



वार्षिक प्रतिवेदन

Annual Report

2017-18



अखिल भारतीय समन्वित कृषि प्रणाली अनुसंधान परियोजना

AICRP on Integrated Farming Systems

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



ICAR-IFFSR

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

Vision

Management of natural resources for holistic improvement of Small and marginal farmers through integrated Farming Systems.

Mission

Improve food, nutrition, livelihood and financial security of small and marginal households through climate smart integrated farming systems (to make marginal and small households as bountifull)

Mandate

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

All India Coordinated Research project on Integrated Farming Systems (AICRP on IFS) is an integral part of ICAR-IIFSR with 75 centres to undertake on-station main (25 no's), on station sub (12 no's), on station voluntary (6 no's) and on -farm research (32 no's) spread across length and breadth of the country. The institute is also leading a Network Project on Organic Farming (NPOF) with 20 centres.

**ALL INDIA CO - ORDINATED RESEARCH PROJECT ON
INTEGRATED FARMING SYSTEMS**

**Annual Report
2017-18**



ICAR-Indian Institute of 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 associated scientists and technical staff of 75 AICRP-IFS centers (data generation), ICAR-IASRI New Delhi (statistical analysis) and ICAR-IIFSR. Modipuram (report writing, compilation, editing and printing).
- The report is based in experimental data generated during kharif, rabi and summer seasons of 2016-17 (period ending June 2017), under 'on-station' and 'on-farm' research programmes of AICRP on Integrated Farming Systems. The other details are relevant to 31st March 2017.
- The report includes both processed and semi-processed data, generated in different sub-objects under AICRP on Integrated Farming Systems, and as such no material/data should be reproduced in any form without prior written permission of the Director, ICAR-Indian Institute of Farming Systems Research and due credit to the concerned scientists.

AKNOWLEDGEMENT

All India Co-ordinated Research Project on Integrated Farming Systems (AICRP-IFS) initiated in 2010-11 is operating with 25 main, 12 sub, 6 voluntary (ICAR Institute) and 32 On-Farm research centres in 25 States/Union territories. The results of experiments conducted during 2016 -17 by all the co-operating centres are processed and compiled in the annual report 2017-18. I take this opportunity to record my sincere thanks to Dr. Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi for his constant and critical review and comments. I extend my gratitude to Dr. K. Alagusundaram, Acting Deputy Director General (Natural Resource Management) for his continuous unflinching support extended to the scheme. The time to time guidance received from Dr. S. Bhaskar, Assistant Director General (Agronomy, Agroforestry and Climate Change) for improving the activities of the scheme is duly acknowledged. Scientific inputs received from Quinquennial Review Team (QRT) of 2012-17 period, Research Advisory Committee (RAC) and Institute Management Committee (IMC) are thankfully acknowledged as those inputs provided immense help in taking new initiatives and shaping the activities for practical utility. I am highly thankful to each and every one of the Scientists, Technical staff and Research fellows involved in the scheme at all the centres for their meticulous effort to conduct a field experiments, lab analysis and generating data. The sincere efforts put forth by Dr. N. Ravisankar, Principal Scientist and Program Facilitator (Coordination Unit) deserves appreciation for compilation of the report. I also extend my appreciation to Dr. A. K. Prusty, Senior Scientist, Dr. M. Shamim, Scientist, Dr. Raghuveer Singh, Scientist, Mr. Dhananjay Tripathi, Chief Technical Officer, Dr. Brij Mohan Garg, Chief Technical Officer and Mrs. Jailata Sharma for their contribution in compilation of the data, statistical analysis, drafting and proof corrections and budget allotments. The contribution of Scientist and technical staff associated from ICAR-Indian Agricultural Statistics Research Institute, New Delhi in data analysis of on-station and on-farm experiments are also acknowledged. The contributions of all the other Scientific, Technical, Administrative and Skilled Supporting staff either directly or indirectly at various levels during preparation of the report is recognized. I am sure, the significant findings and achievements obtained from the experiments of cropping and farming systems and its validation in the farmers field especially impact study of on-farm farming system interventions will be highly useful for the planners and other stake holders to improve the sustainability in agriculture.



(A.S. Panwar)
Director

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एकीकृत कृषि प्रणाली पर अखिल भारतीय समन्वित अनुसंधान परियोजना (ए.आई.सी.आर.पी.) 25 मुख्य केन्द्रों 12 उपकेन्द्रों, 32 फार्म प्रक्षेत्र अनुसंधान (ओ.एफ.आर.) एवं 6 आई.सी.ए.आर. आधारित केन्द्रों द्वारा देश के 25 राज्यों/केन्द्र शासित प्रदेशों में संचालित होती है तथा यह सभी 15 कृषि जलवायु क्षेत्रों को सम्मिलित करती है। ऑन-स्टेशन एवं ऑन फार्म पर 2017-18 में किए गए अनुसंधान कार्यक्रम की प्रमुख उपलब्धियाँ निम्न हैं:

देश के विभिन्न क्षेत्रों के लिए एकीकृत कृषि प्रणाली मॉडल

- **पश्चिमी हिमालय क्षेत्र :** पश्चिमी हिमालय क्षेत्र में तीन एकीकृत कृषि प्रणाली का विकास छत्ता (जम्मू) पालमपुर एवं पंतनगर में फसल चक्र के साथ उद्याननिकी, पशुपालन, मछली पालन एवं मुर्गी पालन के समावेश द्वारा किया गया, जिसमें प्रतिवर्ष उत्पादन (चावल समतुल्य उपज टन/हेक्टेयर) 24.05 से 30.02 टन/हे. एवं औसत शुद्ध लाभ रुपए 2.12 से 2.21 (लाख में) प्राप्त हुआ।
- **पूर्वी हिमालय क्षेत्र :** इस क्षेत्र में उमियम एवं जोरहाट केंद्र में फसल प्रणाली, बागवानी, मुर्गी पालन, पशुपालन मत्स्य, पालन एवं मधुमक्खी पालन मुख्य घटक के रूप में लिया गया एवं औसत शुद्ध लाभ 1.92 से 2.30 लाख प्रति हेक्टेयर प्राप्त हुआ।
- **गंगा के आसपास के मैदानी क्षेत्र :** हिसार एवं लुधियाना ने एक-एक कृषि प्रणाली मॉडल विकसित किए हैं, कृषि प्रणाली घटक के रूप में फसल, बागवानी, पशुपालन, मशरूम, कृमि खाद एवं कृषि वानिकी को लिया गया, जिसमें प्रतिवर्ष चावल समतुल्य उपज 27.7 से 49.7 टन प्रति हेक्टेयर एवं शुद्ध औसत आय 2.21 से 2.93 लाख प्रति हेक्टेयर प्राप्त हुई
- **गंगा के ऊपरी मैदानी क्षेत्र :** इस जलवायु क्षेत्र में मोदीपुरम एवं कानपुर में फसल के साथ-साथ बागवानी, डेयरी, कृमि खाद एवं मशरूम का

समायोजन करके औसत शुद्ध लाभ 1.38 से 1.8 लाख प्रति हेक्टेयर तक प्राप्त किया गया।

- **गंगा का मध्य मैदानी क्षेत्र :** वाराणसी एवं पटना में फसल प्रणाली के साथ-साथ डेयरी, बागवानी, मत्स्य पालन, मुर्गी पालन, कृमि खाद, मशरूम एवं बत्तख मुख्य घटक के रूप में अपनाए गये, जिसके फलस्वरूप औसत शुद्ध आय 1.56 से 3.64 लाख प्रति वर्ष प्राप्त हुई।
- **गंगा का निचला मैदानी क्षेत्र :** पश्चिम बंगाल में कल्याणी में फसल प्रणाली के साथ डेयरी, बागवानी, मत्स्य पालन एवं कृमि खाद के प्रयोग से 14.4 टन/हे. चावल समतुल्य उत्पादन एवं औसत शुद्ध आय 1.09 लाख प्राप्त हुई।
- **पूर्वी पठार एवं पहाड़ियां :** रायपुर एवं रांची केंद्र में फसल चक्र के साथ-साथ बागवानी, मत्स्य पालन, मुर्गी पालन, कृमि खाद, बायोगैस, मशरूम एवं बकरी पालन द्वारा औसत शुद्ध लाभ 0.93 से 1.40 लाख प्राप्त हुआ
- **केंद्रीय पठार एवं पहाड़ियां :** इस जलवायु क्षेत्र में जबलपुर केंद्र पर फसल प्रणाली के साथ-साथ डेयरी, उद्यान मुर्गी एवं मछली पालन को कृषि प्रणाली मॉडल में समायोजित किया गया और शुद्ध लाभ 88000 प्रति हेक्टेयर प्राप्त हुआ एवं लागत में (17 प्रतिशत) कटौती पूनः चक्रण (रीसाइक्लिंग) से प्राप्त की गई।
- **पश्चिमी पठार और पहाड़ियां :** इस क्षेत्र में अकोला, परभणी एवं राहुरी केंद्र ने तीन कृषि प्रणाली मॉडल विकसित किए हैं मुख्य घटक के रूप में फसल प्रणाली के साथ बागवानी, मुर्गी पालन, डेयरी, कृमि खाद एवं मशरूम लिया गया और 14.7 से 28.6 टन प्रति हेक्टेयर चावल समतुल्य उपज प्राप्त हुआ एवं औसत शुद्ध आय 0.66 से 2.25 लाख प्रति हेक्टेयर प्राप्त हुई।

- **दक्षिण पठार एवं पहाड़िया :** इस जलवायु क्षेत्र में चार कृषि प्रणाली मॉडल विकसित किए गए जिनमें मुख्य घटक के रूप में फसल, उद्यान, डेयरी, बकरी, कृमि खाद सीमा वृक्षारोपण एवं अजोला का समावेश किया गया और शुद्ध लाभ 0.97 से 2.41 लाख प्रति हेक्टेयर प्राप्त हुआ एवं चावल समतुल्य उत्पादन 14.4 से 27.2 टन लाख प्रति हेक्टेयर प्राप्त हुआ।
- **पूर्वी तटीय मैदान एवं पहाड़ियां :** भुवनेश्वर एवं तंजावर केंद्र पर फसल प्रणाली के साथ-साथ बागवानी, मत्स्य पालन, डेयरी, मुर्गी पालन, कृमि खाद, मशरूम, बायोगैस एवं मधुमक्खी पालन को मुख्य घटक के रूप में लिया गया जिससे 25.4 से 29.0 टन प्रति हेक्टेयर चावल समतुल्य उत्पादन एवं शुद्ध आय 1.38 से 1.58 लाख प्रति हेक्टेयर प्राप्त हुई।
- **पश्चिमी तटीय मैदान एवं पहाड़ियां :** इस जलवायु क्षेत्र में 7 कृषि प्रणाली मॉडल विकसित किए गए हैं फसल, डेयरी, उद्यान, मुर्गी पालन, प्लांटेशन क्राप एवं सुअर पालन मुख्य घटक के रूप में समावेश किया गया, 11.0 से 24 टन चावल समतुल्य उत्पादन एवं शुद्ध औसत लाभ 0.65 से 2.5 लाख प्रति हेक्टेयर प्राप्त हुई।
- **गुजरात के मैदान एवं पहाड़ियां :** इस जलवायु क्षेत्र में फसल प्रणाली, डेयरी, बागवानी, कृमि खाद, फल, सब्जी एवं सीमा सीमारोपण का समायोजन करके शुद्ध लाभ 2.39 लाख प्रति हेक्टेयर प्राप्त हुई।
- **पश्चिमी शुष्क प्रदेश :** राजस्थान की कृषि फसल एवं पशुपालन आधारित है जिसमें बागवानी, कृमि खाद एवं अजोला जैसे घटक का समायोजन कर के शुद्ध लाभ 2.39 लाख प्रति हेक्टेयर तक प्राप्त किया जा सकता है।
- **दीप :** अंडमान निकोबार दीप समूह में वृक्षारोपण

की फसलें नारियल मसाले लौंग, जायफल, पाइनएप्पल, शकरकंद, सूअर पालन, मछली पालन, मुर्गी पालन, अजोला एवं कृमि खाद का समायोजन करके 36.0 टन चावल समतुल्य उत्पादन के साथ 2.2 लाख प्रति हेक्टेयर शुद्ध आय प्राप्त हुई।

फसल प्रणाली प्रबंधन

फसल चक्र विविधीकरण/गहनता

- **शुष्क जलवायु क्षेत्र :** हिसार, एस.के. नगर एवं सिरुगुप्पा में विभिन्न फसल चक्र निरक्षण किया गया एवं पाया गया कि उपरोक्त जलवायु क्षेत्र में क्रमशः ग्वार-ब्रोकली - प्याज; बी.टी. कॉटन + अरण्डी - गेहूं + रिजका - मूंग एवं धान-मेथी-मूंग की उपज अन्य फसल प्रणाली से उत्तम पाई गई एवं शुद्ध लाभ 1.42 से 4.22 लाख प्रति हेक्टेयर प्राप्त हुआ।
- **अर्ध शुष्क परिस्थितिकी तंत्र :** इस जलवायु क्षेत्र के अंतर्गत बिचपुरी, जूनागढ़, कोयंबटूर, इंदौर, राहुरी, राजेंद्र नगर, परभणी, कानपुर, कोटा एवं लुधियाना में विभिन्न तरह की फसल चक्रों का निरक्षण किया गया एवं पाया गया कि उपरोक्त जलवायु क्षेत्र में क्रमशः ज्वार-जई-लोबिया (चारा); मिर्ची - ढेंचा; सोयाबीन + मक्का - गेहूं + मूंग-मटर; मूंगफली-प्याज-ज्वार; सोयाबीन-प्याज; बी.टी. कॉटन - मूंग - मक्का; कोटन + सोयाबीन-कोटन-चौलाई + मूंग; मक्का + उड़द - आलू - प्याज; ज्वार - करेला एवं ज्वार + लोबिया - गेहूं + गोभी सरसो वैकल्पिक फसल चक्र के रूप में अपनाकर अधिक लाभ प्राप्त किया जा सकता है।
- **उप पारिस्थितिकी तंत्र :** इस जलवायु क्षेत्र में फैजाबाद, पंतनगर, साबोर, रांची, जबलपुर, पावरखेड़ा, कैथलगैरा, रायपुर और चिपलीमा में विभिन्न तरह की फसल चक्रों का निरक्षण किया गया एवं पाया गया कि उपरोक्त जलवायु क्षेत्र में क्रमशः धान - चना - मक्का + लोबिया; मक्का + लोबिया - मटर + तोरिया-मूंगफली + मेंथा; धान - फूलगोभी + धनिया-तिल;

धान – आलू + गेहूँ – मूंग; बासमती चावल – गेंदा – ज्वार; धान – चना – लोबिया; धान – लहसुन; सोयाबीन – मटर – प्याज; धान – मक्का + धनिया – लोबिया + चौलाई एवं धान – पालक फसल चक्र के रूप में अपना कर शुद्ध औसत लाभ अन्य फसल चक्र की तुलना में अधिक प्राप्त किया जा सकता है।

- **आर्द्र पारिस्थितिकी तंत्र :** जोहराट, पालनपुर एवं छता में धान – जई – लोबिया, सेलस – मटर + धनिया एवं बासमती धान – जई, अन्य फसल चक्रों की तुलना में अधिक उत्पादन एवं शुद्ध आय एवं उच्च कैलोरी प्राप्त किया जा सकता है।
- **तटीय पारिस्थितिकी तंत्र :** धान – मक्का + कोसला – लोबिया + एमरैन्थस भुवनेश्वर में, धान – सोयाबीन मारुटेरू में, धान – मेथी – अरण्ड नवसारी में, धान – धान – कुकुंबर करमना में, धान – भिंडी तंजावुर में एवं धान – बैंगन करजट में अन्य फसल चक्र की तुलना में उच्च शुद्ध औसत लाभ एवं कैलोरी प्रदान करती है।

जैविक खेती संकुल विकास

- धान आधारित फसल चक्रों में छता एवं जोरहाट केंद्रों पर धान की अधिकतम उपज (क्रमशः 2.74 टन/हे. एवं 3.71 टन/हे.) जैविक उर्वरक द्वारा पोषक तत्वों की 100 प्रतिशत आपूर्ति के साथ अन्तःफसल लेने से प्राप्त हुई, जबकि कल्याणी एवं रीवा केंद्रों पर धान की अधिकतम उपज (क्रमशः 1.97 टन/हे. एवं 3.60 टन/हे.) क्रमशः उपचार 50 प्रतिशत एन.पी.के. की संस्तुत मात्रा + 50 प्रतिशत नाइट्रोजन की मात्रा, गोबर की खाद द्वारा देने के साथ-साथ, जिंक एवं गंधक की मात्रा मिट्टी की जांच के आधार पर (टी-1) आपूर्ति किये जाने से प्राप्त हुई। जबकि रिवा केंद्र पर एन.पी.के. को 100 प्रतिशत मात्रा के साथ-साथ जिंक एवं गंधक की मृदा जांच आधारित आपूर्ति (टी-7) के द्वारा प्राप्त की गई। इसके अतिरिक्त कुमारगंज केंद्र पर धान (3.25 टन/हे.), सरसों (4.29 टन/हे.) एवं मूंग (2.29 टन/हे.) फसल क्रम के अंतर्गत तीनों फसलों की अधिकतम उपज 100 प्रतिशत पोषक तत्वों की

आपूर्ति जैविक श्रोतो द्वारा किये जाने वाले उपचार (टी-4) के अंतर्गत प्राप्त की गई।

- मक्का आधारित फसल चक्र में लुधियाना केंद्र पर मक्का (5.76 टन/हे.), आलू (23.85 टन/हे.) एवं प्याज (23.14 टन/हे.) की अधिकतम उपज, एन.पी.के. की 50 प्रतिशत संस्तुत मात्रा उर्वरकों द्वारा आपूर्ति के साथ नाइट्रोजन की 50 प्रतिशत मात्रा गोबर की खाद द्वारा दिए जाने के साथ-साथ जिंक एवं गंधक को मृदा जांच के आधार पर दिए जाने वाले उपचार (टी-1) के अंतर्गत प्राप्त की गई।

फार्म प्रक्षेत्र अनुसंधान

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

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

- विभिन्न एन. ए. आर पी. क्षेत्रों एवं फसल प्रणालियों में सिफारिश की गई पोषक तत्वों की तुलना में किसानों द्वारा 26, 23, 73 एवं 100 प्रतिशत कम नाइट्रोजन, फास्फोरस, पोटैश एवं सूक्ष्म तत्वों के उपयोग में लिए जाने से किसानों को उपज कम मिलती है।
- फार्म प्रक्षेत्र पर विभिन्न फसलों/फसल प्रणाली में सिफारिश की गई नाइट्रोजन, फास्फोरस, पोटैश तथा सूक्ष्म तत्वों की मात्रा की तुलना में किसान द्वारा कम मात्रा में पोषक तत्वों के उपयोग में लेने के कारण धान-धान, धान-गेहूँ, मक्का-गेहूँ एवं धान-मूंग फसल प्रणाली में क्रमशः 1572, 2714, 2237 और 1403 किग्रा./हे. उपज में अंतर पाया गया।
- मृदा परक्षण के आधार पर भूमि में सूक्ष्म तत्वों की मात्रा उपयोग में लेने के परिणाम स्वरूप धान-धान धान-गेहूँ, मक्का-गेहूँ और धान-मूंग फसल प्रणाली क्रमशः 821, 395, 397 एवं 352 कि./हे. अतिरिक्त अधिक उपज प्राप्त की गई।
- सभी एन. ए. आर पी. क्षेत्रों एवं फसल प्रणाली में सिफारिश की पोषक तत्वों नाइट्रोजन, फास्फोरस,

पोटाश या नाइट्रोजन, फास्फोरस, पोटाश + सूक्ष्म पोषक तत्वों की मात्रा देने से उपज भी अधिक होती है और पोषक तत्वों के उपयोग की दक्षता भी अधिक होती है। पोषक तत्व विशेषतः नाइट्रोजन की मात्रा एवं संख्या के कम अनुप्रयोग के कारण फसलों की उपज में कमी के साथ-साथ पोषक तत्वों की उपयोग की दक्षता में भी कमी पाई गई।

प्रयोग-2 : मौजूदा कृषि प्रणालियों का विविधीकरण।

सभी स्थानों के परिणाम नीचे संक्षेप में दिए गए हैं:

