Ranjit)		Okra(Pankaj)	4658		17959	22404	240069
	80-40-40		80-40-40	(6678)				
						S.E.(m)	81	2980
						C.D.(5%)	163	5960
						C.V.	1.75	15.99

7.5.1.3 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: Five location specific household centric modules were designed and implemented in 12 households in each location. The general guidelines used for designing the modules are given below

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

Households: Twelve households consisting of 6 each in small and marginal categories was selected for experiment in all the locations except Kangra (Himachal Pradesh), South 24 Paragnas (West Bengal) and Chittorgarh (Rajasthan) where in all the selected 12 households belongs to marginal. The average holding size of marginal households in the study locations ranged from 0.31 to 0.92 ha while it was 1 to 1.52 ha for small households.

Locations: Being a first year of the study, only 16 centres in 9 agro climatic regions covering 16 NARP zones have implemented the interventions in all the modules for improved farming systems while others have partially made the interventions. The details of locations, number of households covered along with existing farming system and interventions in improved farming systems are given in Table 7.5.1/3.

Results: The location specific details of interventions in various farming system modules are presented in Table 7.5.1/4 to 7.5.1/12. Brief description of agro climatic and NARP zone wise results pertaining to 16 locations are presented below.

Western Himalayas

Two NARP zones namely sub montane low hills sub tropical zone in Himachal Pradesh and sub tropical zone in Uttarakhand has been covered in the study area.

Submontane low hills subtropical zone (HP-1): The results of 12 experimental households in

Table 7.5.1/3. Details of existing and improved farming systems in study area

Agro climatic zone	NARP zone code	Study district	Holding size (ha) of study area		Farming systems				
					Existing	Improved			
			Marginal	Small	M0	M1	M2	M3	M4
Western Himalayas	HP-1	Kangra	0.31	-	Crop + cow/buffalo	IV* +BNA + Dfn + PDM	RYFS + MM	CAG +SS+SEM	NKG
	JK-1	Samba	0.15	-	Crop+ cow/buffalo	Dfn. + LS	MM + CMP	CAG	Mushroom
	UK-1	Nainital	0.49	1.0	Crop + Crop + buffalo/cow	IV + BNA + IV +BNA + Dfn	RYFS + RYFS + MM + Sani + DW	-	Fruits in home garden
Eastern Himalayas	AS-4	Kokrajhar	-	-	-	-	-	-	-
	UP-6	SKnagar	0.53	1.1	Crop + buffalo/cow	IV +BNA + Dfn	MM+ DW	-	-
Lower Gangetic Plains	WB-6	24 Paragnas South	0.61	-	Crop + cow/goat /poultry/ducks + fish	CZn +LT+ OP+ GM+ BNA	RYFS +BN+ Vacci.	Oil extraction + SS	CC of fish
Middle Gangetic Plains	BI-2	Purnea	0.72	1.5	Crop + cow/ poultry /pig	IV+BNA+ MN+IPM	AI +RYFS +DW+ MM	CAG + VC+ VW + SS	CC of fish + improved poultry breed
Upper Gangetic Plains	UP-4	Kaushambi	0.78	1.3	Crop + buffalo /cow /goat	IV+BNA +IPM	RYFS +DW+ MM	CAG + SS	NKG
Trans Gangetic Plains	HR-2	Sirsa	0.75	1.3	Crop + buffalo	IV+BNA + MN	MM	Ghee from milk	-
	PB-3	Amritsar	0.82	1.5	Crop + cow/buffalo	IV+BNA + IPM+Dfn	AI+ RYFS+ MM	-	NKG
Eastern Plateau and Hills	CG-1	Kawardha	0.65	1.3	Crop + cow/buffalo	IV + BNA + ST	AI + MM+ Urea to straw	Pulses flour + curd +ghee	Fruits + vegetables +mushroom
	JH-1	Pakur	0.82	1.9	Crop + goat/pig	-	-	-	-
	CG-3	Dindori	0.75	1.4	Crop + cow/buffalo	IV+ BNA	MM + DW	CAG+wheat flour+ ghee	Horticulture

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Agro climatic zone	NARP zone code	Study district	Holding size (ha) of study area		Farming systems				
					Existing	Improved			
			Marginal	Small	M0	M1	M2	M3	M4
	OR-10	Angul	0.85	1.1	Crop+ cow/goat	IV+ BNA+ IPM+ST	AI+ Azolla + MM + Vacci.	Pulses storage + pickle + cheese/ghee	NKG+BYP + CC of fish + VC+ mushroom
Central Plateau and Hills	MP-1	Katni	0.59	1.4	Crop + cow	IV +BNA	MM + DW	CAG	Vegetables
	RJ-7	Chittorgarh	0.92	-	Crop + cow/buffalo	IV +BNA+ IPM + Sale at Mandi	BN+MM+ chaff cutting	Pop corn	Vegetables
Western Plateau and Hills	MH-5	Pune	0.60	1.2	Crop + cow/goat	IV + BNA +IPM + timely harvest	AI + RYFS + MM + Vacci.+ BYP	CAG + SS + VC	Fruit plants in home garden
	MH-7	Aurangabad	0.85	1.2	Crop + cow/buffalo	+ drip systemBNA +IPM	+MMAI + RYFS	Pulses flour + SS + ghee	-
	MH-7	Amravati	0.70	1.6	Crop + cow	-	-	-	-
Southern Plateau and Hills	AP-5	Warangal	0.62	1.4	Crop + cow/buffalo	GM+IV+ BNA+Dfn.	RYFS + Azolla + Poultry	-	-
	KA-5	Kolar	0.58	1.3	Crop + cow/buffalo/ sheep/goat/ poultry + sericulture	IV + bio-fertilizer + MN	MM+ straw enrichment	CAG	NKG
	KA-3	Gadag	0.70	1.5	Crop + cow/buffalo	IV + BNA	RYFS+ MM + DW	-	-
	TN-2	Dharmapuri & Krishnagiri	0.40	1.0	Crop + cow	IV + INM + IWM + IPM	RYFS + MM + Vacci.	CAG	Azolla + vermicompost
East Coast Plains and Hills	AP-2	Srikakulam	0.92	1.9	Crop + buffalo/cow	GM + IV + BNA +Dfn.	RYFS + Azolla + poultry	-	-

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Agro climatic zone	NARP zone code	Study district	Holding size (ha) of study area		Farming systems				
						Improved			
			Marginal	Small	Existing M0	M1	M2	M3	M4
	OR-4	Kendrapara	0.69	1.1	Crop + cow/goat	IV + BNA + IPM + ST	AI + MM Azola + Vacci+ BYP	CAG + papad + chips + SS + cheese/ghee	NKG + mushroom + VC+ fish
	TN-5	Sivagangai & Pudukottai	0.46	1.4	Crop + cow	IV + SRI + BNA + IWM + IPM	AI + RYFS + MM + DW + BYP	CAG	NKG + VC
West Coast Plains and Ghats	KE-5	Pathinamthitta	0.61	1.2	Crop + cow/buffalo	-	-	-	-
	MH-2	Raigad	0.50	1.1	Crop + cow/buffalo + poultry + Mango orchard	IV + BNA + PDM	AI + RYFS + Vacci. +	CAG + SS + ghee	Orchard management practices
Gujarat Plains and Hills	GJ-4	Banaskantha/ Patan	0.85	1.4	Crop + cow	IV + BNA + IPM	RYFS + MM + DW	Grading of vegetables	NKG
	GJ-3	Kheda	0.60	1.4	Crop + cow/buffalo	IV + BNA + IPM	RYFS + MM + DW	-	-
Western Dry	RJ-3	Sikar	0.96	1.8	Crop + cow/buffalo/ goat	IV + BNA + PDM + SC	AI + RYFS + MM + Vacci.	CAG + SS + VC	Boundary plantation with ardu seedlings

*** Note:**

M1: IV: Improved variety, BNA: Balanced nutrient application, Dfn.: Diversification, PDM: Pest and disease management, CZn: Chelated zinc, LT: Line transplanting, OP: Optimum population, GM: Green manure, MN: Micro nutrient, IPM: Integrated Pest management, ST: Seed treatment, SRI: System of Rice Intensification, LS: Line sowing, SC: Seed compaction

M2: AI: Artificial Insemination, RYFS: Round the year fodder supply, MM: Mineral Mixture, Sani : Sanitation, DW: Deworming, BN: Balanced nutrition, Vacci: Vaccination, BYP: Backyard poultry, CMP: Clean milk production

M3: CAG: Cleaning and Grading, SS: Seed storage, SEM: Sale of excess of milk through co-operative union, VC: Vermicompost, VW: Vermi wash

M4: NKG:Nutritional Kitchen Garden, CC: Composite culture, VC: Vermicompost

Table 7.5.1/4. Interventions and returns from on-farm farming system modules in Western Himalayan region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Kangra (Himachal Pradesh), **NARP zone** Sub montane low hills sub tropical zone(HP-1) ; **No. of households:**12, **Average holding size:** 0.31 ha											
Existing FS (M0)	Crop	17213	9775	7438	14703	22141	-	-	0.76	20	-
	Livestock	35209	2863	32346	37762	70108	-	-	11.30	89	-
	Optional	398	240	158	-	158	-	-	0.66	1	-
	Total	**52820**	**12878**	**39942**	**52465**	**92407**	**-**	**-**	**3.10**	**110**	**-**
Improved FS	M1	32425	11775	20650	33144	53794	2000	13213	1.75	57	-
	M2	43992	4283	39709	41896	81605	1421	7563	9.27	109	-
	M4	1042	317	725		725	76	366	2.29	2	-
	Total	**77459**	**16375**	**61084**	**75040**	**136124**	**3497**	**21142**	**13**	**168**	**-**

Mo: Crop (Maize-wheat, rice-wheat) Livestock: Cow (1 no's), buffalo (1 no's); **M1:** Maize : Hybrid + balanced application of RDF 90:45:30 kg/ha + weed and pest management, Wheat: HPW 184 & HPW 211 + balanced nutrient application @ 80:40:40 kg NPK/ha Rice: Kasturi Basmati + balanced nutrient application @ 90:40:40 kg NPK/ha + weed and pest management; **M2:** Cow & Buffalo: Round the year fodder supply by growing cereal and legume fodder + Mineral mixture ; **M3:** Rice, wheat and maize: cleaning and grading + seed storage, Milk: sale of excess milk through cooperative union; **M4:** Nutritional kitchen garden

Paired t testInterventions in crop and processing module are found to be significantly higher while livestock module is found to be non-significant for all the parameters.

District (state): Nainital (Uttarakhand), **NARP zone:** Sub tropical (UK-1) ; **No. of households:**12, **Average holding size:** 0.49 ha (marginal) & 1.0 ha(Small) =0.75 ha											
Existing FS (M0)	Total	218800	101458	117342	50131	167473	-	-	1.16	322	675
Improved FS	M1	145111	39175	105936	92459	198395	678	4839	2.70	290	329
	M2	90006	63478	26528	13341	39869	517	10283	0.42	73	367
	M3	9098	1908	7190	-	7190	-	9098	3.77	20	15
	M4	1392	421	971	-	971	-	1392	2.31	3	13
	Total	**245607**	**104982**	**140625**	**105800**	**246425**	**1195**	**25612**	**9**	**386**	**724**

Mo: Crop (Rice-wheat-maize for fodder, rice-wheat-okra, rice-potato-okra, soybean-onion-okra, rice-wheat-coriander, soybean-lentil-maize) Livestock: cow; **M1:** Improved wheat (UP2572) and tomato variety, inclusion of onion and vegetable pea during *rabi* through diversification and balanced nutrient application to all crops **M2:** Livestock: Green fodder through legumes, mineral mixture, sanitation and deworming; **M3:** Grading of onion and tomato; **M4:** Horticultural crops and cucurbits in homestead

Kangra district of Himachal Pradesh indicates interventions in crop and optional module are found to be significant between existing and improved farming systems while livestock module is non-significant for all the study parameters which is mainly due to the intervention of round the year fodder supply and mineral mixture in the livestock component takes time to get the results in terms of output. The net returns from the intervention in improved farming system consisting of crop, livestock and nutritional kitchen garden module resulted in 6 times increase compared to the cost of interventions. The return over variable cost per rupee invested can be enhanced to Rs. 13 from the present level of Rs. 3.10. The per day net profit for the household also increases by 52.7% (Rs 110 and 168/day in existing and improved farming systems respectively).The total return of Rs. 61084 from 0.31 ha area can be obtained with the investment of Rs 16375 in farming system mode.

Subtropical zone (UK-1): The average holding size of marginal and small experimental households in Nainital district of Uttarakhand was found to be 0.49 and 1 ha respectively. The low cost intervention in crop, livestock, processing and optional module have contributed for significant increase in total net return over variable cost, value of household consumption, return from interventional cost, per day profit and household employment generation. It was observed that 21 times increase in returns compared to interventional cost which was mainly due to crop and livestock components interventions like improved wheat variety, inclusion of vegetable in system through diversification, balanced nutrient application, green fodder production, grading of vegetables for sale and growing of horticultural crops in homestead. Grading of onion and tomato before sale fetched additional return of Rs.9098/-. The total cost of the improved farming system for 0.75 ha area increased marginally by 3.5% while net returns increased by 20% besides higher value of household consumption (111%).The higher value of household consumption is mainly due to the consumption vegetable for the household produced within the farm. The per day profit for the household can be enhanced to Rs 386 from Rs 322 with additional household employment of 49 man days/year in the improved farming system.

Lower Gangetic Plains

The study of 12 households in south 24 Paragnas district of West Bengal covering the coastal saline zone (WB-6) reveals that average holding size is 0.61 ha and intervention in crop and processing module are found to be significantly higher while livestock module is found to be non-significant for all the parameters. The low cost interventions in existing system resulted in 4 time increase in returns over variable coast of interventions. The cost of interventions in various modules of improved farming system ranged from Rs 997 to 2129 for 0.61 ha area. The total cost in improved farming system increased by 11.8 % while net returns rose by 91.2 % due to the intervention in crop, livestock, processing and optional modules. The value of house hold consumption was Rs. 27964 in improved farming system. Farming system intervention, doubled the per day profit of house hold besides generating additional employment of 18 man days.

Middle Gangetic Plains

The interventions in 12 experimental households in Purnea district of Bihar in north east alluvial plain zone (BI-2) reveals that the returns over variable cost of interventions are 7 times in the improved farming system than existing system, which is mainly due to the interventions in crop and livestock modules. The total cost of improved farming system rose by 20 % while net returns rose by 64 % compared to existing farming system. An additional net profit per day of Rs 110 is possible in improved farming system from the area of 1.12 ha area. Improved farming system also generated additional house hold employment of 15 man days/ year due to low cost interventions in various modules.

Trans Gangetic Plains

Two NARP zones namely Western zone in Haryana and Central plains zone in Punjab were covered.

Table 7.5.1/5. Interventions and returns from on-farm farming system modules in Lower Gangetic Plains

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): South 24 Paragnas (West Bengal), **NARP zone :** Coastal saline zone(WB-6); **No. of households:**12, **Average holding size:** 0.61 ha											
Existing FS (M0)	Crop	45681	26513	19168	-	-	-	-	-	-	-
	Livestock	13129	14688	-1559	-	-	-	-	-	-	-
	processing	5933	1876	4057	-	-	-	-	-	-	-
	Total	**64743**	**43077**	**21666**	**-**	**21666**	**-**	**-**	**0.50**	**59**	**232**
Improved FS	M1	59,091	28,642	30449	16619	47068	2129	11281	1.06	83	158
	M2	17,123	16,376	747	6247	6994	1688	2306	0.05	2	81
	M3	4,516	312	4204	-	4204	-	147	13.47	12	1
	M4	8,909	2873	6036	5098	11134	997	6036	2.10	17	10
	Total	**89639**	**48203**	**41436**	**27964**	**69400**	**4814**	**19770**	**0.86**	**114**	**250**

Mo: Crop (Rice-okra, rice- greengram, rice-sunflower); Livestock: Deshi cow (5 nos), Jersey (1.nos), Heifer (1 nos), calves (2 nos), hen (2 nos), goat (1 nos), ducks(5 nos); **M1:** Chelated Zn and green manuring in rice, maintaining optimum plant population through line sowing, recommended dose of fertilizer and scheduled spray for all crops; **M2:** Live stock: balanced nutrition +vaccination, supply green fodder round the year; **M3**Oil extraction from Sunflower seed; **M4:** Nutritional kitchen garden + liming of pond + optimum density of fingerlings

Paired t testInterventions in crop and processing module are found to be significantly higher while livestock module is found to be non-significant for all the parameters.

Table 7.5.1/6. Interventions and returns from on-farm farming system modules in Middle Gangetic Plains

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Purnea (Bihar), **NARP zone:** North – east alluvial plain (BI-2) ; **No. of households:**12, **Average holding size:** 0.72 ha (marginal) & 1.52 ha (small) =1.12 ha											
Existing FS (M0)	**Total**	**102500**	**40000**	**62500**	**-**	**62500**	**-**	**-**	**1.56**	**171**	**325**
Improved FS	M1	85000	41000	44000	-	44000	6000	20000	1.00	121	235
M2	62500	4000	58500	-	58500	1500	25000	14.00	160	55	
M3	15000	3000	-	-	-	500	14500	—	-	15	
Total	**162500**	**48000**	**102500**	**-**	**102500**	**8000**	**59500**	**15**	**281**	**340**	

Mo: Crop (rice-wheat, rice-maize, rice-vegetable) Livestock: cattle, cattle + poultry, cattle + pig**; M1:** Rice : MTU 7029, balance application of 100:40:20 kg NPK ha^{-1} + 25 kg Zn + IPM, Wheat : PBW 373, 10 kg Boron + IPM; **M2:** Live stock: round the year fodder supply through planting of green fodder in 0.04 ha area + artificial insemination+ supplementation of mineral mixture in feeds + De worming ; **M3:** Cleaning and grading in rice and wheat, proper storage of seeds for next season; **M4:** Nutritional kitchen garden + fish (Pond 0.10 ha)+ recycling of organic animal and kitchen wastes to pond

Western zone (HR-2): The holding size of marginal and small households in Sirsa district of Haryana was found to be 0.75 and 1.30 ha respectively. The interventions in existing farming system through crop, livestock and processing modules resulted in 2.08 times increase in returns over variable cost of interventions. The total cost in improved system rose by 7.5% while net returns rose by 18.1 %. The returns over variable cost per rupee invested were found to be Rs 1.17 and 5 in existing and improved farming systems respectively. An additional household employment of 71 man days/year are possible with improved farming system and per day profit can be enhanced to Rs 417 from 354 in 1.02 ha area.

Central pain zone (PB-3): The hooding size of marginal and small farm household in Amritsar and Tamtara districts of Punjab was found to be 0.82 and 1.48 ha respectively. Improved farming system resulted in 2.5 times increase in net returns over variable cost from interventions. An additional per day profit of Rs 193 can be obtained with improved farming system involving improved variety of rice, wheat balanced application of nutrients in crop module round the year fodder supply, artificial insemination and mineral mixture in livestock module and nutritional kitchen garden in optional module. The house hold also gets 108 man days/ year of additional employment per year with improved farming system.

Eastern Plateau and Hills

Two NARP zones namely mid central table land of Odisha and Chattisgarh pain zone of Chattisgarh were covered.

Mid central table land (OR-10): The holding size of marginal and small experimental household was found to be 0.85 and 1.10 ha in Angul district of Odisha. The intervention in all the modules except optional are found to be significantly higher for all the parameters. Returns over variable cost from interventions were found to be 1.7 times higher in improved farming system. The total cost of the modules in improved system rose by 8 % while total net returns by 13 %. Returns over variables cost per rupee invested was 1.07 and 3 in existing and improved farming systems respectively. Improved farming system registered additional household employment of 28 man days/year from 0.98 ha. Statistical analysis revealed that intervention in all the modules except optional are found to be significantly higher for all the parameters studied.

Chattisgarh plain (CG-1): The holding size of experimental households was found to be 0.65 and 1.30 ha for marginal and small holders in Kawardha district of Chattisgarh. The interventions in various modules such as crop, livestock, processing and optional resulted in 8 times increase in returns over variables cost from interventions. Return over variable cost per rupee invested was found to be 1.56 and 5 for existing and improved farming system respectively. An additional profit and employment of Rs 73/ day and 82 man days/year are recorded with interventions under improved farming system from 0.98 ha.

Central Plateau and Hills

The average holding size of experiment farm households in Chittorgarh (Rajasthan) was found to be 0.92 ha. The interventions such as improved variety, balanced nutrient application and integrated pest management in crop module, mineral mixture and balanced nutrition in livestock module, making of popcorn from maize in processing module and vegetables in optional module resulted in additional returns of Rs 7513 from 0.92 ha area. The interventions also led to additional per day profit of Rs 6 and additional employment of 63 man days in sub humid southern plain and Aravali hills (RJ-7). The value of household consumption improved by 8% compared to existing system.

Western Plateau and Hills

Two NARP zones namely Central Maharashtra plateau and Maharashtra plain zone were covered.

Central Maharashtra plateau zone (MH-7): The average holding size of experimental household in Aurangabad district of Maharashtra was found to

Table 7.5.1/7. Interventions and returns from on-farm farming system modules in Trans Gangetic Plains

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Sirsa (Haryana) **NARP zone:** Western (HR-2); **No. of households:**12, **Average holding size:** 0.75 ha (marginal) & 1.3 ha (small)=1.02 ha											
Existing FS (M0)	**Total**	**239562**	**110436**	**129126**	**19700**	**333364**	**-**	**-**	**1.17**	**354**	**274**
Improved FS	M1	185882	75899	109983	60992	170975	1853	6421	1.45	301	181
	M2	69045	38350	30695	36691	67386	1960	5158	0.80	84	151
	M3	16216	4407	11809	-	11809	4407	11809	2.68	32	13
	Total	**271143**	**118656**	**152487**	**97683**	**250170**	**8220**	**23388**	**5**	**417**	**345**

Mo: Crop (Cotton-wheat & groundnut-wheat), Livestock: buffalo + cattle; **M1:** Cotton: balanced nutrient application + Zinc Sulphate @ 25 kgha$^{-1,}$ Wheat : Improved variety (HD-2851); **M2:** Live stock: Supplementation of mineral mixture in feeds; **M3:** Preparation of ghee; **M4:** Nutritional kitchen garden

District (state): Amritsar, Tamtara (Punjab) **NARP zone:** Central Plain Zone (PB-3) ; **No. of households:**12, **Average holding size:** 0.82 (marginal) & 1.48 (small)=1.15 ha

Existing FS (M0)	**Total**	**54915**	**21940**	**32975**	**22177**	**55092**	**-**	**-**	**1.50**	**90**	**205**
Improved FS	M1	57082	24062	33020	-	33020	4238	7550	1.37	90	205
	M2	165923	108632	57291	-	76312	-	-	0.53	157	74
	M4	13374	317	13057	-	13057	256	3497	41.19	36	34
	Total	**236379**	**133011**	**103368**	**-**	**122389**	**4494**	**11047**	**43**	**283**	**313**

Mo: Crop (Rice-wheat), Livestock: Cow (1 nos) & Buffalo (1 nos); **M1:** Rice : Pusa 1121, balance application of 40:0:0; NPK to rice + 12.5 kg Zn ha^{-1} + IPM using *Trichogramma* cards, Wheat: PBW 621, balance application of 120:60:30 NPK to rice + 12.5 kg Zn ha^{-1} + IPM using *Trichogramma* cards; **M2:** Live stock: round the year fodder supply through planting of green fodder in 0.04 ha area + artificial insemination + supplementation of mineral mixture in feeds; **M3:**Cleaning and grading in rice and wheat; **M4:** Nutritional kitchen garden

Table 7.5.1/8. Interventions and returns from on-farm farming system modules in Eastern Plateau and Hills region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Angul (Odisha) **NARP zone:** Mid Central Table land (OR-10), **No. of households:**12, **Average holding size:** 0.85 (marginal) & 1.10 (small) =0.98 ha											
Existing FS (M0)	Crop	55345	29244	26102	-	26102	-	-	-	72	181
	Livestock	11383	7187	4196	-	4196	-	-	-	12	13
	Optional	56594	23137	33817	-	33817	-	-	-	93	36
	Total	**123322**	**59568**	**63754**	**-**	**63754**	**-**	**-**	**1.07**	**177**	**230**
Improved FS	M1	60450	32,386	28064	-	28064	3142	1963	0.87	77	194
	M2	13005	8,288	4717	-	4717	1101	521	0.57	13	18
	M3	1233	879	354	-	354	879	354	-	-	2
	M4	62041	22,912	39129	-	39129	-225	5672	1.71	107	44
	Total	**136729**	**64465**	**72264**	**-**	**72264**	**4897**	**8510**	**3**	**197**	**258**

Mo: Crop (Rice – greengram, rice-vegetable,rice/arhar-maize, rice-sunflower, jute-rice, vegetable. – vegetable, Maize-vegetable), Livestock: Cow (4 nos), Bullock 4 nos), calves (2 nos), Goat (4 nos); **M1:** Rice : HYV (lalat), balanced nutrient application to rice @ 80:40:40 kg NPK/ha and zinc sulphate @25 kg/ha^{-1}, chemical weed control in paddy with butachlor, Pulses: Use of *rhizobium* and paper mill sludge in pulse, Adoption of IPM with use of pheromone traps & imidaclorpid, vegetable: HYV (Tomato-Utkal Raja, Pointed gourd-swarna alokik), balaced nutrient applications with micronutrients; **M2:** Cattle: round the year green fodder and supplementing feed with mineral mixture @ 15 g/day + PPR vaccination & administrating albondazole for deworming+ shed cleaning with disinfectants like Phenyle,CaOCl & CaCo3 + AI of desi cows, Goat: Crossing desi goat with improved breed; **M3:** Ghee and cheese making, pickle making from mango, pickle and ketchup from tomato, cleaning, grading & storing of greengram; **M4:** Nutritional kitchen garden+ backyard poultry with vanaraja+ culture of fast growing fish species. with IMC and supplemental feeding + Intercropping of vegetables in mango orchard.+ stocking of quick growing species of fishes in composite piscicultue, mushroom

Paired t testInterventions in all the modules except optional are found to be significantly higher for all the parameters

District (state): Kawardha (Chhattisgarh) **NARP zone:** Chhattisgarh Plain (CG-1); **No. of households:**12, **Average holding size:** 0.65 ha (marginal) & 1.3 ha (small) =0.98 ha											
Existing FS (M0)	**Total**	**112876**	**44034**	**68842**	**18473**	**87315**	**-**	**-**	**1.56**	**189**	**221**
Improved FS	M1	102406	37267	65139	-	69388	3350	16722	1.75	179	162
	M2	27135	11317	15818	-	23922	1200	1894	1.40	43	76
	M3	21000	12991	-	-	-	-	-	-	-	10
	M4	23553	8900	14653	-	14653	-	17052	1.65	40	55
	Total	**174094**	**70475**	**95610**	**-**	**107963**	**4550**	**35668**	**5**	**262**	**303**

Mo: Crop (Rice/soybean –gram / wheat) , Livestock: Cow (2 nos) & buffalo (3 nos), Goat (8 nos) Poultry (60 nos) + fish pond**; M1:** Rice : MTU1010, recommended dose of nutrients @ 100:60:40 kg NPK/ha + 20 kg ZnSO seedling treatment by Chloropyrifos , Soybean : Hyb. B.N.R.2355, Pro-agro 6444, Seed treatment by Carbendazim , Gram- JG-74, recommended dose of nutrients @ 20:50:20 kg NPK/ha. **M2:**[4,] Livestock: artificial insemination+ 30 g mineral mixture in feeds/ cattle /day + urea treatment to rice straw (Paira), Fish: 800 fingerling of Common carp, Rohu & Mriagal + 3 duck (1 male & 2 female); **M3:** Making gram flour (*Besan*) and Making Curd & Ghee; **M4:** Nutritional kitchen garden, plantation of papaya & banana + chilli, tomato & Brinjal each at 0.1 acre area + Mushroom

be 0.85 and 1.20 ha for marginal and small holders. Improved farming system through intervention in existing farming system resulted in 3 times increase in net returns over variable cost of interventions. The total cost of improved farming system increased to 16% due to various interventions in different module, but the total net returns increased significantly by 43% compared to existing system. The value of household consumption increased from Rs. 12305 to Rs.13482 mainly due to increase in consumption of vegetable and livestock products produced within the farm. Return over variable cost per rupee invested was found to be 1.15 and 6 in existing and improved farming system. Additional net profit of Rs 102/day and employment of 54 man days / year are recorded in improved farming system from 1.03 ha area.