- विभिन्न जिलों, राज्यों में अध्ययनरत सभी कृषि प्रणालियों द्वारा बेंचमार्क आंकड़ों के आधार पर वर्ष 2013-14 में मात्र 0.76 हे. भूमि से औसत शुद्ध आय रु. 84,882/वर्ष पाई गई।
- तीन वर्ष के वांछित बदलाव अवधि (2013-14, 2014-15 और 2015-16) में क्रान्तिक बाधाओं को भौतिक एवं तकनीकी निविष्ट द्वारा दूर किए जाने के उपरांत 0.76 हे. भूमि से औसत शुद्ध आय रु. 1,32,669/वर्ष दर्ज की गई। क्रान्तिक बाधाओं पर निविष्ट की लागत रु. 7,892 दर्ज की गई।
- वांछित बदलाव अवधि के उपरांत (वर्ष 2016-17) बगैर भौतिक एवं तकनीकी निविष्ट के 0.76 हे. भूमि से रु. 1,67,613 की औसत शुद्ध आय दर्ज की गई जो कि वांछित बदलाव अवधि से 21 प्रतिशत अधिक है। इसलिए, अध्ययन से स्पष्ट रूप से निष्कर्ष निकाला जा सकता है कि किसानों द्वारा निविष्ट अवधि के पश्चात भी निविष्ट को जारी रखा गया है।
- चार वर्षों की अवधि (प्रभाव अध्ययन अवधि सहित) के अपरान्त सभी जिलों एवं राज्यों से औसत आय बेंचमार्क आय से 1.93 गुना अधिक पाई गई। रुपये 7,892 मात्र की अतिरिक्त लागत से औसतन रु. 50,985 की अतिरिक्त आय दर्ज की गई। इस प्रकार कृषि प्रणालियों के परिपेक्ष्य में, क्रान्तिक बाधाओं आधारित निविष्ट पर निवेश प्रति फल 7.38 पाया गया।
- उपरोक्त तथ्यों के आधार पर यह निष्कर्ष निकाला जा सकता है कि सीमान्त कृषक परिवारों की विभिन्न कृषि प्रणालियों में क्रान्तिक बाधा आधारित उपयुक्त निविष्ट और विविधीकरण से 4 वर्षों की अवधि के दौरान

किसानों की आय को दोगुना किया जा सकता है।

प्रयोग-3 : फार्म परीक्षण कृषि प्रणाली मॉडल्यू का मुल्यांकन।

सभी स्थानों के परिणाम नीचे संक्षेप में दिए गए हैं:

- विभिन्न जिलों, राज्यों में अध्ययनरत सभी कृषि प्रणालियों द्वारा बेंचमार्क आंकड़ों के आधार पर वर्ष 2011-12 में 0.96 हे. भूमि से औसतन शुद्ध आय रु. 62,550/वर्ष दर्ज की गई।
- तीन वर्ष के वांछित बदलाव अवधि (2013-14, 2014-15 और 2015-16) में क्रान्तिक बाधाओं को भौतिक एवं तकनीकी निविष्ट द्वारा दूर किए जाने के उपरांत 0.96 हे. भूमि से शुद्ध आय रु. 1,14,039/वर्ष दर्ज की गई। क्रान्तिक बाधाओं पर निविष्ट की लागत रु. 10,590 दर्ज की गई।
- वांछित बदलाव अवधि के उपरांत (वर्ष 2016-17) बगैर भौतिक एवं तकनीकी निविष्ट के 0.96 हे. भूमि से रु. 1,29,202 की शुद्ध आय दर्ज की गई जो कि वांछित बदलाव अवधि से 12.63 प्रतिशत अधिक है। इसलिए, अध्ययन से स्पष्ट रूप से निष्कर्ष निकाला जा सकता है कि कुछ स्थान जहां निविष्ट की उपलब्धता की कमी है को छोड़कर, बाकी सभी स्थानों पर सीमान्त एवं छोटे कृषकों द्वारा निविष्ट अवधि के पश्चात भी निविष्ट को जारी रखा गया है।
- चार वर्षों की अवधि (प्रभाव अध्ययन अवधि सहित) के अपरान्त सभी जिलों एवं राज्यों से औसत आय बेंचमार्क आय से 2.11 गुना अधिक पाई गई। रुपये 10,590 मात्र की अतिरिक्त लागत से औसतन रु. 55,235 की अतिरिक्त आय दर्ज की गई। इस प्रकार कृषि प्रणालियों के परिपेक्ष्य में, क्रान्तिक बाधाओं आधारित निविष्ट पर निवेश प्रति फल 7.08 पाया गया।
- उपरोक्त तथ्यों के आधार पर यह निष्कर्ष निकाला जा सकता है कि सीमान्त एवं छोटे कृषक परिवारों की कृषि प्रणालियों के समग्र दृष्टिकोण का उपयोग कर क्रान्तिक बाधाओं आधारित निविष्ट द्वारा 4 वर्षों की अवधि के दौरान किसानों की आय को दोगुना किया जा सकता है।

1. INTRODUCTION

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

- i* To study crop responses to nitrogen, phosphorus and potassium when applied separately and in different combinations under the cultivators field conditions.
- ii* To investigate the relative response of different fertilizers in various soil groups and to work out the optimum fertilizer combinations for different Agro climatic regions.
- iii* To study the relative performance of different nitrogen and phosphatic fertilizers for indigenous production.
- iv* To demonstrate to the farmers the value of fertilizers use for the production of crops.

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

- i* To study the interaction of amounts of fertilizer application with intensity and frequency of irrigation, sowing date and plant density.
- ii* To work out the manure requirement of important crop rotations, and their effect on soil fertility.
- iii* To evaluate the relative efficiency of various sources of nitrogen and phosphorus for different crops and areas, and of different methods of application of nitrogenous and phosphatic fertilizers.

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

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

- i* To obtain information of the response of high yielding varieties of cereal to different economic factors such as fertilizers (including micronutrients), irrigation, weed control, liming etc.
- ii* To study the manure requirements of important crop rotation and their effect on soil fertility.
- iii* To evaluate various sources of Nitrogen and phosphorus for different crops and areas.
- iv* To work out the production potential per unit area per unit time for different Agro climatic condition of the country and.
- v* To determine the most suitable cropping patterns and fertilizer responses under rainfed condition.

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

- i* To study the responses of introduced high yielding and locally improved varieties to nitrogen and phosphorus applied alone in the combination and to potassium in the presence of nitrogen and phosphorus under irrigated as well as dry and 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 soil and agro climatic regions of the country.

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

- i.* To develop, continuously update and test on cultivators' fields the technology for various

crop based farming systems. For this patterns best suited for different agro-climatic zones may be identified, evolved for various emerging farming situations and package of practices developed to realize their production potential.

- ii.* To define/delineate all aspects of the use of fertilizers (recognizing that fertilizer is an important component of modern agricultural technology), including choice of materials maximize its use through recycling of agricultural wastes or employment of microbial aids,
- iii.* To provide facilities for testing new varieties at their pre-release stage, In mid-eighties, the policy planners duly recognized the importance of cropping systems approach of research to enhance resource use efficiencies for improved and sustainable crop productivity. Therefore, to strengthen all aspects of cropping systems research the 'Project Directorate for Cropping Systems Research' was established at Modipuram (Meerut) with effect from March 1989, with 'AICRP on Cropping Systems' as one of the constituent schemes of the Directorate with both the components, namely; 'On- Station Research' and 'On – Farm Research' remaining intact. However, within two decades of existence of PDCSR, the mandate of the Directorate was broadened during 2009-10 to undertake research in integrated farming system mode and the Directorate was renamed as 'Project Directorate for Farming Systems Research (PDFSR)' and mandate redefined as:

- i.* To characterize existing farming systems to know the productivity, viability and constraints.
- ii.* To develop resource efficient, economically viable and sustainable integrated farming system modules and models for different farming situations.

- iii. To undertake basic and strategic research on production technologies for improving agricultural resource use efficiencies in farming system mode.
- iv. To develop and standardize package of production practices for emerging cropping/ farming concepts and evaluate their long-term sustainability.
- v. To act as repository of information on all aspects of farming systems by creating appropriate databases.
- vi. To develop on-farm agro-processing and value addition techniques to enhance farm income and quality of finished products.
- vii. To undertake on-farm testing, verification and refinement of system based farm production technologies.
- viii. To develop capacity building of stakeholders in integrated Farming Systems through training.

The name and mandate of AICRP on Cropping Systems were also changed accordingly, with major emphasis on farming systems research and objectives modified as hereunder. The Project

Directorate for Farming Systems Research was renamed as ICAR-Indian Institute of Farming Systems Research (IIFSR) during November 2014 and the mandate was redefined further as given below.

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

All India Coordinated Research project on Integrated Farming Systems (AICRP on IFS) is an integral part of IIFSR with 75 centres to undertake on-station and on-farm research across length and breadth of the country. The institute is also leading a Network Project on Organic Farming (NPOF) with 20 centres.

2. OBJECTIVES

On-Station Research

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

On-Farm Research

- To undertake characterization of existing farming systems for identification of production constraints and problem prioritization.
- To undertake on-farm testing and refinement of system-based farm production technologies.
- To optimize on-farm integration of farm enterprises for enhanced farm incomes, resource / input use efficiencies, and employment opportunities.

3. LOCATION

Under the aegis of AICRP –IFS there are 25 main 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 centres (earlier known as Experiments on Cultivators' Field /ECF centres)

are engaged in farmers participatory research and are located in different agro climatic zones. These OFR centres remain shifted from one zone /farming situation to another, every 4-5 years. The voluntary centres are situated in ICAR institutes and are taking up only IFS model development activity. The location of different AICRP- IFS centres during the year under report (2016-17)is depicted in Map - 1 & 2 and details are given in table 3.



Map 1. Locations of on - station research centres of AICRP-IFS During 2016-17



Map 2. Locations of on - farm research centres of AICRP-IFS During 2016-17

Table-3/1: Location of Different AICRP-IFS centres during the year under report (2016-17)

S. No.	State	Centre/ District	Status	Ecosystem	Agro-Climatic Region/ Sub-Region of Planning	NARP Zone
1.	A&N	CIARI, Portblair	Voluntary	Island	Island region	Northern Zone AN-1
2	Assam	Jorhat	Main Centre	Humid	Eastern Himalayan Region/Upper Brahmaputra Valley Sub-Region	Upper Brahmaputra Valley Zone (AS-2)
3.		Kokrajhar	OFR Centre	Humid	Eastern Himalayan Region	Central Brahmaputra Valley (AS-3)
4.	Andhra Pradesh	Maruteru (Dist. W. Godavari)	Sub Centre	Coastal	East Coast Plains and Hills Region/ South Coastal Andhra Sub-Region	Krishna Godavari Delta Zone (AP-1)
5.		Srikakulam	OFR Centre	Sub-Humid	East Coast Plains and Hills Region	North Coastal zone (AP-2)
6.	Bihar	Sabour (Dist. Bhagalpur)	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ South Bihar Plains Sub-Region	South Bihar Alluvial Plain Zone (B1-3)
7.		Purnea	OFR Centre	Sub-Humid	Middle Gangetic Plains Region	North-east Alluvial Plain (B1-2)
8.		Patna	Vol. Centre	Sub-Humid	Middle Gangetic Plains Region	South Bihar Alluvial Plain Zone (B1-3)
9.	Chhattisgarh	Raipur	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	Chhattisgarh Plain Zone (CG-1)
10.		Kabirdham	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Chhattisgarh Plain Zone (CG-1)
11.	Delhi	New Delhi	Vol. Centre	Semi-Arid	Trans Gangetic Plains region	Western Semi Arid (ND1)
12	Goa	Old Goa	Vol. Centre	Coastal	West Coast Plains & Hills Region	South Konkani Coastal
13.	Gujarat	S.K. Nagar (Dist. Banaskantha)	Main Centre	Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
14.		Junagadh	Sub-Centre	Semi-Arid	Gujarat Plains and Hills Region/ South Saurashtra Sub-Region	South Saurashtra Zone (GJ-7)
15.		Navsari	Sub-Centre	Coastal	Gujarat Plains and Hills Region/ Southern Hills Sub-Region	South Gujarat Heavy Rainfall Zone (GJ-1)
16.		Deesa	OFR Centre	Semi-Arid	Gujarat Plains and Hills Region/ North Gujarat Sub-Region	North Gujarat Zone (GJ-4)
17.		Thasra	OFR Centre	Arid	Gujarat Plains and Hills Region/ North west Sub-Region	Middle Gujarat Zone (GJ-3)
18.	Haryana	Hisar	Main Centre	Arid	Trans - Gangetic Plains Region/ Arid Sub-Region	Western Zone (HR-2)
19.		Sirsa	OFR Centre	Semi-Arid	Trans - Gangetic Plains Region	Western (HR-2)
20.	Himachal Pradesh	Palampur (Dist. Kangra)	Main Centre	Humid	Western Himalayan Region/ High Altitude Temperature Sub-Region	Mid-Hill Sub-Humid Zone (HP-2)

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S. No.	State	Centre/ District	Status	Ecosystem	Agro-Climatic Region/ Sub-Region of Planning	NARP Zone
21.		Kangra	OFR Centre	Humid	Western Himalayan Region	Sub-Montane and Low Hills Sub-Tropical (HP-1)
22.	J & K	Chatha (Jammu)	Main Centre	Humid	Western Himalayan Region/ High Altitude Temperature Sub-Region	Mid to High Altitude Plain Zone
23.		Samba	OFR Centre	Humid	Western Himalayan Region	Low altitude Sub-Tropical Zone (JK-1)
24.	Jharkhand	Kanke (Ranchi)	Main Centre	Sub-Humid	Eastern Plateau & Hills Region/ Chhota Nagpur, South and West Bengal Hills & Plateau Sub-Region	Western Plateau Zone (B1-5)
25.		Jamtara	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Central and North Eastern Plateau Zone (JH-1)
26.	Karnataka	Kathalgere (Dist. Davangere)	Main Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Transition Zone (KA-7)
27.		Kolar	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Eastern Dry Zone (KA-5)
28.		Siruguppa	Main Centre	Arid	Southern Plateau and Hills Region/ Northern Dry Region of Karnataka	Northern Dry Zone (KA-3) (Dist. Bellary)
29.		Gadag	OFR Centre	Arid	Southern Plateau and Hills Region	Northern dry Zone (KA-3)
30.	Kerala	Karamana (Dist. Thiruvananthapuram)	Main Centre	Coastal	West Coast Plains and Ghats / Mid land Sub-Region	Coastal Southern Zone (KE-2)
31.		Pathanamthitta	OFR Centre	Coastal	West Coast Plains and Ghats	Problem Areas Zone (KE-5)
32.	Madhya Pradesh	Jabalpur	Main Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
33.		Indore	Sub-Centre	Semi-Arid	Western Plateau & Hills Region/ Central Plateau Sub-Region	Malwa Plateau Zone (MP-10)
34.		Powarkheda (Dist. Hoshangabad)	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Central Narmada	Central Narmada Valley Zone Valley Sub-Region (MP-6)
35.		Rewa	Sub-Centre	Sub-Humid	Central Plateau & Hills Region/ Kymore Plateau and Satpura Hills Sub-Region	Kymore Plateau and Satpura Hills Zone (MP-4)
36.		Dindori	OFR Centre	Semi-Arid	Eastern Plateau and Hills	Northern hill zone of Chattisgarh (CG-3)
37.		Katni	OFR Centre	Semi-Arid	Central Plateau & Hills Region	Kymore Plateau and Satpura Hills (MP-1)

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S. No.	State	Centre/ District	Status	Ecosystem	Agro-Climatic Region/ Sub-Region of Planning	NARP Zone
38.	Maharashtra	Akola	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Central Plateau Sub-Region	Western Vidarbha Zone (MH-8)
39.		Amravati	OFR Centre	Semi-Arid	West Coast Plains and Ghats	Central Maharashtra Plateau (MH-7)
40.		Karjat (Dist. Raigad)	Main Centre	Coastal	Western Plains & Ghat Regions/ Coastal Hilly Sub-Region	North Konkan Coastal Zone (MH-2)
41.		Raigad	OFR Centre	Coastal	West Coast Plains and Ghats	North Konkan Coastal Zone (MH-2)
42.		Parbhani	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Central Plateau Sub-Region	Central Maharashtra Plateau Zone (MH-7)
43.		Aurangabad	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Central Maharashtra Plateau Zone (MH-7)
44.		Rahuri (Dist. Ahmednagar)	Main Centre	Semi-Arid	Western Plateau & Hills Region/ Scarcity Sub-Region	Scarcity Zone (MH-6)
45.		Pune	OFR Centre	Semi-Arid	Western Plateau & Hills Region	Western Maharashtra Plain Zone Ganeshkhind (MH-5)
46.	Meghalaya	Umiam	Vol. Centre	Sub-Humid	Eastern Himalayan region	Sub Himalayan region
47.	Odisha	Bhubaneswar	Main Centre	Sub-Humid	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South – Eastern Coastal Plain Zone (OR-4)
48.		Chiplima (Dist. Sambalpur)	Sub-Centre	Sub-Humid	Eastern Plateau & Hills Region/ Wainganga Sub-Region	West-Central Table Land Zone (OR-9)
49.		Angul	OFR Centre	Sub-Humid	Eastern Plateau & Hills Region	Mid-Central Table Land (OR-10)
50.		Kendrapara	OFR Centre	Coastal	East Coast Plains and Hills Region/ Orissa Coastal Sub-Region	East and South – Eastern Coastal Plain Zone (OR-4)
51.	Punjab	Ludhiana	Main Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
52.		Amritsar	OFR Centre	Semi-Arid	Trans-Gangetic Plains Region/ Plains Sub-Region	Central Plain Zone (PB-3)
53.	Rajasthan	Durgapura (Jaipur)	Main Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Semi-Arid Eastern Plain Zone (RJ-5)
54.		Hanumangarh	OFR Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Transitional Plain Zone of Inland Drainage (RJ-3)
55.		Kota	Sub Centre	Semi-Arid	Central Plateau & Hills Region/ Eastern Plains of Rajasthan	Humid South – Eastern Plain Zone (South-Eastern Humid Plain Zone (RJ-9)

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S. No.	State	Centre/ District	Status	Ecosystem	Agro-Climatic Region/ Sub-Region of Planning	NARP Zone
56.		Chittorgarh	OFR centre	Semi-Arid	Central Plateau & Hills Region/ Southern Plains of Rajasthan	Sub-Humid Southern Plain & Aravali Hills Zone (RJ-7)
57.	Tamil Nadu	Coimbatore	Main Centre	Semi-Arid	Southern Plateau and Hills Region/ Central Plateau of Tamil Nadu Sub-Region	Western Zone (TN-3)
58.		Thanjavur	Sub Centre	Coastal	East Coast Plains and Hills Region/ Thanjavur Sub-Region	Cauvery Delta Zone (TN-4)
59.		Paipur	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	North western Zone (TN-2)
60.		Chettinad	OFR Centre	Semi-Arid	East Coast Plains and Hills Region	Sothorn Zone (TN-5)
61	Telangana	Rajenderanagar	Main centre	Semi-Arid	Southern Plateau and Hills Region/ South Telangana Sub-Region	Southern Telangana Zone (AP-5)
62		Rudrur (Dist. Nizamabad)	Sub Centre	Semi-Arid	Southern Plateau and Hills Region/ North Telangana Sub-Region	Northern Telangana Zone (AP-4)
63		Warangal	OFR Centre	Semi-Arid	Southern Plateau and Hills Region	Southern Telangana (AP-5)
64.	Uttar Pradesh	Kanpur	Main Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-6)
65.		Kaushambi	OFR Centre	Semi-Arid	Upper Gangetic Plains Region/ South Western Plains Sub-Region	Central Plain Zone (UP-4)
66.		Faizabad	Main Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-9)
67.		Santkabirnagar	OFR Centre	Sub-Humid	Eastern Himalayas Region/ Eastern Plains Sub-Region	Eastern Plain Zone (UP-7)
68.		Bichpuri (Dist. Agra)	Sub Centre	Semi-Arid	Upper Gangetic Plains Region/ Western Plains Sub-Region	South-Western Semi-Arid Zone (UP-5)
69.		Varanasi	Sub Centre	Sub-Humid	Middle Gangetic Plains Region/ Eastern Plains	Eastern Plain Zone (UP-9)
70		Modipuram	Vol. Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan(UP-3)
71		Modipuram	OFR Centre	Sub-Humid	Upper Gangetic Plains Region	Western Plain Zoan(UP-3)
72.	Uttarakhand	Pantnagar (Dist. US Nagar)	Main Centre	Sub-Humid	Western Himalayan Region/ Valley Temperate Sub-Region	Bhawar and Tarai Zone (UP-2)
73.		Nainital	OFR Centre	Sub-Humid	Western Himalayan Region/ High hill Temperate Sub-Region	Hill Zone (UK-1)
74.	West Bengal	Kalyani (Dist. Nadia)	Main Centre	Humid	Lower Gangetic Plains Region/ Central Alluvial Plains Sub-Region	New Alluvial Zone (WB-3)
75.		24-Parganas South	OFR Centre	Humid	Lower Gangetic Plains Region	Coastal Sline Zone (WB-6)

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4. SOIL AND CLIMATE

The major group of soil (centre-wise) on which on-station experiment of CSR/FSR were conducted during the year 2016-17 and geographical coordinates (latitude and longitude) of the different

research location are given in table 4/1. The general climatic conditions for the experimental location are described below in brief.

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

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

Count/-----

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

Weather condition at different farming system research centers during 2016-17

The annual conditions of important weather parameters e.g., rainfall, monthly average maximum temperature and minimum temperature prevailed during the reporting period (June 2016-May 2017) at the various Integrated Farming Systems Research Centers of the AICRP on IFS are depicted in figures 4.1-3 and described below.

Akola : The total rainfall (832.0 mm) received during the reporting period which was almost near to rainfall occurred during previous year (791.1 mm). Southwest monsoon contributed 88.0% to the total rainfall whereas, Northeast monsoon contributed 88.0 mm rainfall to the total annual rain. Distribution of rainfall was quite erratic throughout the season where, no rainfall was received after october month. The monthly average maximum temperature was ranged between 29.9°C-36.4°C during the reporting period. The winter season was comparatively cold in comparison to previous season where monthly average minimum temperature dropped up to 9.8°C.

Bhubaneswar : A bit lesser rainfall i.e. 86.5% of previous season was received during the reporting period. Southwest monsoon contributed 79.0% to the total rainfall (1192.0 mm). During rest period only 255.0 mm rainfall was occurred. Out of 12 months, three months (December - February) was did not receive any rain whereas, August month received the highest rainfall (273.0 mm) in the entire season. The monthly average maximum temperature ranged between 29.4°C to 43.0°C. The monthly average minimum temperature dropped to 14.4°C in the month of January.

Chiplima : Almost double rainfall (1893.0 mm) to the previous season was received during the reporting period. About 93.0 % of the total rainfall was precipitated during the Southwest monsoon season. With 737.0 mm rainfall, September was found to be the wettest month however; distribution of the rain was fairly good in the season. There were only three months (December, February and April) where no rainy day was recorded. The highest monthly average maximum temperature (38.6°C) was recorded during the May

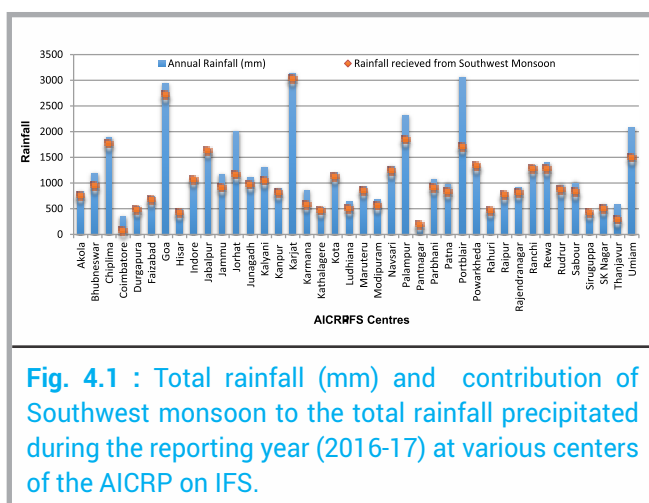


Fig. 4.1 : Total rainfall (mm) and contribution of Southwest monsoon to the total rainfall precipitated during the reporting year (2016-17) at various centers of the AICRP on IFS.

whereas; lowest monthly average maximum temperature (29.7°C) was recorded in January. November was found to be the coldest months where mercury dropped down to 9.8°C.

Coimbatore : The total rainfall (352.0 mm) received during the reporting season was lesser than the rainfall occurred during previous year. As usual Southwest monsoon contributed only 19.0% to the total annual rainfall whereas, Northeast monsoon contributed 135.0 mm rainfall to the total annual rain. Distribution of rainfall was quite good throughout the season and only February was found to be dry month. The monthly average maximum temperature was ranged between 29.9°C-36.4°C during the reporting period. The winter season was also remained moderately warm where monthly average minimum temperature remained above 19.6°C.

Durgapura : With 88.0% contribution from Southwest monsoon, centre received only 538.0 mm rainfall which was double to the previous season. About half of the total rain was poured in the month of August (230.0 mm). Distribution of rainfall was quite good where only three months November, December and February were found as dry months where no rainy day was recorded. The monthly average maximum temperature was

ranged between 21.7°C-41.1°C during the reporting period. The minimum temperature dropped down to 9.0°C during January.

Faizabad : The total rainfall of 734.0 mm was recorded during the reporting period where Southwest monsoon contributed 91.0% to the total rainfall. Distribution of rain remained skewed towards initial phase of monsoon months where 491.0 mm rain was poured during July to August. There was no any rainy day was recorded during November, December, February and April. With 39.9°C monthly average maximum temperature, May was recorded as warmest month. Day temperature remained above 20.5°C even in December where mercury dropped to 7.7°C during night time in January.

Goa : With 2849.2 mm rainfall during the reporting period centre recorded as the third wettest centre of AICRP-IFS where 92.0% of total rainfall was contributed by southwest monsoon. December to April, no rainy day was recorded at the centre. The average monthly maximum temperature was ranged between 38.5°C to 29.0°C. Average monthly minimum temperature was also remained above 19.0°C.

Hisar : In comparison to last crop season, a higher rainfall (492.0 mm) was received at the centre during the reporting period. Southwest monsoon contributed about 86.0% of total rainfall. Among all the months of reporting period, only November, December, and February months were found to be dry. As usual summer was very hot and monthly maximum temperature (40.8°C) was reported highest during the May and winter was severe during which average monthly minimum temperature dropped below 6.9°C in January.

Indore : The centre received 1087.0 mm rainfall which was lower than the last reporting period (1187.7mm) where Southwest monsoon contributed about 98.0% to the total rainfall.

Almost half period of season i.e. November to April, no rainy day was recorded at the centre. With 460.0 mm rain. July was found to be the wettest month during the period. The range of the monthly maximum temperature was 24.3°C-42.3°C. With 9.1°C minimum temperature, December was recorded as coldest month during the period.

Jabalpur : Much higher (1644.0 mm) rainfall received during the reporting season than the previous season (1124.5 mm). The contribution of the Southwest monsoon was 99.0% to the total rainfall. The distribution of the rainfall was highly skewed in the early phase of the season where last 8 months received only one percent rainfall of the total. Summer season was hot and the range of monthly average maximum temperature was 23.9 to 41.4°C. The mercury dropped up to 6.6°C during December.

Jammu : The center received 1165.0 mm total rainfall which was higher than the previous season (998.6 mm). Southwest monsoon contributed 78.0% to the total rainfall occurred in the entire season. All the months except November and December, received rainfall where July was recorded as the wettest month with 378.0 mm of rainfall. The range of monthly average maximum temperature was 17.6°C to 38.3°C. December month was found to be coldest where night temperature was dropped to 6.0°C.

Jorhat : The reporting period received 2003.0 mm rainfall which was 288.8 mm lower than the previous season. The contribution of Southwest monsoon was only 58.0%. The distribution of rainfall during the season was quite good however; June was recorded as the wettest month at the centre with 390.0 mm rainfall. November month received the least amount of rain (17.0 mm). The highest monthly mean maximum temperature (34.3°C) was observed during August, lowest monthly mean minimum temperature (9.4°C) was recorded during January.

Junagarh : The rainfall (1105.0 mm) received during reporting period was about double to the previous season (585.5 mm) and this was due to 88.0% contribution from the Southwest monsoon. The distribution of rainfall was fair in the monsoon season but November to May did not receive any rain. The highest monthly average maximum temperature (40.5°C) was observed during May whereas, lowest minimum temperature (11.9°C) was recorded during January.

Kalyani : Total rainfall received during the reporting period was 1299.0 mm which was almost quadrupled to the rainfall received during the last reporting period (329.3 mm), four months namely December, January, February and April did not observed any rainy day. The range of monthly average maximum temperature was 26.5 to 36.3°C. Lowest monthly average minimum temperature (10.9°C) was recorded during January.

Kanpur : The total rainfall of 899.0 mm was recorded during the reporting season which was quite higher than the previous season (534.4mm) and it was due to strong monsoon which contributed 91.0% to the total rainfall of the season. Highest rainfall (307.0 mm) was precipitated in the month of July. Distribution of rainfall was quite good throughout the monsoon but November, December and February did not blessed with any rainy day. With 39.8°C monthly average maximum temperature, April was recorded as the warmest month while mercury dropped down to 8.1°C during night time of January.

Karjat : Among the AICRP-IFS center this centre has received the highest rainfall (3136.0 mm) where 96.0% of the total rain was contributed by the Southwest monsoon season. July and August contributed (2453.0 mm) more than half of the total rain. There was no any rainy day was observed

during November to April. The range of monthly average maximum temperature was 27.4 to 40.6°C. With 13.7°C, January month was recorded as the coldest months of the reporting season.

Karmana : During the reporting period, the total rainfall received was 863.0 mm which was quite lower than the rainfall received during the previous season (2104.4 mm). About 67.0 % of the total rainfall was contributed by the Southwest monsoon. Each and every months of the reporting period received some rain except February. The range of monthly average maximum temperature was 30.3 to 32.5°C. Night temperature remained above 22.0°C during the reporting period.

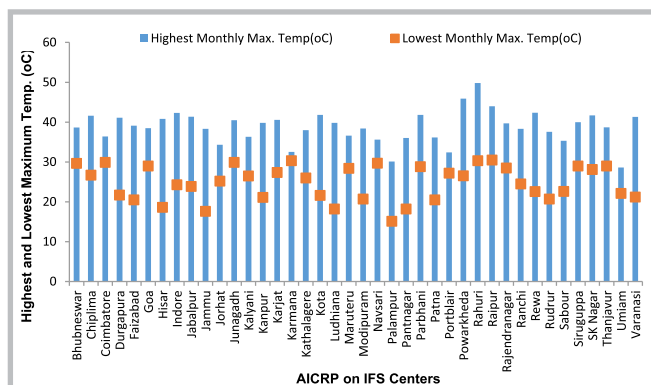


Fig. 4.2 : Highest and lowest monthly average maximum (°C) temperature during the reporting year (2016-17) at various centers of the AICRP on IFS.

Kathalagere : Total rainfall received during the reporting period was 530.0 mm where Southwest monsoon contributed 88.0%. June month was recorded as the wettest month of the season where 226.2 mm rainfall was received. There was no rainfall during November to March. The range of monthly average maximum temperature was 26.0 to 38.0°C. Night temperature remained above 19.0°C during the reporting period.

Kota : Total annual rainfall precipitated during the reporting period was 1197.0 mm which was higher than the last reporting period (781.1 mm) where

94.0% of total rain was precipitated during monsoon season. With 756.0 mm rainfall. August was recorded as the wettest month of the season. The highest average monthly maximum temperature (41.8°C) was recorded during May whereas lowest minimum temperature (7.6°C) was recorded during January.

Ludhiana : The total annual rainfall received during the reporting period was 635.0 mm where 78.0 % was contributed by the Southwest monsoon. Rainfall was highly distributed throughout the season and only two months October and December did not receive any rain. The highest monthly mean maximum temperature (39.8°C) was observed during June whereas, lowest minimum temperature (7.6°C) was recorded during January.

Maruteru : The reporting period received 922.0 mm rainfall which was quite lower than the previous season rainfall (1428.6 mm). The Southwest monsoon season contributed 92.0% to the total. Lower rainfall was due to uneven distribution of the rainy days where January to April did not receive any rainy day. The highest rainfall (310.0 mm) was received in the month of June. The highest monthly mean maximum temperature (36.6°C) was observed during May whereas, lowest

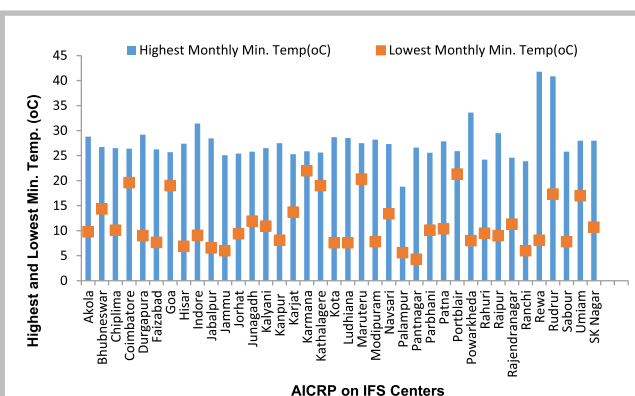


Fig. 4.3 : Highest and lowest monthly average minimum (°C) temperature during the reporting year (2016-17) at various centers of the AICRP on IFS.

monthly mean minimum temperature (28.0°C) was recorded during December.

Modipuram : During the reporting period, the total rainfall received was 677.0 mm where Southwest monsoon contributed only 83.0% to the total rain. Distribution of the rainy days was quite good where only two months November and December did not receive any rainfall. May was observed as warmest (38.4°C) during the year whereas, January was very cool and wet with 7.8°C monthly minimum temperature.

Palampur : The total annual rainfall received during the reporting period was 2324.0 mm which was 80.0% contributed by the Southwest monsoon rain. There was no month except November was found to be dry and July month was reported as the wettest month in the season where 1063.0 mm rainfall occurred. The range of average monthly maximum temperature was 15.1 (lowest among the all the centers) to 30.1°C. Mercury was dropped down to 5.6°C during the night of January.

Pantnagar : During the reporting period, 189.0 mm rainfall was recorded at the centre and it was totally (99.0%) contributed by the monsoon season where October to April were did not receive any rain. The highest monthly mean maximum temperature (36.0°C) was observed during May whereas, lowest minimum temperature (4.3°C) was recorded during December.

Parbhani : The total annual rainfall received during the reporting period was 1067.0 mm which was nearly half to the total rain received in the previous season (2324.0 mm). In the reporting season, 84.0% of the total rain was contributed by the Southwest monsoon. Lower than the average rainfall was due to no rain in the months consequently i.e. November to May. The highest monthly mean maximum temperature (41.8°C) was observed during May whereas, lowest minimum temperature (10.1°C) was recorded during January.

Patna : During the reporting period, the total rainfall received was 970.0 mm where 85.0% rainfall occurred during the Southwest monsoon season. With 375.0 mm rainfall, September was recorded as the wettest month. No any rainy day was observed during November to February. June was observed as warmest (36.1°C) during the season whereas, January was very cool with 10.4°C monthly minimum temperature.

Portblair : The total rainfall (3052.0 mm) received at the centre during the reporting period was 2nd highest among the centers of AICRP-IFS. Where Southwest monsoon contributed about half (56%) and Post-monsoon contributed 32% to the total rainfall. There were no months except February which was deprived of rain. The highest monthly mean maximum temperature (32.4°C) was observed during May whereas, lowest minimum temperature (21.3°C) was recorded during January.

Powarkheda : Total rainfall recorded during the reporting period was 1369.0 mm which was quite higher than the rainfall received in the previous season (523.4 mm). The Southwest monsoon contributes 97.0% to the total rainfall. Almost half of the reporting period i.e. November to April did not receive any rain. The range of monthly average maximum temperature was 26.5 to 45.9°C whereas, January was observed as coldest month and monthly mean minimum temperature was 8.0°C.

Rahuri : Total rainfall precipitated during the reporting period was 507.0 mm which was almost double to the rainfall received in the previous season (265.3 mm) and it was due to strong Southwest monsoon during which 90.0% of total rainfall was received. It was fairly distributed in the monsoon season; however six months of the reporting period (December to May) were deprived of the rain. The range of average monthly maximum

temperature was 30.3 to 49.8°C. January month was recorded as the coolest month where monthly average minimum temperature was 9.5°C.

Raipur : The total rainfall received during the reporting period was 817.3 mm where Southwest monsoon contributed 93.0% to the total rainfall. The highest monthly mean maximum temperature (44.0°C) was observed during June whereas, lowest minimum temperature (9.0°C) was recorded during January.

Rajendranagar : Total rainfall recorded during the reporting period was 913.0 mm which was higher than the previous season, out of which 807.0 mm (88.0%) rain was received during Southwest monsoon. The distribution of rain was fairly good during the season. The range of average monthly maximum temperature was 28.5 to 39.7°C whereas December was recorded as the coldest month with 11.3°C night temperature.

Ranchi : During the reporting period, the total rainfall received was 1340.0 mm which was quite higher than the rainfall received in the previous season (961.2 mm). With 1274.0 mm rainfall Southwest monsoon contributed 95.0% to the total rain and it was highly distributed in the season. Not a single month except November was found to be deprived of rainy day. But November to February, no any rainy day was observed. May was observed as warmest (38.3°C) during the year whereas, January was very cool and dry with 6.0°C monthly minimum temperature.

Rewa : Total rainfall recorded during the reporting period was 1390.0 mm which was almost doubled to the rainfall received in the last reporting season (735.8 mm) where 92.0% of the total rainfall was contributed by Southwest monsoon. The distribution of the rain was highly skewed towards the monsoon season where August was found to be the wettest month with 701.0 mm of rain. The

range of average monthly maximum temperature was 22.6 to 42.4°C whereas January was recorded as the coldest month with 8.1°C night temperature.

Rudrur : The total rainfall received during the reporting period was 960.0 mm in which 89% rain occurred during the Southwest monsoon. September month was found to be the wettest month of the season during which 400.0 mm rain occurred. No any rainy day was observed during November to May. The highest monthly average maximum and minimum temperature recorded during the period was 37.6°C and 17.3°C respectively.

Sabour : The total annual rainfall received during the reporting period was 989.0 mm which was lower than the rainfall occurred in the earlier reporting period (1112.7 mm) where Southwest monsoon contributed about 83.0% to the total rain. November, December and February months did not recorded any rainy day. The highest monthly mean maximum temperature (35.3°C) was observed during May whereas, lowest minimum temperature (7.8°C) was recorded during January.

Siruguppa : During the reporting period, the total rainfall received was 429.0 mm which was quite lower than the rainfall occurred in the previous reporting period (655.3 mm). With 420.0 mm rainfall Southwest monsoon contributed about 98.0% to the total rainfall of the season. April was observed as warmest month during the period with 40.0 °C whereas, December was very cool with 17.0°C monthly minimum temperature.

SK Nagar : The total rainfall recorded during the reporting period was 588.0 mm which was equal to half of the rainfall received in the previous reporting period (905.4 mm) where Southwest monsoon contributed 84.0% to the total of the rainfall. With 331.0 mm rainfall. August month was found to be the wettest month of the season. The highest average monthly maximum temperature

(41.7°C) was recorded during May and with 10.7°C night temperature January was found to be the coolest month of the season.

Thanjavur : During the reporting period, a total of 578.0 mm rainfall was received at the centre where about half of the rainfall (51.0%) was contributed by the Southwest monsoon and 27% by the Post-monsoon rainfall. The highest average monthly maximum temperature (38.7°C) was observed during April whereas; lowest minimum temperature (20.2°C) was recorded during February.

Umiam : Total rainfall recorded during the reporting period was 2073.0 mm which was quite lower than the rainfall received in the previous reporting season (2739.8 mm) where Southwest monsoon contributed 72.0% to the total rainfall

with very good distribution. Only month of February was found to be dry. The range of average monthly maximum temperature was 22.1-28.6°C whereas January was recorded as the coldest month with 5.5°C night temperature.

Varanasi : During the reporting period, 1194.0 mm rainfall received which was quite higher than the rain received in the previous reporting period (833.4 mm). Southwest monsoon contributed about 99.0% to the total rainfall. Distribution of rain was fairly good during the monsoon season but there was no any rainy day was recorded during November to May. The highest average monthly maximum temperature (41.3°C) was observed during September whereas, lowest minimum temperature (9.9°C) was recorded during January.