Western Maharashtra plain zone (MH-5): The average holding size of experimental household was found to be 0.60 and 1.20 ha from marginal and small holders in Pune district of Maharashtra. Improved farming system recorded 1.27 times higher net returns than the variable cost of interventions. The total cost of improved farming system was Rs. 121075 which is 28.3% higher than existing system. However , the total net returns was found to be Rs.82724 which is 70% higher than the existing system implying better recycling of resources within the system. Additional per day profit and household employment of Rs 92 and 127 man days/year are realizable with improved farming system in 0.90 ha.

Southern Plateau and Hills

Two NARP zones namely North western zone of Tamil Nadu and Southern Telangana zone of Andhra Pradesh were covered.

North western zone (TN-2): Average holding size of experimental households was found to be 0.4 and 1 ha for marginal and small holders in Dharmapuri and Krishnagiri districts of Tamil Nadu. Interventions in existing farming system resulted in 6.7 times increase in returns over variable cost from interventions. Improved system resulted in increase in per day profit of Rs 260 and additional employment of 133 man days /year from 0.70 ha.

Southern telangana zone (AP-5): The average holding size of household was 0.62 and 1.4 ha for marginal and small holders in Warangal district of Andhra Pradesh. The return over variable cost per rupee invested was found to be 1 in improved system against 0.32 in existing farming system. Additional per day profit of Rs 8 and employment of 12 man days/year are possible with the low cost interventions. Additional returns of Rs 2689 were obtained with investment of Rs 3273 for interventions in various modules.

East Coast Plains and Hills

Three NARP zones namely East and south – eastern coastal plain zone in Odisha, Southern zone in Tami Nadu and North coastal zone in Andhra Pradesh were covered.

East and south-eastern coastal plain (OR-4): The average holding size of experimental household was found to be 0.69 and 1.02 ha for marginal and small holders in Kendrapara district of Odisha. An additional gross return of Rs 26607 is possible with investment of Rs 12881 in 0.91 ha. The total cost increased to 32 % in improved farming system while total returns increased by 65% compared to existing farming system. Additional per day profit of Rs 37 and household employment of 31 man days/year can be obtained through low cost interventions in farming system mode.

Southern zone (TN-5): The average holding of experimental household of Sivagangai and Pudukottai districts of Tamil Nadu was found to be 0.46 and 1.4 ha for marginal and small holders. A phenomenal increase of 43 times increase in net returns over variable cost was observed which is mainly due to reduction in cost of crop module to the level of Rs 7688 /- attributed to introduction of SRI method of rice cultivation which saved input cost in terms of seed, labour besides increasing yield. The interventions in crop, livestock, processing and optional module resulted in

Table 7.5.1/9. Interventions and returns from on-farm farming system modules in Central Plateau & hills region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Chittorgarh (Rajasthan) **NARP zone:** Sub-Humid Southern Plain and Aravalli Hills (RJ-7) ; **No. of households:**12, **Average holding size:** 0.92 ha (marginal)											
Existing FS (M0)	**Total**	**53475**	**26088**	**27387**	**78453**	**105840**	**-**	**-**	**1.05**	**75**	**317**
Improved FS	M1	47500	32000	15500	31310	46810	9920	-4195	0.48	43	235
	M2	16000	3450	12550	53328	65878	1375	7955	3.64	34	90
	M3	8500	3200	5300	-	5300	1267	3048	-	-	40
	M4	2000	450	1550	-	1550	450	705	3.44	4	15
	Total	**74000**	**39100**	**34900**	**84638**	**119538**	**13012**	**7513**	**8**	**81**	**380**

Mo: Crop (Maize-wheat), Livestock: Cow (2 nos), Buffalo (2 nos); **M1:** Wheat : Raj variety, balanced nutrient application @ 120:40:30 kg NPK/ha+ IPM + sale of produce at Mandi; **M2:** Cattle: Information for balanced ration, addition of mineral mixture in feed; **M3:** Making of pop corn; **M4:** Vegetables

Table 7.5.1/10. Interventions and returns from on-farm farming system modules in Western Plateau & hills region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Aurangabad (Maharashtra) **NARP zone:** Central Maharashtra Plateau (MH-7); **No. of households:**12, **Average holding size:** 0.85 ha (marginal) & 1.2 ha (small)=1.03 ha											
Existing FS (M0)	**Total**	**160559**	**74771**	**85788**	**12305**	**98093**		**-**	**1.15**	**235**	**276**
Improved FS	M1	114331	42333	71998	6480	78478	5300	-	1.70	197	196
	M2	77886	40511	37375	7002	44377	2773	-	0.92	102	76
	M3	17748	3990	13758		13758	3990	-	3.45	38	58
	Total	**209965**	**86834**	**123131**	**13482**	**136613**	**12063**	**-**	**6**	**337**	**330**

Mo: Crop (Pearl millet – chickpea, cotton – maize, maize – wheat, sugarcane / cotton, vegetable – sweet corn, sugarcane / maize/ vegetable – wheat, cotton – wheat/ fodder maize – fodder – sugarcane, sorghum-cotton + Maize), Livestock: Cow (2 nos), Bullock (1 nos) **M1:** Balanced nutrient application for sugarcane (250:115:115 kg/ha), cotton (50:75:75 kg / ha), wheat (120:60:60 kg/ha, maize fodder (100:50:50 kg/ha), cauliflower (160:80:80 kg/ha) and ginger (190:50:50 kg/ ha) + IPM + use of drip irrigation system; **M2:** Cattle: Making available good quality fodder seed during *rabi* and summer + supplementing feed with mineral mixture; **M3:** Cleaning and grading of grains and pulses, grading of cauliflower before marketing, sugarcane Juice centre at rood side in (Aurangabad – Ajanta high way) in summer, proper storage of grains and making ghee from excess milk

District (state): Pune (Maharashtra): **NARP Zone:** Western Maharashtra Plain zone Ganeshkhind (MH-5); **No. of households:**12, **Average holding size:** 0.60 ha (marginal)/1.20 ha (small)=0.90 ha											
Existing FS (M0)	**Total**	**142941**	**94317**	**48624**	**-**	**48624**			**0.52**	**133**	**307**
Improved FS	M1	66921	7,096	59825	-	59825	1880	10446	8.43	164	168
	M2	132308	110,831	21477	-	21477	22690	23464	0.19	59	228
	M3	3494	2860	634	-	634	2073	-45	-	-	27
	M4	1076	288	788	-	788	115	235	2.74	2	11
	Total	**203799**	**121075**	**82724**	**-**	**82724**	**26758**	**34100**	**11**	**225**	**434**

Mo: Crop (Pearlmillet- pea-vegetable, groundnut- wheat, soybean- gram, greengram-onion, maize-berseem, sorghum-marvel grass, lucern grass, hybrid napier), Livestock: Cow/bullock/goat; **M1:** Improved variety of all crops, balanced nutrient application, timely harvest of crops, seed treatment and use of pheromone trap; **M2:** Artificial insemination, round the year fodder production, mineral mixture, vaccination as per schedule and backyard poultry; **M3:** Cleaning and grading of grains, seed storage, ghee making, vermicompost; **M4:** Improved package of practices for fruit plantation

additional return of Rs 19600, 3667, 1794 and 1575 respectively from 0.93 ha. Returns over variable cost per rupee invested increased to Rs 4 in improved farming system compared to 0.57 in existing system. However, reduction in employment of 26 man days/year was observed in crop module while livestock and optional registered additional man days of 18/ year for household employment.

North coastal zone (AP-2): The holding size of experimental households in Srikakulam district of Andhra Pradesh was found to be 0.92 and 1.9 ha for marginal and small holders. The net returns over variable cost from interventions were observed to be Rs 2230 against the cost of interventions of Rs 3732 from 1.41 ha area. Additional net profit of Rs 6/ day and household employment of 21 man days/year are recorded with improved framing system.

The results of on farm farming system modules evaluated in various NARP zones are summarized in table 7.5.1/13. The gist of the summary are;

- The total cost of interventions in all the modules was found to be Rs 7774 for 0.92 ha area.
- The increase in net returns over variable cost of interventions in improved farming systems was found to be 6.8 times.
- The value of household consumption increased by 51.4 % due to the improved farming systems.
- The per day profit of marginal and small households can be increased by 69.2 % through low cost interventions in farming systems perspective.
- An additional employment of 53.6 man days/ year can be generated through interventions in various modules such as crop, livestock, processing and optional in farming system mode.

Important note: The results are from the first year of study and interventions at few places were partial. The staff also new to the on-farm farming system experiment.

Table 7.5.1/11. Interventions and returns from on-farm farming system modules in Southern Plateau & hills region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state): Krishnagiri (Tamilnadu) **NARP zone:** North-Western Zone (TN-2); **No. of households:**12, **Average holding size:** 0.4 ha (marginal) & 1.0 ha (small)=0.70 ha											
Existing FS (M0)	**Total**	**144022**	**-**	**144022**	**-**	**144022**	**-**	**-**	**-**	**395**	**281**
Improved FS	M1	189694	2600	187094	-	187094	2600	38887	71.96	513	247
	M2	48971	650	48321	-	48321	650		74.34	133	146
	M3	4658	-	-	-	-	-		-	-	13
	M4	5834	2550	3284	-	3284	2550		1.29	9	8
	Total	**249157**	**5800**	**238699**	**-**	**238699**	**5800**		**148**	**655**	**414**

Mo: Crop (rice-ragi, rice-coriander, rice-tomato, rice- beet root, groundnut-cabbage, sugarcane- rice, ragi-fallow, ragi-fallow, rice-fallow, Mint, rice- rice, rice- peas, banana). Livestock (cow); **M1:** Crop (improved varieties+ INM+ IPM+ IWM); **M2:** Livestock: mineral mixture+ green fodder+ vaccination; **M3:** Cleaning& grading; **M4:** Azolla + Vermicompost

District (state): Warangal (Andhra Pradesh) **NARP zone:** Southern Telangana Zone (AP-5) ; **No. of households:**12, **Average holding size:** 0.62 ha (marginal) & 1.4 ha (small)=1.01 ha

Existing FS (M0)	**Total**	**6664**	**5046**	**1618**	**18820**	**20438**	**-**	**-**	**0.32**	**4**	**374**
Improved FS	M1	8414	5934	2480	12135	14615	2404	1409	0.42	7	229
	M2	4212	2385	1827	22584	24411	869	1280	0.77	5	157
	Total	**12626**	**8319**	**4307**	**34719**	**39026**	**3273**	**2689**	**1.00**	**12**	**386**

Mo: Crop (Turmeric-banana, rice-fallow, rice-rice, cotton-fallow, rice-maize, turmeric-fallow, rice-vegetables, vegetables-vegetables), Livestock (cow/buffalo); :**M1:** Crop : green manuring before *kharif* rice, high yielding varieties of rice, remunerative irrigated dry crops in *rabi, b*alanced nutrient application (NPK&Zn) for rice & Irrigated dry crops; **M2:** Raising of Green fodder +balanced cattle feed + azolla in trenches as cattle feed + Giriraja birds @ 20 per household

Table 7.5.1/12. Interventions and returns from on-farm farming system modules in East Coast Plains and Hills region

Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)
District (state):Kendrapara(Odisha) **NARP zone:** East & South-Eastern Coastal Plain (OR-4) ; **No. of households:**12, **Average holding size:** 0.69 ha (marginal)/1.12 ha (small)=0.91 ha											
Existing FS (M0)	**Total**	**60727**	**39653**	**21074**	**23949**	**45023**	**-**	**-**	**0.53**	**58**	**215**
Improved FS	M1	70760	43346	27414	-	27414	7273	9399	1.29	75	210
	M2	6256	3773	2483	-	8810	827	940	1.14	7	18
	M3	3488	2322	1166	-	1166	2322	1166	0.50	3	3
	M4	6830	3093	3737	-	3737	2459	2221	0.90	10	15
	Total	**87334**	**52534**	**34800**	**-**	**86150**	**12881**	**13726**	**1.06**	**95**	**246**

Mo: Crop (Rice-fallow, Rice-rice, Rice-greengram / blackgram, Jute-rice-tomato/bitter gourd, Jute-blackgram, mango, Coconut Livestock: Cow (3 no's), bullock (2 no's), Goat (5 no's), Poultry (5 no's)**M1:** Crop (Rice-fallow, Rice-rice, Rice-greengram / blackgram, Jute-rice-tomato/bitter gourd, Jute-blackgram, mango, Coconut Livestock: Cow (3 no's), bullock (2 no's), Goat (5 no's), Poultry (5 no's). **M2:** Cow: Artificial Insemination + Azolla feeding @ 2 kg/day/animal + mineral mixture @ 15 g/day + vaccination as per schedule Goat: Albendozole for deworming Poultry: Improved breed of Vanaraja, cleaning of shed with disinfectant like lime; **M3** Rice: Cleaning and grading, flaked rice preparation, Pulses: Pulses storage with metal bin, Mango: Pickle making, Coconut: flavoured oil preparation, Tomato and bitter gourd: cleaning and grading ; **M4:** Nutritional Kitchen garden + Backyard poultry with vanaraja breed + Culture of fast growing fish species. (pacu, pungatious &silver carp ;

District (state): Sivagangai and Pudukottai (Tamilnadu) **NARP zone:** Southern Zone (TN-5); **No. of households:**12, **Average holding size:** 0.46 ha (marginal) & 1.4 ha (small)=0.93 ha											
Existing FS (M0)	Crop	96596	64367	32229	-	-	-	-	-	88	186
	Livestock	51346	32817	18529	-	-	-	-	-	51	143
	Poultry	9417	2842	6575	-	-	-	-	-	18	8
	Total	**157359**	**100056**	**57303**	**29691**	**86994**	**-**	**-**	**0.57**	**157**	**337**
Improved FS	M1	108508	56679	51829	-	51829	-7688	19600	0.91	142	160
	M2	58346	36150	22196	-	22196	3333	3667	0.61	61	152
	M3	4340	2546	1794	-	1794	2546	1794	0.70	5	-
	M4	13417	5267	8150	-	8150	2425	1575	1.55	22	17
	Total	**184611**	**100642**	**83969**	**-**	**83969**	**616**	**26636**	**4**	**230**	**329**

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Farming System (FS)	Module (s)	Total gross returns (Rs)	Total cost of the module (Rs)	Return over variable cost from module (Rs)	Value of household con-sumption (Rs)	Total returns over variable cost(Rs)	Cost of inter-vention (Rs)	Returns over variable cost from inter-ventions (Rs)	Return over variable cost per rupee invested	Per day profit (Rs/day)	Household employment (man days)

Mo: Crop:(Rice/maize/blackgram/sesame/cucumber, rice-rice-blackgram/groundnut/ sugarcane), Livestock: Cross bred dairy cow; **M1:** Rabi: rice (0.4ha), Summer:rice (0.2 ha), Blackgram (0.2 ha), Summer: brinjal & okra (0.10 ha),rice (0.2 ha), Cucumber (0.1 ha) rice: SRI method, pre & early post emergence application of herbicide, balanced application of NPK and micro nutrient and split application. Blackgram:VBN5,line planting, pre & early post emergence application of herbicide, groundnut: TMV 13 line sowing raised bed planting, pre & early post emergence application of herbicide, balanced application of NPK and Micro nutrient and split application, Use of bio inoculants PGPR and IPM, **M2:** Livestock: Supply of green fodder round the year BNH CO 4+ supplementation of mineral mixture+ artificial insemination+ De worming and vaccination and Dual purpose Kavery Chicks; **M3:** Cleaning, grading and packing ; **M4:** Backyard Poultry and Kitchen garden, Hybrid vegetables (tomato, chilli, bhendi, raddish &greens) annual moringa, Jack Fruit Hybrid vegetables (tomato, chilli, bhendi, radish & greens) Silpaulin vermi compost

District (state): Srikakulam (AP) **NARP zone:** North coastal zone (AP-2); **No. of households:**12, **Average holding size:** 0.92 ha (marginal) & 1.9 ha (small)=1.41 ha

Existing FS (M0)	**Total**	**6664**	**4587**	**2077**	**-**	**2077**	**-**	**-**	**0.45**	**6**	**374**
Improved FS	M1	8414	5934	2480	-	2480	2689	1124	0.42	7	236
	M2	4212	2385	1827	-	1827	1043	1106	0.77	5	159
	Total	**12626**	**8319**	**4307**	**-**	**4307**	**3732**	**2230**	**1.18**	**12**	**395**

Mo: Crop (cashew + turmeric, rice-rice, cotton-fallow, rice-maize, turmeric-fallow, rice-vegetables, vegetables-vegetables), Livestock (cow/buffalo); :**M1:** Crop : green manuring before *kharif* rice, high yielding varieties of rice, remunerative irrigated dry crops in *rabi, b*alanced nutrient application (NPK&Zn) for rice & Irrigated dry crops; **M2:** Raising of Green fodder +balanced cattle feed + azolla in trenches as cattle feed + Giriraja birds @ 20 per household

Table 7.5.1/13. Improvement of household consumption, net returns, per day profit and employment in improved farming systems in various NARP zones (All values are calculated over existing farming systems)

ACZ	NARP zone code	District (State)	Holding size (ha)	Improved farming system module/model	Cost of interventions (Rs)	Increase in value of household consump-tion (%)	Increase in net returns over variable cost of interventions (no. of times)	Increase in per day net profit (%)	Increase in household employment (man days)
Western Himalayas	HP-1	Kangra (HP)	0.31	Crop (IV* +BNA + Dfn + PDM) + cow/buffalo (RYFS + MM) + CAG +SS+SEM + NKG	3497	43	6.0	52.7	-
	UK-1	Nainital (UK)	0.75	Crop (IV +BNA + Dfn) + buffalo/cow (RYFS + MM + Sani + DW) + Fruits in home garden	1195	111	21.0	19.8	49
Lower Gangetic Plains	WB-6	24 Paragnas South (WB)	0.61	Crop (CZn +LT+ OP+ GM+ BNA) + cow/goat /poultry/ducks (RYFS +BN+ Vacci.) + fish	4814	-	4.0	93.2	18
Middle Gangetic Plains	BI-2	Purnea (Bihar)	1.11	Crop (IV+BNA+ MN+IPM) + cow/ poultry /pig (AI +RYFS +DW+ MM) CAG + VC+ VW + SS CC of fish + improved poultry breed	8000	-	7.0	64.0	15
Trans Gangetic Plains	HR-2	Sirsa (HR)	1.02	Crop (IV+BNA + MN)+buffalo (MM) +Ghee from milk	8220	-	2.8	17.8	71
	PB-3	Amritsar	1.15	Crop (IV+BNA + IPM + Dfn) + cow/buffalo (AI+ RYFS+ MM) + NKG	4494	-	2.4	214.0	108
Eastern Plateau and Hills	OR-10	Angul (Odisha)	0.98	Crop (IV+ BNA+ IPM+ST) + cow/goat (AI+ Azolla + MM + Vacci.) pulses storage + pickle + cheese/ghee + NKG+BYP + CC of fish + VC+ mushroom	4897	-	1.70	11.2	28

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ACZ	NARP zone code	District (State)	Holding size (ha)	Improved farming system module/model	Cost of interventions (Rs)	Increase in value of household consump-tion (%)	Increase in net returns over variable cost of interventions (no. of times)	Increase in per day net profit (%)	Increase in household employment (man days)
	CG-1	Kawardha (CG)	0.98	Crop (IV + BNA + ST) + cow/buffalo (AI + MM+ Urea to straw)+ pulses flour + curd +ghee Fruits + vegetables +mushroom	4550	-	7.80	38.6	82
Central Plateau and Hills	RJ-7	Chittorgarh (RJ)	0.92	Crop (IV +BNA+ IPM + Sale at Mandi) + cow/buffalo (BN+MM+ chaff cutting) + pop corn +vegetables	13012	8	0.60	8.0	63
Western Plateau and Hills	MH-7	Aurangabad (MH)	1.03	Crop (BNA +IPM + drip system) + cow/buffalo (AI + RYFS +MM) + pulses flour + SS + ghee	12063	10	3.1	43.0	54
	MH-5	Pune (MH)	0.90	Crop (IV + BNA +IPM + timely harvest) + cow/goat (AI + RYFS + MM + Vacci.+ BYP) + CAG + SS + VC + fruit plants in home garden	26758	-	1.3	69.2	127
Southern Plateau and Hills	TN-2	Dharmapuri & Krishnagiri (TN)	0.70	Crop (IV + INM + IWM + IPM) + cow (RYFS + MM + Vacci.) + CAG Azolla + vermicompost	5800	-	6.7	65.8	133
	AP-5	Warangal (AP)	1.01	Crop (GM+IV+ BNA+Dfn.) + cow / buffalo (RYFS + Azolla + Poultry)	3273	85	1.0	200.0	12

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ACZ	NARP zone code	District (State)	Holding size (ha)	Improved farming system module/model	Cost of interventions (Rs)	Increase in value of household consump-tion (%)	Increase in net returns over variable cost of interventions (no. of times)	Increase in per day net profit (%)	Increase in household employment (man days)
East Coast Plains and Hills	OR-4	Kendrapara (Odisha)	0.91	Crop (IV + BNA + IPM + ST) + cow/goat (AI + MM + Azolla + Vacci.+ BYP) + CAG + papad + chips + SS + cheese/ghee + NKG + mushroom + VC+ fish	12881	-	1.1	63.8	31
	TN-5	Sivagangai & Pudukottai (TN)	0.93	Crop (IV + SRI + BNA + IWM + IPM) + cow (AI + RYFS + MM + DW + BYP) + CAG +NKG + VC	616	-	43	46.5	-8
	AP-2	Srikakulam (AP)	1.41	Crop (GM + IV + BNA +Dfn.) + buffalo/cow (RYFS + Azolla + poultry)	3732	-	0.6	100.0	21
Mean	**0.92**	**Mean**	**7774**	**51.4**	**6.8**	**69.2**	**53.6**		

* Note:

M1: IV: Improved variety, BNA: Balanced nutrient application, Dfn.: Diversification, PDM: Pest and disease management, CZn: Chelated zinc, LT: Line transplanting, OP: Optimum population, GM: Green manure, MN: Micro nutrient, IPM: Integrated Pest management, ST: Seed treatment, SRI: System of Rice Intensification, LS: Line sowing, SC: Seed compaction

M2: AI: Artificial Insemination, RYFS: Round the year fodder supply, MM: Mineral Mixture, Sani : Sanitation, DW: Deworming, BN: Balanced nutrition, Vacci: Vaccination, BYP: Backyard poultry, CMP: Clean milk production

M3: CAG: Cleaning and Grading, SS: Seed storage, SEM: Sale of excess of milk through co-operative union, VC: Vermicompost, VW: Vermi wash

M4: NKG:Nutritional Kitchen Garden, CC: Composite culture, VC: Vermicompost

7.5.2 FRONTLINE DEMONSTRATION ON CROPPING SYSTEMS INVOLVING OILSEEDS

India occupies a premier position with regard to oilseed production, covering 19% of the area and 10% of the production in the world. All the oilseed crops together are grown on an area of 25.3 million ha, which is next only to food grains. PDFSR through its on-farm centres across the country undertaken FLD's as a part of crop diversification for obtaining improved income and oilseed crops are introduced in various existing systems. The results of the FLD's conducted in farmer's field's by OFR units of AICRP-IFS during 2011-12 are given in the report.

Objective

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

Technical Programme

The FLD's were conducted at 13 OFR units of All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) in five agro ecosystems *viz.,* Arid, Semi Arid, Sub Humd, Humid and Coastal; covering 10 states. Crops/ cropping systems in which FLDs were conducted are given in Table 7.5.2/1. A total of 56 demonstrations were on systems involving mustard, followed by 18 demonstrations on gobhisarson. The systems involving groundnut was undertaken in 15 demonstrations while soybean and castor crops were taken in 5 and 2 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.

Out of 8 centres in which mustard was evaluated under FLD's with farmers and improved practice, improved nutrient management practice alone was evaluated at Sirsa while improved variety alone was evaluated at Kaushambi. In Sabour improved package as a whole comprising of land preparation, variety, seed treatment, seed rate, spacing, irrigation, weed control, nutrient application and plant protection measures was evaluated in mustard against farmers practice. Improved variety and nutrient practice was evaluated at Santkabirnagar in mustard while sowing method, spacing and nutrient practice was evaluated at Kawardha in the same crop. In Nainital, improved package consisting of variety, sowing method, weed control and nutrient practice was evaluated. In case of groundnut, improved variety with recommended nutrient application was tested at Kendrapara while improved variety, land preparation, spacing, seed rate, weed control, nutrient application and plant protection was evaluated at Raigad. In Aurangabad, land preparation, variety, nutrient application and plant protection measures were taken up in soybean-gram system. At Amritsar, sowing method, spacing and nutrient source was tested in Gobhisarson – ray system while at intercropping of cowpea and greengram was tested at Deesa. In terms of nutrient management, sulphur application to mustard was tested at Sirsa and Sabour while recommended dose of NPK was tested against sub optimal application fertilizers in farmers practice at Santkabirnagar, Kawardha and Nainital. In case of groundnut, application of gypsum with NPK was evaluated at Raigad while application of gypsum along with boron and rhizobium inoculation was tested at Kendrapara. In soybean, recommended dose of nutrient was evaluated at Aurangabad while in gobhisarson and raya, nutrient source was changed from DAP to SSP at Amritsar.

***Results*:** The mean yield of mustard under improved package ranged from 1213 kg ha^{-1} (Sabour) to 2337 kg ha^{-1} (Deesa) (Table 7.5.2/1). The yield increase in mustard due to improved package was higher (52.9 %) at Santkabirnagar where in improved variety and nutrient management practice was used (NDR-8501 and

Table 7.5.2/1. Influence of farmers and improved practices on grain or pod yield (kg/ha) of various crops under FLD (2010-11)

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									
Sirsa (Haryana)	Cotton	Mustard	5	-	2070	-	2263	-	9.3
Deesa (Gujarat)	Pearlmillet	Mustard	3	1910	1922	2307	2337	20.8	21.6
	greengramCastor +	-	1	2160*	-	(290)2575	-	33.8**	-
	Castor + cowpea	-	1	2290*	-	2480 (675)	-	35.9**	-
2. Semi Arid									
Aurangabad (Maharashtra)	Soybean	Chickpea	5	1317	1525	1676	1747	27.3	14.6
Modipuram (Uttar Pradesh)	-	Mustard	13	-	1680	-	2020	-	20.2
Kaushambi (Uttar Pradesh)	-	Mustard	5	-	1460	-	1675	-	14.7
Amritsar (Punjab)	Gobhi sarson	Raya	12	1686	1610	1906	1870	13.0	16.1
Santkabirnagar (Uttar Pradesh)	-	Mustard	10	-	1070	-	1636	-	52.9
3. Sub Humid									
Sabour (Bihar)	-	Mustard	5	-	1073	-	1284	-	19.7
Kawardha (Chattisgarh)	-	Mustard	5	-	1313	-	1605	-	22.2
Nainital (Uttarakhand)	-	Mustard	10	-	1227	-	1494	-	21.8
Kendrapara (Odisha)	Rice	Groundnut	5	-	1880	-	2330	-	23.9
4. Humid									
Kangra (Himachal Pradesh)	Maize	Gobhi sarson	6	1250	508	3142	1213	151.4	138.7
5. Coastal									
Raigad (Maharashtra)	Rice	Groundnut	10	3106	1678	5869	2537	89.0	51.2

*Sole castor, **based on equivalent yield basis

FLD demonstration at Kaushambi (Uttar Pradesh) on Mustard

120:60:40 kg N, P and K ha^{-1} through urea, DAP and MOP) over farmers practice. This was followed by 22.2 % increase in yield at Kawardha where in line sowing + 45 X 10 cm spacing + recommended nutrient practice was used. Across the locations, the mean increase in yield of mustard was found to be 23 % with improved package over farmers practice. Change of variety in mustard contributed for higher yield increase at Santkabirnagar and Nainital while application of sulphur at Sirsa and Sabour recorded 14.5 % increase on an average in mustard yield. On an average, 75.9 % increase in yield was observed with gobhisarson under improved package. Maintaining the spacing of 45 X 10 cm in gobhisarson recorded 13 % yield increase over farmers practice of broadcast sowing and no thinning. An yield increase of 51.2 and 23.9 % was observed in groundnut with improved package at Raigad and Kendrapara respectively. Intercropping of greengram and cowpea in castor led to increase in yield to the tune of 33.8 and 35.9 % respectively compared to sole castor at Deesa on equivalent yield basis. In soybean, 27.3 % increase in yield was observed at Aurangabad with improved variety of MAUS-71 + land preparation + balanced nutrient application + plant protection. Adopting the spacing of 45 X 10 cm and changing the source of P from DAP to SSP contributed for 16.1 % yield increase in raya at Amritsar. Significant improvement in yield of other crops grown in the system such as rice, maize, pearlmillet, greengram and cowpea was also observed under improved package. The increase was found to be 89, 151.4 and 20.8 % in rice, maize and pearlmillet respectively. Incase of mustard, higher increase in yield was observed under Semi Arid ecosystem (29.2 %) followed by Sub Humid (21.2 %) and Arid (15.5 %).