5. STAFF POSITION

Out of 618 total staff sanctioned for different centres, 416 staff were actually in position as on 31st March 2017, suggesting that to 32.7 percent of total posts were vacant (Table-5/1 and Appendix-III)

Table-5/1 :Staff Position Under AICRP-IFS (University –wise) as on 31.03.2017

S.No.	Name of the University	Scientific		Technical		Administrative		Supporting	
		Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled
1	ANGRAU,Guntur	2	2	11	7	1	1	1	1
2	PJTSAU, Hyderabad	6	5	12	3	1	0	1	1
3	HPKV, Palampur	4	4	11	10	2	2	2	0
4	GBPUA & T, Kanpur	5	4	11	7	2	0	2	1
5	CSAU & T,Kanpur	4	4	11	8	2	1	2	2
6	NDUA & T, Faizabad	4	3	11	9	2	2	2	1
7	BHU, Varanasi	1	1	3	0	1	1	0	0
8	BAU, Ranchi	4	4	11	11	2	2	2	2
9	BAU , Sabour	4	4	11	5	2	1	2	2
10	BCKVV, Kalyani	4	3	11	11	2	1	2	2
11	AAU, Jorhat	5	4	11	7	2	0	2	0
12	PAU, Ludhiyana	4	4	11	8	2	2	2	2
13	HAU, Hisar	5	5	11	7	2	2	2	2
14	SKNAU, Jobner	4	2	11	6	2	0	2	2
15	SDAU, S.K. Nagar	5	5	11	8	2	2	2	2
16	NAU, Navsari(*)	1	1	3	2	1	0	0	0
17	JAU, Junagarh (*)	1	1	3	3	1	1	0	0
18	AAU, Anand(*)	1	1	8	6	1	0	1	0
19	JNKVV, Jabalpur	8	5	23	11	5	2	3	1
20	RVSKVV, Gwalior	1	1	3	1	1	1	0	0
21	IGKV, Raipur	5	4	11	7	2	2	2	2
22	OUAT, Bhubaneswar	7	7	22	18	4	4	3	3
23	PDKV, Akola	4	3	11	6	2	0	2	2
24	MAU, Parbhani	4	3	11	7	2	0	2	0
25	MPKU, Rahuri	5	4	11	9	2	2	2	1
26	KKV, Dapoli	4	3	11	10	2	0	2	1
27	UAS, Raichur	3	3	3	3	1	1	1	1
28	UAS, Dharwad	1	1	8	7	1	0	1	1
29	UAS, Bangalore	2	1	7	2	1	1	1	1
30	UAHS, Shimoga	3	3	4	2	1	1	1	1
31	TNAU, Coimbtore	7	7	22	16	4	4	3	3
32	SKUAST, Jammu	4	4	11	11	2	1	2	2
33	KAU, Thrissur	5	5	11	10	2	2	2	2
34	MPUAT, Udaipur	2	2	5	4	2	1	1	1
35	AU, Kota	1	1	3	2	1	1	0	0
36	RBS College,Bichpuri	1	1	3	2	1	1	0	0
37	ICAR-IIFSR, Modipuram	1	0	8	0	1	0	0	0
Total		132	113	360	221	69	44	57	38

6. BUDGET

Table-6.1 Funds (Rs. In lakhs released during Financial year 2016-17 and 2017-18 under AICRP on Integrated Farming Systems (ICAR share only)

Sl. No.	Name of University/ Institute	Other than NEH & TSP						TSP COMPONENT				NEH COMPONENT				GRAND TOTAL	
		Grant-in-Aid 'General'		Grant-in-Aid 'Capital'				Grant in-Aid General		Sub-Total 'TSP'	Grant-in-Aid 'Salaries'	Grant-in-Aid 'General'		Sub-Total in-Aid 'Capital' 'NEH'			
		T.A.	Contr. Services	POL/ Veh. Hiring	Other cont.	Equipments	Works	Info. Tech.	Vehicle			Contr. Services	POL/ Veh. Hiring		HRD		Other cont.
1	ANGRAU, Hyderabad	45.00	0.76	0.00	0.30	2.00	0.00	0.00	0.00	0.00	48.06	0.00	0.00	0.00	0.00	0.00	48.06
2	PJTSAU, Hyderabad	70.00	1.25	5.40	0.30	7.00	2.25	0.00	0.00	0.00	86.20	0.00	0.00	0.00	0.00	0.00	86.20
3	HPKVV, Palampur	78.00	0.76	5.40	0.30	6.00	2.25	0.00	0.00	0.00	92.71	0.00	0.00	0.00	0.00	0.00	92.71
4	GBPU&T, Pantnagar	53.00	1.00	6.84	0.30	4.53	0.00	0.00	0.00	0.00	65.67	0.00	0.00	0.00	0.00	0.00	65.67
5	CSAU&T, Kanpur	39.00	1.00	6.03	0.30	4.90	0.00	0.00	0.00	0.00	51.23	0.00	0.00	0.00	0.00	0.00	51.23
6	NDUA&T, Faizabad	69.00	1.00	5.40	0.30	5.75	0.00	0.00	0.00	0.00	81.45	0.00	0.00	0.00	0.00	0.00	81.45
7	BHU, Varanasi	20.00	0.50	7.74	0.00	2.75	0.00	0.00	0.00	0.00	30.99	0.00	0.00	0.00	0.00	0.00	30.99
8	BAU, Ranchi	47.76	1.00	5.40	0.20	2.00	0.00	0.00	0.00	0.00	56.36	0.00	0.00	0.00	0.00	0.00	56.36
9	BAU, Sabour	38.00	1.00	4.62	0.30	3.60	0.00	0.00	0.00	0.00	47.52	0.00	0.00	0.00	0.00	0.00	47.52
10	BCKVV, Kalyani	49.00	1.00	5.76	0.20	4.65	2.25	0.00	0.00	0.00	62.86	0.00	0.00	0.00	0.00	0.00	62.86
11	AAU, Jorhat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60.00	1.50	6.00	0.15	8.35	0.00	76.00
12	PAU, Ludhiana	75.00	1.00	5.40	0.30	5.25	0.00	0.00	0.00	0.00	86.95	0.00	0.00	0.00	0.00	0.00	86.95
13	HAU, Hisar	48.50	1.00	5.40	0.30	5.25	2.25	0.00	0.00	0.00	62.70	0.00	0.00	0.00	0.00	0.00	62.70
14	SKNAU, Jobner	42.00	1.00	5.40	0.30	4.87	0.00	0.00	0.00	0.00	53.57	0.00	0.00	0.00	0.00	0.00	53.57
15	SDAU, S.K. Nagar	62.00	2.00	5.40	0.20	4.88	0.00	0.00	0.00	0.00	74.48	0.00	0.00	0.00	0.00	0.00	74.48
16	NAU, Navsari	8.00	0.50	0.00	0.00	2.00	0.00	0.00	0.00	0.00	10.50	0.00	0.00	0.00	0.00	0.00	10.50
17	JAU, Junagadh	12.50	0.50	0.00	0.00	2.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	15.00
18	AAU, Anand	19.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.10	0.00	0.00	0.00	0.00	0.00	20.10
19	JKVV,Jabalpur	75.00	1.50	6.32	0.30	7.28	0.00	0.00	0.00	0.00	90.40	0.00	0.00	0.00	0.00	0.00	90.40
20	RVSUV, Gwalior	27.00	0.50	0.00	0.00	2.00	0.00	0.00	0.00	0.00	29.50	0.00	0.00	0.00	0.00	0.00	29.50
21	IGKV, Raipur	49.00	1.00	6.32	0.20	2.18	3.00	0.00	0.00	0.00	61.70	0.00	0.00	0.00	0.00	0.00	61.70
22	OUAT, Bhubaneswar	80.00	1.50	5.40	0.30	10.00	3.00	0.00	0.00	0.00	100.20	0.00	0.00	0.00	0.00	0.00	100.20
23	PDKV, Akola	49.00	0.68	2.35	0.30	9.25	0.00	0.00	0.00	0.00	61.58	0.00	0.00	0.00	0.00	0.00	61.58
24	MAU, Parbhani	45.00	1.00	6.12	0.30	4.39	3.00	0.00	0.00	0.00	59.81	0.00	0.00	0.00	0.00	0.00	59.81
25	MPKV, Rahuri	46.00	1.00	6.12	0.30	4.39	0.00	0.00	0.00	0.00	57.81	0.00	0.00	0.00	0.00	0.00	57.81
26	KKV, Dapoli	57.00	1.00	5.40	0.00	2.25	2.25	0.00	0.00	0.00	67.90	0.00	0.00	0.00	0.00	0.00	67.90
27	UAS, Raichur	32.00	0.80	5.40	0.00	2.56	0.00	0.00	0.00	0.00	40.76	0.00	0.00	0.00	0.00	0.00	40.76
28	UAS, Dharwad	32.00	0.80	0.00	0.20	2.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00	35.00
29	UAS, Bangalore	22.00	0.50	0.00	0.10	1.25	0.00	0.00	0.00	0.00	23.85	0.00	0.00	0.00	0.00	0.00	23.85
30	UAHS, Shimoga	19.00	0.60	5.40	0.00	2.57	0.00	0.00	0.00	0.00	27.57	0.00	0.00	0.00	0.00	0.00	27.57
31	TNAU, Coimbatore	112.00	2.25	4.79	0.50	11.60	2.25	0.00	0.00	0.00	133.39	0.00	0.00	0.00	0.00	0.00	133.39
32	SKUAST, Jammu	86.00	0.80	7.15	0.30	5.60	2.25	0.00	0.00	0.00	102.10	0.00	0.00	0.00	0.00	0.00	102.10
33	KAU, Thrissur	90.24	1.50	5.40	0.30	5.75	2.25	0.00	0.00	0.00	105.44	0.00	0.00	0.00	0.00	0.00	105.44
34	MPUAT, Udaipur	22.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.50	0.00	0.00	0.00	0.00	0.00	22.50
35	AU, Kota	10.00	0.50	0.00	0.00	2.00	0.00	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	12.50
36	RBS College, Bichpuri	10.50	0.50	0.00	0.00	2.00	0.00	0.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00	0.00	13.00
37	ICAR-IIFSR, Modipuram	0.00	0.34	6.31	0.25	6.09	6.00	0.00	0.00	0.00	18.99	0.00	0.00	0.00	0.00	0.00	18.99
38	P.C.Unit,IIFSR, Modipuram	0.00	1.00	2.50	0.00	6.25	3.14	0.00	0.00	0.00	12.89	0.00	0.00	0.00	0.00	0.00	12.89
39	ICAR Res. Comp., Patna	0.00	0.50	4.00	0.00	3.00	0.00	0.00	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00	7.50
40	ICAR Res. Comp., Umiam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.21
41	ICAR Res. Comp., Old Goa	0.00	0.25	3.75	0.00	2.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	6.00
42	CARI, Port Blair	0.00	0.25	3.75	0.00	2.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	6.00
43	IASRI, New Delhi	0.00	0.19	3.75	0.00	0.25	0.00	0.00	0.05	0.00	4.24	0.00	0.00	0.00	0.00	0.00	4.24
	Total	1640.00	35.33	164.42	6.95	164.09	36.14	0.00	0.05	0.00	2046.98	0.00	0.00	0.00	12.10	89.21	2136.19

Revised (R.E.) for the year 2017-18 in the scheme of AICRP-IFS ICAR share (Rs.)

Sl. No.	Name of University/Institute	Other than NEH & TSP										SCSP				Sub-Total SSCP	Grant-in-Aid General				NEH				Sub-Total NEH	GRAND TOTAL	
		Grant-in-Aid Salaries'	Domestic T.A.	Operational Charges	Research Expenses	Equipment	Works	Information Technology	Furniture & Fixture	Livestock	Vehicle	Sub-Total Other than NEH & TSP	Total TSP	Livestock	Research Expenses		Operational Charges	Grant-in-Aid Salaries'	Domestic T.A.	Operational Charges	Research Expenses	Equipment	Works	Livestock			Furniture & Fixture
1	ANGRAU, Guntur	68.98	0.79	0.00	2.37	0.00	3.00	0.00	0.00	0.00	73.14	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.14
2	PTSAU, Hyderabad	105.78	0.60	1.75	9.75	0.00	3.00	0.00	5.00	0.00	125.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125.88
3	IPKV, Palampur	145.84	0.90	3.25	5.25	0.00	0.00	0.00	0.00	0.00	155.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	155.24
4	GBPUAT, Pantnagar	83.24	0.90	3.25	5.25	0.00	0.00	0.00	0.00	0.00	92.64	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.64
5	CSAU&T, Kanpur	73.25	0.90	2.25	4.75	0.00	0.00	0.00	0.00	0.00	81.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.15
6	NDUA&T, Faizabad	94.86	0.60	0.00	7.25	0.00	0.00	0.00	0.00	0.00	102.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	102.71
7	BHU, Varanasi	35.74	0.57	0.56	5.55	0.00	0.00	0.00	0.00	0.00	42.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.42
8	BAU, Ranchi	66.33	0.77	1.88	2.96	0.00	0.00	0.00	0.00	0.00	71.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.94
9	BAU, Raipur	78.81	0.85	3.06	6.75	0.00	0.00	0.00	0.00	0.00	90.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.47
10	BCKV, Kalyani	77.50	0.85	1.75	6.00	0.00	0.00	0.00	0.00	0.00	86.10	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.10
11	AAU, Jorhat	71.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.50	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.37	5.50	13.21	0.00	63.38	0.00	0.00	0.00	84.46
12	PAU, Ludhiana	164.29	1.00	1.15	5.75	0.00	0.00	0.00	0.00	0.00	172.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	172.19
13	HAU, Hissar	84.05	1.00	3.75	6.25	0.00	0.00	0.00	0.00	0.00	95.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	95.05
14	ISKRAU, Jodhpur	62.00	0.90	1.75	5.75	0.00	0.00	1.0	5.00	0.00	76.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.40
15	SPAU, S.K. Nagar	112.61	1.23	1.50	5.75	0.00	0.00	0.00	0.00	0.00	121.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.09
16	NAU, Narsari	29.00	0.52	0.00	2.99	0.00	0.00	0.00	0.00	0.00	35.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.51
17	IAU, Junagadh	27.50	0.52	0.00	2.99	0.00	0.00	0.00	0.00	0.00	34.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.01
18	AAU, Anand	34.00	0.60	0.00	1.00	0.00	0.00	0.00	0.00	0.00	35.60	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.60
19	JKVV, Jalandhar	121.16	1.00	0.00	8.90	0.00	0.00	0.00	0.00	0.00	131.06	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	132.06
20	RVSVA, Gwalior	49.96	0.52	0.50	3.49	0.00	0.00	0.00	0.00	0.00	57.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.47
21	IKVU, Raipur	89.11	0.85	1.50	7.75	0.00	0.00	0.00	0.00	0.00	99.21	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.21
22	OUAT, Bhubaneswar	110.78	1.63	1.75	10.15	0.00	0.00	0.00	0.00	0.00	123.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	123.31
23	PKV, Aizawl	83.96	0.90	1.25	5.75	0.00	0.00	0.00	0.00	0.00	91.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.86
24	MAU, Parbhani	72.90	0.90	3.25	6.25	0.00	0.00	0.00	0.00	0.00	82.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82.90
25	MPKV, Rahuri	96.55	0.90	1.25	5.75	0.00	0.00	0.00	0.00	0.00	104.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104.45
26	KKV, Dapoli	119.40	1.05	1.75	6.25	0.00	0.00	0.00	0.00	0.00	128.45	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	129.72
27	UAS, Raichur	46.28	0.64	1.25	4.75	0.00	0.00	0.00	0.00	0.00	52.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.92
28	UAS, Dharwad	53.03	0.73	0.00	4.49	0.00	0.00	0.00	0.00	0.00	58.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.25
29	UAS, Bangalore	57.14	0.53	0.00	4.75	0.00	0.00	0.00	0.00	0.00	62.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.42
30	UAS, Shimoga	40.30	0.60	1.25	4.75	0.00	0.00	0.00	0.00	0.00	46.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.90
31	TNAU, Coimbatore	215.79	2.13	1.13	11.90	0.00	0.00	0.00	0.00	0.00	238.95	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240.10
32	SKUAU, Jamnalu	150.57	0.88	10.81	4.13	0.00	0.00	0.00	0.00	0.00	166.39	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	167.31
33	KAU, Thiruvananthapuram	224.93	0.89	2.75	10.25	0.00	0.00	0.00	0.00	0.00	238.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	238.82
34	MPUAT, Udaipur	50.54	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.86	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.86
35	AU, Koba	14.33	0.52	0.00	1.99	0.00	0.00	0.00	0.00	0.00	19.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.84
36	RBS College, Bhopal	28.74	0.37	0.00	0.88	0.00	0.00	0.00	0.00	0.00	29.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.99
37	ICAR-IFSR, Modipuram	0.00	0.66	2.90	10.76	0.00	0.00	0.00	0.00	0.00	14.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.32
38	PCU, IISIR, Modipuram	0.00	0.96	3.00	1.50	0.00	0.00	0.00	0.00	0.00	6.96	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.22
39	ICAR Res. Comp., Patna	0.00	0.28	1.00	3.14	0.00	0.00	0.00	0.00	0.00	4.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.42
40	ICAR Res. Comp., Urmam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	ICAR-COARI, Old Goa	0.00	0.28	0.75	4.64	0.00	0.00	0.00	0.00	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67
42	ICAR-COARI, Port Blair	0.00	0.28	1.00	1.64	0.00	0.00	0.00	0.00	0.00	2.92	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00</								

7

RESEARCH RESULTS

7.1 INTEGRATED FARMING SYSTEMS

7.1.1 DEVELOPMENT OF REGION-SPECIFIC ON-STATION IFS MODELS

Title of the experiment : Development of region - specific on-station IFS models

Objectives

- To characterize existing farming systems to know the productivity, viability and constraints.
- To develop and validate region specific Integrated Farming System models for enhanced system productivity, profitability and sustainability
- To assess the relative efficiencies of the IFS

model in terms of economics, resource use and energy.

- To optimize individual components of IFS in regional perspective.
- Capacity building of stake holders in IFS through appropriate trainings

Year of start : 2011-12

Modules : A Location specific component of IFS has been integrated and details are given along with results.

Locations

Agro-climatic region	Locations (State)	Number of IFS models
Western Himalaya	Chatha (J&K), Palampur (HP), Pantnagar (UK)	3
Eastern Himalaya	Umiam (Meghalaya), Jorhat (Assam)	2
Trans Gangetic Plains	Hisar (Haryana), Ludhiana (Punjab)	2
Upper Gangetic Plains	Modipuram (UP), Kanpur (UP)	2
Middle Gangetic Plains	Varanasi (UP), Faizabad (UP), Patna (Bihar), Sabour (Bihar)	5
Lower Gangetic Plains	Kalyani (WB)	1
Eastern Plateau and Hills	Raipur (Chhattisgarh), Ranchi (Jharkhand)	2
Central Plateau and Hills	Jabalpur (MP)	1
Western Plateau and Hills	Akola (MS), Parbhani (MS), Rahuri (MS)	3
Southern Plateau and Hills	Rajenderanagar (Telangana), Coimbatore (TN), Thanjavur (T.N), Kathalgere (Karnataka), Sriguppa (Karnataka)	5
East Coast Plains and Hills	Bhubaneswar (Odisha)	1
West Coast Plains and Hills	Goa, Karjat (MS), Karamana (Kerala)	7
Western dry	Durgapura (Rajasthan), Kota (Rajasthan)	2
Gujarat Plains and Hills	S K Nagar (Gujarat)	1
Islands	Portblair (A&N)	2
Total		39

1. Western Himalayan Region

In this Agro Climatic Region three AICRP-IFS centers viz. Chhata (Jammu and Kashmir), Palampur (Himachal Pradesh) and Pantnagar (Uttarakhand) with on-station Integrated Farming Systems (IFS) models have been initiated during 2011-12.

Chatha

One ha integrated Farming System (IFS) model comprising of cropping systems (rice-wheat-green manuring, rice-potato-blackgram, rice-mustard-greengram and berseem + oat-maize + sorghum with hybrid napier on bund) in 0.52 ha +

horticulture (Guava as main crop, Lemon & mango (Amarpali) as boundary crop and broccoli, KnolKhol, palak, cauliflower, radish, turmeric as intercrops) in 0.32 ha + dairy (2 cow, 1 buffalo heifer) including 2 m³ bio-gas and vermicompost unit in 0.08 ha + fish cum poultry in 0.1 ha) + mushroom (button & dhingri) was developed for the Mid to high altitude plain zone (JK-1) in Western Himalayas (Table 7.1.1) in the year 2011-12 at research farm of SKUAST-J Main Campus, Chatha under subtropical irrigated condition of Jammu region of J&K. This IFS model of 1.02 ha provided an average gross and net return of Rs. 4,95,356 and Rs.2,33,768 during 2011-12 to 2017-18.