8. GENERAL/MISCELLANEOUS

8. GENERAL/MISCELLANEOUS

8.1 LIST OF PUBLICATIONS

8.1.1 Research Papers

CCS HAU Hisar (Haryana)

Kumar, P., Yadav, S.K. and Kumar, M. 2011. Influence of integrated nutrient management on weed emergence and productivity in pearlmillet (*Pennisetum glaucum*)-wheat (*Triticum aestivum*) cropping system. *Indian Journal of Weed Science,* **43**: 44-47.

Yadav, S.K., Kumar, P. and Kumar, M. 2010 (Published in 2012). Possible alternative cropping systems for farmers of semi-arid Haryana-India*. Journal of Farming System Research and Development,* **16**: 36-42.

Kumar, M. Kumar, P. and Yadav, S.K. 2010 (Published in 2012). Influence of integrated fertilizer management on nutrients utilization and soil chemical properties by pearlmillet-wheat cropping system. *Haryana Journal of Agronomy,* **26** (1&2): 1-8.

SDAU S.K. Nagar (GUJRAT)

Dabhi, B. M., Solanki, R. M. and Sagarka, B. K. 2012. Cropping system diversification, its production potential and economics under Saurashtra region of Gujarat. *Journal of Oilseeds Research,* **29**(1):37-40.

CSK HPKVV Palampur (H.P.)

Subehia, S.K., Dhanika and Rana S.S. 2011. Effect of continuous cropping and fertilization on availability of nutrients on acid soil. *Agropedology,* **21**(1): 18-22.

Rana, S.S., Sharma, H.L., Subehia, S.K., Negi, S.C. and Sharma, S.K. 2011. Promising cropping systems for mid hill agro-climatic conditions of Himachal Pradesh. *Himachal Journal of Agricultural Research,* **37**(2): 138-148.

Sharma, S.K., Rana, S.S., Subehia, S.K. and Negi, S.C. 2011. Impact of improved practices in comparison with farmer's practice on the productivity of maize-wheat system in rainfed areas of sub-montane low hills of Himachal Pradesh. *Himachal Journal of Agricultural Research,* **37**(2): 157-164.

SKUAT, Jammu (J&K)

Kachroo, D., Thakur, N.P., Kour, M., Kumar, P. and Sharma, R. 2012. Productivity and energetic of rice based cropping system under sub-tropical condition of Jammu*. Indian Journal of Agronomy*, **57**(2):290-294

Khokhar, A., Gupta, A.K., Thakur, N.P. and Sharma, R. 2012. Effect of rice straw management in wheat on soil fertility, nutrient uptake and yield of rice and wheat in a system under sub-tropical conditions of Jammu. *Journal of Soil and Water Conservation*, **11**(1): 19-23

Kour M., Singh, K.N., Thakur, N.P. and Sharma, R. 2012. Crop performance, nutrient uptake, nitrogen use efficiency and harvest index of wheat (*Triticum aestivum*) genotypes as influenced by different sowing dates under temperate Kashmir and its validation using CERES model. *Indian Journal Agricultural Research*, **46**(2):119-126.

JNKVV Jabalpur (M.P.)

Jha, A. K., Kewat, M. L., Upadhyay, V. B. and Vishwakarma, S. K. 2011. Effect of tillage and sowing methods on productivity, economics and energetics of rice (*Oryza sativa*) - wheat (*Triticum aestvum*) cropping system. *Indian Journal of Agronomy,* **56** (1): 1-10.

Soni, M., Upadhyay, V. B., Vishwakarma, S. K. and Singh, P. 2012. Productivity and sustainability of rice based cropping systems for Kymore Plateau and Satpura hills zone of Madhya Pradesh as influenced by diversification and intensification. *Indian Journal of Agronomy,* **57** (1): 27-32

Upadhyay, V. B., Jain, V., Vishwakarma, S. K. and Kumhar, A. K. 2011. Production potential, soil health, water productivity and economics of rice (*Oryza sativa*)-based cropping system under different nutrient sources. *Indian Journal of Agronomy,* **56** (4): 18-22.

PAU, Ludhiana (Punjab)

Singh, G., Dhaliwal, S. S., Sadana, U. S. and Walia, S. S. 2011. Surface and subsurface distribution of Zn, Cu, Fe and Mn as influenced by differential cropping systems in typic Ustochrepts soils of Punjab. *Indian Journal of Plant Science Research,* **27**(2): 175-88.

Walia, S. S., Gill, M. S., Bharat Bhushan, Phutela, R. P. and Aulakh, C. S. 2011. Alternate cropping systems to rice-wheat for Punjab. *Indian Journal of Agronomy,* **56** (1): 23-26.

OUAT Bhubaneswar

Barik, T., Sahu , S., Garnayak , L.M., Gulati J.M.L., and Bastia D.K. 2011. Split application of vermicompost and its effect on growth and yield of organic rice. *Oryza,* **48**(3): 226-232.

Barik, T., Gulati, J.M.L., Garnayak, L.M. and Bastia, D.K. (2011). Production of vermicompost from agricultural wastes-A review. *Agricultural Reviews,* **31**(3): 172-183.

MAU,Parbhani

Narkhede, W. N., Deshmukh, M. S., Bhale, V. M., Gill, M. S., Gadade G. D. and More S. S. 2011. Diversification of cropping systems under assured irrigated conditions in central plateau zone of Maharashtra. *Indian Journal of Agronomy,* **56**(2) 104-108.

UAS,Raichur

Basavanneppa M.A., Salakinakoppa S.R. and Biradar D.P. 2012. Productivity and profitability of Bt cotton as influenced by spacing and NPK levels in irrigated ecosystem. *Journal of Cotton Research and development*, **26**(1):66-69.

Biradar D.P., Aladakatti Y.R., Basavanneppa M.A., Shivamurty D. and Satyanarayana T. 2011. Assessing the contribution of nutrients to maximize transgenic cotton yields in vertisols of northern Karnataka. *Better Crops*, pp 22-25.

Biradar D.P., Basavanneppa M.A., Yedahalli G.S., Udikeri S.S., Alagawadi A.R. and Patil V.C. 2011. Agronomic performance and economics of Bt cotton as influenced by intercrops and plant protection schedules. *International Agricultural Statistical Science,* **7**(1):117-123.

MPUAT Udaipur Kota (Rajasthan)

Jain, N.K., Singh, H. and Dashora, L.N. 2011. Production potential, profitability, sustainability and energetic of different wheat (*Triticum aestivum*) based cropping systems. *Archives of Agronomy and Soil Science,* **57** (5): 1- 11.

Meghwal, H. P., Bajpai, N. K., Ameta, O. P., Swaminathan, R. And Jain, H. K. 2011. Efficiency of different storage structures to control the insect infestation in maize grains. *Journal of Plant Protection and Environment,* **8** (1): 15-20.

Bhatnagar, V., Rajkumar and Meghwal, H.P. 2011. Assessment of yield gaps in linseed (*Linum usitatissimum* L.) through validation of improved technology at farmer's field. *International Journal of Tropical Agriculture,* **29** (1-2): 145-147.

Bhatnagar, V., Bhatnagar, G.S., Tetarwal, J.P. and Meghwal, H.P. 2011. Performance of linseed cultivars under irrigated situation. *International Journal of Tropical Agriculture,* **29** (1-2): 149-152.

Bhatnagar, G.S., Bhatnagar, V**.** and Meghwal, H.P. 2011. Profitability and sustainability of peri-urban agriculture. *International Journal of Rural Development and Management Studies,* **5** (1): 219-222.

Meghwal, H.P., Bajpai, N.K. and Chaudhary, H.R. 2012. Relative efficacy of some vegetable oils as grain protectant against *Sitophilus oryzae* (L.) in stored maize grains. *Indian Journal of Entomology,* **74** (1): 9-12.

Chaudhary, H.R. and Meghwal, H.P. 2012. Efficacy of novaluron against green semilooper, *Chrysodeixis acuta* Walker infesting soybean. *Indian Journal of Entomology,* **74** (1): 13-15.

TNAU,Coimbatore(T.N.)

Paramasivan, M., Kumaresan, K.R., Malarvizhi, S., Thiyageshwari, S., Mahimairaja and Velayudham, K. 2011.Nutrient optimization strategy for sustainable productivity of hybrid maize in peelamedu series of soils of Tamil Nadu. *Research on Crops,* **12**(1):33-38.

Paramasivan, M., Kumaresan, K. R., Malarvizhi, S., Thiyageshwari, S., Mahimairaja and Velayudham, K. 2011. Nutrient optimization strategy for sustainable productivity of hybrid maize in palaviduthi series of soils of Tamil Nadu. *Research on Crops,* **12**(1):39-44.

Porpavai, S., P.Devasenapathy, K.Siddeswaran and Jayaraj, T. 2011. Impact of various rice based cropping systems on soil fertility. *Journal of Cereals and Oilseeds,* **2**(3):43-46.

Sangeetha, S.P. and Balakrishnan, A. 2011. Effect of organically supplemented N on yield of rice (*Oryza sativa* L.). *Journal of crop and weed,* **7**(1): 86-88.

KAU,Karmana

Jacob, J. 2011. Energy concerns in agriculture: Integrated farming systems-A viable alternative. *Energy Manager,* **4** (4): 31-36.

Jacob, J. and Sarada, S. 2012. Role of phenolics in allelopathic interactions. *Allelopathy Journal*, **29** (2): 215-230.

Rani, B., Varughese, K., Suja, A. Jacob, J. and Vijayan, M. 2012. Yield performance and agronomic efficiency of wetland rice under long term fertilization in an entisol. *Agricultural Science Digest,* **32**(2): 137-140.

CSAUAT, Kanpur (U.P.)

Singh, A.R., Dubey, S.D., Awasthi, U.D., Tiwari, U.S. and Pandey R.K. 2011. Micronutrient status of soils under different cropping systems in Kanpur, U.P. *Current Advances in Agricultural Science,* **3**(2):135-136.

Pandey, R.K., Kishore, R., Tiwari, U.S., Husain, K, Dubey, S.D and Tiwari, H.N. 2012. Response of chickpea (*Cicer aritinum*) to phosphorus and zinc under irrigated condition. *Current Advances in Agricultural Science,* **4**(2):174-175.

Rai, J. and Tiwari, U.S. 2012. Economics and productivity of biological efficiency and profitable cropping system in central plain zone of Uttar Pradesh. *International Journal of Agricultural Science,* **8**(1):125-127.

Kumar, S., Biswas, S.K., Naresh, P., Kumar, S. and Khan, N. 2012. Evaluation of SAAF with other fungicides and biocides against sheeth blight of paddy caused by *Rhizoctonia solani. International Journal of Bio-resource and Stress Management,* **3** (1) : 245-248.

NDUAT Faizabad (UP)

Tripathi, H.P. Kumar, A. and Singh, S.P. 2011. Efficient alternative cropping systems for agro-climatic zones of eastern Uttar Pradesh. *In: Efficient Alternative Cropping Systems. Eds: B. Gangwar and A.K.Singh,* PDFSR, Modipuram, Meerut, India pp 84-96.

8.1.2 Papers presented in seminar/symposia

SDAUSK Nagar (GUJRAT)

Patel, B.S**.** 2011. Mitigation strategies to counter act impact of climate change on agriculture. Paper presented in National Conference on food Security-Role of policies, Optimum use of Agricultural inputs and Natural Resources held at Ahmedabad Management Association, Ahmedabad during 25-26 February 2011, pp 177-181.

Patel, B. S., Gangwar, B., Patel, R. L., Patel, P. K., Patel, S. M., Patel, R. R. and Patel, A. M. 2011. Solving the pulses crises through crop diversification in Gujarat state. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 82-83.

Patel, R. R., Patel, B. S., Patel, R. M., Patel, P. K. and Bidage A. 2011. Social aspects and challenges of organic farming. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 72-73.

Patel, P. K., Patel, B. S., Patel, S. M., Patel, R. R. and Ali S. 2011. Effect of integrated nutrient management on soil fertility status and productivity of pearlmillet-wheat sequence in loamy sand soils of North Gujarat. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 74-75.

Ali, S., Patel, B. S., Patel, S. M., Patel, P. K. and Patel, R. R. 2011. Development of organic farming package for system based high value crops. Paper presented in National symposium on resource utilization through Integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) on 20-22 December 2011, pp 76.

Patel, S. M., Patel, B. S., Patel, P. K., Patel, R. R., Ali, S. and Pandya, S. P. 2011. Cropping systems diversification and/or intensification. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 77.

Parjapati, T. R., Patel, B. S., Yadav, B. L. and Patel, N. B. 2011. Productivity and economics as influenced by different carrot (*Daucus carota* L.) based cropping systems in North Gujarat agro-climatic conditions. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 77-78.

Singh, J., Patel, B. S. and Ali, S. 2011. Study on inter/mixed cropping systems of mustard (*Brassica juncea* L.) and lucerne (*Madicago sativa*) in North Gujarat agro-climatic conditions. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 78.

Yadav, B. L., Patel, B. S. and Patel, N. B. 2011. Study on intercropping in summer pearlmillet (*Pennisetum glaucum* L.) R. Br. Emend. Stuntz] under North Gujarat agro-climatic conditions. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 78-79.

Patel, S. K., Patel, B. S., Patel, P. K., Patel, S. M., Singh J. and Ali S. 2011. Alternate cropping systems for pearlmillet-mustard cropping system on farmers field in North Gujarat. Paper presented in National symposium on resource utilization through integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) during 20-22 December 2011, pp 79-80.

CCS HAU Hisar (Haryana)

Kumar, P., Yadav, S. K. and Kumar, M. 2012. Maximizing yield through intensive cropping systems in semi-arid environment of Haryana. Paper presented and abstract published in : National seminar on “Sustainable agriculture and food security: Challenges in changing climate”, organized by Directorate of Research during 27-28 March 2012, CCS Haryana Agricultural University, Hisar, pp 252.

Kumar, M., Kumar, P. and Yadav, S.K. 2012. Impact of integrated fertilizer management on nutrients utilization and soil chemical properties in pearlmillet-wheat cropping system. Paper presented and abstract published in: National seminar on "Sustainable agriculture and food security: Challenges in changing climate", organized by Directorate of Research during 27-28 March 2012, CCS Haryana Agricultural University, Hisar, pp 252.

Kumar, P., Yadav, S. K. and Kumar, M. 2011. Effect of different plant management techniques on pearlmillet-wheat/mustard economic returns. Paper presented and abstract published in: International conference on issues for climate change, land use diversification and biotechnological tools for livelihood security at Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, India during 8-10 October 2011, pp 99.

Kumar, M., Kumar, P. and Yadav, S.K. 2011. Nutrients uptake in relation to various planting management techniques in pearlmillet-wheat/mustard cropping systems. Paper presented and abstract published in: International conference on issues for climate change, land use diversification and biotechnological tools for livelihood security at Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, India during 8-10 October 2011, pp 41.

Yadav, S.K., Kumar, P. and Kumar, M. 2011. Effect of different planting management techniques on pearlmillet-wheat/mustard productivity. Paper presented and abstract published in : International conference on issues for climate change, land use diversification and biotechnological tools for livelihood security at Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, India during 8-10 October 2011, pp 107.

CSK HPKVV Palampur (H.P.)

Subehia, S.K., Sepehia, S., Negi, S.C., Rana, S.S. and Sharma, S.K. 2011. Long term effect of INM in rice-wheat system and soil properties in an acid soil of NW Himalayas. Paper presented in 76th Annual Convention of Soil Science at University of Agricultural Sciences Dharwad, Karnataka during 16-19 November 2011.

Ramesh, Rana, S.S., Kumar, S. and Negi, S.C. 2012. Influence of tillage/planting techniques on weed dynamics in maize-wheat cropping system. National Seminar on Sustainable Agriculture and Food Security: Challenges in Changing climate, CCS HAU, Hisar, during 27-28 March 2012, pp 237-238.

Rana, S.S., Subehia, S.K., Negi, S.C. Sharma, R.K. and Sharma, S.K. 2012. Alternative cropping system for mid hills Agro climatic conditions of H.P. Extended summaries: Third International Agronomy Congress held at New Delhi during 26-30 November 2012, **2**: 394.

Negi, S.C., Rana, S.S., Subehia, S.K., Sharma, S.K. and Sharma, H.L. 2012. Long term effect of integrated nutrient management on the productivity and sustainability of rice-wheat cropping systems in acid alfisol of Himachal Pradesh. Extended summaries: Third International Agronomy Congress held at New Delhi during 26-30 November 2012, **2**: 417.

SKUAT, Jammu (J&K)

Thakur, N.P., Kachroo, D., Kumar, J., Sharma, R. and Gupta, A. K. 2011. Sustainable production management for yield maximization of rice-wheat cropping system under irrigated condition of Jammu

region. Paper presented in 76th Annual convention of the ISSS held at UAS, Dharwad during 16-19 November 2011.

Thakur, N.P., Kachroo, D., Kour, M., Kumar, P., Sharma, R. and Khajuria, V. 2011. Enhancing productivity and profitability of rice and wheat through input use management under sub-tropical condition of Jammu. Proceeding 1st Jammu and Kashmir Agricultural Science Congress held at SKUAST-K, Srinagar during 8-10 September 2011, pp 18.

Sharma, R., Kachroo, D., Bharat, R. and Thakur, N. P. 2011. Yield of rice as affected by irrigation scheduling, puddling intensity and sources of nutrients and its residual effect on succeeding wheat crop under irrigated condition of Jammu. Proceeding 1st Jammu and Kashmir Agricultural Science Congress held at SKUAST-K, Srinagar during 8-10 September 2011, pp 23.

UAS Bangalore

OUAT Bhubaneswar

Mohapatra, B.K., Swain, S.K., Mishra, K.N., Mohanty, A.K., Haldar, J., Mishra, S.N. and Garnayak, L.M. 2012. Effect of nutrient management and plant population on productivity of rice-groundnut cropping system under Central Table Land Zone of Odisha. National Seminar on rice based farming system for changing climate scenario held at Chiplima during 27-29 February 2012.

Halder, J., Mishra, K.N., Swain, S. K. Mohapatra, B. K. Mohanty, A. K. Mishra, S. N. and Garnayak**,** L.M. 2012**.** Resource conservation technology (RCT) in rice-wheat cropping system in western Odisha. National Seminar on rice based farming system for changing climate scenario held at Chiplima during 27-29 February 2012.

Mohanty, A.K., Mishra, K.N., Mohapatra, B. K., Swain, S.K., Haldar, J., Mishra, S. N. and Garnayak**,** L.M. 2012. Effect of resource conservation technologies (RCT) on productivity, economics, energy use and physico-chemical properties of soil in rice-rice system. National Seminar on rice based farming system for changing climate scenario held at Chiplima during 27-29 February 2012.

Mohapatra, B.K., Mohanty, M., Mishra, S.N., Swain, S.K., Mohanty, A.K., Haldar, J., Mishra, K.N. and Garnayak**,** L.M. 2012. Comparative economics and employment generation through a vegetable based integrated farming system in an open dug well command area. National Seminar on rice based farming system for changing climate scenario held at Chiplima during 27-29 February 2012.

Garnayak, L.M., Swain, S.K., Mohapatra, B.K. and Mishra, K.N. 2012. Oilseed-based cropping systems for changing climate scenario. National Seminar on rice based farming system for changing climate scenario held at Chiplima from 27-29 February 2012.

MAU, Parbhani

Narkhede, W. N. and Katkade, J. L. 2012. Effect of spacing and Nutrients level on yield and nutrient availability in Bt cotton-Gram cropping system. State Level Seminar of Akola Chapter, “On Braking yield barriers major field crops” held during 6-7 January 2012 by Indian Society of Agronomy, pp 110.

Narkhede, W. N. and Katkade, J. L. 2012. Productivity and fertility status in sorghum (*Sorghum bicolor* M.)- Wheat (*Triticum aestivum*) sequences influenced by integrated nutrient management. State

Level Seminar of Akola Chapter, “On Braking yield barriers major field crops” held during 6-7 January 2012 by Indian Society of Agronomy, pp 196.

UAS, Raichur

Basavanneppa, M.A., Biradar, D.P., Ajaykumar M.Y. and Shivakumar. 2011. Influence of foliar application of nutrition on Bt cotton productivity and profitability in irrigated ecosystem. In: World Cotton Research Conference-5 held at Mumbai, during 7-11 November 2011, pp 156.

Biradar, D.P., Yedahalli, G.S., Basavanneppa, M.A., Udikeri, S.S., Alagawadi, A.R. and Guruprasad, G.S., 2011. Response of Bt cotton to spacing under different levels of plant protection schedules. In: World Cotton Research Conference-5 held at Mumbai, from 7-11 November 2011, pp 173.

Biradar, D.P., Aladakatti, Y.R., Basavanneppa, M.A. and Patil, V.C. 2011. Site specific nutrient management approaches for enhancing the productivity of Bt cotton. In: National Symposium on Innovation and modern technologies for agricultural productivity, food security and environmental management held at Mangalore, 22-23 July 2011, pp 38.

PAU Ludhiana (Punjab)

Singh, P., Walia, S. S., Singh, Babbanbir and Ram, S. 2012. Rice-Capsicum+ garlic cropping system-more remunerative than rice-wheat. In: *Proceedings of National seminar on new frontier and future challenges in horticultural crops* organized at Punjab Agricultural University, Ludhiana during 15-17 March 2012, pp 101-102.

Walia, S. S., Aulakh, C. S. and Singh, R. 2012. Productivity of maize-potato-onion after 7 crop cycles under organic Vs chemical sources of nutrition. In: *Proceedings of National Seminar on New Frontier and Future Challenges in Horticultural Crops* Organized at Punjab Agricultural University, Ludhiana during 15-17 March 2012, pp 137-38.

Walia, S. S. and Gill, M. S. 2012. Yield maximization in maize-wheat system. In: *Proceedings of 15th Punjab Science Congress* held at Guru Nanak Dev University, Amritsar during 7-9 February 2012, pp 120-121.

Walia, S. S., Aulakh, C. S. and Singh, R. 2012. Groundnut-toria+*gobhi sarson*-A sole oilseed based cropping system. In: *Proceedings of 15th Punjab Science Congress* held at Guru Nanak Dev University, Amritsar during 7-9 February 2012, pp 134.

Walia, S. S., Singh, R., Aulakh, C. S. and Kaur, A. 2012. Identification of predominant farming systems in Punjab.In: *Proceedings of 15th Punjab Science Congress* held at Guru Nanak Dev University, Amritsar during 7-9 February 2012, pp 133.

Walia, S. S., Singh, Satpal., Aulakh, C. S. and Singh, Roopinder 2012. Farming system approach for income enhancement. In: *Proceedings of 15th Punjab Science Congress* held at Guru Nanak Dev University, Amritsar during 7-9 February 2012, pp 131-32.

JNKVV Jabalpur (M.P.)

Dwivedi B. S. 2011. Performance of integrated nutrient management on yield of paddy. Paper presented in National seminar on innovative extension approaches for enhancing rural house hold income, held at JNKVV, Jabalpur (M.P.) on 27 September 2011.

MPUAT Udaipur

Meena, G. L., Singh, H., Pant, D.C. and Burark, S.S. 2012. Scenario of micro finance in India. National Seminar on Micro finance: Issues and challenges for Sustainability held at MPUAT, Udaipur during 19-20 February, 2012.

Bhosale, S.S., Burark, S.S., Pant D.C. and Singh, H. 2012. Microfinance Through DCCB's on Konkan Region of Maharastra- National Seminar on microfinance: Issues and challenges for Sustainability held at MPUAT, Udaipur during 19-20 February 2012.

TNAU Coimbatore

Kathirvelan, P., Siddeswaran, K. and Balasubramaniyan, P. 2012. Response of nutrient N, P & K in rice-rice cropping system through farmers participatory approach. In: *Proceedings of the 100 years of Rice Science and Looking Beyond* held at CPBG, TNAU, Coimbatore, **1** : 317-318.

Kathirvelan, P., Balasubramaniyan, P. and Jeyaraman, S. 2012. Resource conservation techniques in direct sown rice (DSR) under dry seeded condition. In: *Proceedings of the International Symposium on 100 years of Rice Science and Looking Beyond* held at CPBG, TNAU, Coimbatore, **2**: 445-446.

Vijayabaskaran, S., Mani, A. K., Pandian, B. J. and Chellamuthu, S. 2012. Evaluating the performance of machine planted SRI in the farmers' holdings at Pennaiyar sub basin of Tamil Nadu State, India. In: *Proceedings of International symposium on 100 years of Rice Science and looking beyond* held during 9-12 January, 2012 TNAU, India, pp 477-478.

KAU, Karmana

Jacob, J. 2011. Homestead Farming: Constraints and Future Strategies. In: *Proceedings of the State Level Workshop on Homestead Farming Homestead Farming. Practices for Food and Nutrition Security.* (Eds. Reghu, R.D. and Sabith L.K.), Mitraniketan, Thiruvananthapuram, pp 13-18.

Jacob, J., Varughese, K., Rani, B. 2012. Influence of rainfall pattern on the performance of different rice based cropping systems in southern Kerala. In: *Compendium of selected papers of National Seminar on Watershed Planning for Natural Resource Management* (Eds.Edison, S.,Kumar, R.S., Nizamudheen, A., Tina, B., Yasmin, L.K. and Shyam, K.S.L.) Kerala State Land Use Board, Thiruvananthapuram, Kerala, pp 172-174.

Varughese, K. and Manoj, L. W. 2012. Enhancing water productivity and return flow in rice fields of Pudunagaram and Ongallur watersheds of Palakkad district. In: *Compendium of selected papers of National Seminar on watershed Planning for natural resource management.* (Eds. Edison, S., Kumar, R. S. Nizamudeen, A., Tina, B., Yasmin, L. K. and Syam, K. S. L.) Kerala State Land Use Board, Thiruvananthapuram, Kerala, pp 186-188.

Rani, B., Varughese, K., Jacob, J. and Suja, A. 2012. Efficiency of site specific nutrient management in a rice-rice cropping system. In: *Compendium of selected papers of National Seminar on Watershed Planning for Natural Resource Management* (Eds.Edison, S., Kumar, R.S., Nizamudheen, A., Tina, B., Yasmin, L.K. and Shyam, K.S.L.) Kerala State Land Use Board, Thiruvananthapuram, Kerala, pp 213-215.

CSAUAT Kanpur (UP)

Tiwari, U. S., Yadav, M. P. and Rai, J. 2011. Effect of different cropping systems on crop productivity, profitability and soil properties in alluvial tract of U.P. Presented in 76th Annual convention of the Indian society of Soil Science held at Dharwad Karnataka during 16-19 November 2011.

Dubey, A.P., Khan, N. and Yadav, M. P. 2011. Effect of thermal stress on Wheat productivity in Central Uttar Pradesh. Presented in Zonal Symposium (Mid-Eastern) on Sustainable Crop Protection in Changing Agriculture Scenario held during 18-19 November 2011 at C.S.A.U.A & T, Kanpur, pp 24.

Khan, N., Yadav, R. A. and Yadav, M. P. 2011. Long-term effect of tillage and weed control measures on weed dynamics and yield of wheat in rice-wheat cropping system. Oral paper presented in Zonal symposium (Mid Eastern) on Sustainable Crop Protection in changing Agriculture scenario held during 18-19 November 2011 at C.S.A.U.A. &T., Kanpur, pp 16.