Table 7.1.1: Area allocation and component wise economics (2017-18) in IFS Model

Component	Net Area (ha)
Crop unit	
Cropping system	0.3802
Horticulture unit	
Fruit crops	0.3
Vegetables (intercrop)	-
Floriculture	0.07
Agro-forestry	0.1
Livestock unit	
Dairy animals (including vermicompost)	0.08
biogas unit	-
Fish cum poultry unit	
Poultry/Ducks	
Fisheries	0.1
Apiary unit (03 boxes)	-
Green fodder (Fodder-fodder cropping system and on bunds planted perennial fodder crops (Hybrid Napier)	0.07
Mushroom unit (6 qts wheat straw)	0.02
Grand total	1.02

The IFS model provided 504 days of average employment generation during 2011-12 to 2017-18, while resource saving of 14% through on-farm recycling during the same period (Table 7.1.2). The highest production and profit was realized in January, while highest employment was observed in the month of February signifying the work even during lean period. Among the different

components of farming system, the maximum percent profit share was realized from Animal unit including Vermicompost and biogas which contributes 54% share of total profit. The model also meets around 75% of inputs required for different enterprises within the farm besides providing all the commodities (cereals, pulses, oilseeds, vegetables, fruits, mushroom, milk, egg,

Table 7.1.2: Performance of IFS Model at Chatha, Jammu during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20 Rs 18150/ton)
495356	233768	261588	504	88783	148343	36759	14	27



General view different components of IFS model under irrigated condition of Jammu

and fish) required for the farm family. Moreover, this IFS model under sub-tropical condition of Jammu is having the potential to improve the farm income to three-fold besides will address the sustainability issues in the long run.

Palampur

One hectare integrated farming system (IFS) model started in 2010 at CSK HPKV, Palampur developed for mid hills zone in western Himalayas comprise of cropping systems viz. Rice-Wheat, Soybean-Pea, Maize + Soybean - Potato in 0.65 ha + horticulture cum vegetable unit viz. Peach, Pecanut, Pomegranate and Litchi as main fruit crops and Frenchbean, Okra, Maize Fodder-Gobhisarson as intercrops (0.175) + Fodder unit viz. Sorghum + Bajra –Oats in Forage block (0.10 ha), dairy crop unit (3 cows+ 4 female calves) +Mushroom cultivation and Vermicompost Unit (0.075). Component wise area allocation for different components is given in [Table 7.1.3](#).

In On station IFS model being developed at Badhiarkhar farm gross returns of Rs. 3,66,098 and net returns of Rs. 1,75,459 were obtained during 2017-18 besides employment generation of 468 days and resource saving of 25.5 % through on farm recycling of farm products and by products. The highest net returns of Rs. 47,938 were received from cropping system unit followed by Livestock unit with net returns of Rs. 40,834/- followed by Horticulture cum vegetable unit with net returns of Rs. 11,821.

Table 7.1.3 : Component wise area allocation in IFS Model at Palampur

Component	Net Area
1 Cropping systems	0.65
2 Horticulture	
i Vegetables	0.175
ii Fruit crops (Peach, Pecanut, Pomegranate, Litchi)	
3 Agro-forestry	Border plantation
i Leucenia Plants	
ii Setaria grass (5000 seedlings)	Bunds plantation
4 Livestock	
i Dairy animals	
5 Others (Fodder Block)	0.1
6 Mushroom	
7 Poultry	

Performance analysis of IFS model during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 3,10,723 and Rs. 2,01,340 respectively besides generating employment of 503 days and 24 % resource saving through on farm recycling excluding farm labour ([Table 7.1.4](#)).

Table 7.1.4 : Performance of IFS Model at Palampur during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20 Rs 18150/ton)
310723	109384	201340	503	70042	82658	48640	24	17



Intercropping of okra in peach and pecanut plantation in horticulture cum vegetable block



Director Dr. A.S. Panwar visiting IFS Model



Livestock unit



Vermicomposting unit

Pantnagar

The integrated farming systems (IFS) Model at GBPUAT, Pantnagar for *Tarai* region of Uttarakhand was started during April, 2011-12 at Norman E. Borlaugh Crop Research Centre, Pantnagar on one

hectare land comprises of crops, dairy, biogas, vermicomposting, fishery, horticulture, agroforestry and boundary plantation. Details of the components and area allocated under each enterprise are given in [Table 7.1.5](#).

Table 7.1.5 : Integrated Farming System Model (1.0 hectare model)

Particulars	Area (m ²)
Field crops	4700
Agroforestry/horticultural crops	4200
Dairy (3 Cows) +Vermicompost +Kitchen Garden	500
Fishries	600
Grand Total	10000

There were five diverse cropping systems under the crop unit of the IFS model. Amongst different cropping systems, rice- veg. pea- maize system was most remunerative concerning gross as well as net returns and this system was closely followed by rice- potato- okra and rice- barseem (F) + oat (F) + mustard (F)- maize (F) + cowpea (F) systems. Gross return of the rice- potato- okra system was good enough but this system involved high input value too which was the probable cause behind the low net profit with the system. Low input intensive system such as fodder dominated system and fodder-oilseed and pulse system showed promising net profit. The IFS model at Pantnagar provided gross returns of Rs. 5,27,409 and net returns of Rs. 2,34,730 during 2017-18 besides employment generation of 450 days and resource saving of 23 % through on farm recycling of farm products and by products. Mean performance of IFS model in terms of gross return, net return, employment generation, resource recycling etc over period of 2011-12 to 2017-18 have been given in [Table 7.1.6](#).

Performance analysis of IFS model during 2011-12 to 2017-18 revealed that the IFS model could

provide an average gross and net return of Rs 4,38,895 and Rs. 2,29,005 respectively besides generating employment of 497 days and 21 % resource saving through on farm recycling excluding farm labour over the reporting period ([Table 7.1.6](#)). It was observed that the livestock unit was the best and this component was followed by crop component. Under crop unit, the maximum production was observed with the cereal crops followed by green fodder, veg. pea and pulses. Milk production in the livestock unit comprised of the lion share of the production of that unit. Likewise, fruit and fish production shared the most under horticulture and fishery units respectively.

Performance analysis of IFS models developed across Western Himalayan region

Performance analysis of 3 IFS model developed at Chatha (Jammu and Kashmir), Palampur (Himachal Pradesh) and Pantnagar (Uttarakhand) over duration of 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.4,14,992 and 1,84,347 respectively while generating mean employment of 502 mandays and 20% resource saving ([Table 7.1.7](#)).

Table 7.1.6 : Performance of IFS Model at Pantnagar during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20 Rs 18150/ton)
438895	209890	229005	497	94891	85227	48887	21	24

Table 7.1.7 : Performance of IFS Models of Western Himalayan region during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
414992	184347	230644	502	84572	105409	44762	20	23

2. Eastern Himalayan Region

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

Umiam

The integrated farming systems (IFS) unit at ICAR Research Complex for NEH Region started during 2009-10. All the components of IFS viz. crops, livestock, fruit trees, fishery were developed and incorporated during 2010-11 in one hectare area and the IFS model became fully functional during 2011-12. Composition of IFS model is given in Fig 1.



Fig. 1 : IFS Model at umiam

The IFS model developed at Umiam have different modules viz., crop production, horticulture, fishery, poultry piggery and vermicompost / recycling of farm waste. The system generates year round income and employment to the farm family. The IFS model at Umiam provided gross returns of Rs. 4,85,351 and net returns of Rs. 1,69,794 during 2017-18 besides employment generation of 366 days and resource saving of 7 % through on farm recycling of farm products and by products. Mean performance of IFS model in terms of gross return, net return, employment generation, resource recycling etc over period of 2011-12 to 2017-18 have been given in Table 7.1.8.

Performance analysis of IFS model during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 4,12,368 and Rs. 1,54,050 respectively besides generating employment of 310 days and 6 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.8). Highest net return was obtained from cropping systems followed by livestock component. The system could provide maximum gross and net return during the month of October. However, maximum employment generation was recorded to be during the month of November. Improved IFS model was tested and validated for 1 ha area to support a farm family of 5 members. IFS model was found to be about 37% more energy efficient than the farmers practices of the region.

Table 7.1.8 : Performance of IFS Model at Umiam during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
412368	154050	258318	310	61759	183355	13204	6	23



Cultivation of pumpkin above the compost pit



High Density Guava Orchard



Livestock unit



Layer unit

Jorhat

Integrated Farming System model was established at Instructional and Research Farm of Assam Agricultural University, Jorhat during the year 2010-11 with a land area of 1.0 ha. The land was allocated under different components of Integrated farming system viz. Field crops, Horticultural crops, Cattle, Fishery, Poultry and Apiary with the objective to meet up different family requirement (of five members family. IFS

model comprising of cropping systems - Rice (w) - Toria-Cowpea(F), Rice (w) – Toria - Green gram, Rice (W) - Oat(F) - Blackgram, Rice (W) – Potato - Lady's finger, Rice (W) – Cabbage - Cowpea(V); some other fodder crops viz. Setaria and Hybrid Napier were grown on bunds in 0.65 ha, horticulture guava, lemon, pine apple, banana, arecanut and vegetables such as cabbage, potato, tomato, french bean, cow pea(V), okra & pea in 0.095 ha + dairy including animal shed with store house and threshing floor including biogas plant,

vermin-compost & liquid manure unit in 0.11 ha and fishery 0.092 ha developed for the Marginal and Small farmers of Assam of North-east India. The Raised and Sunken bed module was also developed within the model to utilize the marshy land for production of rice and as well as vegetables. During the year 2015-16, the poultry unit is also incorporated to the IFS model for which a poultry house of 12.5 m² is constructed over the pond water. The model had 25 broiler chicken and 11 ducks and 5 boxes of apiary. The IFS model at Jorhat provided gross returns of Rs. 6,89,171 and net returns of Rs. 3,61,881 during 2017-18 besides employment generation of 492 days and resource saving of 30 % through on farm recycling of farm products and by products. Performance analysis of IFS model at Jorhat during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 4,50,027 and Rs. 2,30,324 respectively besides generating employment of 438 days and 25 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.9). On an average the model generates nutrients of 272.8 kg

N, 152.03 kg P₂O₅ and 220.52 kg K₂O per year through nutrient recycling by the process of vermicomposting, liquid manure and biogas production. From the designed IFS model, approximately 511 m³ bio-gas is produced per annum, which is equivalent to 219.73 kg of Liquid Petroleum Gas (Approx. 15 LPG cylinder). IFS approach adopted at the center suggested that Integrated Farming system plays a vital role in securing sustainable production of high quality food and other production fulfilling the basic needs of household like food (cereal, pulse, oilseed, milk, honey, fish, meat etc), fodder, fuel etc.

Performance analysis of two IFS models developed in Eastern Himalayan region

Performance analysis of 2 IFS model developed at Umiam (Meghalaya) and Jorhat (Assam) in Eastern Himalayan Region for the period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.4,31,197 and 1,92,187 respectively while generating mean employment of 374 mandays and 16% resource saving (Table 7.1.10).

Table 7.1.9 : Performance of IFS Model at Jorhat during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
450027	230324	219703	438	78251	98311	61105	25	27

Table 7.1.10 : Performance of IFS Models of Eastern Himalayan region during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
431197	192187	239010	374	70005	140833	37155	16	25



Raised and sunken bed module of IFS model at Jorhat, Assam

3. Trans Gangetic Plains Region

Trans Gangetic Plains Region is represented by the states of Punjab and Haryana. Under AICRP-IFS, two independent centers one at PAU, Ludhiana (Punjab) and another one in CCHAU, Hisar are given the responsibility of development of “Region specific IFS models” at respective centers.

Hisar

The IFS Model developed at Hisar was started in the year 2011-12 in one hectare area comprises of field crops (Cereals, pulses, oilseeds, fodder, and fibre), horticultural crops (fruits, vegetables and

flower), animal unit (2 buffalos), mushroom unit, vermicompost unit/ recycling of farm waste and boundary plantation and was revised in 2017. The model has been designed for 7 member family. In order to enhance, the income and resource recycling, complementary enterprises such as vermicompost (75 m²) and quality FYM production (75 m²) and karonda and bael as boundary plantation were incorporated. Under horticultural crops, lemon + guava + marigold/vegetable (0.06 ha) and mushroom (75 m²) was added as income supplementing activities in the model. The composition of different modules in the IFS model is depicted in [Table 7.1.11](#)

Table 7.1.11 : Area allocation and component wise economics (2017-18) in IFS Model

Modules	Area allotted (m2)
Cotton - wheat	2000
Mungbean -wheat (tall)	500
Pearl millet - mustard	2000
Sorghum (f) – wheat	2000
Sorghum (f) -berseem (f)	750
Sorghum (f) - oat (f)	750
Vegetable-vegetable-vegetable	500
Vegetable-vegetable-vegetable	500
Horticultural crop (lemon+guava)+ vegetable	600
Dairy (Two buffaloes & 3 heifer)	175
Mushroom cultivation	75
Biogas	30
Recycling of Agril.waste /FYM/ Vermicompost production/Biogas production	120

The IFS model at Hisar provided gross returns of Rs. 2,94,378 and net returns of Rs. 93,820 during 2017-18 besides employment generation of 386 days and resource saving of 15.4 % through on farm recycling of farm products and by products. Performance analysis of IFS model at Hisar during 2011-12 to 2017-18 revealed that the IFS model

could provide an average gross and net return of Rs 2,48,496 and Rs. 1,33,619 respectively besides generating average employment of 254 days and 20 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.12).

Table 7.1.12 : Performance of IFS Models at Hisar during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
248496	133619	114877	254	64304	29065	21507	20	14



View of different components of IFS model at Hisar

Ludhiana

IFS study at PAU, Ludhiana was initiated during kharif 2010 on 1.0 ha farm area and comprise of 6400 sq.m for field crops i.e. Cereals/pulses /oilseeds/ green fodders etc., 1900 sq.m for horticultural crops and vegetable intercropping, 300 sq.m for agro-forestry, 200 sq. m for dairy enterprise, 1000 sq.m for aquaculture (Fresh water fish production), 200 sq.m for kitchen gardening. In addition to this boundary plantations are also done in which cranberry (Karonda) and galgal are grown. In kharif crops grown in the 6400 sq m area were paddy, maize and turmeric) and in the following rabi and summer season potato, berseem, wheat, gobhi sarson, onion, pearl millet and spring maize were grown. The vegetable crops were raised as intercrops between horticultural plants. Two dairy cows (One HF and One Sahiwal) have been integrated in the livestock component of IFS. The washings from dairy shed are managed to put into fish pond which serve as a source of nutrients for fish.

The IFS model at Ludhiana provided gross returns of Rs. 7,85,465 and net returns of Rs. 4,76,308 during 2017-18 besides employment generation of 303 days and resource saving of 22.4 % through on farm recycling of farm products and by products. Performance analysis of IFS model at Ludhiana during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 6,34,160 and Rs. 3,09,157 respectively besides generating average employment of 293 days and 18 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.13).

The IFS model not only fulfill the farmer family demands but is also helpful in generating output which can be used as an input for other components of the IFS model and make farming more economic. For residue recycling, the straw was used to feed to the cows, heifer and two young calves. The residue of other crops viz., rice were utilized for bedding in the cattle shed during winter months and then these rice residues were decomposed in the pit along with cowdung.

Table 7.1.13 : Performance of IFS Models at Ludhiana during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
634160	335888	298271	293	76969	168827	52476	18	35



Dairy Unit



Overview of crops & hort. fields



Fish production



Value added product Muramba

Performance analysis of two IFS models developed in Eastern Himalayan region

Performance analysis of 2 IFS model developed at Hisar (Haryana) and Ludhiana (Punjab) in Trans Gangetic Plains region for the period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.4,41,328 and 2,34,754 respectively while generating mean employment of 273 mandays and 19% resource saving.

4. Upper Gangetic Plains Region

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

centers are described below :

Modipuram

To demonstrate the diversified system of farming under irrigated conditions of western U.P., a cultivated area of 0.70 hectare was undertaken for diversifying prevailing farming system ***crop + dairy*** (opted by more than 84% of the total farm families). Seven modules viz., Cropping systems, horti-pasture, agri-horti, dairy, vermicompost, boundary plantation and secondary agriculture (value addition) modules were integrated in order to develop sustainable resource management packages for climate smart integrated farming systems for marginal farm households. The details of the area and composition of each module as per approved new technical programme is given in **Table 7.1.14**

Table 7.1.14 : Composition of climate smart IFS modules evaluation for marginal households at Modipuram

Modules	Net area (m ²)	Composition
Cropping systems	3800	CS 1(1250 m²) : Basmati rice (<i>Kharif</i>)-wheat+mustard (0.065 ha)/Wheat+gram (0.065 ha) (Rabi)-Green Manure (Summer) CS 2(1250 m²) : Sesbania (seed production) (Kharif)-chickpea (Rabi)-Green gram (Summer) CS 3(1250 m²) : Okra (Kharif)-cauliflower (Rabi)-Baby corn + cowpea (Summer)
Horti-pasture	1800	Kinnow + Sorghum-Berseem(300 m ²) Kinnow + pearl millet-lucerne (300 m ²) Kinnow + cowpea-oat (300 m ²) Kinnow + maize-mustard (300 m ²) Kinnow + maize + cowpea- Makhhan grass (300 m ²)
Agri-Horti	1200	Crop (soybean-vegetable pea-green manure) + papaya (600 m ²) Crop (soybean-vegetable pea-green manure) + banana (600 m ²)
Dairy	50	1 Desi cow + 1 Buffalo

Modules	Net area (m ²)	Composition
Vermicompost	50	
Boundary plantation	--	Karonda, guava
Secondary agriculture (value addition)	-	Marketable surplus will be converted in value added products
Area under supporting	100	Manure pit and Fodder chopping unit activities
Total	7200	

Cropping systems: Three cropping systems namely basmati rice-wheat + mustard/gram-green manure, Sesbania (seed)-chickpea-green gram and okra-cauliflower-babycorn + cowpea was planned under the module to meet the household demand of food, feed and generate income for the family under changing climate. The results indicate that under family nutrition system, basmati rice (variety PB -1) resulted in 313 kg of grain and wheat 325 kg of grain. The straw of rice was recycled as mulch in cauliflower under okra-cauliflower-baby corn + cowpea system. Seed production of Dhaincha could not be taken up and it was incorporated in the soil at 50 DAS for green manuring for timely sowing of next crop. Under Okra-Cauliflower-Baby corn + Cowpea, Okra recorded 1135 kg of green pod yield, 620 kg of baby corn and 105 kg cowpea from 1250 m² area. Stalks of okra, cauliflower, babycorn and cowpea were incorporated in-situ to increase soil fertility. Total 4228 kg of rice equivalent yield was recorded from cropping systems module. Total cost of cultivation, gross return and net return of cropping system module was Rs.29968, Rs.75170 and Rs.41290, respectively. Among three tested cropping system, okra - cauliflower - babycorn + cowpea cropping system was found highest profitable.

Horti-pasture: Five fodder crops viz. sorghum,

pearlmillet, maize, cowpea and maize+cowpea were evaluated during kharif 2017 in 5 strips (300 m² each) of kinnow plantation. Kinnow recorded 849 kg of fruits from 0.18 ha (27416 kg/ha). Among fodder crops, maize + cowpea recorded higher fodder production (1170 kg from 300 m²) followed by maize (1080 kg from 300 m²), sorghum (810 kg from 300 m²), pearlmillet (720 kg from 300 m²) and cowpea (450 kg from 300 m²). It can be inferred that with the cultivation of maize + cowpea for fodder during kharif in 0.18 ha of horti-pasture can supply green fodder to 1 cow and 1 buffalo for 195 days. Intercropping of fodder maize, sorghum, pearlmillet and cowpea in horti-pasture can supply fodder to two animals for 180 days, 135 days, 120 days and 75 days only, respectively. During the rabi season fodder crops viz. mustard, berseem, lucerne, oat and rye (makhan) grass were grown under inter-row space of kinnow. Highest fodder yield was found in berseem followed by ryegrass under kinnow plantation.