Yadav, R. A., Khan, N. Dixit, R. N. and Yadav, P. 2011. Efficacy of herbicides for controlling weeds in direct seed rice. National symposium on “Biodiversity and Food Security: Challenges & Devising Strategies” organized at IIPR, Kanpur during 10-11 December 2011, pp 61.

Khan, N., Yadav, R. A., Dixit, R. N., Kumar, V. and Trivedi, A. 2011. Effect of intercropping and weed management practices on weed dynamics and yield of garlic. National symposium on “Biodiversity and Food Security: Challenges & Devising Strategies” organized at IIPR, Kanpur during 10-11 December 2011, pp-11.

ICAR Research Complex for Goa

Korikanthimath, V. S. and Manjunath, B. L., 2011. Integrated farming systems for sustainable agriculture. In: Souvenir of XIV National Symposium on Tobacco- New Frontiers in Tobacco Science held during 20-22 December 2011 Rajahmundry, Andhra Pradesh, pp 45-56.

Manjunath, B. L. and Singh, N.P. 2012. Plantation crop based integrated farming system for coastal areas, In: Sovenier cum abstract book of National Seminar on Technologies for Improving Productivity of Spices and Plantation Crops, organized by Central Agricultural Research Institute, Port Blair during 27-28 February 2012, pp 45-53.

Singh, N. P. and Manjunath, B. L. 2012. Plantation based farming systems for coastal Agro-eco system, In: Sovenier of National Symposium on rice based farming systems for livelihood security under changing climatic scenario, organized by College of Agriculture, Chiplima and Agri-Horti Society of India, Chiplima, Odisha during 27-29 February 2012, pp 13-20.

Manjunath, B. L. and Singh, N. P. 2012. System approach in agriculture for climate change mitigation, In: Summaries of National Seminar on Indian Agriculture; Preparedness for Climate Change, organized by Indian Society of Agricultural Sciences in New Delhi during 24-25 March 2012, pp 182-184.

8.1.3 Popular Articles

AAU, Thasra (Gujrat)

Kacha, R. P., Patel, A. S., Patel, R. M., Shah, S. N. and Patel, C. J. 2012. Scientific Cultivation of Mustard. Agricultural Research Station for Irrigated Crops, AAU, Thasra.

Kacha, R. P., Patel, R. A. and Patel, A. S. 2012. Scientific cultivation of castor crop in Narmada command area of middle Gujarat ago-climatic zone. Agricultural Research Station for Irrigated Crops, AAU, Thasra.

JNKVV,Jabalpur (M.P.)

Dwivedi, B. S., Jha, Amit and Upadhyay, V. B. (2011). tfod [krh —f"k mRiknu e fVdkÅiu —"kd 'kfDr ¼f}ekfld —f"k if=dk½ tykb&vxLr] i"B l[;k 20-

Dwivedi, B. S., Jha, Amit (2011). to mojd d mi;kx —"kd pruk ¼f}ekfld —f"k if=dk½ tykb&vxLr] i"B l[;k 22-

Rai, R. K., Dwivedi, B. S., and Dubey, Lokesh (2011). tyok;q ifjoru —"kd lekt fodkl] ¼—f"k ekfld if=dk½ flouh ¼e- Á-½ vDV- i"B l[;k 27&28-

Amule, P. C., Dwivedi, B. S. and Rawat, A. K. (2011). fVdkÅ [krh gr tfod mojdk dk lefUor mi;kx] —"kd pruk ¼—f"k f}ekfld if=dk½ tcyij ¼e- Á-½ flr-&vDV- i"B l[;k 45-

Gautam, A. N., Dwivedi, B. S. and Sharma, G. D. (2011). iNrh xgq d mRiknu gr u; vk;ke] —"kd pruk ¼—f"k f}ekfld if=dk½ tcyij ¼e- Á-½ uo-&fnl- i"B l[;k 20-

Amule, P. C., Dwivedi, B.S. and Rawat, A. K. (2011). vU/kk/kU/k jk;uk d Á;kx l vueky feVVh dh ekr —"kd pruk ¼—f"k f}ekfld if=dk½ tcyij ¼e- Á-½ tuojh&Qjojh i"B 21-

Singh, R. K., Singh, D. K. and Dwivedi, B. S. (2011). l{e thok d Vhdkdj.k l Qly mRiknu e of) —"kd pruk ¼—f"k f}ekfld if=dk½ tcyij ¼e- Á-½ tuojh&Qjojh i"B 22-

MPUAT Udaipur Kota (Rajasthan)

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jkefuokl pk/kjh] ljUn flg] jkeorkj [k.Myoky ,o j.kthr flgA 2012] ljlk&2 % vf/kd mRiknu gr mUur Ñf"k rduhd viuk;A [kkn if=dk % 53¼11½% 0&11

KAU, Karmana

Jacob, J. and Vipitha, V.P. (2012). Purayida Krishi-Oru susthira krishi samprudhayam. *Kalpadhenu* **33**(3): 20-25

Jacob, J. (2012). Theetapullu Krishi Purayidangalilum. *Mangofest Madhuram 2012 Souvenir,* pp 104-105

CSAUAT, Kanpur (U.P.)

Yadav, R. A., Khan, N. and Yadav, M. P. 2011. Sarson me Kahrpatwar Prabandhan (Hindi). *Krishak Bharti*, pp 28-30.

8.1.4 Books/Book chapter

CCS HAU Hisar (Haryana)

Kumar, P., Yadav, S. K. and Kumar, M. 2011. Efficient alternative cropping systems: Zone 3. Trans Gangetic Plains, In: Efficient alternative cropping systems, Eds: B. Gangwar and Anil Kumar Singh, Published by Project Directorate for Farming Systems Research, Modipuram, India, pp: 59-68.

PAU, Ludhiana

Walia, U. S., Walia, S. S., Kler, D. S. and Singh, D. 2011. *Science of Agronomy*. Scientific Publishers, Jodhpur. ISBN: 978-81-7233-746-9, pp 604.

CSK HPKVV Palampur (H.P.)

Sharma, H. L., Rana, S. S., Sharma, S. K. and Subehia, S.K. 2011. Efficient alternative cropping systems – mid and low hill zones of Himachal Pradesh. In efficient alternative cropping systems, Project Directorate for Farming Systems Research, Modipuram, Meerut, India (Eds: B. Gangwar and A. K. Singh) pp 12-26.

CSAUAT Kanpur (UP)

Yadav, R. A., Khan, N. and Yadav, M. P. 2011. Gajarghas Prabhav avam Prabandhan (Hindi).

Yadav, R. A., Khan, N. and Yadav, M.P. 2011. Success Stories of Weed Management.

Chapters in book

SKUAT, Jammu (J&K)

Walia, S. S. and Gill, M. S. 2011. Trans-Gangetic plains-zones of Punjab. In: *Efficient Alternative Cropping systems* (Eds: B. Gangwar and A. K. Singh). Project Directorate for Farming System Research, Modipuram, Meerut, pp 41-58.

SDAUSK Nagar (GUJRAT)

Patel, B. S., Mehta, R. S., Tikka, S. B. S., Gangwar, B., Patel, B. T. and Patel, S. M. 2011. Efficient alternative cropping systems. Zone 13.Gujarat plains and Hill Region., Published by Project Directorate for FSR, ICAR, Modipuram, Meerut, pp 273-303

Patel, B. S., Ali, S. and Patel, S. M. 2011. North Gujarat: Cropping pattern before and after Narmada water. In book "Agricultural Statistics: SDAU domain" (Eds: Modi *et al.*) College of ABM, S. D. Agricultural University, Sardar krushinagar, pp 112-118.

Patel, B. S., Patel, R.R. and Yadav, B.L. 2011. North Gujarat: Statistics of Narmada command. In book "Agricultural Statistics: SDAU domain" (Eds: Modi *et al.*) College of ABM, S.D. Agricultural University, Sardar krushinagar, pp 119-131.

Patel, R. R. and Patel, R. R. 2011. North Gujarat: Cost of cultivation of major field crops. In book "Agricultural Statistics: SDAU domain" (Eds: Modi *et al.*) College of ABM, S.D. Agricultural University, Sardar krushinagar, pp 119-131.

Patel, B. S., Patel, R. L., Shreedharan, K. and Patel J. C. 2011. SDAU in service of the farmers of North Gujarat. In souvenir, National symposium on resource utilization through Integrated farming system and bio-diversity conservation in drylands held during 20-22 December 2011. Eds: P. C. Moharana, D.V. Singh and Arvind Kumar published by Arid Zone Research Association of India and CAZRI, Jodhpur, pp 40-44.

Patel, B. S., Sisodiya, D. B. and Patel, P. M. (2012). Uttar Gujaratna pakoni pak paddhatio. Chapter in vividh chomasu pakoni vaignanik kheti paddhatio. Published by T & V yojana, S. D. Agricultural University, Sardar krushinagar, pp 28-32.

Mody, S. K., Thakkar, K. P., Vhora, P. H., Patel, M. V., Patel, B. S., Patel, H. B., Modi, C.M., Patel, V. R., Patel, B. B., Patel, J. G. and Pavaya, R. P. Eds: "Agricultural Statistics: SDAU domain", 2011: College of ABM, S.D. Agricultural University, Sardarkrushinagar.

OUAT Bhubaneswar

Mishra, K. N., Jena, D. and Mahalik, N. 2012. *'Soil resource and agricultural practice in coastal tract'* Book Chapter in '*Coastal Tract of Odisha'* published by Geomin Consultants Pvt. Ltd, Bhubaneswar

MPUAT Udaipur Kota (Rajasthan)

Lal, M., Singh, S., Gill, O.P. and Choudhary, R. 2012. Arid Western Plain Zone of Rajasthan. In Book Efficient alternative cropping system eds: B. Gangwar and A.K. Singh, PDFSR, Modipuram.

Karjat

Pawar, L. G., Chavan, A. P. Dalvi, A. S. Jondhale, D.G.and Mhaskar, N.V. 2011. Efficient Alternative Cropping Systems for Konkan, the Coastal Zone of Maharashtra In: ICAR book entitled "Efficient Alternative Cropping Systems' published by Project Director, PDFSR, Modipuram.

TNAU,Coimbatore(T.N.)

Devasenapathy, P., Shanmugam, P. M., Kumar, G. S. and Thiyageshwari, S. 2012. Crop diversification strategies for profitable agriculture. In Cropping system management. Eds: B. Gangwar published by Agrotech Publishing Academy, Udaipur, pp. 27-44.

Devasenapathy, P., Shanmugam, P. M., Kumar, G. S. and Thiyageshwari, S. 2012. Energy management in crop production. In Cropping system management. Eds: B. Gangwar published by Agrotech Publishing Academy, Udaipur, pp. 245-264.

Jeyaraman, S., Muthukrishnan, P., Siddeswaran, K., Mohammed A. M., Murali, A. P., Shanmugam, P. M., Vaiyapuri, K. and Nagarajan, R. 2011. Alternative farming system options for food and nutritional security. AE Publications, Coimbatore – 41, Tamil Nadu (ISBN No.978-93-80460-16-1)

Jeyaraman, S., Muthukrishnan, P., Siddeswaran, K., Murali, A. P., Shanmugam,P. M. and Nagarajan, R. 2012. Water harvesting technology and conservation agriculture in dry land farming. AE Publications, Coimbatore – 41, Tamil Nadu

Muthukrishnan, P., Jeyaraman, S., Siddeswaran, K., Mohammed A. M., Vaiyapuri, K., Murali A. P., Shanmugam, P. M. and Nagarajan, R. 2012. Natural resource management for sustainable agriculture. AE Publications, Coimbatore – 41, Tamil Nadu (ISBN No.978-93-81972-00-7)

Siddeswaran, K. and Puvila, P. 2011. Residue management in alternate farming systems. In: Alternative farming system options for food and nutritional security. (Ed. Jeyaraman *et al.)*. AE Publications, Coimbatore – 41, Tamil Nadu, pp 71-76.

Siddeswaran, K. and Shanmugam, P. M. 2012. Green manures for sustainable crop production. In: Natural resource management for sustainable agriculture. (Ed. Muthukrishnan *et al.*). AE Publications, Coimbatore – 41, Tamil Nadu.

Siddeswaran, K., Sangeetha,S.P. and Shanmugam, P.M. 2012. Organic rice production. In. Rice Farming. (Ed. Ed. Muthukrishnan *et al.*). Directorate of Extension Education, TNAU, Coimbatore – 641003, pp 137 -148.

Siddeswaran, K. 2012. Conservation tillage. In. Water harvesting technology and conservation agriculture in dry land farming. (Ed. Jeyaraman *et al.*). AE Publications, Coimbatore – 41, Tamil Nadu, pp 118-123

KAU,Karmana

Jacob, J. 2012. Integrated farming systems of Kerala. In: *Entrepreneurship Development and Management for VHSE-Agripreneurs*. (Eds: A.S. Anilkumar, M. Govindan, S.M. Nehru, and A. Anil kumar) College of Agriculture, Kerala Agricultural University, Padannakkad, Kasaragod pp 66-68.

8.1.5 Bulletins (Success Story)/ Pamphlets/ Folders

SDAUSK Nagar (GUJRAT)

Profile – AICRP on Integrated Farming Systems, Sardarkrushinagar, Published by Director of Research, Sardar krushinagar, Technical Bulletin No. 11/2011

KAU,Karmana

Thomas, M. 2011. Annual Administration Report – AICRP on Farming System, OFR Centre, Thiruvalla, pp 10.

CSAUAT, Kanpur (U.P.)

Yadav, R. A., Khan, N., Dixit, R. N. and Yadav, M. P. 2011. Weed Management recommended on Various Crops and Cropping system.

Yadav, R. A., Khan, N., Dixit, R. N. and Yadav, M. P. 2011. Kharpatwar Prabandhan Ki Sanstutiyan (Hindi).

Media Publication

- Now stable income is possible for farmers due to integrated farming systems. *Hindustan Times* 24 June, 2011.
- ,dhdr df"k i.kkyh l cgrj gkxh fdlkuk dh vk;A *jk"Vh; lgkjk* 17 flrEcj 2011
- Need to develop farmers friendly research. *Times of India* 17 September 2011
- lh0,l0,0 df"k fo'ofo|ky; e df"k i.kkyh ij py jg 'kks/k l ykHkkfUor gkx fdlkuA *tu In'k VkbEl* 27 vDVcj 2011

Pamphlets/ Folders

MPUAT Udaipur Kota (Rajasthan)

Mk- ljUn flg- 2011 tyok; ifjoruA

BCKV, Kalyani (W.B.)

Dakkhin chobbis porgonar nona mati onchole kencho saar toirirpoddhoti ebong tar byabohar Nona mati onchole bigyan sommoto upaaye gopalon

8.2 PARTICIPATION OF SCIENTISTS IN SYMPOSIA/SEMINARS/CONFERENCES/ WORKSHOPS/TRAININGS

CSK HPKVV Palampur (H.P.)

Dr S.C. Negi, Dr S.K Sharma, Dr S.K. subehia and Dr S.S. Rana attended AICRP-FSR QRT meeting at SKUAST, Jammu 22-23 March 2012.

Dr S.C. Negi, and Dr S.S. Rana attended REC meeting on 21 April 2012 and Agricultural Officers' Workshop on 24 April, 2012 at CSKHPKV, Palampur.

Dr. S.S. Rana attended 21 days Summer Training Programme on "Geo-Spatial Technologies and Applications", Centre for Geo Informatics Research and Training, College of Basic Sciences, CSKHP Agriculture University, 24 June to 14 July, 2012.

Dr S.C. Negi attended Model training course Management of Integrated Farming systems for improvement of livelihood security of hill farmers on 8-15 October, 2012

BAU,Ranchi

Dr. R. Thakur attended"*Biennial group meeting of AICRP on IFS"* held at CARI Port Blair from 27-29 Dec, 2011

Dr. R. Thakur attended *"Review meeting of QRT of PDFSR"* at BHU Varanasi from 28-29 March, 2012

Sh. R. P. Manjhi, and Sh. Uday Shanker Mall attended *Workshop on protection of plant varieties & farmers rights (PPV & FR)"* at BAU, Kanke, Ranchi from 30th April, 2011

BAU,Sabour

Dr. R. P. Sharma, attended Biennial Group Meeting of AICRP on IFS at CARI, Port Blair (A&N Islands) from 27-29Dec.2011.

Dr. R. P. Sharma, attended Annual work plan meet under NICRA project at PDFSR, Modipuram during 21st- 22nd February, 2012**.**

Dr. R. P. Sharma, attended Review Meeting for long- term nutrient management trial on31st August, 2012 at NASC Complex, New Delhi.

PAU, Ludhiana

Dr S.S.Walia, Dr C.S. Aulakh and Dr Roopinder Singh attended Research and Extension Specialists Workshop for *rabi* crops on August 18-19, 2011.

Dr S.S.Walia attended Biennial Group meeting of All India Coordinated Research project on Integrated Farming Systems at (A&N Islands) from 27-29Dec.2011.

Dr S.S.Walia and Dr Roopinder Singh attended 15th Punjab Science Congress at Guru Nanak Dev University, Amritsar from Feb 7-9, 2012.

Dr S.S.Walia attended Annual work plan meet under NICRA project at PDFSR, Modipuram during 21st-22nd February, 2012**.**

Dr S.S.Walia attended National Seminar on New Frontiers and Future Challenges in Horticulture Crops organized by Department of Fruit Science, Punjab Agricultural University, Ludhiana from March 15-17, 2012.

Dr S.S.Walia, Dr C.S. Aulakh and Dr Roopinder Singh attended QRT meeting of AICRP-Integrated Farming Systems Project at Shere-e-Kashmir University of Agricultural Sciences & Technology, Main Campus, Jammu on March 22-23, 2012.

SDAUSK Nagar (GUJRAT)

Dr. S. K. Patel, Dr. R. R. Patel, Sh. P. K. Patel attended National symposium on resource utilization through Integrated farming system and bio-diversity conservation in drylands held at CAZRI, Kukma-Bhuj (Gujarat) on December 20-22, 2011.

Dr B. S. Patel attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair.

NAU,Navsari

Dr Nitin Gudadhe attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair

OUAT Bhubaneswar

L.M.Garnayak, B.K.Mohapatra, J.Haldar A.K.Mohanty, K.N.Mishra, S.K.Swain, and S.N.Mishra attended National Seminar on rice based farming system for changing climate scenario held at Chiplima from 27-29 February, 2012.

K.N.Mishra attended 76th Annual Convention & National seminar of Indian Society of Soil Science.16-19 November 2011; UAS, Dharwad

L.M.Garnayak attended Annual Work Plan Meet under NICRA Project, 21-22 February, 2012, Modipuram, Meerut

L.M.Garnayak attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair.

CCS HAU Hisar (Haryana)

Pawan Kumar and Manoj Kumar attended International conference on issues for climate change, land use diversification and biotechnological tools for livelihood security, 8-10 October 2011 at Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, India.

Pawan Kumar and Manoj Kumar attended Sustainable agriculture and food security: Challenges in changing climate", 27-28 March., 2012, organized by Directorate of Research, CCS Haryana Agricultural University, Hisar.

S.K.Yadav and Anil Mehta attended Review meeting of QRT on IFS and presented the work of Hisar centre at SKUAST, Jammu during 22-23 March 2012.

S.K.Yadav attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair.

SKUAT, Jammu (J&K)

Dr. N.P.Thakur attended 1st J&K Agricultural Science. Congress organised by State Science and technology Department and SKUAST-K, Srinagar on 8-10 Sept, 2011 at SKUAST-K, Shalimar campus, Srinagar.

Dr. N.P.Thakur attended 76th Annual Convention of the ISSS organized by ISSS New Delhi on 16-19 Nov, 2011 at UAS, Dharwad.

Dr Dileep Kachroo attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair.

UAS, Raichur

Basavanneppa M.A attended World Cotton Research Conference-5, Organised by International Cotton Advisory committee(ICAC, Washington D.C., ISCI, Mumbai from Nov, 7-11,2011.

Basavanneppa M.A attended Workshop on SCP and TSP farmers organised by UAS, Raichur on Jan18,2012

KAU, Karmana (Kerala)

Dr.KuruvillaVarughese, Dr. Rani, B., and Dr. Jacob John attended *National Seminar on Watershed Planning for Natural Resource Management* Kerala-StateLand Use Board, Thiruvananthapuram, KeralaDecember 2011.

Dr. Thomas Mathew attended All India Group meeting of OFR Agronomist held at PDFSR, Modipuram on May 4-5.2011.

Dr. D. Jacob attended 21 days summer school at CIAE at Bhopal on "Sensor based application for precision farming to improve input efficiency" from 05.07.2011 to 25.07.2011.

MPKV, Rahuri (Maharastra)

Sh. Hari Singh attended Workshop on Emerging paradigms in management education held at CTAE, MPUAT, on 4th Feb. 2012

Sh. Hari Singh attended Orientation Course organized by Directorate of Planning & Monitoring,

MPUAT, Udaipur from 23rd December 2011 – 13 January 2012.

JNKVV, Jabalpur (M.P.)

Upadhyay, V. B., Vishwakarma, S. K., Dwivedi, B.S., Singh, M. D., Rai, R. K. and Dubey, L. 2011 attended State level workshop "Stratgies for enhancing crop production and productivity organized by Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur and Rajmata Vijayaraje Sindhiya Krishi Vishwa Vidyalaya Gwalior held at JNKVV, Jabalpur on 16-18 June 2011.

Dr.K.R.Naik attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair

Dr.K.K. Agrawal and Dr. S. K. Vishwakarma attended the QRT on AICRP-IFS held at Bhubaneswar during 26 to 29th May 2012.

CSAUAT, Kanpur (U.P.)

Dr. M. P. Yadav and Dr. Naushad Khan attended Annual work plan meet on climatic adaptation and mitigation potential through farming systems and conservation agriculture held at PDFSR, Modipuram, Meerut during February 21–22, 2012.

Dr. M. P. Yadav attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair

Dr. U. S. Tiwari attended Seventy sixth Annual convention of the Indian society of Soil Science held at Dharwad Karnataka during Nov 16-19, 2011.

Dr. Naushad Khan attended National symposium on “Bio-diversity and Food Security Challenges and Devising Strategies” at IIPR, Kanpur during Dec., 10-11, 2011

Dr. M. P. Yadav and Dr. Naushad Khan attended National seminar on “Importance of Potassium in Balance Fertilization for Sustainable Crop Production” held at CSAUA&T, Kanpur on November 04, 2011.

PDKV, Akola

Prof. B. V. Saoji attended Meeting on stake holder consultation for rainfed research priotization and technology organized by CRIDA, Hyderabad & Dryland research unit Dr. PDKV, Akola on 17.8.2011

Prof. B. V. Saoji attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair

Prof. B. V. Saoji attended Attended and participated in climate resilience meeting ’Action plan meet on climate resilience and conservation agriculture’ organized by on 21-23 Feb. 2012 at PDFSR, Modipuram, Meerut.

BCKV, Kalyani (W.B.)

M. Ray, M. K. Nanda and P. K. Mani attended National seminar on Agro meteorological research and services to combat climate change challenges, on 9-10 Dec, 2011. Association of Agro meteorologists, India, B.C.K.V., Kalyani.

L. Dhanabati, M. Ray, D. Sengupta, S. Chatterjee and P. K. Ghosh attended National symposium on approaches to maximizing crop productivity- on January 12-14, Inst. of Agricultural Sc. Kolkata.

TNAU, Coimbatore (T.N.)

Dr. S.Vijayabaskaran attended National seminar on Nanotechnology on 07-08 April 2011 at T Dr. V. Saravanakumar

NAU, Coimbatore attended Workshop on Supply Chain Management for Horticultural Commodities: Approaches for Socio-Economic Impact Analysis on 02.05.2011 at TNAU, Coimbatore

Dr. S.Vijayabaskaran attended International Water Week 2011- Sustainable water solutions for a changing urban environment on 04-08 July 2011 at Singapore

Dr. S.Vijayabaskaran attended 28th International Rice Research Conference on 09-11 November 2011 at Vietnam

Dr. K. Siddeswaran, Dr. S. Thiyageshwari, Dr. P.M. Shanmugam, Dr. S.P. Sangeetha, Dr. P. Kathirvelan, and Dr. S.Vijayabaskaran attended International Symposium-100 years of rice science and looking beyond organized by the Dept. of Rice, TNAU, Coimbatore on 09-12 January 2012 at TNAU, Coimbatore

NDUAT, Faizabad (UP)

Dr. Alok Kumar attended Group meet of AICRP on Integrated Farming Systems organized on 27-28 Dec. 2011, at CARI, Port Blair

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S. No.	Title, organizer, date(s) and venue of seminar/symposium/conference/Workshop	Participants
1	46th All India Rice Group meetings organized by Directorate of Rice Research, Hyderabad on 8-11 April, 2011 at Hyderabad	Project Scientists
2	Review meeting of Mega Seed Project in Agricultural crops and Fisheries organized by Directorate of Seed Research, Mau. U.P on 19-20 September, 2011 at New Delhi	Project Scientists
3	International Seminar on Organics- Beyond Agriculture in the New Vistas organized by BIOFACH, ICCOA and Directorate of Agriculture, Government of Karnataka on 10-12 November, 2011 at Bangalore	Project Scientists
4	6th National Extension Education Congress organized by Extension Education Society, Agra and ICAR Research Complex for Goa, Old Goa on 17-19 December, 2011 at Goa	Project Scientists
5	Biennial Group Meeting of AICRP on Integrated Farming Systems organized by PDFSR, Modipuram and CARI, Port Blair- Andamans on 27-29 December, 2011 at PortBlair	Project Scientists
6	National Seminar on Coastal Agro-ecosystem organized by National Centre for Coastal Agro-Ecosystem, New Delhi and National Institute of Oceanography, Goa on16-17 February, 2012 at Goa	Project Scientists
7	National Seminar on Coir pith composting and use of geo-textiles organized by Coir Board, Bangalore and ICAR Research Complex for Goa, Old Goa on 17 March, 2012 at Goa	Project Scientists

8.3 GROUP MEETING/ WORKSHOPS ORGANIZED

8.3.1 Biennial Workshop organized at ICAR Research Complex for Goa on 16-19 November, 2012

The Biennial Workshop of AICRP on Integrated Farming Systems was held at ICAR Research Complex, Goa during 16-19 November 2012. A pre-work shop interaction meeting was organized on 16 November 2012 in which progress was reviewed in two separate sessions for on-station and on-farm programmes.

On this occasion 4 publications of PDFSR, viz. '**PDFSR at a Glance (English)**' , '**Samanvit Krishi**

Pranali Pravandhan (Hindi)', '**Sarankshan Krishi Apnaye, Kheti Ka Bhabishya Banaye '(Hindi)** and '**Annual Report of AICRP on IFS**' were released by Chief Guest.

Based on 3 days deliberations following major recommendations emerged out:

On-station: Research:

- Continuation/ modification of LTINM experiment (2a) is already under review by a high power committee under the chairmanship of DDG (NRM). However, in the meantime, find out the modalities for generating the data with respect to nutritive value of produce (grain and straw) so that data may be linked with human and animal health under chemical and integrated nutrient management systems.
- The area allocation under IFS should include the efficient cropping systems identified in experiment 1 (a) with a view to produce more with less.
- Experiment details on conservation agriculture are to be worked out in a separate meeting by involving few willing centres representing different states.

On-farm:Research:

- The characterization of existing farming systems will be taken up as a new experiment with focus on NARP zone of different states.
- The OFR experiment on nutrient response in different cropping systems stands modified to On- Farm crop response to plant nutrients in predominant cropping systems and their impact on crop-livestock-human continuum. The synthesis will be made to focus the results in farming system perspective.
- The experiment of "On-Farm evaluation of new diversified cropping systems under irrigated/ rainfed conditions" is to be concluded in 2012-13 and a new experiment in farming systems perspective entitled "Diversification of existing farming systems under marginal households" will be taken with focus on marginal farmers in different agro-climatic regions.

8.3.2 Regional Workshops-cum-Training

As discussed in the group meeting held at Port Blair during 27-29 December 2011, the directorate organized the first regional level workshop cum training on "Methodology for OFR experiments with special emphasis for ON-Farm Integrated Farming Systems" for Agronomists, Associated Scientists and Field Assistants of On-Farm Research (OFR) centres from Southern region comprising of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu during 23-25 August 2012 in collaboration with OFR centre, Paiyur at Hosur, Tamil Nadu.