Dairy: The dairy unit is having one buffalo (murrah) and one desi cow. A total of 2533 litre of milk were produced out of which buffalo produced 1899.5 litres while and cow produced 633.5 litres. Total cost works out to Rs. 79,205 with share of 64.5, 20.3 and 15.2% respectively on concentrates, green fodder and straw, respectively. Total gross

return and net returns from dairy unit was found to be Rs. 1,23,835 and Rs. 44,630 respectively. Average daily dung production from dairy unit was found to be 54 kg which works out to 19.7 t/year. Per cent share of feeding cost in dairy is presented in which indicates 65 % share for concentrates.

Boundary plantation: On the boundary of IFS module guava and karonda hedge is planted for better utilization of different resources. Karonda hedge is also acts as biological fencing because of its spikes and protects crops from stray animals. During the reporting year total 704 kg guava and 206 kg of karonda was harvested and Rs. 23140 net return was earned.

Secondary agriculture (value addition): Protocol for production of kinnow mandarin squash (squash) was evaluated during October, 2017.

Fully matured kinnow fruits were harvested, washed with clean water and sorted by removing the damaged fruits. After sorting, fruits were made into halves with the help of knife and juices were extracted with hand juice extractor. Extracted juices were further filtered with muslin cloth. Economic analysis of value addition to kinnow indicates that additional income of Rs 0.28 lakhs can be obtained from 0.18 ha by making kinnow mandarin squash. The increase in net income due to value addition was found to be 2.17 times when 50 % of produces are made as kinnow mandarin squash and 50 % sold as fresh fruits. If 100 % of produces are subjected to value addition in the form of kinnow mandarin squash, the net income increases by 3.32 times over net income obtained by selling fresh kinnow.



Dairy unit of IFS model at Modipuram



Kinnow + fodder in IFS model



Residue/waste recycling



Value added products from kinnow mandarin

Table 7.1.15 : Economics of climate smart IFS model at Modipuram developed for marginal farmers

Module	Variable cost (Rs.)	Gross return (Rs.)	Net return (Rs.)	B:C ratio
Cropping system	29968	75170	41290	2.51
Horti-pasture	8350	37023	28673	4.43
Agri-Horti	-	-	-	-
Dairy	79205	123835	44630	1.56
Boundary Plantation	3300	26440	23140	8.01
Total (All modules)	1,20,823	2,62,468	1,37,733	2.17

The IFS model at Modipuram provided gross returns of Rs. 2,62,468 and net returns of Rs. 1,37,733 during 2017-18 besides employment generation of 531 days and resource saving of 30 % through on farm recycling of farm products and by products (Table 7.1.15).

Kanpur

Crop + Dairy is the most dominate farming system with area coverage of 89% followed by Crop + Dairy + Horticultural crops (9%). On Station IFS Model on One hectare area for small and marginal farmers of Central Plain Zone of U.P. was started at C.S.A. University of Agriculture & Technology, Kanpur during Kharif 2011 to achieve profitability, sustainability and livelihood security. This model consists three farming components i.e. (i) Crop (ii) Dairy and (iii) Horticulture. In crop component, Six cropping systems were adopted viz; (i) Rice-wheat-GG(G+R) (ii) Maize-Mustard-Sourghum (iii) Maize-Chickpea (iv) Maize-Potato-GG(G+R) (v) Maize-Garlic-GG(G+R) (vi) Sourghum(GF)-Barseem (GF) on an area of 7200 m². Dairy unit consisting of 4 animals i.e. One Buffalo, One Cow and two Calves along with Nadep and vermicomposting was also established on an area of 210 m²(60+150sqm). Horticulture unit is maintained on an area of 1920 m² which includes

plantation of Guawa (24), Aonla (09), Lemon (08), Mango(03), Jaick fruit(01) and Banana plantation. Vegetable and flower are also being grown as intercrop in horticulture unit besides five boxes apiary. Three component i.e. crop production dairy and horticulture are running in one ha land allotted for IFS model. During 2017-18, total net income of Rs. 1,67,434.00 was recorded from on station model. During the year net income of Rs. 37,438.00 from crop production unit, Rs. 1,19,986.00 from Dairy Unit and Rs. 10,010.00 from Horticulture unit. Performance analysis of IFS model at Kanpur during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 2,78,302 and Rs. 1,08,117 respectively besides generating average employment of 343 days and 36 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.16). Resource flow diagram of the IFS model is represented in Fig 2.

Soil fertility status after seven years was improved slightly in crop production and horticulture units in comparison to its initial value. Maximum improvements in soil fertility status was noted in green manuring followed by inclusion of legumes in cropping sequence

Table 7.1.16 : Performance of IFS Models at Kanpur during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
278301	108117	170184	343	47416	59627	63140	36	15

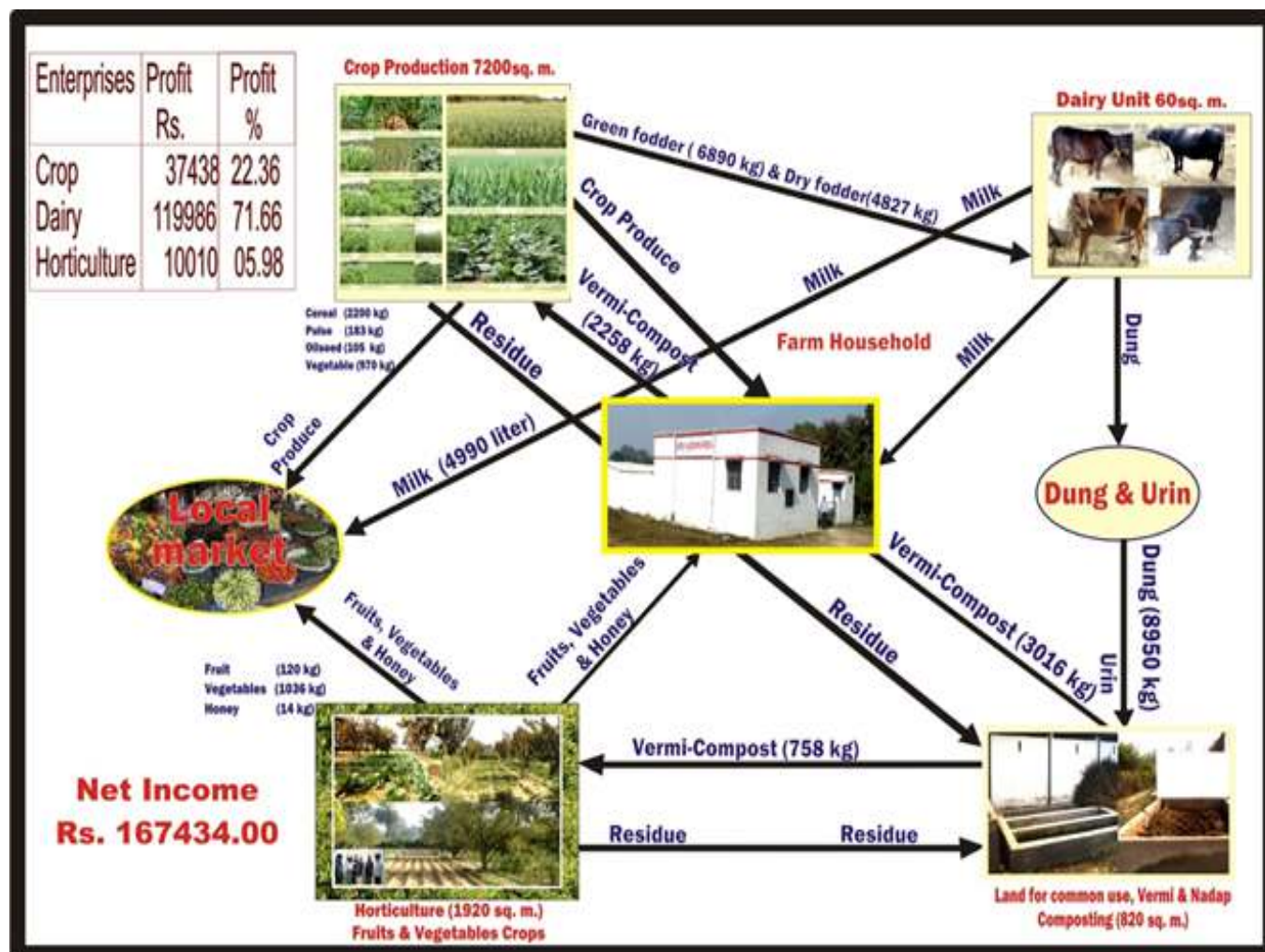


Fig 2. Resource flow diagram of IFS model at Kanpur

Performance analysis of two IFS models developed in Eastern Himalayan region

Performance analysis of 2 IFS model developed at Modipuram (Uttar Pradesh) and Kanpur (Uttar Pradesh) in Upper Gangetic Plains region for the

period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.3,74,781 and 1,63,143 respectively while generating mean employment of 385 mandays and 32% resource saving through on-farm recycling.

5. Middle Gangetic Plains Region

Four AICRP –IFS Centers, two in eastern part of Uttar Pradesh namely IAS, BHU, Varanasi and NDUA&T, Kumarganj, Faizabad and two in Bihar ICAR Research Complex for eastern region, Patna., and BAU, Sabour-Bhagalpur (Bihar) are given responsibilities of developing Region Specific IFS Models for respective states since 2010-11. Significance of IFS approach towards production, profitability and livelihood of small land holders in the regions as reflected from the results of study during 2017-18 along with mean performance of different IFS models of the zone through 2011-12 to 2017-18 of the programme is summarized hereunder;

Varanasi

Varanasi lies at 25°18' north latitude and 83°03' east longitude and at an altitude of 128.93 m above mean sea level. It falls under sub-humid climate with average rainfall of 1100 mm and belongs to Eastern Plain and *Vindhyan* region and NARP zone of Eastern Plain Zone: U.P.-4, Major farming system of the region is Crop +Dairy with area coverage of more than 70% followed by Crop + vegetables (20%). Area and composition of 1.0 ha IFS model developed for Varanasi region comprised of, 0.81 ha assigned to crop component with six cropping sequences, dairy component included 4 cross bred cows, the area assigned to fish pond and horticulture was 0.1 ha and 0.06 ha,

respectively. Regulated drain of the cattle shed goes to the fish pond and the urine was collected in separate tank for various uses. The harvested water of the farm building entered directly to the fish pond where high density poly culture consisting of grass carp, rohu, catla and mrigal is practiced. Horticulture included 14 permanent trees viz. guava, mango, citrus, *aonla*, jack fruit along with intercrops of banana and vegetables. Cucurbits are taken on the fence of orchard during *kharif*. Boundary plantation includes *karonda*, banana and papaya. Supplementary enterprises include poultry and mushroom cultivation. In poultry 200 chicks of Kuroiler are reared and six cycles are completed in one year. White button mushroom is cultivated on compost prepared using 5.0 q wheat straw during winter. Value additions include processing of rice, pulses, and oilseeds as well as NADEP and Vermicompost. Boundary plantation of *karonda*, banana and papaya is being practiced in about 200 m periphery. The IFS model at Varanasi provided gross returns of Rs. 9,07,809 and net returns of Rs. 3,88,440 during 2017-18 while performance analysis of IFS model during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 8,47,381 and Rs. 3,59,217 respectively besides generating average employment of 789 days and 18 % resource saving through on farm recycling excluding farm labour over the reporting period (Table 7.1.17).

Table 7.1.17 : Performance of IFS Models at Varanasi during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
847381	359217	488164	789	144727	259705	89063	18	46

Kumarganj

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

Faizabad is described in Table 7.1.18. The yield data showed that 4.11 t cereals, 2.92 t potato, 0.265t oilseed, 0.538t pulses 5.295t dry fodder and 25.53t green fodders were obtained from 0.7 ha area during 2017–18. Economics of crop production enterprise showed that net return of Rs. 120315 was obtained against incurred cash of Rs. 72652 in 0.7 ha area/annum. The average milk production of both the cows was 1.9 lit/day. The inputs cost occurred Rs. 78537 including labour cost of Rs. 12922 during 1st July 2017 to 30th June 2018. The income from milk production (692 lit) was Rs. 27680 while the compost prepared from the dung and animal shed wastes were recycled in the crops.

Table 7.1.18 : Component wise area allocation of IFS model at Kumarganj, Faizabad

A:Crops and Cropping Systems	Area (Net) allotted (m2)
1. Paddy – wheat – Sudanchari	2200
2. Paddy – potato- green gram	1200
3. Paddy-mustard – black gram	1200
4. Paddy – Lentil – Maize +Cowpea (fodder)	1200
5. Desi Chari– berseem - Cowpea	1200
B:HORTICULTURE (A multistoried fruit and vegetable unit) :	
Area covered under horticultural crops: – 50 M x 40 M	
Fruit species and their number:-	
Main fruit tree aonla – 30; Filler fruit plant guava – 24	
Boundary - Karonda and lemon trees	2000
C: DAIRY (Milk Production) :	
1.Two milch animals – two cows	
Vermicomposting unit	100
D: FISH COMPONENT :	
Rohu, Nain, Catla, Common carp, Silver carp, Grass Carp.	
Foot Yam is sown on the boundary of fish tank.	1000
Total	10100

Over all the farming system module of one hectare area provided net return of Rs. 136507 from crop + dairy enterprises by the incurred cost of Rs.173257 per annum during 2017-18 while generating 299 mandays of employment generation. Component wise economics of various enterprises under IFS model at Faizabad is given in [Table 7.1.19](#).



Horticulture block in IFS model at Faizabad

Performance analysis of IFS model during 2011-12 to 2017-18 revealed that the IFS model could provide an average gross and net return of Rs 3,16,184 and Rs. 1,48,807 respectively besides generating average employment of 441 days and 24 % resource saving through on farm recycling excluding farm labour over the reporting period ([Table 7.1.20](#)).



Dairy unit at IFS model at Faizabad

Table 7.1.19 : Component wise economics of various enterprises under IFS model during 2017-18.

IFS component	Net area (ha)	Gross returns (Rs/year)	Cost of production (Rs/year)	Net returns (Rs/year)	B:C ratio	Monetary efficiency (Rs/ha/day)
Field crops	0.70	192967	72652	120315	1.66	329.63
Agroforestry/ Horticulture	0.20	19480	5986	13494	2.25	36.97
Dairy (Milk production)	0.01	27680	78537	-50857	-0.65	-139.33
Vermicomposting		8635	1560	7075	4.54	19.38
Fish component	0.10	61200	14522	46678	3.21	127.88
Total	1.01	309962	173257	136705	0.79	374.53

Table 7.1.20 : Performance of IFS Model at Kumarganj, Faizabad during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
847381	359217	488164	789	144727	259705	89063	18	46

Patna

Two IFS models were developed at ICAR Research Complex for Eastern Region, Patna Research Farm comprising of Crop + Goat + poultry (one acre model: 0.4 ha, Fig 3) and Crop + Livestock (2 Cows) + Fishery cum duckery (two acre model: 0.8 ha, Fig 4) for upland and lowland situation which represents more than 75 percent of eastern region. Total establishment cost of one acre IFS model was Rs. 1.2 lakhs and for two acre IFS model was Rs. 2.05 lakhs which includes construction of

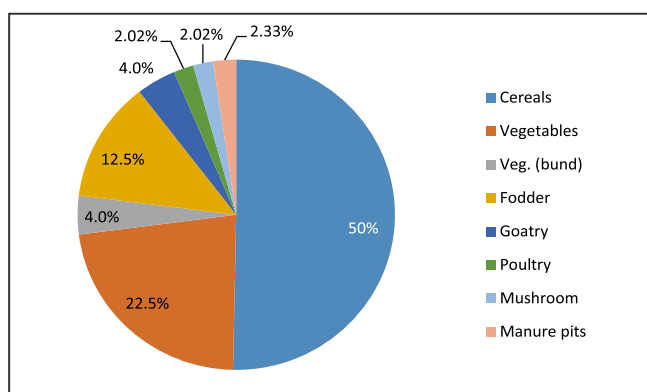


Fig 3 Area allocation for one acre model (0.4 ha)

sheds for animals and birds, mushroom, pond, vermi-pits, biogas, boundary plantation and fruit crop unit.

IFS model (0.4 ha) generated gross and net return of Rs. 2,92,800 and Rs 94,320 while the 0.8 ha model provided gross and net return of Rs. 3,80,810 and Rs 1,46,720 during 2017-18. Likewise, the 04 ha model resulted in 239 days of employment while the 0.8 ha model generated 320 days of employment. Performance analysis of IFS models (0.4 ha and 0.8 ha) during 2011-12 to 2017-18 is given in Table 7.1.21

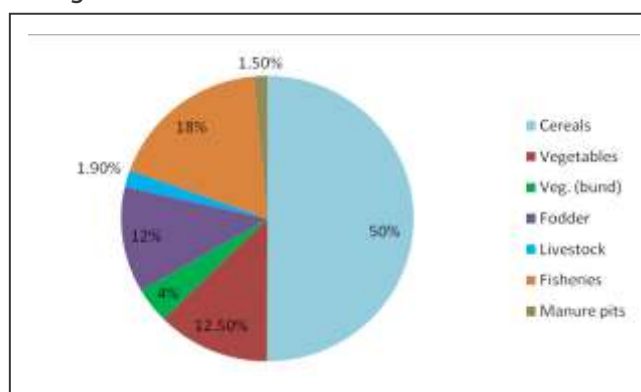


Fig 4. Area allocation two acre model (0.8 ha)

Table 7.1.21 : Performance of IFS Models at Patna during 2011-12 to 2017-18

Gross Return	Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
0.4 ha	325443	96812	228631	421	67156	71890	55594	23	18
0.8 ha	365402	163399	202003	459	80092	44757	57083	28	20



View of one acre model at Patna



View of two acre model at Patna

Sabour

The IFS model was developed at Sabour centre of Bihar Agricultural University during *kharif*, 2010. The Integrated Farming System model was synthesized using the scientific inputs from the on-station research experiments conducted at Bihar Agricultural University, Sabour for improving the productivity, profitability and sustainability of the whole farm as well as livelihood security of farmer's family. The cropping systems were modified by including cereals, pulses, oilseeds, vegetables, fruits, milk, eggs etc. to meet the family needs. The area allocated under different components of one hectare integrated farming system (IFS) model were 5916 m² under three cropping systems viz., rice - wheat- green gram (grain + residue incorporation), rice - winter maize + potato - cowpea (F), rice - mustard - maize (G) + cowpea (F); 1098 m² under fodder system, i.e. sorghum + rice bean - berseem - maize + cowpea (F), 792 m² under seasonal vegetables; Area under Fish production (800 m²) and fruits (Guava and Papaya) on embankment of fish pond (620 m²) totaling it to 1420 m². Besides, 125 numbers of subabool (*Leucaenaleucocephala*) plants and 50 numbers of Moringa plants were also planted along the boundary of field in 200 m² areas. Vermicompost pits (3 nos.) were constructed near dairy shed for recycling of farm and animal wastes in 100 m² area + dairy (2 cross breed milch cows) in 70 m² area, Goatry (10 + 1 Black Bengal breed) for meat purpose in 80 m² area, ducks for eggs and meat have been included in the system. All the

farm and animal wastes were properly recycled into system so that nothing goes waste and output of one enterprise worked as input for other enterprises.

The net income of Rs. 3,14,650 was realized from Cropping+ dairy+ goatry + fishery including fruits + duckery + boundary plantation+ vermicompost. Net income obtained from cropping systems, dairy unit, goat unit, fishery, duckery, boundary plantation and recycling of farm waste contributed Rs.71,855 (22.84%), Rs.1,47,379 (46.84%), Rs.25,139 (7.99%), Rs.19,892 (6.32%), Rs.-3,529 (-1.12%), Rs. 18,924 (6.01%) and Rs.34,990 (11.12%), respectively to the total income of the system. The IFS model also helped in increasing employment (705 man days/year) and regular income (Rs. 862/day) through out the year to farm family. Performance analysis of IFS model during 2011-12 to 2017-18 is given in [Table 7.1.21](#).

Performance analysis of different IFS models developed in Middle Gangetic Plains

Performance analysis of IFS models developed across Middle Gangetic Plains viz. Varanasi (Uttar Pradesh), Kumarganj (Uttar Pradesh), Patna (Bihar) and Sabour (Bihar) for the period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.4,86,760 and 2,08,453 respectively while generating mean employment of 560 mandays and 27% resource saving through on-farm recycling.