The training cum workshop was conducted strictly as business meeting. Dr. B. Gangwar, Project Director, PDFSR straightway initiated

proceedings by briefing about the AICRP-IFS and objectives of training to the field assistants of OFR. Being one of the oldest programme, started during 1952-53 as simple fertilizer trial, later on as on-farm experiments, then cropping system research and currently Integrated Farming System research with the changing mandate and priorities. He emphasized that, we have the unique opportunity in the OFR programme to contribute significantly in the form of good publications such as research papers, popular articles, leaflets, phamplets etc. He also informed that this training cum workshop is first of its kind exclusively for Field Assistants working in OFR programme along with concerned agronomists and economists. The objective is to have a discussion on wholistic approach in conducting the field experiments in farming systems perspective, reporting of data, characterization of existing farming systems, upscaling of technologies and impact assessment of programme along with imparting of practical idea for implementation of different modules under on-farm IFS experiment.

During workshop cum training, exercise on learning by doing, seeing as beliving, work and appreciate, confusion solving agenda and training

involving the gross root level workers were carriedout.

Field visits to Krifafed Agro Service at Kamandoddi, nutrient response and IFS experiment at Samanapalli village, crop

diversification/intensification experiment at in Keeranapalli village, Precision farming at Pillekothur and TANFLORA Polyhouse were also made in which all the field assistants got the first hand information about the OFR experiments.

The following points very clearly emerged which can be of use to other centres working on the similar lines.

- Input supply registers should be kept for all the OFR experiments in which date, name, quantity of input supplied should be mentioned clearly and signature of farmer followed by Field Assistant and Agronomist should be made.

- Data register should be kept at farmer, field assistant and agronomist levels in order to improve the data quality of OFR. All the above note books/ registers should be produced at the time of monitoring visits.

- Maximum interventional cost for each module of on farm IFS is fixed at Rs.10,000/household.
- Centres should prepare at least one leaflet/ phamplet in local language per year from on farm experimental results.
- All the centres, should organize one field day in each season at right time when the experiment is in significant stage.
- Inventory of technical (knowledge) inputs given/ adopted by individual farmer should be maintained separately.
- Only low cost/ no cost interventions should be given emphasis in each module of on farm IFS experiment.
- GPS data of each experiment should be reported compulsorily and should be recorded from the centre point of the experimental field.

In fact, the experience of this training cum workshop conclusively revealed that there is need to organize such activities every year for different regions which can provide a strong way forward for pursuing the livelihood improvement in farming systems perspective.

8.4 RADIO AND TELEVISION TALKS DELIVERED BY PROJECT STAFF

Centre/Date	Title of the talk	Name of Doordarshan/Akaswani Kendra	Name of Staff
Rajendranagar			
16.08.2012	Agency prantallo samparadeyatara pratti sagulu yajamanyam	Akaswani Kendra,Visakhapatnam	Dr K T Rao
19.10.2012	Agency prantallo samagra vyavasaya vidhanala avsyakatha	Akaswani Kendra,Visakhapatnam	Dr K T Rao
11.01.2013	Girijanaprnatallo vari maganullo aparalallo maelaina yajamanyapaddatulu	Akaswani Kendra,Visakhapatnam	Dr K T Rao
Jabalpur			
22.02.2012	xh"e _r e ex ,o mMn dh dLr dl dj	Akashwani Jabalpur	Dr. S. K. Vishwakarma
Sabour			
01.06.2011	bl ekg dh [krh ckjh	All India Radio, Bhagalpur	Dr. R.P.Sharma
21.10.2011	xg dh mUur'khy fdLe	-do-	Dr. R. P.Sharma
28.08.2011	,l0vkj0vkb0 fof/k l yxk; x, /kku dh Qly dh n[kHkky	-do-	Dr. R. P.Sharma
1/1/2011	bl ekg dh [krh ckjh	-do-	Dr. S.K.Pathak
01.11.2011	bl ekg dh [krh ckjh	-do-	Dr. S.K.Pathak
15.03.2012	fdlkuk dk lkekf;d lykg	-do-	Dr. S.K.Pathak
SK Nagar			
2011	Importance and use of biofertilizers.	Akashvani, Rajkot.	Sagarka, B.K.
	Micro nutrientnun pak utpadanman mahatva. Talk given		Dr. B. M. Dabhi
Rahuri			
06.01.2013	Management of Organic Farming	Mumbai	Dr. B.S. Raskar
Ludhiana			
5/12/2011	*Jhonne de vadhiya paniri ate machinan rahi jhone de lagwayee* (Live phone in programme)	Dehati Programme, All India Radio, Jalandhar	Dr S S Walia
10/18/2011	Resource conservative cropping systems	Doordarshan Kendra, Jalandhar in *Krishi Darshan* programme	Dr S S Walia

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Centre/Date	Title of the talk	Name of Doordarshan/Akaswani Kendra	Name of Staff
Karjat			
23.04.2011	*'Kharif hangamasathi bhat shetiche purvaniyojan'*	Mumbai	Dr. A.S. Dalvi
June, 2011	*Bhat lagvadisathi SRI paddhati.*	Mumbai	Dr. L.G. Pawar
October, 2011	*Kadadhanya lagvadisathi sudharit paddhati.*	Mumbai	Dr. L.G. Pawar
Coimbatore			
30.05.2011	Cultivation of Mint & Banana bunch covering	Makkal TV	Dr. S.Vijayabaskaran
18.02.2012	Precision Farming in TC banana & Federation	Makkal TV	Dr. S.Vijayabaskaran
Sirruguppa			
02.07.2011	Maize improved Agronomic practices	Door Darshan Kendra, Gulbarga	Basavanneppa M.A
14.08.2011	Paddy cultivation practices in irrigated condition	Door Darshan Kendra, Gulbarga	Basavanneppa M.A
28.05.2011	Live in phone programme on Paddy and Bt cotton cultivation practices Phone programme	All India Radio, Hospet	Basavanneppa M.A
12.09.2011	Live in phone programme on Paddy cultivation practices	All India Radio, Hospet	Basavanneppa M.A
Parbhani			
5/6/2011	On Changes in cropping Systems and its management	Akashwani Kendra	Dr. W. N. Narkhede
9/27/2011	On Integrated Farming Systems	Akashwani Kendra	Dr. W. N. Narkhede
Ranchi			
	Water management of wheat for higher water productivity	Doordarshan Kendra	Dr. R. Thakur
18.07.2011	Cultivation of kharif potato	Doordarshan Kendra	Sri R.P. Manjhi
18.07.2011	Top dressing of nitrogenous fertilizer in paddy	Akaswani Kendra	Sri R.P. Manjhi
09.01.2012	Top dressing of urea in wheat	Akaswani Kendra	Sri R.P. Manjhi
Palampur			
17.04.2012 (6.06 pm)	Organic waste management through vermicompost	Doordharshan, Shimla	Dr SS Rana
16.05.2012	Diversification of existing cropping systems – A way to earn higher profit	Doordharshan, Shimla	Dr SC Negi

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Centre/Date	Title of the talk	Name of Doordarshan/Akaswani Kendra	Name of Staff
Bhubneswar			
30.05.2011	Sharad Dhana Pain Agua Prastuti	Akaswani Kendra	Dr. L.M.Garnayak
27.07.2011	Cultivation of pulses and oilseeds in canal command	Akaswani Kendra	Dr. L.M.Garnayak
04.08.2011	After care of transplanted rice	Akaswani Kendra	Dr. L.M.Garnayak
06.04.2011 & 20.04.2011	Question answer	Doordarshan	Dr. L.M.Garnayak
23.05.2011 to 27.05.2011	Sesame cultivation (KD)	Doordarshan	Dr. L.M.Garnayak
01.08.2011 to 05.08.2011	After care of kharif groundnut and maize	Doordarshan	Dr. L.M.Garnayak
21.10.2011	Crop planning for *rabi* season	Doordarshan	Dr. L.M.Garnayak
09.12.2011	Groundnut cultivation	Doordarshan	Dr. L.M.Garnayak
30.01.2012 to 03.02.2012	Nutrient management in Oilseed crops (KD)	Doordarshan	Dr. L.M.Garnayak
Kalyani			
19.08.11	Paschimbonger soshyo porjayer poribortone krishi o krishoker lav loksaan	Akaswani Kendra (Kolkata)	Dr. Soumitra Chatterjee

9. APPENDICES

APPENDIX I: INITIAL SOIL PARAMETERS FOR ON-STATION EXPERIMENTAL SITES DURING 2011-12

Name of CSR centre	Expernment no	PH	EC (ds/m)	O.C.%	Available nutrient (kg/ha)		
					N	P	K
Rajendranagar	1(a)	7.72	0.27	0.51	210.0	32.0	288.0
	2(a)	8.50	0.24	0.54		34.0	224.0
	OF	7.60	0.54	0.36		24.0	293.0
	CA-CI	8.12	0.23	0.56	178.0	28.5	189.0
Maruteru	1(a)			0.90		38.0	314.0
	2(a)	5.10	0.38	0.90		38.0	344.0
	OF	7.30	0.48	0.46		41.0	425.0
Rudrur	1(a)	6.68	0.55	0.46		39.6	305.0
	2(a)	7.99	0.36	0.56		17.5	304.0
	OF	5.80	0.76	0.80		34.0	479.0
	CA-CI	7.43	0.23	0.52		32.1	259.0
Sabour	1(a)	7.48	0.13	0.53	213.3	23.6	226.0
	2(a)	7.40	0.23	0.46	246.0	23.6	155.0
	SPM	7.52	0.15	0.53	238.4	27.2	208.6
	OF	8.10	0.22	0.50	153.4	26.9	122.0
	TPM	7.50	0.11	0.54	200.7	26.5	219.5
	IFS Model	7.55	0.45	0.55	226.3	29.5	143.0
Raipur	1(a)	6.90	NR	0.52	243.0	20.2	240.0
	2(a)	NR	NR	0.51	234.0	11.5	232.0
	OF			0.58	169.0	17.4	270.0
	CA-CI	NR	NR	NR	NR	NR	NR
SK Nagar	1(a)	—	—	0.33	195.0	15.9	198.0
	2(a)	—	—	0.30	190.0	38.0	230.0
	OF	—	—	0.26	195.0	23.9	261.0
	RCT	—	—	0.32	198.0	19.3	208.0
	IFS	7.65	0.13	0.33		18.6	172.0
Junagadh	1(a)			0.68	190.0	9.5	140.0
	2(a)With potash			0.77	240.0	29.9	165.0
	2(a)WithOut potash			0.36	245.0	32.0	216.0
	OF			0.83	199.0	19.0	160.0
	TPM			0.56	218.0	16.0	106.0
Navsari	1(a)	—	—	0.59	194.0	18.2	153.0
	2(a)	—	—	0.58	297.0	29.0	317.0
	RCT	—	—	0.59	256.0	21.4	160.0
	OF	—	—	0.56	176.0	16.5	219.0
Hisar	1(a)	7.80	0.21	0.46	169.9	12.7	291.6
	2(a)	7.80	0.23	0.43	191.3	16.4	291.7
	TPM	7.90	0.23	0.46	161.3	16.4	256.1
	O.F.	7.80	0.21	0.49	162.2	15.5	237.6
Jammu	1(a)	8.10		0.55	216.0	23.0	118.0
	2(a)	7.10		0.62	456.0	13.8	154.0
	SPM	7.20		0.52	200.0	26.3	124.0
	SSNM	8.07		0.56	240.9	24.5	117.6
	TPM	8.03		0.55	247.7	22.0	103.3

Contd...

Name of CSR centre	Expernment no	PH	EC (ds/m)	O.C.%	Available nutrient (kg/ha)		
					N	P	K
Palampur	1(a)	5.70	-	0.99	590.0	48.5	117.5
	2(a)	5.50	-	0.60	675.3	21.8	121.0
	O.F.	5.70	-	0.80	505.0	35.5	186.0
Ranchi	1(a)	6.00		0.38	225.0	20.0	115.0
	2(a)	6.50		0.42	260.0	19.5	195.0
	2(b)	6.40		0.42	260.0	19.5	195.0
	IFS	5.63		0.50	282.0	25.8	123.0
Kathalagere	1(a)	—	——	——	——	——	——
	2(a)	6.40	0.13	0.60	288.0	12.3	211.4
	OF	5.30	0.15	0.52	302.3	17.5	273.0
	CA-CI	5.20	0.09	0.60	315.0	22.0	197.0
Siruguppa	1a	8.18	0.38	0.65	177.0	19.3	348.0
	TPM	8.12	0.36	0.38	165.0	16.6	341.0
	TPM	8.18	0.37	0.62	185.0	22.0	365.0
	OF	8.11	0.34	0.59	221.0	18.1	390.0
	IFS	8.24	0.34	0.67	212.0	10.5	364.0
Karamana	OF	5.60		0.75	139.5	11.6	103.9
	2(a)	5.60		0.86	242.6	11.2	121.6
Jabalpur	1(a)	7.68	0.53	6.50	260.0	9.0	295.0
	2(a)	7.62	0.55	6.50	240.0	16.0	448.0
	Of	7.50	0.50	6.40	210.0	8.8	370.0
Rewa	1(a)	7.68	0.53	6.50	260.0	9.0	295.0
	2(b)	7.52	0.54	6.30	258.0	12.5	500.0
	OF	7.25	0.46	5.60	224.0	8.2	315.0
Powarkheda	1(a)	7.60	0.55	6.60	260.0	9.0	340.0
	OF	7.65	0.48	5.90	262.0	9.5	300.0
Rahuri	1(a)	8.00	0.26	0.62	220.0	7.0	585.0
	2(a)	8.15	0.35	0.64	153.0	14.2	705.0
	OF	8.36	0.33	0.64	208.0	12.0	442.0
Akola	1(a)	-	-	-	250.0	13.0	281.0
	2(a)	-	-	0.40	209.0	11.0	350.0
	TPM	-	-	0.43	205.0	15.4	306.0
	OF	-	-	-	243.0	11.0	261.0
Karjat	1(a)	7.01	0.03	0.97	217.3	18.4	199.3
	2(a)	7.55	0.03	1.25	213.0	13.0	244.8
Bhubaneswar	1(a)	6.72	0.27	0.69	212.4	15.7	189.2
	2(a)	5.10	0.36	0.43	254.2	20.3	210.4
	OF	5.83	0.13	0.62	245.4	18.5	165.4
	CA-CI	6.66	0.19	0.89	274.8	24.4	169.4
Chiplima	1(a)	6.10	0.41	0.58	315.4	16.2	210.4
	2(a)	5.40	0.31	0.62	295.4	10.2	185.4
	OF	5.91	0.31	0.76	294.2	10.1	121.4
	CA-CI	6.62	0.34	0.78	262.8	18.4	177.6

Contd...

Name of CSR centre	Expernment no	PH	EC (ds/m)	O.C.%	Available nutrient (kg/ha)		
					N	P	K
Ludhiana	1(a)	7.80	0.40	0.38	242.0	47.5	100.4
	2(a)	8.15	0.32	0.31	43.0	11.2	101.0
	SPM	7.80	0.38	0.44	134.4	50.4	140.0
	OF	7.49	0.20	0.39	179.4	22.3	135.8
Durgapura Jaipur	1(a)	8.20	0.28	0.22		16.4	150.5
	OF	8.10	0.18	0.21		9.4	161.5
	SPM	8.10	0.19	0.20		14.6	158.7
Coimbatore	1(a)	8.10	0.43	0.56	241.0	28.0	687.0
	OF	8.40	0.45	0.59	249.0	19.2	498.0
	TPM	8.40	0.77	0.57	224.0	15.6	643.0
Thanjavur	1(a)	7.00	0.25	0.40	242.0	21.8	149.0
	OF	7.00	0.30	0.40	204.0	18.8	154.0
Kanpur	1(a)	8.10	0.18	0.45	-	11.5	205.0
	2(a)	8.10	0.18	0.24	-	10.4	170.0
	OF	8.02	0.16	0.40	-	14.4	125.0
	CA-CI	8.20	0.18	0.36	-	14.0	203.0
Faizabad	1(a)	8.20	0.31	0.41	136.0	16.7	233.0
	2(a)	8.80	0.50	0.37	102.0	13.8	355.0
	2(b)	7.70	0.15	0.45	130.0	10.0	113.0
	OF	8.20	0.40	0.46	127.0	17.4	247.0
Varanasi	1(a)	NR	NR	NR	NR	NR	NR
	2(a)	NR	NR	NR	192.0	18.8	199.6
	TPM	NR	NR	NR	NR	NR	NR
Bichpuri	2(a)			0.31	124.0	10.6	204.0
	OF	7.80	1.80	0.31	123.0	10.6	284.0
Pantnagar	1(a)	7.80	NR	NR	122.0	5.6	156.0
	2(a)	5.50		0.60		20.0	143.0
	SPM	7.70				16.0	125.0
	OF	7.80				15.5	122.0
	CA-CI	NR	NR	NR	NR	NR	NR
Kalyani	1(a)	7.20	0.65	0.65	123.2	11.9	96.3
	2(a)	7.40	0.59	0.92	110.0	12.1	80.9
	OF	7.10	0.46	0.62	129.8	11.9	93.0

APPENDIX II: WEATHER PARAMETERS (MONTHELY AVERAGES) AT DIFFERENT CROPPING SYSTEM CENTERS DURING 2011-12

Name of CSR centre	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Rajendranagar	140.9	358.7	104.8	30.4	0.0	4.4	10.8	0.0	0.0	99.4	139.7	112.7
Maruteru	253.7	301.0	81.8	92.8	-	5.1	0.4	-	2.0	6.0	21.2	97.4
Rudrur	495.2	338.1	95.2	28.0	0.0	0.0	0.0	0.0	0.0	30.4	3.1	187.2
Sabour	161.7	460.5	153.3	41.2	0.0	0.0	17.7	0.0	3.5	6.5	33.8	27.4
Raipur	339.2	304.5	531.8	0.0	0.0	0.0	54.7	5.4	0.0	16.2	0.0	NR
SK Nagar	224.2	334.9	356.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0
Junagadh	341.7	341.7	241.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navsari	17.5	115.0	155.5	80.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Hisar	76.0	95.7	141.1	0.0	0.0	0.0	14.4	0.0	0.0	33.3	29.8	26.5
Palampur	483.0	872.2	252.4	34.8	1.8	6.0	183.2	263.1	32.6	57.2	35.2	59.3
Ranchi	486.2	522.6	382.6	20.4	0.0	0.0	60.1	25.2	12.8	7.5	6.0	75.4
Kathalagere	19.4	10.4	9.4	13.0	5.1	—	—	—	—	37.4	5.6	30.0
Siruguppa	72.7	62.2	17.0	18.1	-	-	0.0	0.0	-	NR	NR	NR
Karmana	70.5	101.0	112.5	64.5	185.2	49.5	5.0	0.0	22.0	116.4	48.5	72.0
Jabalpur	278.9	338.5	181.4	0.0	0.0	0.0	4.8	0.0	0.0	0.0	22.6	73.6
Powarkheda	168.3	338.7	353.1	107.0	0.0	0.0	4.8	0.0	0.0	0.0	6.2	16.4
Rewa	269.8	238.0	430.2	181.2	0.0	0.0	0.0	0.0	32.4	17.8	0.0	0.0
Rahuri	160.6	165.9	74.0	33.2	0.0	0.0	0.0	0.0	0.0	0.0	17.4	29.4
Akola	166.2	126.6	88.6	1.7	0.0	0.0	6.2	0.0	0.0	0.7	10.1	111.0
Karjat	1446.0	1134.9	869.2	275.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	356.4
Ludhiana	114.2	513.4	177.1	0.0	3.8	11.4	52.6	4.6	0.0	38.6	1.6	3.5
Kota	313.0	214.0	0.0	6.0	9.0	0.0	0.0	0.0	0.0	0.0	6.2	18.2
Durgapura Jaipur	192.2	219.6	136.9	0.0	0.0	0.0	0.0	0.0	0.0	11.8	1.0	0.0

Contd..../-

Name of CSR centre	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Coimbatore	31.5	7.1	48.2	305.3	243.1	11.6	1.0	0.0	1.2	78.4	25.6	11.1
Thanjavur	13.4	114.9	95.5	170.6	208.1	12.4	21.0	-	-	6.0		
Kanpur	280.1	259.8	93.6	-	-	-	56.8	10.8	-	6.6	3.0	3.5
Faizabad	250.8	412.7	295.9	-	-	-	64.6	17.2	4.2	-	-	-
Varanasi	166.8	292.6	123.2	3.6	0.0	0.0	28.2	0.0	6.4	11.6	0.0	NR
Bichpuri	131.6	213.3	70.5	0.0	0.0	0.0	33.5	0.0	0.0	9.2	0.0	13.6
Pantnagar	653.5	534.3	311.1	0.0	0.0	0.0	25.2	0.6	3.2	1.1	0.0	NR
Kalyani	407.7	387.3	211.1	91.1	3.8	0.0	57.0	11.8	0.0	36.0	93.5	183.6
Bhubneshwar	361.7	419.5	290.0	57.0	0.0	0.0	44.4	0.0	0.0	85.9	12.2	117.2
Chiplima	283.0	324.7	412.9	67.8	0.0	0.0	60.6	13.8	0.0	5.2	7.1	57.6
Parbhani	53.4	41.0	32.2	9.6	0.0	0.0	0.0	0.0	0.0	0.0	1.8	20.6
Goa	1114.5	899.1	529.1	68.0	13.4	0.0	0.0	0.0	0.0	3.6	1.4	983.4

Appendix II B : Maximum and minimum temperature(^{0}C) (July 2011 to June 2012)

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	31.2	22.7	30.2	22.7	30.7	22.0	32.1	20.3	30.1	15.4	29.9	12.6	30.1	14.2	33.0	15.4	36.9	17.3	37.5	22.6	40.5	26.8	35.1	25.5
Maruteru	31.2	24.8	29.3	24.1	31.0	25.3	31.1	23.4	30.5	19.6	28.9	18.6	29.0	16.3	31.6	16.9	32.9	22.5	33.7	24.5	37.0	27.0	34.8	26.3
Rudrur	30.2	23.3	29.8	22.6	30.1	22.4	29.2	20.4	27.3	16.5	29.6	16.1	30.9	13.9	33.4	16.5	36.2	18.6	39.4	21.3	42.4	23.9	39.0	22.5
Sabour	32.0	25.2	30.8	25.5	30.8	25.2	31.7	22.2	27.6	15.4	21.5	10.1	20.6	9.2	25.8	9.9	31.2	14.1	35.3	20.9	37.5	24.0	37.5	26.5
Raipur	31.6	25.0	30.5	25.2	30.0	24.2	32.3	21.1	31.3	15.5	28.8	11.9	25.8	13.2	29.5	14.1	35.2	16.0	39.5	24.2	42.3	26.9	44.8	29.7
SK Nagar	34.6	24.4	31.6	23.3	31.5	21.8	35.8	17.3	33.4	14.3	29.1	7.8	25.0	5.5	27.8	9.2	33.7	14.0	38.3	21.3	39.4	24.5	38.4	26.6
Junagadh	32.0	25.2	30.3	25.1	30.9	24.2	35.4	23.0	34.7	20.0	31.1	13.7	28.1	11.6	31.2	13.3	36.0	17.7	39.3	23.2	38.3	25.4	36.5	27.0
Navsari	33.6	27.1	30.1	25.4	29.3	25.3	30.3	24.3	35.6	22.2	35.1	18.7	32.4	14.7	29.1	12.6	31.5	13.6	35.7	18.1	35.5	23.7	34.0	26.5
Hisar	35.8	26.3	34.1	25.8	33.3	23.1	33.0	15.4	29.4	11.0	22.9	5.2	18.4	4.8	21.1	5.3	28.7	10.6	34.2	18.0	39.9	22.3	41.6	27.8
Palampur	26.3	19.9	25.5	19.2	26.3	17.4	25.4	13.3	22.8	9.9	19.2	5.4	13.3	3.0	15.9	5.4	22.3	9.5	26.3	13.5	31.4	17.9	33.8	20.7
Ranchi	31.5	22.4	29.4	21.7	28.2	20.5	28.1	17.4	25.5	11.0	23.5	5.8	21.2	8.3	25.6	9.2	30.8	12.3	35.9	19.0	38.7	21.3	36.2	22.7
Kathalagere	32.0	31.0	32.0	21.0	31.0	21.0	31.0	19.0	30.0	17.0	29.0	14.0	30.0	12.0	32.0	17.0	33.0	17.0	32.0	17.0	32.0	18.0	32.0	20.0
Karmana	29.6	24.1	29.8	24.3	29.7	24.1	32.4	24.6	30.3	23.0	30.5	22.9	30.3	20.9	31.2	22.3	31.7	23.5	32.1	25.0	31.2	25.8	30.4	24.4
Jabalpur	34.0	23.0	32.0	23.0	32.0	22.0	34.0	15.0	33.0	13.0	30.0	8.0	27.0	5.0	31.0	6.0	41.0	10.0	42.0	18.0	44.7	20.0	45.0	22.6
Powarkheda	32.6	23.8	30.0	23.8	31.5	23.3	33.0	17.6	31.3	13.8	27.5	10.0	25.2	6.6	29.0	7.5	36.3	10.8	41.4	20.4	43.5	25.0	NR	NR
Rewa	35.2	24.2	32.5	26.6	31.4	24.8	31.2	24.1	32.2	16.8	31.7	11.5	28.5	9.7	24.3	5.2	23.0	7.4	30.5	14.6	38.1	18.6	38.1	17.5
Rahuri	30.8	22.7	30.0	22.7	30.6	21.3	32.1	18.3	31.5	13.6	30.2	11.1	31.3	5.9	33.7	10.4	36.8	12.5	39.3	20.5	40.1	20.4	35.7	23.8
Parbhani	31.8	23.2	24.5	22.4	31.0	21.7	33.5	18.0	32.1	13.7	25.9	11.5	30.0	12.3	33.1	14.1	37.3	15.5	40.4	18.4	41.5	25.8	38.0	25.8
Akola	31.7	24.1	30.0	23.5	30.8	23.0	35.0	19.2	32.8	14.6	30.1	12.0	28.6	12.9	32.8	14.3	37.5	18.4	41.1	26.3	42.4	28.4	37.5	26.5
Karjat	29.0	24.2	28.7	24.4	30.3	23.6	33.5	21.6	34.5	17.9	34.0	14.5	31.9	12.2	35.8	14.2	38.3	17.2	39.6	23.4	38.2	25.2	32.9	25.6
Bhubneswar	32.8	25.4	32.2	25.4	31.4	24.8	33.4	23.1	32.3	18.1	29.0	15.5	28.7	16.3	33.1	16.9	37.4	22.8	38.2	25.1	39.3	27.2	37.6	26.8
Chiplima	36.3	19.3	32.3	19.6	30.4	22.6	31.1	18.6	29.0	13.3	27.3	9.1	25.8	11.5	31.0	15.0	34.4	14.8	37.6	20.5	41.7	22.3	37.9	22.3
Ludhiana	33.9	26.8	32.4	25.0	32.1	24.1	32.1	17.5	27.6	12.5	21.6	6.5	16.9	5.6	19.9	6.7	27.1	11.6	33.8	18.1	39.6	22.6	40.6	27.2
Kota	30.0	25.3	30.1	24.2	29.9	21.7	34.3	18.8	27.5	12.3	19.8	5.9	20.8	5.8	26.8	10.7	30.6	15.6	36.4	20.2	35.9	24.6	32.0	26.4

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.
Durgapura Jaipur	33.4	25.2	32.0	24.4	32.1	23.2	34.0	19.3	30.5	15.9	25.1	10.1	20.4	7.1	24.5	10.8	31.8	15.5	36.8	23.0	40.4	26.1	40.6	29.5
Coimbatore	31.0	23.2	31.3	22.8	30.3	22.2	31.6	22.6	28.7	20.8	29.3	19.1	29.7	18.4	32.3	19.3	34.9	22.5	35.2	24.3	34.5	24.1	32.4	23.8
Thanjavur	36.1	27.8	34.7	24.5	34.8	26.0	33.3	25.2	30.0	23.9	30.0	22.5	30.7	21.4	33.6	22.1	33.6	22.1	35.7	25.3	37.7	27.6	37.8	30.7
Kanpur	29.7	26.4	31.2	26.0	32.5	24.5	25.4	17.7	29.1	13.0	22.9	6.9	19.5	7.6	24.3	9.1	30.9	13.6	37.7	19.5	42.4	23.6	43.6	25.6
Faizabad	32.7	26.5	32.6	26.2	32.1	25.5	32.0	17.5	28.4	13.7	21.9	7.9	20.4	7.9	25.4	8.4	31.1	11.9	38.0	16.7	41.2	22.6	39.2	27.9
Varanasi	32.5	27.1	31.2	26.7	30.8	26.5	31.7	22.7	29.0	15.1	21.8	9.8	21.0	10.2	28.9	11.6	31.9	15.8	38.4	22.2	42.1	26.1	NR	NR
Bichpuri	32.3	26.7	31.5	27.3	32.7	25.3	32.3	18.1	29.1	15.8	23.4	6.3	21.2	4.1	25.2	7.7	30.9	11.8	34.7	20.0	40.1	25.0	38.5	28.2
Pantnagar	32.9	25.5	29.7	25.8	31.1	24.7	28.4	18.1	26.8	12.3	18.9	8.1	19.9	5.6	25.5	8.7	30.3	13.3	34.5	18.4	36.6	20.8	NR	NR
Kalyani	32.2	26.3	32.3	26.2	32.9	26.3	32.4	22.0	30.3	18.4	26.8	11.8	23.5	13.2	28.9	14.0	34.4	20.6	36.1	24.2	36.7	26.6	35.4	27.6
Goa	31.0	21.3	31.2	21.7	30.1	22.7	36.1	23.9	36.9	22.1	36.6	20.1	35.5	18.2	37.4	18.8	36.9	21.9	37.5	24.9	37.3	25.3	31.4	23.5

APPENDIX III: CENTRE-WISE STAFF POSITION

1. ANGRAU,HYDERABAD (A.P.)

Main Centre, Rajendranagar

Chief Agronomist	Vacant
Jr. Agronomist	Dr. M.Venkata Ramana
Jr. Soil Scientist	Dr. S.Sridevi
Technical Asstt.	Vacant
Field assistant	Mr. K.Sugunanandam
Field assistant	Mr.K.Venugopalan
Jr. Steno/UDC	Vacant
Messenger	Mr.G.Saibaba

Sub Centre, Maruteru

Agronomist	Dr.C.Venkata Reddy
Technical Asstt.	Mr.M.Narasing Rao
Field assistant	Mr. K.Viswanadham
Field assistant	Mr.V. Kondala Rao
LDC/Typist	Mr.Md.Khaja Babu

Sub Centre, Rudrur

Agronomist	Dr.G.E.Ch. Vidya Sagar
Technical Asstt.	Vacant
Field assistant	Vacant
Field assistant	Mr.M Narsinga rao
LDC/Typist	Mr.K.Sanker

On-Farm Centre, Seetampet

Agronomist	Dr.K.Tejeswara Rao
Field assistant	Mr.T.Ramjogi
Field assistant	Mr. B.V.A. Satyanarayana
Field assistant	Mr. S.K.Babjee
Field assistant	Mr. A.V.Ramana
Field assistant	Mr. K.Gopi
Field assistant	Mr.K.Jaganmohan Rao
Jr.Stenographer	Vacant
Driver	Vacant
Watchman	Vacant

On-Farm Centre, Warangal

Agronomist	Dr.M.Malla Reddy
Asst.Jr.Economist	Mr.V.Rajendra Prasad
Field assistant	Mr.K.Simhachalam
Field assistant	Mr.S.Rathna Sree
Field assistant	Mr.P.Yadagiri
Field assistant	Mr.Md. Hafeiz
Field assistant	Mr.K.V.Subramanyam
Field assistant	Mr.A.Prameela/ Mr. I.Babu Rao
Jr.Stenographer	Mr.T.Laxmi
Driver	Vacant
Watchman	Vacant

2. 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

3. RAU, PUSA (BIHAR)

Main Centre, Sabour

Chief Agronomist	Dr.R P Sharma
Jr. Soil Scientist	Dr.N.Chattopadhyaya
Jr. Agronomist	Dr.S.Tyagi
Technical Asstt.	Mr.K.R.Raman
Field assistant	Mr.C. B. Prasad.
Field assistant	Mr.S. R. Singh
Jr. Steno/UDC	Mr. A. P. Yadav
Watchman	Mr. Ganesh Ram

On-Farm Centre, Purnea

Agronomist	Dr. D.K. Mahto
Technical Asstt.	Vacant
Field assistant	Mr.Gautam Prasad
Field assistant	Mr.P. Kumar
Field assistant	Mr.R. Ram,
Field assistant	Mr.S. Singh
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Mr. Ajit Kumar Choudhary
Driver	Mr.Surendra Kumar
Watchman	Mr.Brajendra Mandal

4. IGKV, RAIPUR (CHHATISSGARH)

Main Centre, Raipur

Chief Agronomist	Dr.G.P.Pali
Jr. Soil Scientist	Dr.Alok Tiwari
Jr. Agronomist	Dr.Shrikant Chitale
Technical Asstt.	Mr. B.K.Chandrakar
Field assistant	Mr.Dilip Kumar Verma
Field assistant	Mr.G.Yadav
Jr. Steno/UDC	Ms.Rubi Majumdar
Messenger	Mrs.S Mishra

On-Farm Centre, Kawardha

Agronomist	Dr.S.K.Agrawal
Technical Asstt.	Vacant
Field assistant	Mr.J.L.Soni
Field assistant	Mr. D D Singh
Field assistant	Mr.Amit ku.Tondar
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Mr.Saiyyad Javed Ali
Driver	Mr.Prasant Kumar Choure
Watchman	Mr. C B Dwivedi

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

Chief Agronomist	Dr. B.S.Patel
Jr. Soil Scientist	Mr. P.K.Patel
Jr. Agronomist	Mr S.M.Patel
Technical Asstt.	Vacant
Field assistant	Mr.B.R.Patel
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Watchman	Mr. R.A.Joshi

On-Farm Centre, Deesa

Agronomist	Dr.S.K. Patel
Jr. Sci.(Eco)	Dr. R.R.Patel
Tech.Asstt.	Vacant
Field assistant	Mr.S.S.Chaudhary
Field Assistant	Mr. A.G. Patel
Field Assistant	Mr B.B.Jat
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	Mr. V.A. Goswami
Watchman	Mr. G.K.Chaudhary

6. JAU, JUNAGADH (GUJARAT)

Sub Centre, Junagadh

Agronomist	Dr. B. K. Sagarka
Technical Asstt.	Mr. A. K. Padaliya
Field assistant	Mr. C.T.Dalwadi
Field assistant	Mr. K.G. Rabadia
Jr. Steno/UDC	Mr. J. B. Sodha

7. NAU, NAVSARI (GUJRAT)

Sub Centre, Navsari

Agronomist	Dr.R.A.Dungrani
Technical Asstt.	Vacant
Field assistant	Mr. M. B. Patel
Field assistant	Mr.M.B.Solanki
Jr. Steno/UDC	Vacant

8. AAU, ANAND (GUJRAT)

On-Farm Centre, Arnej

Agronomist	Dr. R.P.Kacha
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.S.K.Yadav
Jr. Soil Scientist	Dr.Manoj Kumar Sharma
Jr. Agronomist	Dr. Pawan Kumar
Technical Asstt.	Mr.S.K.Sharma
Technical Asstt.	Vacant
Field assistant	Mr.Tara Chand
Field assistant	Mr.Sat Narain
Jr. Steno/UDC	Mrs.Veena Kakkar
Watchman	Mr.Naval

On-Farm Centre, Kurukshetra

Agronomist	Dr.Anil Mehta
Jr. Agronomist	Dr.Mahesh Kumar
Field assistant	Mr.Sube Singh
Field assistant	Mr.Santosh Kumar
Field assistant	Mr.Pritam Singh
Field assistant	Mr. Churia Ram
Field assistant	Mr.Ved Prakash
Field assistant	Vacant
Jr. Steno/UDC	Mrs.Meenu Kumari
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.	Dr.R.K.Sharma
Field assistant	Mr.Pratap Chand
Field assistant	Mr.Anirudh
Field assistant	Mr.Sandhu Ram
Jr. Steno/UDC	Mr.Mehar Chand
Watchman	Mr.Babu Ram

On-Farm Centre, Kangra

Agronomist	Dr.S.K.Sharma
Technical Asstt.	Mrs.Anuradha
Field assistant	Mr.Rakesh Kumar
Field assistant	Mr.Balak Ram
Field assistant	Mr.Bihari Lal
Field assistant	Mr.Vikram Singh
Field assistant	Mr.Amarjit Singh
Field assistant	Mr.Pradeep Kumar
Jr. Steno/UDC	Vacant
Driver	Mr.Ujagar Singh
Messenger	Mr.Surjeet Kumar

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	Mr.Khazan Singh
Field assistant	Mr.Babu Ram
Field assistant	Mr.A.W. Katoch
Field assistant	Mr.Ashwani Sharma
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	Vacant
Jr. Soil Scientist	Vacant
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.K.Pandey
Messenger	Mrs.Deomani Devi

On-Farm Centre, Jamtara

Agronomist	Mr.W.Aind
Technical Asstt.	Mr.Rakesh Kumar Sinha
Field assistant	Mr.S.K.Soy
Field assistant	Mr.S.N.Baitha

Field assistant	Mr.K.Dom
Field assistant	Mr.saikullah
Field assistant	Mr.Karjru Oraon
Field assistant	Mr.B.L. Singh
Jr.Stenographer	Mr.Dinesh Toppo
Driver	Mr.Krishun Kujar
Watchman	Mr.Sarif Ansari

13. UAS, Banglore (KARNATAKA)

Main Centre, Kathalelgere

Chief Agronomist	Dr.H.Chandrappa
Jr. Soil Scientist	Dr P Chandravanshi
Jr. Agronomist	Dr.A.Y. Hugar
Technical Asstt.	Mr.Nagaraja kusugur
Field assistant	Mr.N.Rajappa
Field assistant	Mr.P. Maheshwarappa
Jr. Steno/UDC	Mr.S. Ashwini
Messenger	Mr.K.M. Chandrakala

On-Farm Centre, Banglore

Agronomist	Dr.A.P.Viswanath
Jr. Soil Scientist	Mr.M.N.Venkatamana
Technical Asstt.	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

14. UAS, Raichur (KARNATAKA)

Main Centre, Siruguppa

Chief Agronomist	Mr.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
Field assistant	Mr.S.V.Angadi
Jr. Steno/UDC	Mr.Onkerappa

15. UAS Dharwad

On-Farm Centre, Gadag (KARNATAKA)

Agronomist	Dr.M.H.Hosmani
Technical Asstt.	Mr.C.B.Koujalagi
Field assistant	Mr.B.Y.Bhajantri
Field assistant	Mr.Channabasappa
Field assistant	Mr.M.S.Tal;akeri
Field assistant	Mr.R.P.Pinjar
Field assistant	Mr.Vidyadher
Field assistant	Mr.N.N.Hokkundi
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Mr.A.M.Harinath

16. KAU, THRISSUR (KERALA)

Main Centre, Karmana (Thiruvananthapuram)

Chief Agronomist	Dr.Kuruvilla Varughese
Jr. Soil Scientist	Dr.B.Rani
Jr. Agronomist	Dr.B.Jacob john
Technical Asstt.	Mrs.Suja abraham
Field assistant	Mr.Tony 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	Mrs.S.Naseema
Field assistant	Mr.Georgy Joseph
Field assistant	Mr.A.R.Venu
Field assistant	Mr.P.S.Sonal Kumar
Field assistant	Mr.Mathew Thomas.C
Jr. Steno/UDC	Mr.Aneesh Kumar.M
Driver	Vacant
Messenger	Mrs.K.G.Pushpakumari

17. JNKVV, Jabalpur (M.P.)

Main Centre, Jabalpur

Chief Agronomist	Dr.K.R.Nayak/ Dr.K.K.Agarwal/ Dr.V.K.Shukla

Jr. Soil Scientist	Dr.B.S.Dwivedi
Jr. Agronomist	Dr.Mrs Nisha Mehra
Technical Asstt.	Dr.S.K.Vishwakarma
Field assistant	Mr.S.P.Dubey
Field assistant	Mr.A.N.Goutam
Jr. Steno/UDC	Mr.T.P.Verma
Messenger	Mr.N.L.Bhumiya

Sub Centre, Rewa

Agronomist	Dr.B.M.Mouya
Tech.Assistant	Vacant
Field assistant	Vacant
Field assistant	Miss.Richa Singh
Jr. Steno/UDC	Mr.S.S.Dwivedi

Sub Centre, Powerkheda

Agronomist	Dr R.S.Lidder
Tech.Assistant	Mr.A.K.Dubey
Field assistant	Vacant
Field assistant	Mr.Sudhir Dubey
Jr. Steno/UDC	Mrs.Sushila Jhariya

On Farm Centre, Dindori

Agronomist	Vacant
Jr. Soil Scientist	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	Vacant
Technical Asstt.	Dr.R.K.Sharma
Field assistant	Vacant
Field assistant	Mr.B.L.Gupta
Field assistant	Vacant
Field assistant	Mr.R.D.Mahor
Field assistant	Mr.M.S.Prajapati
Field assistant	Mr.S.S.baghel
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

18. RMVRSUA & T GWALIAR

Sub Centre, Indore

Agronomist	Dr.A.K.Sharma
Tech.Assistant	Mr.N.K.Sinha
Field assistant	Mr.R.K.Tamere
Field assistant	Mr.G.S.Yadav
Jr. Steno/UDC	Mr.N.K.Bangre

19. MPKV, RAHURI (MAHARASHTRA)

Main Centre, Rahuri

Chief Agronomist	Dr. B.S. Raskar
Jr. Agronomist	Mr.A.D.Tambe
Jr.Soil Scientist	Dr.V.S.Patil
Tech. Assistant	Mr.N.S.Ugale
Field Assistant	Mr.M.L.Kuldharan
Field Assistant	Mr.J.A.Rajnur
Jr.Stenographer	Mr.R.R.Gore/Vacant
Messenger	Mr.P.L.Dolas

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

20. DPDKV, AKOLA (MAHARASHTRA)

Main Centre, Akola

Chief Agronomist	Mr.B.V.Saoji
Jr. Agronomist	Mr.B.S.Morwal
Jr.Soil Scientist	Vacant
Tech. Assistant	Mr. M.G.Dikkar
Field Assistant	Vacant
Field Assistant	Mr.T.L.Pawar
Jr.Stenographer	Mr.S.T.Girhe

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

21. MAU, PARBHANI (MAHARASHTRA)

Main Centre, Parbhani

Chief Agronomist	Dr.W.N.Narkhede
Jr.Economist	Prof.J.L.Katkade/ Vacant
Jr.Soil Scientist	Dr.Hanwate/ Dr. S. T. Shirale/ Shri. R. N. Khandare
Jr.Stenographer	Mr.R.R.Dharasurkar
Tech. Assistant	Vacant
Field Assistant	Mr.G.Y.Sonwane/ Vacant
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
Jr.Stenographer	Mr. S. S. Mundhe

22. DBS KKV, DAPOLI (MAHARASHTRA)

Main Centre, Karjat

Chief Agronomist	Dr.L.G.Pawar
Jr. Soil Scientist	Mr.D.G.Jondhale
Jr. Agronomist	Mr.A.S.Dalvi
Technical Asstt.	Mr.P.M.Talha
Technical Asstt.	Mr.P.M.Hegade
Field assistant	Mr.A.B.Gaikwad
Field assistant	Mr.J.P.Hambir
Jr. Steno/UDC	Mr.R.L.Biwalkar
Messenger	Mr.L.N.Hambir

On Farm Centre, Mulde

Agronomist	Dr.M.S.I.Shaikh/ Dr.S.B.Bhagat
Field Assistant	Mr.S.V.Kamble
Field Assistant	Mr.B.L.Shanwar
Field Assistant	Mr.D.R.Kasalkar
Field Assistant	Mr.S.D.Phale
Field Assistant	Mr.V.S.Daphal
Field Assistant	Mr.R.P.Gorivale
Jr.Stenographer	Vacant
Driver	Mr.S.J.Jadhav
Messenger	Mr.V.D.Zagade

23.OUAT,BHUBNESWAR (ORISSA)

Main Centre, Bhubaneswar

Chief Agronomist	Dr.L.M.Garnayak
Jr. Agronomist	Mr.A.K.Mohanty
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.Bhakta Danta
Field Assistant	Mr.J.K.Behera
Jr.Stenographer	Vacant

On Farm Centre, Angul

Agronomist	Dr.Alok Kumar Patra, I/C
Jr.Economist	Dr. Sarba Narayan Mishra (Vacant) 31/10/2012

Field Assistant	Mr.S.Baral
Field Assistant	Mr. Kasinath Mallick
Field Assistant	Mr Sridhar Mallik
Field Assistant	Mr Biranchi Pradhan
Field Assistant	Mr Sarat Ch. Sahoo, (Vacant) 08/10/2012
Field Assistant	Vacant
Jr.Stenographer	Vacant
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
Driver	Mr.K.C.Mallick
Watchman	Mr.S.Munda

24. PAU, LUDHIANA (PUNJAB)

Main Centre, Ludhiana

Chief Agronomist	Dr.Sohan Singh Walia
Agronomist	Dr.C.S.Aulakh
Jr.Soil Scientist	Mr.Roopinder Singh
Tech. Assistant	Mr. Surender Kumar Sharma
Field Assistant	Mr.Khandu Ram
Field Assistant	Mr.Baljit Singh
Field Assistant	Mr.Prem Prakash
Jr.Stenographer	Mr.Ram Ji Dass Yadav
Watchman	Mr.Jagmohan Singh

On Farm Centre, Amritsar

Agronomist	Dr.Satpal Singh
Field Assistant	Mr.Amrik Singh
Field assistant	Mr.Bhagwant Singh
Field assistant	Mr.Gurudip Singh
Field assistant	Mr.Sukhdev Singh
Field assistant	Mr.Joginder Singh
Field assistant	Vacant
Jr.Stenographer	Mrs.Nirmala Rani
Driver	Mr.Gurudev Singh
Watchman	Mr.Danial

25. MPUAT, Udaipur (RAJASTHAN)

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

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

26. RAU, Bikaner, (RAJASTHAN)

Main Centre, Durgapura

Chief Agronomist	Dr.O.P.Gill
Jr. Soil Scientist	Vacant
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, Hanumangarh

Agronomist	Dr.R.P.S.Chauhan
Technical Asstt.	Vacant
Field assistant	Mr.Banwari Lal
Field assistant	Mr.Chaju Ram Jat
Field assistant	Mr.Iswar Singh
Field assistant	Mr.Hanuman Lal

Field assistant	Vacant
Field assistant	Vacant
Driver	Vacant
Jr. Steno/UDC	Vacant
Watchman	Mr.Panna Lal

27. TNAU, COIMBATORE (TN)

Main Centre,Coimbatore

Chief Agronomist	Dr.K.Siddeswaran
Jr.Soil Scientist	Dr.S.Thiyageshwari
Jr. Agronomist	Dr.P.M.Shanmugam
Jr.Economist	Dr.V.Sarvanakumar
Tech. Assistant	Vacant
Tech.Assistant	Vacant
Field Assistant	Mr.A.Gowthaman
Field Assistant	Vacant
Jr.Stenographer	Mrs.R.Vennila
Messenger	M.Vijayalakshmi

Sub Centre, Thanjavur

Agronomist	Dr.S.Vallal Kannan/ Dr.R.Marimuthu
Tech. Assistant	P.Amutha
Field Assistant	Mr.S.Palanisamy
Field Assistant	M.Periyasamy
Jr.Stenographer	Mr.S.Rajendran

On farm, Chettinad

Agronomist	Mr.P.Kathirvelan
Tech. Assistant	Vacant
Field Assistant	Mr.A.Rajeshwari
Field Assistant	Mr.V.Krishnan/ Mr.M.Punitha
Field Assistant	Mr.Sayee Lakshmi
Field Assistant	M.Baskarandian
Field Assistant	Mr.M.K.Rajendran
Field Assistant	Mr.C.Shanmugam/ Mr.A.Savithri
Jr.Stenographer	Mr.Paramasivam
Driver	Mr.M.Radha
Messenger	Mr.M.Annadurai

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.V.Sekar
Messenger	Mr.C. Murugesan

28. CSAUAT, KANPUR (U.P.)

Main Centre, Kanpur

Chief Agronomist	Dr.M.P.Yadav
Jr. Soil Scientist	Dr.U.S.Tiwari
Jr. Agronomist	Mr. Birendra Kumar/ Dr.Naushad Khan
Technical Asstt.	Mr. U. S. Yadav
Field assistant	Mr. R.P.Dubey
Field assistant	Dr.A.K.Mishra
Jr. Steno/UDC	Mr.S.T.Siddiqui
Messenger	Mr. Vijay Bahadur

On Farm Centre, Saini (Koushambi)

Agronomist	Dr.Mohd Aslam
Technical Asstt.	Vacant
Field Assistant	Mr.Jagdish Chandra
Field Assistant	Mr.Ram Babu
Field Assistant	Mr.Virendra Singh
Field Assistant	Mr.Dinesh Kumar
Field Assistant	Mr.Sudhir/Mr.Pratap Singh
Field Assistant	Vacant
Jr.Stenographer	Mr. K.S.Mishra
Driver	Mr.Mahendra Singh
Watchman	Mr. Ashok Kumar

29. NDUAT, FAIZABAD (UP)

Main Centre, Faizabad

Chief Agronomist	Dr. H.P.Tripathi
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, Sant Kabir Nagar

Agronomist	Dr.S.P.Singh
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	Mr.R.R.Singh
Field Assistant	Vacant
Jr.Stenographer	Mr.Ram Lal
Driver	Mr.J.P.Yadav
Watchman	Mr.Satendra Kumar Singh

30. BHU, VARANASI (UP)

Sub Centre, Varanasi

Agronomist	Dr.J.S.Bohra
Tech. Assistant	Mr.Manoj Kumar
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr.Mohan Ram

31. 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

32. GBPUAT, PANTNAGAR (UTTARAKHAND)

Main Centre,Pantnagar

Chief Agronomist	Dr.A.K.Bhardwaj
Jr.Soil Scientist	Dr.Ajeet Pratap Singh
Tech. Assistant	Mr.Y.S.Khokar
Tech. Assistant	Vacant
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.Purushottam Kumar
Jr. Agronomist	Dr.D.K.Singh
Field Assistant	Mr.Y.P.Gangwar
Field Assistant	Mr.S.K.Verma
Field Assistant	Mr.Gulsher Ahmed
Field Assistant	Mr.Virendra Singh
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Vacant
Driver	Vacant
Messenger	Mr.Panjabi Mahtao

33. BCKV, Kalyani

Main Centre, Kalyani

Chief Agronomist	Vacant
Jr. Soil Scientist	Mr.Nadira Banu Choudhuri
Jr. Economist	Dr.S.Chatterjee
Technical Asstt.	Dr.Dilip Saha
Technical Asstt.	Mr.Basudev Datta
Field assistant	Mr.Bipul Chandra Pal
Field assistant	Mr.Amar Chakrabarty
Jr. Steno/UDC	Mrs.Sonali Rakshit
Messenger	Mrs. Kanak Prabha Biswas

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	Mr.S.K.Dutta
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 C : Soil fertility Status (kg/ha) of different crop sequence in exp. No 2 (a)

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Rajendra nagar	Kharif	OC%	0.52	0.53	0.52	0.58	0.57	0.64	0.66	0.63	0.69	0.61	0.60	0.59		
		N	163.4	174.4	172.8	181.3	179.6	188.7	190.6	183.8	192.1	185.1	183.6	182.5		
		P	32.1	36.7	34.5	41.5	41.6	42.1	42.1	42.8	39.7	42.5	42.0	37.5		
		K	176.2	181.3	167.7	208.3	169.0	187.8	204.5	190.0	173.2	184.4	156.4	159.5		
	Rabi	OC%	0.56	0.54	0.53	0.54	0.61	0.57	0.59	0.66	0.61	0.56	0.53	0.54		
		N	160.1	160.8	164.6	163.4	166.8	151.8	146.0	176.8	185.1	163.4	170.1	162.3		
		P	32.9	40.9	41.6	43.1	51.4	57.9	66.6	62.5	55.0	44.1	40.5			
		K	172.5	162.1	156.1	166.2	157.4	180.3	164.6	174.7	197.7	144.4	164.1	156.1		
Maruteru	Kharif	OC%	0.98	0.99	0.96	0.98	1.08	1.22	1.17	1.14	1.18	1.18	1.17			
		N	175.6	167.1	180.1	169.7	181.9	190.2	187.6	181.2	180.6	175.4	186.9			
		P	28.6	40.6	40.9	41.2	44.8	44.8	42.4	44.8	38.7	45.0	39.6			
		K	198.0	201.0	207.0	212.0	237.0	215.0	221.0	227.0	233.0	214.0	209.0			
	Rabi	OC%	0.74	0.81	0.80	0.79	0.79	1.12	1.10	1.15	1.01	1.10	1.10			
		N	181.9	170.6	176.7	178.1	175.6	188.2	181.9	188.2	175.6	188.3	175.6			
		P	24.5	31.0	340.0	36.0	41.1	33.9	37.0	44.6	38.9	35.9	38.6			
		K	145.0	156.0	154.0	160.0	171.0	168.0	150.0	169.0	163.0	143.0	160.0			
Rudrur	Kharif	OC%	0.48	0.52	0.50	0.51	0.63	0.71	0.73	0.72	0.69	0.71	0.68	0.51		
		N	136.0	161.0	168.0	169.0	188.0	125.0	134.0	126.0	131.0	156.0	140.6	142.1		
		P	42.0	45.1	50.6	60.2	89.1	82.1	89.6	79.1	84.6	80.7	60.2	50.6		
		K	164.0	187.0	201.0	210.0	286.0	276.0	263.0	301.0	289.0	224.0	236.0	210.0		
	Rabi	OC%	0.40	0.56	0.58	0.59	0.60	0.70	0.70	0.70	0.70	0.70	0.70	0.61		
		N	130.6	158.2	149.6	151.2	174.2	139.4	133.8	136.8	126.2	160.1	154.6	152.1		
		P	47.0	49.0	56.0	59.6	86.0	70.0	98.0	62.0	78.0	86.0	57.0	59.1		
		K	203.0	214.0	221.0	231.0	267.0	265.0	255.0	312.0	291.0	230.0	240.0	210.6		
Sabour	Rabi	OC%	0.34	0.40	0.50	0.56	0.60	0.80	0.75	0.77	0.72	0.78	0.74	0.45		
		N	120.4	152.6	170.5	178.9	186.9	227.7	218.6	222.5	209.2	224.9	210.6	151.4		
		P	12.5	20.6	33.4	37.5	42.3	52.1	47.8	46.5	42.0	51.6	47.2	28.8		
		K	113.8	118.2	126.2	124.9	135.1	177.5	156.2	189.4	169.4	177.0	158.2	123.6		
Raipur	Rabi	OC%	0.52	0.53	0.58	0.61	0.71	0.69	0.64	0.61	0.58	0.71	0.69	0.60		
		N	165.0	205.0	233.0	249.0	263.0	261.0	251.0	248.0	243.0	275.0	263.0	233.0		
		P	11.1	19.1	20.4	21.1	28.7	25.3	27.5	22.6	20.4	30.0	25.3	19.7		
		K	173.0	226.0	243.0	249.0	272.0	287.0	292.0	269.0	256.0	299.0	283.0	249.0		
SK Nagar	Summer	OC%	0.12	0.18	0.19	0.20	0.22	0.32	0.27	0.30	0.27	0.31	0.30	0.19		
		N	113.0	163.0	171.0	170.0	196.0	212.0	204.0	207.0	201.0	209.0	199.0	174.0		
		P	14.8	29.7	31.4	31.9	35.3	40.3	38.9	39.8	37.0	40.9	38.9	21.8		
		K	133.0	148.0	148.0	151.0	156.0	177.0	174.0	179.0	174.0	182.0	172.0	146.0		