Table 7.1.21 : Performance of IFS Model at Sabour during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
579390	274028	305362	688	124948	54742	128692	42	32

6. Lower Gangetic Plains Region

To demonstrate the benefits of diversified farming an IFS Model was established in 2012 in order cater to the needs of six-member farm family so as to sustain their livelihood under irrigated ecosystem of New Alluvial zone of West Bengal. In order to meet the requirements of the farm families and livestock, the IFS Model has been synthesized for 0.66 ha land holding to support a family of small and marginal farmer having six family members. The model encompasses components like crop (0.42 ha), horticulture (0.11 ha), dairy, vermicomposting and biogas unit (0.03 ha) and fishery (0.09 ha). Low lying area measuring 0.2 ha of the total crop area of 0.42 ha has been converted into five pairs of raised and sunken beds alternately, each bed measuring 200 m² for paddy cum fish cultivation in the sunken

beds and for cultivation of vegetables and arable field crops in the raised beds. Slope in the junction of raised and sunken beds has been utilized for fodder cultivation (hybrid napier). Some vegetable creepers (dolichos bean, bottle gourd etc.) are also grown above the sunken beds on netted scaffolds.

The model generated employment of 295 man days (mean data during last six years from 2011-12 to 2017-18). The mean production in terms of REY was recorded to the tune of 11 t/ha/year. The model provided mean gross and net return of Rs.1,90,599/- and Rs. 73,697/- (Mean of last six years). About 28% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family (Table 7.1.22)

Table 7.1.22 : Performance of IFS Model at Kalyani during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
190599	73697	116902	295	50112	30953	35838	28	11



View of different components of IFS model at Kalyani



View of different components of IFS model at Kalyani

7. Eastern Plateau and Hills

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

Raipur

Integrated farming system research model of 1.0 hectare has been started from the year 2010-11 with cropping system, horticultural system, fishery and poultry enterprises. From the year 2012-13, dairy component, vermicompost, biogas units have also been taken under operation in addition to the aforesaid components goatry unit was also included. Under region specific integrated farming systems model of 1.0 ha cropping system, horticulture system, fishery, poultry, dairy, goatry, vermicompost and mushroom

components were under operation during 2017-18 at IGKV, Raipur. Gross income of Rs. 407728/-, was generated from IFS model, which includes Rs. 200734/- through crop component, Rs. 167402/- by livestock, Rs. 7464/- from fishery, Rs 17328/- by bund and boundary plantation and rest of Rs 14800/- from the other enterprises. Net return of Rs. 189439/- was achieved from the 1.0 ha model with employment generation of 348 man days during 2017-18.

The model generated employment of 308 man days (mean data from 2011-12 to 2017-18). The mean production in terms of REY was recorded to the tune of 16 t/ha/year. The model provided mean gross and net return of Rs.2,86,652/- and Rs. 1,40,444/- (Mean of last six years). About 16% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family ([Table 7.1.23](#)).

Table 7.1.23 : Performance of IFS Model at Raipur during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
286652	140444	146208	308	64576	64819	23221	16	16



View of crop module of IFS model at Raipur

Ranchi

An integrated farming system model of 1 ha comprising of components like cropping, milch cows, fishery, apiary, mushroom production, nutritional garden and vermicompost was undertaken at Agronomy Research Farm of Birsa Agricultural University during 2011-12 to study the

productivity, profitability, employment generation and resource recycling of integrated farming system. Area allocation of different components of the IFS model is described in [Table 7.1.24](#). Integrated farming system provided an opportunity to increase the economic yield per unit time by intensification of cropping and integration of allied enterprises.

Table 7.1.24 : Components and area distribution of different components of the IFS model at Ranchi (2017-18)

Sl. No.	Component s	Area (m ²)	Variety/Breed	
			Kharif	Rabi
1	Crop Sequences	8000	PA 6444	HD 2967
	CS1- Rice –wheat	2500	Suwan +	
	CS2- Maize + Black gram (1:2) – Gram	2000	Pant-U-19	KWR 108
	CS3- Maize + Soybean(1:2) – Mustard	1000	Suwan +	
	CS4- Groundnut – Mustard	1000	Birsa soy safed-2	NRC HB 101
	CS5- Maize(F) + Cowpea(F) (1:1)	1500	Birsa groundnut 3	NRC HB 101
	– Berseem + Oat		African tall + EC-4216	Vardan + Japani
2	Dairy	590 (5.9%)		Sarson 2
3	Mushroom	145 (1.45%)	HF Cross- 2	
4	Vermi-compost	265 (2.65%)	Oyster	
5	Fishery/ pond	1000 (10%)	Eusinea foetida	
6	Apiary	-	Rohu, Catla, Mrigal	
	Total	10,000	Apis indica	

Gross income of Rs. 2,38,567/- and net return of Rs. 95,800/- was achieved from the 1.0 ha model with employment generation of 221 man days during 2017-18. The model generated employment of 262 man days (mean data during last six years from 2011-12 to 2017-18). The mean production in terms of REY was recorded to the tune of 12

t/ha/year. The model provided mean gross and net return of Rs. 2,19,948/- and Rs. 93,238/- (Mean of last six years). About 27% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family ([Table 7.1.25](#)).

Table 7.1.25 : Performance of IFS Model at Ranchi during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
219948	93238	126710	262	47596	38252	40872	27	12



View of different modules of IFS model at Ranchi

Performance analysis of two IFS models developed in Eastern Plateau and Hills

Performance analysis of IFS models developed across Eastern Plateau and Hills viz. Raipur (Chhatisgarh) and Ranchi (Jharkhand) for the period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.2,53,300 and Rs.1,16,841 respectively while generating mean employment of 285 mandays and 22% resource saving through on-farm recycling.

8. Central Plateau and Hills

Jabalpur

AICRP-IFS Centre Jabalpur (MP), falls under ACR Central Plateau and hills region of the country. The average family size of the region is 5 members (3 male + 2 female) with the holding size of 0.70 ha for marginal and 1.20 ha for the small farmers. IFS model of 1.0 ha was initiated at Jabalpur during kharif season of 2012. In the IFS model cropping component covers 0.64 ha, dairy component covers 0.007 ha with 3 cow + 1 calf, fisheries component 0.06 ha (1800 m³), poultry component 300 birds, vermicompost 0.0039 ha and mandatory other enterprises like kitchen garden, boundary plantation etc. The total farm production in terms of Rice Equivalent Yield (REY), the average productivity of IFS model is 5.6 t/ha/year. The total average of gross and net returns of the IFS model fetched Rs 114049 and

4047 per ha per year, respectively. The different cropping systems in the crop component recorded the maximum gross return and net return of Rs 28782 and Rs 16436, respectively from the rice-wheat cropping system closely followed by sorghum-berseem + gobhisarson (Rs 12663 & Rs 7842), soybean-oats (Rs 7120 & Rs 2477 respectively) and Maize-chickpea cropping system (Rs 4621 and Rs -421). Okra-tomato cropping system registered the minimum gross and net return (Rs 4340 & Rs -1550). The employment opportunity was also increased both in terms of man days and employment generation in rupees to 208 man days per ha and worth Rs 52208 by inclusion of all the enterprises as against cropping alone (14 man days per ha and worth Rs 3514). Combining cropping with other allied enterprises would increase labour requirement and thus provide scope to employ family labour round the year. The model generated employment of 443 man days (mean data from 2012-13 to 2017-18). The mean production in terms of REY was recorded to the tune of 17 t/ha/year. The model provided mean gross and net return of Rs.2,46,670/- and Rs. 1,57,715/- (Mean data from 2012-13 to 2017-18). About 17% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family (Table 7.1.26).

Table 7.1.26 : Performance of IFS Model at Jabalpur during 2012-13 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
246670	88956	157715	443	87651	44720	25344	17	14



View of different modules of IFS model at Jabalpur

9. Western Plateau and Hills

AICRP-IFS programme running in three representative districts of Western Plateau and Hill Region include i AICRP-IFS Centre - Parbhani, ii AICRP-IFS Centre – Akola and iii) AICRP-IFS center at Rahuri. Region specific on station IFS models are being developed at all the three respective centers. Composition of IFS models and production & economic trends under scientific management and prevailing farming practices are summarized below;

Akola

To increase the productivity, profitability and bring sustainability under small and marginal

farmers of Vidarbha Region of Maharashtra state, an IFS model was established at main center of Dr. PDKV, Akola during 2012-13 in one hectare irrigated land to meet out the needs of an average family of 5-6 members. This model includes crops and cropping systems (0.70 ha), horticulture (0.25 ha), goatary, poultry, kitchen gardening, boundary plantation and composting (0.05 ha) etc. One hectare Integrated farming system model comprising of cropping systems (Cotton + Pigeonpea (6:2) - Sesame, Soybean + Pigeonpea (5:1), Sorghum – Wheat, Soybean – Chickpea, Cowpea – Fenugreek) on 0.70 ha + Horticulture (Custard apple + Black gram/Pigeon pea – Safflower + Agasto + Drumstick) on 0.25 ha +

Goatary (10+2) + Poultry (Chicken & Eggs) + Organic Kitchen garden (Leafy vegetables, root crops, vines and flowers) + Compost + Boundary plantation (Karonda and Glyricidia) on 0.05 ha area developed for small and marginal farmers of Vidarbha region in Maharashtra. The IFS model provided gross and net returns of Rs. 3,73,093 and Rs.1,65,402 per ha respectively with B: C ratio of 2:15 and employment generation of 540 Mandays from 1 ha IFS model. Among the various components, highest gross return of Rs. 1,37,281 and net return of Rs. 76,479 were recorded cropping system

module of the IFS model. Total compostable biomass produced 160 q, that contributes 68 kg N, 29 kg P, 74 kg K and 7.4 kg calcium which saved the input expenditure of Rs. 4,653.

The model provided mean gross and net return of Rs.1,95,624/- and Rs. 55,247/- (Mean data from 2012-13 to 2017-18). About 14% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family (Table 7.1.27).

Table 7.1.27 : Performance of IFS Model at Akola during 2012-13 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
195624	55247	140378	476	72781	51666	18844	14	11



View of vegetables in kitchen garden of IFS model at Akola



Summer sesame in custard apple in IFS model at Akola



Berari goats in IFS model at Akola



Hybrid Napier + Berseem (Green Fodder)

Parbhani

An Integrated Farming System model was established at VNMKV, Parbhani during the year 2010-11 with a land area of 1.0 ha. The land was allocated under different components of Integrated farming system viz. Field crops, Horticultural crops, Livestock, Poultry and Apiary with the objective to meet up different family requirement (of five members family. IFS model comprising of cropping systems - Soybean-Wheat (0.1 ha), Soybean-Rabi Sorghum (0.1 ha), Soybean-Onion (0.1 ha), Green gram-Brinjal (0.16 ha); Fodder crops viz. Hybrid Napier (0.075 ha) and Lucerne (0.075 ha) were grown, horticulture [Kagzi lime

(0.20 ha) intercrop –*Kharif* Soybean and *Rabi* Cabbage, spices- Turmeric (0.1 ha), Boundary plantation such as Anjan and Drumstick on 0.04 ha + dairy including animal shed (1 Cow-Holdev and 1 Buffalo- Murrah), vermicompost (0.05 ha) developed for the Marginal and Small farmers of Central Maharashtra Plateau Zone (MH-7).

Detailed economics for the year 2017-18 from different modules of IFS model developed at Parbhani is presented in [table 7.1.28](#) which revealed that, gross return of Rs.2,96,433 and net return of Rs. 1,03,636 was realized from the IFS model besides employment generation of 497 mandays.

Table 7.1.28 : Detailed economics of different components in IFS model at Parbhani (2017-18)

Sr. No.	Components	Area (ha) (Rs/ha)	GMR (Rs/ha)	COC (Rs/ha)	NMR Generation	Employment (Man days)
A.	Cropping System					131
1.	Soybean- Rabi Sorghum	0.100	12766	7125	5641	
2.	Bt. Cotton	0.100	12515	6260	6255	
3.	Maize - Gram	0.100	27521	12385	15136	
4.	Green gram – Chickpea	0.160	15740	7363	8377	
5.	Lucerne	0.075	14536	6815	7721	67
6.	Hybrid napier	0.075	19472	8789	10683	
7.	Kagzi lime	0.200	30000	15362	14638	92
8.	Spice crop (Turmeric)	0.100	15204	7593	7611	35
B.	Boundary plantation	0.04				
1.	Drumstick		7850	3367	4483	22
2.	Anjan		1248	618	630	
C.	Dairy component	0.05				
1.	Cow Holdev – 1 (Dry period)		8100	7125	975	133
	Cow Holdev – 2 (Milking)		78876	68310	10566	
D.	Vermicompost Unit		22605	11685	10920	17
E.	Goat unit (15/3/2018)		--	--	--	--
	Grand Total	1.00	266433	162797	103636	497

The model provided mean gross and net return of Rs.2,66,132/- and Rs. 98,748/- (Mean data from 2011-12 to 2017-18). About 24% of the input cost of the model was realized through recycling farm

produce and by produce besides providing almost all the commodities required for the farm family (Table 7.1.29).

Table 7.1.29 : Performance of IFS Model at Parbhani during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
266132	98748	167383	444	66631	60162	40590	24	15



View of different components of IFS model at Parbhani

Rahuri

The integrated farming systems (IFS) unit at MPKV, Rahuri was started during 2010-11. The model is developed for small farming household with 1.00 ha area under irrigated ecosystem. The IFS model on 1.00 ha. area comprises of crops (0.72 ha) viz., Soybean –Wheat (0.30 ha), Maize –Onion (0.20 ha), Pearlmillet – Chickpea (0.10 ha),

Lucerne and Napier (0.12 ha) area, Mango (0.20 ha) and cross breed cow (2), poultry four lots of 500 birds total, Vermi-compost unit (0.08 ha). The gross monetary returns (Rs. 5, 29, 911 ha⁻¹) and net monetary returns (Rs.2, 75, 206 ha⁻¹) were obtained from IFS Model during the year 2017-18. The overall B:C ratio obtained for the IFS model was 2.08. The model generated 485 man days of employment during 2017-18 (Table 7.1.30).

Table 7.1.30 : Economic performance and employment generation of from different components in IFS model at Rahuri (2017-18)

Component	Gross return (Rs.)	Cost of cultivation (Rs.)	Net Return (Rs.)	Percentage share in net return	Net return per rupee invested	Employment Generation (Man days)
Crop	172114	49654	122460	44.00	3.46	167
Animal	150344	88218	62126	23.00	1.70	219
Poultry	125000	93150	31850	12.00	1.34	28
Mango Orchard	33600	9096	24504	9.00	3.75	21
Vermi-compost/ vermi-culture	20678	5956	14722	5.00	3.52	10
Forage crop	28175	8631	19544	7.00	3.26	40
Total	529911	254705	275206	100	2.08	485



Maize-onion cropping system of 1.0 ha IFS model at Rahuri



Livestock component of 1.0 ha IFS model at Rahuri

Table 7.1.31 : Performance of IFS Model at Rahuri during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
404544	225056	179351	400	62322	73008	47273	27	22

The model provided mean gross and net return of Rs.4,04,544/- and Rs. 2,25,056/- (Mean data from 2011-12 to 2017-18). About 27% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family producing 22.0 t of system yield (REY) (Table 7.1.31).

Performance analysis of three IFS models developed in Western Plateau and Hills

Performance analysis of IFS models developed across western Plateau and Hills viz. Akola (Maharashtra), Parbhani (Maharashtra) and Rahuri (Maharashtra) for the period 2011-12 to 2017-18 revealed the models could provide an average gross and net return of Rs.2,88,767 and 1,26,350 respectively while generating mean employment of 440 mandays and 21% resource saving through on-farm recycling.

10. Southern Plateau and Hills

Five AICRP-IFS centers namely, TNAU, Coimbatore (Tamilnadu), ARS, Kathalgere (Karnataka), ANGRAU, Rajendra Nagar, Hyderabad (A.P.), Thanjarur (T.N) and ARS, Sirriguppa (Karnataka) are located in different NARP zones of Southern Plateau and Hill Agro Climatic Zone of the country.

Coimbatore

IFS study on development of integrated farming system model for small farmers of irrigated dryland in western zone of Tamil Nadu was initiated in research farm of TNAU, Coimbatore during June 2010, with an objective to develop and validate Integrated Farming System model for enhanced system productivity, profitability and sustainability in irrigated dryland, to assess relative efficiencies of the IFS model in terms of economics, resource use and energy and to optimize individual components of IFS in

regional perspective. The predominant farming systems followed is crop + dairy in 70 % area and crop + dairy + goat in 30 % area. The average size of a farm family is five members (3 male and 2 females). The model was designed for 1.0 ha land holding, to support a family of five to six members. The IFS model comprised of crop unit, horticulture (aonla, sapota, acid lime and

pomegranate), dairy unit (2+2), goat unit (10+1), biogas unit (2 m³), vermicompost unit, border plants (annual moringa, curry leaf and agathi) and area under supporting activities during 2017-18. Detailed economics of the IFS model at Coimbatore is given in Table 7.1.32 and resource flow diagram of the model is given in Fig 5.

Table 7.1.32 : Economic performance of different components in IFS model at Coimbatore (2017-18)

No.	Component	Size	Gross return (Rs.)	Total return (Rs.)	Net return (Rs.)	% contribution
1.	Crop	1.02 ha	2,75,857	1,29,393	1,46,464	42.45
2.	Horticulture	0.16 ha	10,640	10,013	627	0.18
3.	Dairy	2 cow + 2 calves	2,50,983	2,01,049	49,935	14.47
4.	Goat	10 + 1	1,27,811	68,875	58,936	17.08
6.	Vermicompost	50 m ²	52,500	-	52,500	15.22
7.	Compost yard	100 m ²	8,600	-	8,600	2.49
8.	Kitchen Gardening	200 m ²	16,555	5,182	11,373	4.81
9.	Boundary planting	---	21,485	4,880	16,605	3.30
	Total		7,64,431	4,19,392	3,45,040	

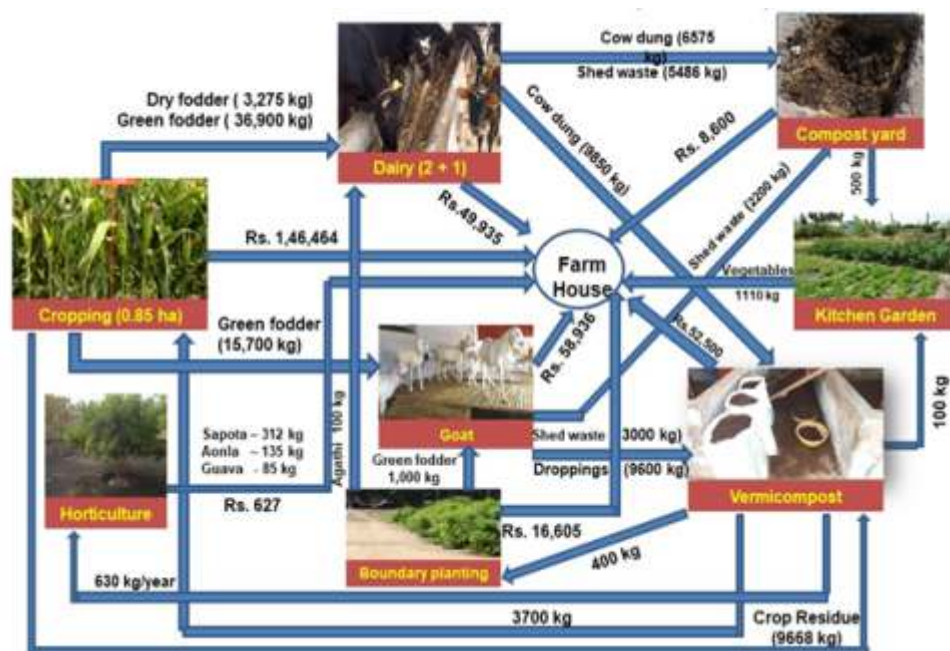


Fig 5 Resource flow diagram of IFS model at Coimbatore

Table 7.1.33 : Performance of IFS Model at Coimbatore during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
701664	281726	419938	724	165192	128925	113881	25	39

The model provided mean gross and net return of Rs.7,01,664/- and Rs. 2,81,726/- (Mean data from 2011-12 to 2017-18). About 25% of the input cost of the model was realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family producing 39.0 t of system yield (REY) (Table 7.1.33).