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Junagadh	Rabi With P Potash	OC%	0.57	0.63	0.63	0.66	0.67	0.75	0.72	0.73	0.69	0.73	0.69	0.66		
		N	181.0	214.0	215.0	214.0	221.0	256.0	250.0	256.0	250.0	251.0	243.0	206.0		
		P	9.5	21.3	23.0	24.1	26.0	31.1	29.1	30.2	28.6	30.2	28.6	20.4		
		K	161.0	189.0	203.0	196.0	203.0	210.0	200.0	207.0	200.0	214.0	207.0	168.0		
	Rabi Without Potash	OC%	0.60	0.66	0.68	0.70	0.73	0.79	0.75	0.73	0.71	0.71	0.69	0.69		
		N	155.0	209.0	209.0	210.0	216.0	232.0	225.0	229.0	225.0	228.0	221.0	196.0		
		P	8.1	20.2	23.2	23.8	25.5	31.4	30.2	30.5	29.7	30.2	29.4	16.0		
		K	144.0	140.0	147.0	151.0	147.0	175.0	161.0	168.0	158.0	165.0	147.0	137.0		
Navsari	Summer	OC%	0.44	0.53	0.54	0.56	0.56	0.63	0.59	0.61	0.60	0.62	0.58	0.54		
		N	179.0	237.0	242.0	243.0	251.0	261.0	256.0	259.0	251.0	257.0	254.0	232.0		
		P	20.4	26.6	29.4	28.0	30.2	34.7	33.0	33.6	32.2	33.6	31.1	26.3		
		K	166.0	157.0	161.0	161.0	166.0	195.0	186.0	190.0	186.0	178.0	170.0	174.0		
Hisar	Kharif	OC%	0.32	0.36	0.38	0.37	0.44	0.46	0.43	0.45	0.38	0.39	0.39	0.38		
		N	131.0	149.0	154.0	170.0	191.0	194.0	184.0	177.0	179.0	180.0	179.0	179.0		
		P	14.0	15.0	14.0	16.0	18.5	19.3	18.0	15.0	15.0	17.0	17.0	15.5		
		K	219.0	239.0	265.0	285.0	298.0	301.0	290.0	285.0	283.0	289.0	281.0	280.0		
	Rabi	OC%	0.33	0.39	0.45	0.44	0.46	0.49	0.47	0.44	0.42	0.46	0.42	0.40		
		N	140.0	163.0	166.0	186.0	207.0	210.0	200.0	186.0	189.0	200.0	196.0	189.0		
		P	13.0	14.0	15.0	17.0	20.3	21.0	17.5	16.0	18.0	17.0	19.3	16.0		
		K	204.0	222.0	255.0	255.0	298.0	299.0	292.0	289.0	291.0	295.0	285.0	282.0		
Palampur	Kharif	OC%	0.56	0.65	0.66	0.71	0.74	0.87	0.82	0.84	0.75	0.84	0.71	0.73		
		N	181.5	198.8	209.0	216.8	248.3	280.5	270.8	250.5	245.8	265.5	239.0	225.8		
		P	17.9	29.3	48.5	60.1	66.9	75.2	70.2	65.7	63.8	62.9	70.8	63.3		
		K	120.5	136.0	144.3	141.8	162.5	167.0	158.5	159.8	155.5	157.8	153.8	159.3		
	Rabi	OC%	0.60	0.68	0.68	0.72	0.74	0.88	0.83	0.85	0.77	0.84	0.73	0.72		
		N	202.3	206.4	229.9	219.2	245.9	316.1	286.3	271.6	253.7	269.7	260.9	237.4		
		P	16.8	27.4	46.5	61.0	70.0	75.6	68.9	66.6	57.7	66.6	59.4	62.2		
		K	121.1	142.3	146.6	153.3	158.1	172.9	165.3	162.2	159.7	164.6	161.0	157.8		
Jammu	Rabi	OC%	0.51	0.55	0.54	0.57	0.59	0.81	0.73	0.80	0.77	0.72	0.74	0.52		
		N	161.6	212.0	246.0	213.3	244.0	278.0	249.1	232.4	203.8	258.7	217.5	200.1		
		P	8.9	10.5	15.9	17.7	19.7	23.1	21.5	19.9	20.1	23.6	21.3	11.7		
		K	100.2	105.3	105.5	105.5	122.5	152.5	132.7	147.8	132.3	139.8	116.8	104.2		
Ranchi	Kharif	OC%	0.38	0.44	0.43	0.44	0.46	0.62	0.55	0.50	0.48	0.49	0.48	0.38		
		N	193.0	212.0	212.0	225.0	230.0	308.0	273.0	248.0	242.0	244.0	237.0	202.0		
		P	16.0	20.7	31.7	43.0	65.0	92.3	81.0	74.3	69.3	65.0	59.3	12.0		
		K	138.0	149.0	153.0	159.0	169.0	176.0	170.0	169.0	161.0	166.0	158.0	130.0		

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
	Rabi	OC%	0.39	0.44	0.44	0.49	0.51	0.64	0.53	0.53	0.48	0.51	0.47	0.39		
		N	200.0	224.0	210.0	228.0	239.0	308.0	269.0	252.0	242.0	245.0	237.0	200.0		
		P	15.8	21.2	30.4	42.4	65.7	91.6	80.6	74.2	69.5	70.0	58.8	11.8		
		K	138.0	152.0	158.0	159.0	170.0	180.0	171.0	166.0	163.0	165.0	160.0	100.0		
Jabalpur	Rabi	OC%	0.60	0.64	0.64	0.66	0.68	0.75	0.73	0.74	0.73	0.77	0.75	0.68		
		N	238.0	256.0	264.0	265.0	270.0	285.0	279.0	282.0	278.0	290.0	283.0	272.0		
		P	8.6	9.3	9.7	10.8	13.7	15.0	15.8	15.6	16.4	17.7	16.2	14.6		
		K	287.0	320.0	370.0	370.0	428.0	455.0	450.0	475.0	462.0	480.0	468.0	429.0		
Rahuri	Kharif	OC%	0.43	0.60	0.60	0.61	0.64	0.72	0.69	0.69	0.65	0.67	0.62	0.59		
		N	124.0	166.0	176.0	185.0	188.0	196.0	184.0	187.0	186.0	195.0	190.0	178.0		
		P	7.0	15.0	16.0	16.0	17.0	19.0	17.0	17.0	16.0	17.0	17.0	11.0		
		K	532.0	629.0	640.0	644.0	667.0	675.0	664.0	624.0	616.0	668.0	644.0	618.0		
	Rabi	OC%	0.47	0.61	0.62	0.64	0.64	0.72	0.70	0.69	0.66	0.68	0.64	0.59		
		N	122.0	170.0	178.0	188.0	191.0	198.0	187.0	189.0	188.0	193.0	193.0	159.0		
		P	8.0	16.0	17.0	17.0	19.0	19.0	18.0	17.0	18.0	18.0	18.0	13.0		
		K	535.0	606.0	643.0	647.0	671.0	679.0	668.0	629.0	621.0	671.0	648.0	621.0		
Akola	Kharif	N	95.0	184.5	24.3	228.8	248.8	318.8	252.5	252.8	227.5	233.8	230.0	161.3		
		P	7.6	14.7	15.1	17.1	21.4	33.4	24.8	27.7	17.8	18.6	18.3	13.4		
		K	173.1	234.9	273.6	322.8	360.3	445.4	361.3	340.3	242.5	300.2	292.3	211.6		
	Rabi	OC%	0.36	0.50	0.51	0.54	0.63	0.66	0.60	0.62	0.59	0.65	0.60	0.47		
		N	113.0	215.0	224.0	236.0	240.9	325.0	305.0	310.0	293.0	132.0	306.0	205.0		
		P	9.2	19.1	22.4	22.6	30.8	32.9	27.3	29.2	25.4	27.2	26.8	15.5		
		K	253.0	199.0	190.0	211.0	282.0	313.0	202.0	279.0	266.0	152.0	158.0	205.0		
Karjat	Kharif	OC%	1.07	1.31	1.30	1.31	1.28	1.39	1.32	1.36	1.32	1.34	1.31	1.27		
		N	170.7	200.0	211.2	245.7	255.1	217.4	245.7	204.6	223.7	201.7	223.7	192.4		
		P	8.8	13.0	13.5	14.7	14.9	13.6	14.6	13.3	13.9	13.3	13.6	14.8		
		K	213.1	238.4	240.4	242.2	274.5	265.7	260.9	268.8	267.2	259.9	260.3	266.5		
	Rabi	OC%	1.05	1.25	1.25	1.21	1.19	1.33	1.26	1.28	1.26	1.27	1.25	1.21		
		N	167.8	208.1	222.9	211.8	241.4	237.7	219.2	226.6	215.5	226.6	215.5	222.9		
		P	8.4	12.9	13.3	12.9	13.5	13.4	13.2	13.4	13.0	13.4	13.1	13.4		
		K	209.4	233.1	246.5	249.1	278.5	265.6	236.3	269.7	266.2	263.9	254.1	239.8		
Bhubaneswar	Rabi	OC%	0.55	0.58	0.59	0.57	0.60	0.86	0.74	0.80	0.79	0.92	0.80	0.62		
		N	211.0	235.7	255.7	239.0	266.0	319.7	285.0	305.0	301.0	344.0	311.3	255.3		
		P	8.0	8.9	15.1	14.2	13.9	20.9	17.1	20.9	17.1	22.9	16.9	11.7		
		K	70.8	93.1	96.8	94.0	100.5	143.3	136.4	170.2	149.6	155.3	143.4	101.5		

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Chiplima	Rabi	OC%	0.62	0.70	0.65	0.63	0.65	0.79	0.67	0.76	0.69	0.82	0.70	0.64		
		N	258.0	281.0	270.7	263.0	274.0	294.3	276.7	290.3	283.0	322.3	278.3	262.3		
		P	7.0	8.0	9.2	8.5	9.1	12.9	11.9	13.1	12.0	13.6	12.1	8.5		
		K	85.7	97.9	98.7	97.7	104.6	134.2	127.6	150.5	138.5	141.1	133.8	99.1		
Ludhiana	Rabi	OC%	0.35	0.38	0.38	0.37	0.41	0.58	0.57	0.48	0.47	0.57	0.56	0.57	0.44	0.35
		N	148.5	160.8	165.5	178.5	186.5	234.5	225.8	210.5	215.8	238.6	228.6	218.9	196.8	148.5
		P	11.2	16.8	17.2	20.8	30.2	41.2	36.7	24.8	26.8	32.8	30.5	34.5	34.8	11.2
		K	80.6	88.8	90.2	105.6	108.9	165.8	158.2	134.8	128.9	145.8	140.2	146.8	134.8	80.6
		Zn	1.5	1.6	1.6	1.6	1.7	1.9	1.8	1.7	1.7	1.8	1.7	1.8	1.5	1.7
		Cu	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.8
		Fe	14.2	24.8	20.6	26.4	24.8	32.6	31.8	30.4	28.6	31.6	33.4	31.7	24.8	25.9
		Mn	6.2	6.9	6.7	7.3	8.4	8.9	8.7	8.6	8.3	9.1	8.8	8.9	7.6	7.5
Kanpur	Summer	OC%	0.14	0.36	0.50	0.49	0.67	0.68	0.58	0.51	0.49	0.63	0.57	0.42		
		N	-	-	-	-	-	-	-	-	-	-	-	-		
		P	9.0	15.2	17.9	22.2	26.9	25.3	23.4	22.0	23.0	25.1	24.8	19.8		
		K	9.2	139.5	149.5	157.5	176.1	168.4	161.2	165.5	164.2	171.3	169.0	134.3		
Faizabad	Kharif	OC%	0.24	0.34	0.38	0.42	0.52	0.66	0.60	0.57	0.55	0.63	0.61	0.39		
		N	104.0	138.0	144.0	152.0	188.0	212.0	204.0	196.0	183.0	218.0	205.0	159.0		
		P	5.6	15.4	18.6	17.3	23.4	25.1	22.6	19.8	18.3	25.8	23.3	17.0		
		K	198.0	226.0	240.0	245.0	262.0	253.0	247.0	277.0	260.0	250.0	238.0	228.0		
	Rabi	OC%	0.22	0.31	0.36	0.39	0.50	0.61	0.58	0.55	0.52	0.60	0.58	0.37		
		N	108.0	143.0	150.0	153.0	194.0	209.0	210.0	190.0	188.0	209.0	202.0	164.0		
		P	5.2	14.8	17.1	18.2	22.1	23.7	20.6	18.7	17.9	23.2	21.0	18.0		
		K	192.0	218.0	244.0	240.0	264.0	258.0	244.0	281.0	263.0	255.0	242.0	231.0		
Kalyani	Kharif	OC%	0.60	0.61	0.64	0.69	0.64	0.66	0.71	0.68	0.71	0.56	0.60	0.61		
		N	112.0	109.8	110.6	108.7	108.6	107.7	112.6	113.5	119.7	118.7	112.0	109.8		
		P	54.0	45.0	41.1	32.8	39.9	45.0	41.9	43.9	41.1	39.7	54.0	45.0		
		K	312.7	298.8	295.5	296.4	288.9	278.0	284.5	281.6	288.5	284.2	312.7	298.8		
Karamana	Kharif	OC%	0.71	0.83	0.78	0.78	0.75	0.84	0.99	0.77	0.85	0.94	0.99	0.85		
		N	292.6	306.8	300.7	301.4	304.0	314.6	306.9	318.2	308.0	309.5	328.1	317.7		
		P	9.7	13.9	12.7	13.5	15.0	16.2	14.8	13.1	13.2	13.2	13.1	12.9		
		K	82.9	113.4	117.5	146.2	111.4	118.4	150.1	127.4	153.2	131.9	155.1	145.0		
	Rabi	OC%	0.69	0.86	0.74	0.80	0.72	0.86	0.71	0.83	0.77	0.70	0.87	0.77		
		N	305.3	328.8	306.1	322.0	327.0	298.7	322.3	318.1	382.2	285.7	316.8	294.9		
		P	8.4	12.8	11.3	11.8	13.0	10.4	16.3	11.0	11.4	11.9	12.5	10.9		
		K	96.8	102.6	130.2	133.7	119.6	108.1	145.0	135.5	126.6	126.8	96.0	97.2		

Table D : Nutrient uptake (kg/ha) of different crop sequence in exp. No 2 (a)

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Rajendra nagar	Kharif Rice	N	30.8	39.5	48.1	65.1	74.8	64.0	70.5	55.9	55.3	78.3	83.4	70.3		
		P	7.5	9.6	11.2	15.5	17.6	16.2	18.9	14.3	16.0	17.7	17.1	14.0		
		K	29.3	41.9	48.9	61.3	64.2	66.1	81.5	59.8	61.4	78.1	79.0	63.4		
	Rabi Rice	N	34.1	43.4	67.1	86.0	93.6	76.8	63.5	66.4	54.2	86.4	86.1	79.4		
		P	8.2	8.6	14.8	16.2	17.0	17.6	16.4	17.7	16.7	17.6	18.3	16.5		
		K	34.2	48.0	67.6	69.1	66.7	74.5	75.7	72.7	75.7	79.8	81.1	68.5		
Maruteru	Kharif Rice	N	76.8	105.4	108.4	117.5	139.1	147.2	146.3	141.7	134.5	149.2	150.1	128.5		
		P	15.6	21.3	22.3	22.5	24.7	26.3	24.0	23.9	21.2	24.8	25.6	25.3		
		K	60.2	81.1	84.7	94.8	112.1	114.2	105.2	104.4	103.7	110.5	112.0	95.5		
	Rabi Rice	N	24.1	47.2	75.3	68.2	83.0	85.9	78.9	82.4	78.4	85.1	80.7	64.0		
		P	4.9	9.0	13.3	13.7	17.2	17.8	17.7	18.2	16.1	17.7	16.8	13.3		
		K	22.5	41.6	64.9	68.1	81.0	83.9	72.3	78.4	71.5	84.4	76.6	66.0		
Rudrur	Kharif Rice	N	49.2	65.9	71.1	87.7	91.1	90.8	110.8	84.5	100.0	84.4	104.8	91.9		
		P	12.3	17.2	17.4	23.7	24.0	20.7	25.1	20.0	24.9	22.1	24.0	23.2		
		K	55.9	71.5	71.9	85.2	94.9	89.4	105.4	89.1	109.9	87.2	106.3	89.7		
	Mustard	N	9.6	19.3	22.8	20.7	29.5	28.2	29.3	29.9	29.4	31.2	34.5	23.6		
		P	1.1	2.2	2.3	2.2	3.3	3.1	2.9	3.2	2.9	3.2	3.1	2.4		
		K	1.4	2.9	3.8	3.1	4.6	4.6	4.5	4.8	5.0	4.8	5.2	3.6		
Sabour	Rice	N	21.3	48.0	52.0	68.1	94.6	102.9	96.1	99.8	94.8	101.4	94.8	58.3		
		P	6.6	13.8	14.6	18.7	26.7	28.3	26.9	28.0	26.3	28.5	26.9	16.1		
		K	32.5	57.6	61.4	83.0	105.4	116.7	110.1	114.1	109.1	115.1	110.0	69.6		
	Wheat	N	19.1	46.6	95.7	74.7	101.9	112.1	104.2	109.2	102.2	113.0	104.0	67.8		
		P	5.2	13.1	26.5	21.4	29.2	32.1	28.9	31.3	27.8	31.7	29.2	17.8		
		K	21.9	51.3	103.6	81.0	109.8	125.5	113.1	123.3	119.1	124.0	114.4	77.1		
SK Nagar	Pearlmillet	N	2.9	18.4	21.1	24.7	32.4	57.6	60.7	47.6	52.3	58.4	60.7	19.8		
		P	0.7	4.6	5.1	6.0	8.3	15.4	17.8	13.6	14.9	17.7	18.3	6.0		
		K	4.0	18.5	20.6	23.7	29.5	55.7	59.4	46.3	52.6	59.8	62.3	21.2		
	Wheat	N	2.1	16.9	23.7	30.6	51.5	84.7	76.5	77.1	69.4	77.3	72.9	33.8		
		P	0.4	3.0	4.2	5.9	10.1	15.6	14.1	14.7	13.9	14.7	13.5	7.1		
		K	2.9	18.1	28.0	33.6	51.6	71.7	70.7	70.2	62.4	71.2	68.3	45.6		
Junagadh	Pearlmillet with K	N	78.0	103.6	105.1	122.0	127.4	159.5	145.9	140.4	136.8	137.1	137.6	114.1		
		P	18.7	24.9	26.0	27.9	32.6	44.9	35.9	38.0	35.1	38.0	37.0	27.4		
		K	91.8	117.9	124.8	137.2	141.3	166.6	154.9	148.6	148.6	146.9	149.7	130.8		

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
	Wheat	N	44.4	53.9	59.3	62.4	67.6	83.2	76.4	72.6	74.2	74.2	75.6	57.5		
		P	7.3	8.6	11.3	10.6	13.2	19.6	14.0	16.2	14.6	16.2	16.8	10.1		
		K	57.1	70.5	79.8	81.7	86.8	101.7	91.7	87.9	89.7	90.1	92.9	79.2		
	without K															
	Pearlmillet	N	21.4	32.8	30.1	36.1	37.1	48.9	45.7	43.1	40.7	41.2	37.2	36.8		
		P	3.9	5.5	4.7	5.7	6.6	10.4	9.5	8.8	8.4	8.2	7.4	6.4		
		K	24.8	34.2	33.3	37.9	38.5	49.2	46.3	45.7	43.9	40.7	40.0	37.0		
	Wheat	N	29.2	35.3	45.6	45.2	50.3	67.6	63.4	52.4	52.6	59.2	54.0	45.3		
		P	4.9	5.5	8.4	6.8	8.8	13.1	11.7	9.4	9.7	11.3	8.7	6.8		
		K	32.7	49.9	56.5	57.9	60.9	73.4	69.6	63.1	66.3	63.1	68.4	55.2		
Navsari	Rice	N	33.2	38.2	42.2	42.7	49.4	56.7	55.5	52.1	53.4	58.1	60.2	45.7		
		P	6.9	9.3	10.7	8.9	10.2	12.6	14.5	11.8	10.6	11.0	10.9	9.1		
		K	48.1	62.8	66.2	67.3	75.6	81.5	82.5	76.1	77.7	80.2	81.0	68.6		
	Wheat	N	37.1	46.8	57.4	46.3	55.0	61.8	55.8	61.8	58.9	60.3	53.7	50.7		
		P	5.6	7.5	10.2	7.8	9.2	11.2	10.7	10.9	10.5	11.0	7.7	9.3		
		K	38.8	44.4	49.4	46.9	55.8	58.8	55.4	56.2	55.6	56.5	53.2	49.3		
kanpur	Rice	N	14.8	238.5	65.8	67.6	96.0	101.4	88.8	84.7	81.8	91.9	88.3	50.1		
		P	1.4	7.5	10.6	11.7	15.8	23.8	19.0	16.9	15.3	19.8	17.8	7.7		
		K	24.2	91.8	97.4	98.1	137.5	146.9	128.3	122.5	122.0	132.1	131.4	80.9		
	Wheat	N	12.6	71.8	89.8	85.5	123.6	128.4	116.8	113.1	109.9	119.4	115.2	64.5		
		P	1.3	10.1	13.1	11.6	18.8	20.8	17.2	15.5	14.2	18.3	16.6	8.4		
		K	10.7	61.6	72.2	69.0	96.6	102.8	89.6	87.0	82.9	88.7	88.4	52.6		
Faizabad	Rice	N	19.4	48.7	54.7	78.0	111.3	116.9	111.8	87.9	96.2	107.0	114.7	74.0		
		P	4.0	9.1	10.2	14.9	21.5	22.5	23.3	16.2	18.0	20.2	23.1	13.7		
		K	33.0	72.9	80.7	106.4	138.4	140.8	138.5	126.4	133.6	130.4	142.8	95.3		
	Wheat	N	10.2	39.2	66.0	51.7	79.3	86.9	71.2	77.0	61.6	87.7	72.3	45.9		
		P	2.1	7.3	11.6	8.8	15.6	17.5	13.8	15.1	11.5	16.7	13.5	8.5		
		K	15.1	47.0	75.5	59.3	86.5	96.7	81.2	92.1	75.3	94.6	78.2	49.7		
Palampur	Rice	N	46.7	64.8	67.9	56.5	75.0	92.1	88.4	71.1	67.5	77.8	63.8	88.7	6.7	
		P	14.7	21.8	22.8	20.2	26.4	30.9	28.5	23.2	23.0	25.6	22.7	29.7	3.3	
		K	35.2	46.3	48.7	47.5	60.4	66.1	62.0	51.8	50.1	55.5	52.8	65.6	9.9	
	Wheat	N	28.7	43.6	68.3	46.1	72.5	73.9	54.3	54.9	49.9	62.0	63.2	38.3	12.4	
		P	9.8	14.8	23.5	16.5	24.5	23.1	17.3	19.5	16.8	20.4	20.7	11.8	4.3	
		K	28.0	45.5	64.5	48.3	69.3	64.5	50.4	59.2	49.1	58.7	59.3	37.8	13.8	

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Kathalgere	Summer	N	53.4	77.4	139.9	125.4	155.7	158.8	174.8	193.4	171.3	153.7	142.6	95.0		
	Maize	P	15.8	22.9	33.8	27.4	41.6	37.8	34.7	41.1	42.8	38.0	32.5	21.0		
		K	43.4	54.9	93.6	87.9	102.6	106.9	107.8	115.8	120.1	105.9	98.6	53.2		
Jammu	Rice	N	31.3	65.1	66.4	72.3	83.2	85.7	79.4	73.4	72.9	76.7	73.7	56.2		
		P	5.8	14.4	15.1	19.1	22.5	23.2	19.8	18.1	19.1	20.8	19.2	12.7		
		K	39.8	88.4	123.6	130.8	146.2	156.8	139.1	142.1	144.6	134.5	135.0	86.9		
	Wheat	N	23.8	54.0	58.2	54.7	65.3	70.3	59.6	58.9	56.0	61.3	55.8	46.9		
		P	4.9	13.8	15.8	14.8	18.0	20.8	16.9	16.6	14.6	18.0	15.4	12.2		
		K	29.5	64.5	66.7	64.6	78.0	89.4	71.1	72.0	65.9	72.9	71.2	64.9		
Bhubneswar	Kharif Rice	N	43.0	58.7	60.3	59.7	69.2	74.0	72.7	61.3	62.0	79.3	71.5	54.8		
		P	11.6	15.9	17.3	17.4	20.9	22.7	22.5	18.7	18.7	24.7	21.9	15.2		
		K	48.9	67.2	68.9	70.4	78.5	86.3	84.8	73.4	71.7	91.9	83.6	62.5		
	Rabi Rice	N	29.1	39.2	64.6	61.7	68.7	77.3	71.9	70.2	66.9	82.6	72.1	55.8		
		P	8.6	13.0	20.2	20.9	23.0	27.2	25.2	24.6	23.2	31.1	25.6	18.4		
		K	32.6	52.2	84.8	81.8	90.0	106.1	94.8	92.4	89.0	114.7	93.9	77.1		
Chiplima	Kharif Rice	N	38.2	56.1	60.0	65.5	73.1	76.9	76.4	70.0	74.4	82.4	79.1	54.4		
		P	11.0	16.5	18.4	19.9	23.7	23.8	25.7	22.2	24.6	27.5	25.7	17.0		
		K	48.8	73.6	76.9	82.3	89.8	94.5	97.8	92.8	98.6	106.3	100.9	69.0		
	Rabi Rice	N	38.2	56.1	60.0	65.5	73.1	76.9	76.4	70.0	74.4	82.4	79.1	54.4		
		P	11.0	16.5	18.4	19.9	23.7	23.8	25.7	22.2	24.6	27.5	25.7	17.0		
		K	48.8	73.6	76.9	82.3	89.8	94.5	97.8	92.8	98.6	106.3	100.9	69.0		
Ludhiana	Rice	N	45.4	74.4	81.6	111.1	137.0	144.4	157.9	123.8	122.3	168.3	161.0	170.4	157.1	139.0
		P	6.9	13.1	17.2	20.0	23.4	23.4	30.8	20.9	20.0	31.3	25.8	32.1	28.0	23.9
		K	46.0	91.1	95.0	103.3	134.6	116.8	124.3	117.4	118.8	116.6	137.2	141.8	153.8	115.1
	Wheat	N	48.9	90.4	131.0	117.3	147.9	163.9	163.6	155.2	132.1	153.3	147.6	172.6	164.1	139.7
		P	11.2	20.5	24.5	21.5	18.1	36.1	29.4	31.2	26.0	39.3	30.5	30.2	29.3	21.4
		K	50.5	85.4	90.6	109.7	120.2	149.8	139.1	120.0	123.1	134.6	111.4	134.3	145.9	106.9
Rahuri	Sorghum	N	8.6	85.6	97.7	105.1	114.2	123.9	107.8	100.7	103.4	114.8	108.6	73.1		
		P	0.8	12.1	14.4	16.2	20.8	20.0	16.8	15.3	15.9	17.3	16.2	11.3		
		K	12.9	117.0	119.3	127.8	145.2	147.4	136.8	123.9	126.0	140.5	132.8	92.7		
	Wheat	N	12.9	61.1	75.1	73.5	84.6	93.3	81.5	82.0	75.4	82.5	76.2	56.6		
		P	2.6	14.3	16.1	15.8	19.2	21.0	18.0	17.9	16.4	16.9	16.8	12.7		
		K	12.7	47.9	61.2	60.6	70.2	74.3	65.2	64.2	59.1	65.0	60.2	46.3		

Contd..../-

Name of CSR Centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
Kalyani	Rice	N	25.3	50.8	70.8	55.2	71.0	101.0	68.5	92.1	74.2	88.9	77.6	57.1		
		P	7.2	12.7	18.7	16.6	18.7	27.5	18.5	24.1	18.0	25.5	15.6	14.9		
		K	25.4	31.8	50.8	62.1	73.0	86.8	58.5	84.3	65.3	82.7	53.6	43.9		
	Wheat	N	41.4	51.3	83.1	72.2	96.4	104.1	81.4	88.4	74.0	107.5	72.9	65.6		
		P	35.3	37.0	35.6	31.4	38.0	48.3	38.0	34.4	25.3	31.3	33.5	16.2		
		K	20.1	33.1	55.8	63.9	71.5	96.5	68.9	91.1	62.5	88.0	60.0	51.3		
Karamana	Kharif	N	65.8	110.3	109.9	115.5	130.1	146.3	148.1	140.1	132.6	135.8	120.9	117.6		
		P	16.7	34.5	37.3	34.0	36.4	45.6	41.8	39.6	46.3	43.8	41.6	40.1		
		K	72.9	114.1	100.7	99.6	116.7	159.3	151.0	133.1	164.5	134.8	118.3	130.6		
	Rabi	N	37.3	81.2	117.7	101.2	96.6	120.5	103.3	119.9	109.5	117.9	99.7	103.9		
		P	5.7	11.3	12.6	13.5	10.1	15.0	15.4	17.0	12.0	12.5	14.0	12.0		
		K	37.9	93.5	89.8	88.4	92.9	86.6	101.8	102.0	89.7	84.0	84.0	88.1		
Parbhani	Maize	N	16.0	47.5	49.6	55.1	88.0	94.1	87.8	76.1	72.6	69.4	55.7	20.5		
		P	2.6	8.5	9.1	10.1	16.4	19.0	17.0	14.2	12.4	13.5	10.2	3.5		
		K	12.7	38.0	40.3	45.0	72.5	77.4	66.6	59.5	58.9	54.6	43.8	15.8		
	Wheat	N	28.0	80.6	82.9	93.9	147.2	160.7	147.4	127.0	120.7	116.6	93.5	35.8		
		P	4.8	14.4	15.0	16.5	27.3	31.2	28.4	23.5	20.5	22.0	17.4	5.7		
		K	14.6	43.6	47.1	51.9	83.0	89.0	78.4	68.8	67.4	62.9	51.1	17.8		

Table E : Soil fertility Status (kg/ha) in Organic farming

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Rajendra nagar	Kharif	OC%	0.66	0.78	0.78	0.83	0.65	0.76	0.45	0.80
		N	192	206	206	213	190	204	164	208
		P	39.7	46.6	43.6	44.7	41.2	41.1	32.8	42.2
		K	564	628	429	531	548	560	331	598
	Rabi	OC%	0.55	0.63	0.63	0.61	0.60	0.60	0.53	0.65
		N	194	182	201	194	194	176	188	207
		P	38.7	38.3	28.0	37.4	35.3	41.3	31.8	45.3
		K	305	251	235	394	281	326	264	288
Maruteru	Kharif	OC%	1.16	1.3	1.21	1.26	1.14	1.22	1.06	1.26
		N	201	218	201	196	211	212	194	212
		P	56.1	50.1	49.6	47.5	59.6	58.1	47.1	56.1
		K	189	260	279	279	281	276	251	290
	Rabi	OC%	1.24	1.41	1.30	1.31	1.17	1.24	1.13	1.30
		N	210	226	218	209	210	216	206	228
		P	63.8	48.2	42.4	51.5	63.5	70.8	45.5	63. 8
		K	196	256	298	286	290	284	265	314
Rudrur	Kharif	OC%	0.53	0.62	0.69	0.78	0.71	0.76	0.48	0.56
		N	176	185	190	202	197	209	175	178
		P	32.4	39.7	39.7	42.8	34.4	39.1	36.7	41.8
		K	317	271	309	268	222	298	315	298
	Rabi	OC%	0.55	0.63	0.73	0.79	0.73	0.77	0.51	0.57
		N	125	183	190	196	202	210	170	171
		P	33.3	40.4	42.1	43.6	35.4	39.8	39.0	42.6
		K	326	276	328	273	228	303	334	303
Sabour	Summer	OC%	0.66	0.74	0.75	0.71	0.68	0.75	0.59	0.70
		N	199	203	200	206	207	215	182	201
		P	43.2	45.9	43.2	47.5	48.7	49.7	40.1	45.3
		K	162	166	165	170	166	169	137	165
Raipur	Rabi	OC%	0.56	0.53	0.55	0.52	0.50	0.54	0.53	
		N	245	233	250	229	233	237	265	
		P	21.1	20.0	20.5	18.6	17.2	19.1	23.5	
		K	262	248	251	248	242	256	294	
SK Nagar	Summer	OC%	0.34	0.35	0.32	0.30	0.31	0.30	0.28	0.32
		N	243	239	236	237	220	237	231	234
		P	33.6	32.5	32.8	32.5	38.1	34.7	33.0	34.2
		K	308	308	305	294	291	301	312	305
Junagadh	Rabi	OC%	0.96	0.94	0.88	0.96	0.89	0.85	0.69	0.93
		N	243	239	237	240	237	240	236	239
		P	26.3	26.6	26.0	23.0	24.6	22.7	20.2	19.0
		K	198	192	202	211	186	192	189	198

Contd..../-

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Navsari	Rabi	OC%	0.61	0.62	0.63	0.63	0.64	0.63	0.59	0.61
		N	232	239	245	242	232	245	236	242
		P	16.2	15.4	15.7	16.2	19.6	18.8	16.8	15.1
		K	215	203	190	199	203	199	207	195
Hisar	Kharif	OC%	0.46	0.45	0.46	0.46	0.45	0.47	0.48	0.46
		N	176	172	175	179	161	178	178	169
		P	15.6	15.2	14.8	14.0	14.4	15.6	17.6	16.0
		K	222	217	218	222	188	222	235	220
	Rabi	OC%	0.46	0.47	0.48	0.49	0.44	0.47	0.50	0.47
		N	162	151	154	155	148	157	161	153
		P	13.2	12.8	13.6	12.8	15.6	15.2	16.4	13.2
		K	220	215	220	218	210	228	233	220
Palampur	Kharif	OC%	3.08	2.67	3.05	2.6	3.14	2.72	0.94	2.7
		N	364	335	379	329	368	334	296	351
		P	316	228	267	211	284	242	123	211
		K	1163	987	1051	989	1032	1051	323	836
	Rabi	OC%	2.93	2.76	3.03	2.61	2.97	2.99	0.72	2.69
		N	360	319	393	359	361	329	286	374
		P	316	204	267	233	298	228	119	211
		K	1055	1032	1132	1108	1110	1054	300	906
	Summer	OC%	2.82	2.63	2.84	2.69	2.82	2.49	1.08	2.77
		N	364	319	362	339	366	339	399	327
		P	327	222	269	233	287	246	123	206
		K	1251	944	1032	995	1080	1029	339	853
Jammu	Summer	OC%	0.55	0.54	0.56	0.56	0.53	0.55	0.54	0.56
		N	224	210	197	200	215	232	211	208
		P	12.9	13.8	14.7	14.1	16.2	15.5	15.0	14.9
		K	116	122	118	120	110	117	116	113
Kathalagere	Summer	OC%	0.68	0.67	0.67	0.64	0.70	0.71	0.70	
		N	363	353	358	337	351	368	355	
		P	18.0	18.9	18.6	16.3	19.0	19.5	18.1	
		K	221	221	227	225	226	231	228	
Siruguppa	Kharif	OC%	0.78	0.95	0.84	0.91	0.84	0.80	0.71	0.89
		N	264	258	236	242	254	261	234	262
		P	32.0	35.0	28.0	28.0	33.0	35.0	29.0	34.0
		K	382	364	349	364	375	362	349	374
		S	35	31	37	33	32	34	30	32
	Rabi	OC%	0.84	1.02	0.9	0.97	0.84	0.86	0.68	1.02
		N	222	232	218	210	236	228	222	246
		P	28.0	24.0	26.0	20.0	29.0	29.0	25.0	28.0
		K	346	355	347	364	340	384	361	357
		S	32	37	33	34	28	35	29	34

Contd..../-

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Karamana	Summer	OC%	0.98	0.86	0.68	0.72	0.86	0.83	0.66	
		N	179	176	185	199	204	221	195	
		P	18.1	23.1	21.8	20.5	24.3	26.8	23.6	
		K	139	125	139	108	118	105	96	
Jabalpur	Rabi	OC%	0.68	0.68	0.68	0.68	0.69	0.68	0.66	0.68
		N	230	235	231	233	238	230	208	232
		P	9.2	8.9	8.7	8.6	9.5	9.2	9.0	8.8
		K	340	330	320	325	335	331	360	323
Rewa	Rabi	OC%	0.59	0.62	0.61	0.60	0.63	0.61	0.58	0.60
		N	225	238	335	230	240	238	240	233
		P	8.5	8.6	8.5	8.5	8.7	8.6	8.7	8.6
		K	290	295	290	295	300	298	310	290
Powarkheda	Rabi	OC%	0.70	0.71	0.70	0.69	0.70	0.71	0.67	0.69
		N	273	259	256	253	255	260	250	253
		P	9.6	9.8	9.6	9.7	9.8	9.7	9.7	9.8
		K	295	287	290	286	290	288	298	286
Rahuri	Kharif	OC%	0.67	0.69	0.69	0.69	0.65	0.69	0.65	0.51
		N	193	194	195	193	178	190	186	158
		P	17.0	15.0	14.0	15.0	13.0	17.0	15.0	8.0
		K	559	569	561	568	554	556	554	460
	Rabi	OC%	0.68	0.69	0.70	0.69	0.66	0.70	0.66	0.51
		N	196	197	199	197	182	193	189	157
		P	18.0	16.0	16.0	16.0	15.0	18.0	16.0	9.0
		K	562	571	562	571	557	560	558	464
Akola	Kharif	N	270	240	260	210	220	225	315	180
		P	19.9	22.5	21.0	21.1	20.9	19.9	24.9	19.4
		K	372	538	493	424	414	504	414	202
	Rabi	N	310	320	350	290	278	285	314	210
		P	22.1	23.7	14.8	16.1	18.0	21.1	27.0	12.2
		K	501	490	440	430	450	445	501	302
	Summer	N	265	238	256	209	216	223	300	175
		P	15.9	20.4	19.2	19.1	18.5	17.8	22.1	8.0
		K	365	525	475	420	402	420	400	198
Bhubaneswar	Summer	OC%	0.70	0.81	0.86	0.79	0.75	0.82	0.59	0.71
		N	289	321	345	312	303	329	257	285
		P	18.8	19.3	19.1	18.7	18.1	19.8	15.4	17.3
		K	170	182	177	174	168	190	145	169
Chiplima	Summer	OC%	0.78	0.84	0.90	0.85	0.81	0.84	0.67	0.80
		N	315	346	355	349	322	340	298	319
		P	10.4	11.2	10.8	10.6	10.1	11.0	8.1	10.2
		K	129	142	138	139	133	141	117	126

Contd..../-

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Ludhiana	Summer	OC%	0.52	0.61	0.60	0.58	0.56	0.52	0.42	0.52
		N	220	239	241	236	231	247	215	220
		P	28.5	30.8	28.9	32.6	35.6	31.8	27.6	28.5
		K	155	161	169	163	174	159	152	155
		Zn	1.48	1.54	1.46	1.42	1.48	1.4	1.38	1.26
		Cu	0.75	0.86	1.15	0.72	0.88	0.96	0.68	0.78
		Fe	20.02	22.8	26.4	22.8	20.9	30.8	26.5	32.8
		Mn	8.86	7.85	10.08	9.94	8.6	10.08	9.96	10.3
Faizabad	Summer	OC%	0.60	0.71	0.68	0.73	0.58	0.70	0.54	0.69
		N	178	172	176	182	163	170	189	174
		P	22.3	23.6	24.1	23.0	20.1	25.2	24.6	23.0
		K	272	266	276	271	261	274	284	270
Coimbatore	Summer	OC%	0.65	0.64	0.64	0.60	0.60	0.60	0.62	0.62
		N	290	292	286	274	256	270	273	285
		P	21.8	22.7	21.4	21.6	20.8	23.8	20.7	22.1
		K	466	478	458	435.0	412	418	422	442
Kanpur	Summer	OC%	0.40	0.52	0.60	0.58	0.55	0.58	0.59	0.48
		P	14.4	17.3	16.8	16.8	16.6	16.8	17.1	18.9
		K	125	134	131	130	130	131	130	136

Table F :Nutrient uptake (kg/ha) in Organic farming

Name of CSR centre	Season	Nut./ Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Rajendra nagar	Kharif	N	113.8	122.1	118.5+83.1	100.5	103.9	109.5	126.6	110.1
		P	38.9	45.5	44.5+6.9	43.1	35.5	38.9	46.9	44.1
		K	85.8	75.7	74.5+85.8	80.0	80.0	85.5	79.6	74.2
	Rabi	N	139.4	150.0	140.6+ 301.0	163.7	133.1	149.8	146.2	143.2
		P	32.1	42.3	36.9+36.4	30.8	29.2	26.0	36.9	35.7
		K	145.6	145.9	169.5+ 216.3	143.4	149.7	154.2	160.7	152.2
Rudrur	Kharif	N	174.9	147.6	94.1+5.2	130.6	127.8	140.3	166.9	147.5
		P	55.2	46.6	29.7 +1.0	47.7	50.9	55.8	71.1	62.9
		K	339.4	286.4	182.7+5.1	265.7	276.0	303.0	375.5	296.9
	Rabi	N	12.8	11.9	10.4	10.1	10.4	10.1	12.9	11.6
		P	1.9	1.9	1.7	1.5	1.5	1.5	2.0	1.7
		K	2.4	2.0	1.8	1.9	1.8	1.9	2.5	2.0
Maruteru	Kharif	N	98.0	82.7	76.1	84.0	77.0	82.7	93.8	82.8
		P	18.9	16.8	18.1	19.6	19.2	18.3	20.1	16.8
		K	81.7	81.9	80.3	78.0	81.3	86.0	85.2	77.9
	Rabi	N	83.9	72.4	67.1	77.5	64.7	72.7	79.5	66.8
		P	19.3	16.0	18.2	17.0	21.7	18.5	19.4	17.2
		K	71.6	76.5	77.4	75.5	68.8	76.5	72.5	71.0
S K Nagar	Rabi	N	154.5	141.7	136.2	140.3	93.7	151.5	166.1	147.6
		P	22.0	19.8	18.4	21.3	12.0	21.7	27.2	20.5
		K	153.8	143.0	138.8	139.3	94.7	150.6	163.3	149.1
	Summer	N	188.4	181.4	158.2	166.0	122.9	176.4	136.9	174.4
		P	21.0	20.6	16.0	16.5	11.9	18.1	12.1	18.6
		K	63.2	58.6	50.3	52.5	38.1	55.6	43.2	53.9
Junagadh	Kharif	N	113.3	97.1	95.1	106.0	90.3	105.1	100.6	93.4
		P	11.1	7.8	7.5	8.8	7.7	11.2	10.3	6.6
		K	40.0	34.5	33.0	37.3	30.6	36.6	36.1	32.5
	Rabi	N	151.4	127.2	132.2	133.5	147.0	135.4	130.3	131.7
		P	23.1	16.3	18.8	19.4	20.4	20.2	16.7	17.2
		K	70.4	60.5	60.8	61.7	67.2	62.6	59.9	60.9
Navsari	Kharif	N	41.0	32.9	33.3	30.4	27.9	40.2	35.8	34.3
		P	13.0	11.1	9.9	9.0	8.7	12.1	11.6	9.1
		K	62.7	55.4	54.3	52.3	48.5	67.3	58.3	58.8
	Summer	N	111.0	125.1	115.7	125.3	94.6	118.0	103.2	123.8
		P	13.5	14.0	14.7	14.0	10.5	14.3	9.7	12.1
		K	38.1	43.3	39.2	41.9	32.6	40.4	35.7	43.2
Bhubaneswar	Kharif	N	65.6	59.9	65.5	62.8	58.1	76.2	51.4	65.6
		P	19.7	17.0	21.3	21.4	18.1	25.0	15.3	19.7
		K	121.0	112.1	126.7	120.6	118.8	145.8	95.9	121.0
	Rabi	N	58.2	58.0	59.9	59.5	61.6	74.1	61.6	54.1
		P	12.5	11.4	11.7	12.1	11.5	17.0	12.9	11.1
		K	169.1	156.0	162.9	158.4	167.8	216.5	168.8	158.7

Contd..../-

Name of CSR centre	Season	Nut./ Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
	Summer	N	105.1	92.9	93.7	107.1	109.2	134.8	118.7	103.7
		P	21.7	18.6	19.7	20.7	22.8	28.3	23.3	19.7
		K	141.7	129.9	130.0	144.3	152.4	178.9	156.6	143.0
Chiplima	Kharif	N	71.2	65.6	71.1	72.7	69.1	76.0	67.1	65.0
		P	20.2	17.6	20.8	22.2	19.2	22.9	19.6	19.4
		K	83.6	76.4	83.7	86.3	84.3	90.4	80.6	78.6
	Rabi	N	47.6	44.3	43.9	46.9	44.7	52.1	52.9	50.0
		P	5.3	4.9	5.2	5.2	5.1	6.4	5.1	4.9
		K	83.2	81.4	82.2	87.3	83.1	92.3	86.3	81.3
	Summer	N	73.2	54.7	60.4	65.0	69.5	83.4	83.3	60.4
		P	15.6	11.8	13.3	13.3	14.8	18.1	16.7	12.1
		K	100.0	77.8	84.1	88.5	97.5	111.2	110.3	84.1
Sabour	Kharif	N	94.1	95.7	92.1	96.4	87.2	96.9	92.6	95.2
		P	28.2	28.7	27.6	28.9	26.1	29.0	27.7	28.5
		K	108.4	110.7	106.6	111.6	100.9	111.7	106.7	110.0
	Rabi	N	106.7	108.0	105.4	107.2	86.9	109.2	101.1	107.7
		P	44.4	44.9	43.8	44.6	36.2	45.4	42.1	44.8
		K	146.1	147.9	144.3	146.8	119.0	149.6	138.5	147.5
	Summer	N	51.1	52.0	104.5	52.5	42.1	52.9	47.4	51.4
		P	21.1	21.4	39.6	21.7	17.6	21.9	19.7	21.2
		K	74.1	75.4	120.2	73.6	59.4	74.2	66.6	71.8
Palampur	Kharif	N	84.3	31.2	51.7	54.7	66.6	29.1	67.5	30.5
		P	49.8	18.8	31.0	43.2	19.0	21.9	49.3	12.4
		K	190.3	109.1	118.9	174.1	121.7	64.2	148.4	73.0
	Rabi	N	78.7	59.6	49.2	47.0	48.3	57.4	48.9	52.8
		P	9.9	9.0	6.3	6.1	6.9	7.7	5.1	7.3
		K	48.5	42.1	27.6	25.9	29.7	42.9	27.6	29.1
	Summer	N	47.5	46.1	37.9	41.8	31.7	38.5	14.2	28.8
		P	18.8	18.2	13.6	13.6	12.5	13.7	2.3	9.9
		K	57.1	53.4	42.2	39.4	40.0	42.4	17.0	30.6
Ludhiana	Kharif	N	232.1	211.3	231.8	201.3	191.8	209.7	237.0	206.2
		P	44.6	45.7	48.1	37.0	32.6	43.9	41.0	41.6
		K	200.9	192.5	173.3	182.4	119.8	182.5	207.0	143.6
	Rabi	N	89.7	86.7	90.9	91.1	68.2	50.0	77.2	89.0
		P	6.8	5.7	6.2	6.1	6.9	4.1	5.4	6.9
		K	96.9	98.1	92.0	91.9	73.3	51.3	86.5	91.4
	Summer	N	60.7	74.9	90.8	64.0	72.4	77.6	84.2	88.8
		P	39.3	41.0	45.6	35.1	34.2	29.3	36.7	35.2
		K	82.0	71.4	85.6	82.0	67.5	82.9	75.4	78.4
Karamana	Kharif	N	105.4	107.0	120.7	93.0	104.6	97.8	106.2	
		P	63.0	57.2	57.3	57.8	67.3	56.1	62.4	
		K	161.7	164.8	177.7	111.4	148.9	144.6	111.0	

Contd..../-

Name of CSR centre	Season	Nut./ Treat.	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8
	Rabi	N	124.2	96.8	78.6	76.6	112.8	106.5	137.0	
		P	13.8	10.8	8.0	7.5	12.1	15.7	11.9	
		K	109.3	75.8	59.5	59.7	63.7	68.3	78.2	
Rahuri	Kharif	N	185.6	175.4	171.8	171.3	116.4	194.5	205.2	48.6
		P	28.5	27.4	26.5	27.8	18.9	30.8	33.0	8.1
		K	69.1	66.3	64.7	65.8	45.9	73.4	79.2	21.2
	Rabi	N	43.2	43.2	43.1	42.4	41.0	45.7	50.5	21.6
		P	15.3	16.0	15.7	16.5	15.9	16.0	18.3	8.0
		K	51.4	50.1	48.5	52.2	49.4	49.1	56.8	30.6
Kalyani	Kharif	N	58.5	41.9	80.5	67.4	53.0	37.2	37.8	51.3
		P	26.8	17.9	25.3	21.8	23.2	19.7	18.2	23.6
		K	188.9	132.4	116.4	195.2	216.1	120.3	144.4	167.7
	Rabi	N	219.2	150.2	80.1	177.7	115.0	172.1	423.7	104.3
		P	29.1	18.2	10.0	25.9	15.5	24.4	68.1	16.9
		K	293.9	185.1	76.7	198.8	125.5	191.6	487.6	122.2
	Summer	N	119.2	85.3	85.2	135.4	82.4	83.3	81.8	86.8
		P	26.6	10.2	10.9	16.8	10.3	10.6	25.5	10.4
		K	9.4	6.9	7.4	12.6	13.9	6.8	8.8	7.0
Kathalagere	Summer	N	138.8	129.0	126.3	122.4	124.4	187.9	176.8	
		P	13.8	15.8	14.0	14.0	15.1	19.6	16.7	
		K	75.6	64.7	72.0	69.6	66.6	72.4	68.3	
Coimbatore	Kharif	N	135.0	113.0	114.0	124.0	83.0	100.0	135.0	126.0
		P	45.0	39.0	41.0	40.0	33.0	38.0	42.0	38.0
		K	181.0	144.0	149.0	158.0	123.0	137.0	174.0	162.0
	Rabi	N	50.0	41.0	44.0	46.0	40.0	41.0	48.0	47.0
		P	14.0	11.0	13.0	13.0	11.0	11.0	14.0	13.0
		K	33.0	30.0	31.0	32.0	30.0	30.0	32.0	32.0
Thanjavur	Summer	N	345.0	303.0	319.0	318.0	267.0	322.0	356.0	327.0
		P	107.0	98.0	100.0	93.0	83.0	97.0	111.0	102.0
		K	233.0	204.0	216.0	214.0	180.0	217.0	241.0	221.0
Jabalpur	Rabi	N	171.0	143.0	138.0	139.0	146.0	136.0	190.0	138.0
		P	28.0	20.4	19.4	21.2	22.4	23.1	28.8	20.9
		K	208.0	187.0	192.0	182.0	192.0	202.0	241.0	201.0
Rewa	Rabi	N	169.0	117.0	144.0	135.0	129.0	122.0	179.0	151.0
		P	25.0	18.7	22.0	21.0	20.2	19.8	27.3	22.7
		K	201.0	148.0	181.0	175.0	150.0	148.0	213.0	185.0
Powarkheda	Rabi	N	179.0	112.0	139.0	152.0	119.0	116.0	204.0	136.0
		P	20.2	13.2	15.4	16.4	14.0	13.2	20.8	14.9
		K	180.0	127.0	165.0	166.0	129.0	120.0	214.0	133.0

Table: G Fertility status kg/ha of sustainable production management system

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5
Jabalpur	Rabi	OC%	0.63	0.68	0.63	0.62	
		N	267	288	265	263	
		P	9.5	10.5	9.5	9.6	
		K	320	360	330	280	
Sabour	Rice-Wheat	OC%	0.55	0.56	0.59	0.57	0.53
		N	220.8	216.7	246.4	226.7	215.9
		P	31.4	30.7	32.2	31.1	29.4
		K	192.9	185.5	216.8	219.9	181.6
Ludhaina	Rice-Wheat	OC%	0.46	0.58	0.55	0.48	0.42
		N	158.8	186.5	168.9	152.8	150.6
		P	25.8	28.8	25.8	24.5	22.6
		K	156.8	171.5	166.5	161.5	152.6
	Maize-wheat	OC%	0.45	0.52	0.58	0.5	0.54
		N	162.5	182.6	178.6	162.8	168.5
		P	30.1	33.8	32.6	30.8	29.6
		K	152.6	170.6	180.2	177.2	162.5

Table: H Nutrient uptake kg/ha of sustainable production management system

Name of CSR centre	Season	Nut./Treat.	T_1	T_2	T_3	T_4	T_5	T_6
Jabalpur	Rabi	N	170	187	199	200		
		P	19.81	22.38	20.52	22.62		
		K	167	208	204	210		
Sabour	Kharif	N	121.2	133.2	129.8	126.4	106.1	
		P	36.6	40	39.1	37.8	31.9	
		K	139.3	151.7	148.2	146.9	124.2	
	Rabi	N	109.8	111.1	118.2	114	87.3	
		P	31.1	32.1	34.7	32.4	24.5	
		K	115	115.5	120.4	116.9	90.8	

ANNEXURES

Annexure I

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Annexure-II

PRICES (RS./Q) & CALORIE PER 100 G FOR 2011-12*

Crops	Price (Rs./q) 2011-12	Cal./100 gm
All Fodders	110	16
All green manuring	220	16
Amaranthus	935	49
Arhar/Pigeonpea/Redgram	**3200#**	335
Ashwagandha	8800	45
Baby Corn	99paise/cob or 6600/q	125
Barley	**980**	336
Beetroot	1320	25
Berseem (seed)	8800	344
Bitter Gourd	1650	25
Blackgram/Urad	**3300#**	347
Bottle gourd (Lauki)	550	12
Brinjal	880	24
Broccoli	2200	45
Bt. cotton	3300	332
Buck Wheat	2750	346
Cabbage	550	27
Capcicum	1650	24
Carrot	550	48
Cassava	880	134
Castor	1815	440
Cauliflower	660	66
Chandrasur	1650	300
Chillies(green)	1650	29
Clusterbean	916	35
Coleus	1540	86
Coriander(S)	3300	288
Coriander(L)	990	49
Cotton(F-4/1180)	**2800**	332
Cotton (H-1380)	**3300**	332
Cowpea/Lobia(S)	1875	323
Cowpea (Veg.)pod	954	48
Cucumber	880	13
Cumin/SiyaZeera	3300	356
Dolichosbean(pod)/ LabLab	1650	48
EFY(Kalyani)	1320	79
Fennel garin	5000	31
Fennugreek (seed)	3300	333
Fennugreek leaves/spinach	990	49
Field bean	1787	48
Fieldpeas/Veg.peas	880	93
Frenchbeans	1787	26
Garlic	3080	145
Ginger	3300	67
Gram/Chickpea/ Bengalgram	**2800**	360
Greengram/Moong	**3500#**	334
Groundnut	**2700**	567
Guar	-	93
Horsegram	2310	321
Indian bean	1650	26

Crops	Price (Rs./q) 2011-12	Cal./100 gm
Isabgol	6545	124
Jute stalk**	**1675**	350
Kalongi	-	656
Kasni	1936	33
Knolkhol	550	43
Ladyfinger	990	35
Lentil /Masur	**2800**	343
Linseed	2783	530
Lucerne grain	15000	23
Maize(Grain)	**980**	342
Maize (green cobs)	0.73/cob or 253/q	125
Maize Sweet Corn	1100	342
Marigold	1650	4
Mentha	-	48
Methi	-	333
Mothbean	-	334
Rapeseed& Mustard	**2500**	541
Gobi sarson/Hayola	1650	541
Niger Seed	2695	515
Oat	990	374
Onion (big)	825	50
Pea	1980	315
Pea (veg.)	880	93
Pearlmillet/Bajra	**980**	361
Potato	363	97
Pumpkin	660	25
Radish (White)	275	17
Ragi/Fingermillet	**1050**	328
Rajgira	3300	319
Rajmash/Rajmah	1788	346
Rice(coarse)*	**1110**	346
Ricebean fodder	110	16
Ridge /Round gourd	1100	17
Safflower	**2500**	356
Sesamum/Gingely/ Til	**3400**	563
Sorghum/Jowar	**1000**	349
Soyabean (b)	**1650**	432
Soyabean (y)	**1690**	432
Sugar beat	440	48
Sugarcane	**145***	34
Summer Squash	880	16
Sunflower	**2800**	620
Rice Baspati	2178	346
Sweet Potato	726	120
Tomato (green)	770	23
Toria/Raya/Ridgeguard	**2425**	541
Turmeric	2200	349
Wheat	**1285**	346
White gingely	4400	563
Yam	1320	79
Yard long bean	1320	85

 # Additional incentive bonus of Rs. 500/q of tur, urad & moong sold to procurement agencies; * Fair and remunerative price; Prices in bold &yellow shade 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

S.N.	Common name	Botanical name	Hindi Name
30	Indian Mustard	*Brassica juncea Coss.*	Sarson/ Raya
31	Indian rape	*Brassica campestris* L. var. Toria	Toria
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

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