Kathalagere

The IFS study has been conducted on irrigated based integrated farming system for marginal and small farm holders with an area of 1.0 ha at Agricultural and Horticultural Research Station, Kathalagere, Davangere district of Karnataka state under Bhadra command area. The allocation

INTEGRATED FARMING SYSTEM MODEL COMPONENT WISE AREA & PERCENT



of land resource for accommodating different enterprises was done as per the family needs (calculated for a family of 5 members) and size/numbers of individual components of the system. Out of one hectare area, 0.50 hectare was allotted for crop component (Cereals, pulses and millets), 0.35 hectare was taken up with Horticulture crops (Areca nut, Coconut, Banana, Drumstick and Vegetables). Dairy and Sheep components were also introduced as additional components with buffalo (one) + HF cow (two) and sheep (10+1). Green fodder block was fixed in an area of 0.03 hectare. Additional components like compost (2 units), vermicompost (3 units) and Azolla (2 units) were included subsequently in the system. Cow dung, urine, sheep excreta, farm wastes and crop residues were properly recycled by composting (FYM and vermicompost) and incorporated in to the soil. Similarly, Azolla was released in to paddy field as source of nitrogen fixer and also used as animal feed in limited quantity (1:10 ratio of azolla and feed). Component wise Area allocation for different enterprises is represented in pictorial representation below :

The gross monetary returns (Rs. 2,92,946 ha⁻¹) and net monetary returns (Rs. 2,01,436 ha⁻¹) were obtained from IFS Model during the year 2017-18. The model generated 965 man days of employment during 2017-18. The model provided mean gross and net return of Rs. 2,65,928/- and Rs. 1,67,595/- (Mean data from 2011-12 to 2017-18). About 48% of the input cost of the model was

realized through recycling farm produce and by produce besides providing almost all the commodities required for the farm family producing 15 t of system yield (REY) (Table 7.1.34).

Rajendranagar

Integrated Farming Systems research was initiated at Rajendranagar, PJTSAU in 1.0 ha land under irrigated dry situation during 2010-11. The land was earmarked for developing 1 hectare Model for marginal/small farmers by integrating crops with horticulture and animal components. During 2017-18 Cropping system module was refined by adding climate resilient crops/varieties and also based on requirement of household for food, nutrition, fodder, fuel etc. IFS Model Composition was refined by deleting uneconomic and/or non-feasible enterprises based on past results and also adding socially accepted, economically viable and less area requiring climate proof enterprises. The detailed allocation of area and number for different modules of IFS at Rajendranagar is given in Table 7.1.35.

During the year 2017-18, holistic integration of animals with crops in 1 ha area resulted in a total productivity of 28.5 t REY ha⁻¹ with gross and net income of Rs. 5,16,396/- and 2,13,631/- with the total operational expenditure of Rs. 3,02,765/- in addition to generation of 639 man days of employment in the system. Detailed economics of the IFS model is presented in Table 7.1.36.

Table 7.1.34 : Performance of IFS Model at Kathalgere during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
265928	167595	98333	448	89680	22373	44724	48	15

Table 7.1.35 : Components and area distribution of different components of the IFS model at Rajendranagar (2017-18)

Modules/ Enterprises identified	Area (ha)	Treatments
Crops	0.70	Cropping Systems:
	0.20	Rice-Groundnut
	0.10	Bt cotton+Greengram - Sorghum (Fodder)
	0.10	Maize-Groundnut
	0.10	Pigeonpea + Sweet corn - Bajra
	0.10	Maize + Pigeonpea -Sunhemp (Fodder)
	0.10	Hybrid Napier and Lucerne
Horticulture	0.20	
Fruits		Guava
Under storey Pastures and fodders		Stylosanthes and Hedge lucerne
Livestock	0.07	
Desi Cows -2 (Gir breed)	0.04	Gir breed
Goatery (9 A + 3 K)	0.015	Osmanabadi breed
Back yard Poultry		
(200 No)		Aseel breed
Vermi-compost unit	0.015	
Supporting activities#	0.03	Kitchen garden, Azolla production, Dwelling unit, tube-well, irrigation channels, store house etc.,
TOTAL	1.0	

Table 7.1.36 : Production and economics of different components in IFS model at Rajendrangan (2017-18)

Component	Area	Returns (Rs plot-1 –Yr-1)			% share in income	
Crop	(m ²)	COC	Gross	Net	Gross	Net
Rice – Groundnut	2000	16671	36304	19633	9.19	7.03
Pigeonpea+Sweet corn-Bajra	1000	9503	21888	12385	5.80	4.24
Maize + pigeon pea – Sunhemp (F)	1000	6858	17597	10739	5.03	3.41
Bt Cotton + Gr.gram – Fodder Sorghum	1000	7935	20792	12857	6.02	4.03
Maize-Groundnut	1000	9819	23835	14016	6.56	4.62
Napier	1000	3782	60360	56578	26.48	11.69
Sub total	7000	54569	180775	126207	59.08	35.01
Horti-Pasture						
Guava Orchard	800	4433	5850	1417	0.66	1.13
Hedge Lucerne	400	3240	18789	15549	7.28	3.64

count/....

Stylo	600	2251	0	-2251	-1.05	0.00
Sub total	2000	9924	24639	14715	6.89	4.77
Livestock	550					
Dairy		147532	154888	7356	3.44	29.99
Goatery		44832	91443	46611	21.82	17.71
Backyard Poultry		31440	34082	2643	1.24	6.60
Sub total		223804	280413	56610	26.50	54.30
Others : FYM	200	5891	12780	6888	3.22	2.47
Vermicomposting		5478	10860	5382	2.52	2.10
Kitchen garden	250	3100	6929	3829	1.79	1.34
Sub total	1000	14469	30569	16100	7.54	5.92
Grand Total	10000	302766	516396	213631	100	100

Table 7.1.37 : Performance of IFS Model at Rajendranagar during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
499176	135650	363526	743	150569	137356	75601	20	28

The model provided mean gross and net return of Rs.4,99,176/- and Rs. 1,35,650/- (Mean data from 2011-12 to 2017-18). About 25% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 28 t (REY) (Table 7.1.37).

Siruguppa

An Integrated Farming System model of 1 ha was established at Agricultural Research Station, Siruguppa, Karnataka, under AICRP on Integrated Farming System for livelihood security of small farmers in Tungabhadra Project area during the year 2010-11. The land was allocated under different components mainly on agriculture components including crop (Cereals and pulses components in 0.74 ha), horticultural in 0.18 ha (Sapota, curryleaf, papaya, vegetables and floriculture) and fodder component in area of 0.02 ha. The remaining land of 0.06 ha was allotted for

agriculture allied activities such as live stock unit including 2 cows, one buffalo and goatery (14 nos.), Fish pond, Vermicomposting unit (4), compost unit (1) and Azolla unit (1). The boundary plantation with teak and glyricidia was established to protect the unit and to generate the biomass for further utilization. The internal bunds were also planted with pigeon pea, fig and banana to meet out nutritional security of a small family (of six member's family).

Results revealed that during 2017-18, the 1 ha IFS model realized the Rs. 3,60,980/- and Rs. 2,18,426/- gross return and net return, respectively with a B:C ratio of 2.53 (Table 7.1.38). Among the different components of IFS, higher gross returns (Rs. 1,49,765/-) and net returns (NR) (Rs. 84,608/-) were recorded in animal component including buffalo and cow followed by Goatery with NR of Rs. 54,570/- The model generated 511 man days/ha/year from all the components put together.

The model provided mean gross and net return of Rs.3,29,133/- and Rs. 1,85,647/- (Mean data from 2011-12 to 2017-18). About 42% of the input cost

of the model was realized through recycling farm produce and provided mean system yield of 18 t (REY) (Table 7.1.39).

Table 7.1.38 : Area allocation and economics of different components in IFS model at Siruguppa (2017-18)

Components	Area (sqm)	% area	COC (Rs)	Gross returns (Rs)	NR (Rs)	B:C
Crop components						
Paddy-paddy	1650	16.5	9497	16501	7004	1.74
Paddy-maize	1150	11.5	6715	16001	9286	2.38
Paddy-sorghum	1150	11.5	4823	10640	5817	2.21
Bt cotton-GM	1600	16.0	5096	12674	7578	2.49
Maize-chickpea	1850	18.5	8695	33806	25111	3.89
	7400	74.0	34826	89622	54796	2.54
Horticulture (Sapota + curryleaf + Papaya + vegetables) + kitchen garden	1443 256	16.99	2911	7598	4687	2.61
Animal component (Cows	81	0.81	65157	149765	84608	2.30
Goatary (Goat + manure)	13	0.13	29230	83800	54570	2.87
Azolla / Vermicompost	51	0.51	7726	17195	9469	2.23
Crop residues + fodder + BP + F	527.31	5.27	736	5390	4654	
Total	1.0 ha	100	142554	360980	218426	2.53

Table 7.1.39 : Performance of IFS Model at Siruguppa during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
329133	185647	143486	492	74295	55043	62978	42	18



Horticulture unit with intercrops in IFS model at Siruguppa

Thanjavur

Integrated Farming System model for the marginal farmers of Cauvery New Delta Zone under irrigated condition was established June 2012 in 0.8 ha area at Soil and Water Management Research Institute, Thanjavur. AICRP – IFS sub centre of Tamil Nadu. Six components viz., crop (6100m²) + Horticulture (1000m²) + Dairy (20m²) + Fishery (800m²) + Poultry (20m²) + Vermicompost (20m²) were included in this model. The soil of the

experimental block was sandy loam in texture.

Results revealed that during 2017-18, the 0.8 ha IFS model realized the Rs. 4,54,087/- and Rs. 1,80,273/- gross return and net return, respectively (Table 7.1.40). Among the different components of IFS, higher gross returns (Rs. 1,59,528/-) and net returns (NR) (Rs. 70,476/-) were recorded from cropping systems module followed by dairy. The model generated 423 man days of employment generation from all the components put together.

Table 7.1.40 : Economics of different components in IFS model at Thanjavur (2017-18)

Component	Gross Return (Rs)	Net Income (Rs)	% of contribution
Cropping system	159528	70476	39.1
Horticulture	24256	9865	5.5
Dairy	119725	28436	15.8
Poultry	37222	10772	6.0
Fishery	52650	28730	15.9
Vermicompost	34250	13950	7.7
Boundary plantings	26456	18044	10.0
Total	454087	180273	100



View of cropping systems module of IFS model at Thanjavur

The model provided mean gross and net return of Rs.3,59,075/- and Rs. 1,51,821/- (Mean data from 2012-13 to 2017-18). About 16% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 20 t (REY).

Performance analysis of five IFS models developed in Southern Plateau and Hills

Performance analysis of IFS models developed across southern Plateau and Hills viz. Coimbatore (Tamil Nadu), Kathalgere (Karnataka), Rajendranagar (Telengana), Siruguppa (Karnataka) and Thanjavur (Tamil Nadu) for the last 6 years revealed the models could provide an average gross and net return of Rs.4,30,995 and 1,84,488 respectively while generating mean employment of 556 mandays and 30% resource saving through on-farm recycling.

11. East Coast Plain & Hills

The IFS model at AICRP-IFS center at Bhubneshwar (Odisha) representing East Coast Plain & Hill region is developed for small farming household with 1.25 ha area under irrigated ecosystem. The present system consists of cropping system, horticultural system, dairy, poultry, fishery, boundary plantation, kitchen garden and apiary.

The gross and net returns were Rs. 3,64,732 and Rs. 1,29,071 with benefit cost ratio 1.55 from the IFS model at Bhubaneswar during 2017-18 (Table 7.1.41). The poultry and horticultural components were the most remunerative. The relative contribution of gross return from dairy component to gross return from the whole system was high (54%); however, relative contribution of net return from this component to the net return from the whole system was low (47%) due to higher cost of production (57%).

Table 7.1.41 : Area allocation and economic performance of the IFS model of 1.25 ha farmland at Bhubaneswar (2017-18)

Modules	Net Area (ha)	REY (t)	Total Cost (Rs.)	Gross return (Rs.)	Net returns (Rs.)	BCR	Relative (%)	contribution	
							Total Cost	Gross return	Net returns
Cropping systems	0.32	1.66	15,853	24,077	8,224	1.52	6.73	6.60	6.37
Horticulture	0.195	4.136	34,558	59,975	25,417	1.74	14.66	16.44	19.69
Dairy animals (2 crossbred Jersey cows)	0.0086	13.553	1,35,330	1,96,520	61,190	1.45	57.43	53.88	47.41
Poultry 300 birds (100 bird/rotation, coloured)	0.0041	4.117	36,720	59,700	22,980	1.63	15.58	16.37	17.80
Fisheries (including dyke area)	0.5839	1.687	13,200	24,460	11,260	1.85	5.60	6.71	8.72
Total (including building, threshing area, etc.)	1.25	25.153	2,35,661	3,64,732	1,29,071	1.55	100	100	100



View of different modules of IFS model at Bhubaneswar

Table 7.1.42 : Performance of IFS Model at Bhubaneswar during 2012-13 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
298938	103139	195800	455	73614	94222	27963	15	16

The model provided mean gross and net return of Rs.2,98,938/- and Rs. 1,03,139/- (Mean data from 2012-13 to 2017-18). About 15% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 16 t (REY) (Table 7.1.42).

12. Western Coast Plains & Hills

In this particular Agro Climatic Region three AICRP-IFS centers in the states of Goa (ICAR- Central Coastal Agricultural Research Institute, Goa), Maharashtra (Karjat) and Kerala (Karmana) are

in process of developing of Region Specific IFS Models for respective states . The composition of IFS models and performances of production and productivity in respective regions are summarized below;

Goa

Goa is a small State in the West coast of India. The average holding size of farmers is below 0.5 ha. These small land holdings are further characterized by undulating terrain with diverse soil conditions. The marginal uplands with shallow soils are

dominated by cashew crop. However, the local food habits of rice-fish curry, use of coconut in most of the culinary preparations and cashew for beverage and food needs to be met continuously by the agricultural sector. Two IFS models were established at ICAR- Central Coastal Agricultural Research Institute, Goa for typical low land and upland conditions.

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

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

Components and land allocation

- Rice (Jyoti) = 0.40 ha during *kharif*
- Moong (TM 96-2) = 0.1 ha during *rabi*
- Cowpea (Local cowpea) = 0.1 ha during *rabi*
- Vegetables (Chilli- Nisha) = 0.1 ha during *rabi*
- Baby corn -0.1 ha during *rabi*
- Bund grown forage crops (Hybrid napier IGFR1 -3, CO-3,4 &5) = 0.0315 ha
- Rice cum fish pond = 0.07 ha
- Dairy (cross bred jersy x sindhi) = 24 m² for low cost shed
- Kitchen garden : 80 m²

Results revealed that gross and net returns were Rs. 2,62,154 and Rs. 1,63,204 respectively was realized from the IFS model for low land area having 0.5 ha area besides employment generation of 143 mandays.. An amount of Rs. 62,877 was saved through on-farm recycling and farm labour engaged to the tune of Rs. 38,755 during 2017-18.

Integrated farming system models for typical upland (Plantation crop based) situations

A upland model of area 0.79 ha comprising of enterprises such as Plantation crops: Cashew (variety Bhaskara) + Pineapple (Variety Giant Kew), Coconut (benaulim)+ Pineapple (Giant Kew) + Noni + Tapioca, Areca nut (Mangala) + Banana (G-9), piggery, poultry, vermicompost unit, compost unit was evaluated for upland situations of Goa.

Components and land allocation of upland IFS at Goa

- Cashew (Bhaskara) + Pineapple (Giant kew) = 0.25 ha
- Coconut (Benaulim) + Pine apple (Giant kew)+ Noni + Papaya (Local selection) = 0.23 ha
- Arecanut (Magala)+ Banana (G-9) = 0.22 ha
- Piggery = 48.00 m²
- Poultry = 56.96 m²
- Vermi-compost unit = 35.75 m² (Low cost shed)
- Compost unit = 42.7 m²
- Direct catch pits = 6 nos. (10.89 m² each)
- Plant propagation unit = 14.96 m²

Table 7.1.43 : Economic performance of upland IFS model (0.79 ha) at Goa during 2017-18

	Cashew- pineapple	Coconut- Pineapple-noni	Arecanut- Banana	Piggery	Poultry	Total
Cost of production	17890	13680	9200	23450	6820	71040
Gross income	55200	32450	54200	68500	25450	235800
Net income	37310	18770	45000	45050	18630	164760
The benefit cost ratio for the upland system - 2.31						

Results revealed that gross and net returns were Rs. 2,35,800 and Rs. 1,64,760 respectively was realized from the IFS model for up land area (Table

7.1.43) having 0.79 ha area besides an amount of Rs. 18,244 was saved through on-farm recycling during 2017-18.



View of lowland IFS model at Goa



View of upland IFS model at Goa

Karjat

The prevailing farming system in Konkan region consists Field crops + Horticulture + Livestock + Composting, comprising an area of 73 % whereas, second ranking farming system adopted by farmers is Field crops + Dairy/Draught animals on an area of 18 %. The land holding of small and marginal farmers is 1.44 and 0.36 ha, respectively. The Integrated Farming System Model of 1.00 ha area has been developed under AICRP on IFS at RARS, Karjat for family having 3 males and 3 females (6 persons). The IFS model comprised different enterprises viz., crops and cropping systems on an area of 0.50 ha, horticulture component (fruit crops + nursery) 0.40 ha, livestock components namely, dairy, goatary and poultry on area of 35.75 m² each (107.25 m²),

vermicompost unit on 18.00 m² and rest of the land (874.75 m²) used for operational and other purpose. This region is dominated by rice based cropping systems due to high rainfall.

Results revealed that during 2017-18, the IFS model realized the Rs. 9,36,376/- and Rs. 3,12,429/- gross return and net return, respectively besides employment generation 122 mandays from all components put together and resource saving to the tune of 18.7% through on farm recycling. The model provided mean gross and net return of Rs.5,88,144/- and Rs. 1,60,382/- (Mean data from 2012-13 to 2017-18). About 20% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 32 t(REY) (Table 7.1.44).

Table 7.1.44 : Performance of IFS Model at Karjat during 2012-13 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
588144	160382	427762	1006	181917	158760	87085	20	32



View of Rabi crops in IFS model at Karjat

Karmana

AICRP-IFS center at Karmana has developed four IFS models viz; Homestead based, Coconut based,

Rice based and Banana based farming systems having 0.20 ha area each for different situations. Composition of 4 IFS models are presented in [table 7.1.45 to 7.1.48](#)

Table 7.1.45 : Area allocation under Homestead based IFS model (0.20 ha)

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

Table 7.1.46 : Coconut based IFS at a glance (Area allocation-0.2 ha)

Components	Net Area (m ²)	Gross area (m ²)
Coconut on bunds and adjoining areas (30 nos)	1480	1480
Border trees: Teak (15 nos)	400	400
Multi-tier cropping : (In coconut interspaces + additional area): Papaya (6 nos), Jack (1 no), Mango (1 no), Bread fruit (1 no), Fodder crops Azolla - in a shallow pit of 2 x1x 0.2 m3 size, lined with silpaulin.	20	620
Livestock components: 1. Cow unit (1 + 1)	100	100
2. Fresh water fish - GIFT : (In trenches dug between coconut bunds) var.Haritha Green Manure crop (Daincha)	0	600

Table 7.1.47 : Area allocation under Rice based IFS (0.2 ha)

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

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

Table 7.1.48 : Area allocation under banana based IFS for different components of(0.2ha)

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

Table 7.1.49 : Economic performance of different IFS models (0.20 ha)

IFS models	Gross Return (Rs. Per year)	Cost of Production (Rs. Per year)	Net Return (Rs. Per year)
Homestead based	2,33,221	2,17,068	16,153
Coconut based	2,42,663	1,73,608	69,055
Rice based	2,65,884	2,26,383	39,501
Banana based*	2,20,923	1,71,837	49,086
Existing farming system (Rice-Rice-Fallow)	40000	32243	7757

The economics of all the 4 IFS models during 2017-18 is summarized in **Table 7.1.49** which

revealed highest net return was realized from coconut based IFS model.

13. Gujarat Plains & Hills

S. K. Nagar

The economy of the region is based on animals and mainly dairy based farming system with crops as necessary components representing more than 95% farm families with an annual net returns of Rs.68758/ha/year. Average holding size of the region ranges from 0.53 ha (marginal farmers) to 1.46 ha (Small farmers) with 6 member family. The IFS study on Integrated farming Systems at SDAU, Sardarkrushinagar of Gujarat State going on since 2010-11 with different components viz., 1. Crops (0.70 ha), 2. Multistoried horticultural crops (0.25 ha), 3. Boundary plantation, 4. Dairy unit with two Mahesani breed buffaloes (0.025 ha), 5. Vermicompost and Nursery unit (0.01 ha) and 6. Water recharging unit (0.015 ha). The system is based on in vogue cropping system on 0.70 ha of 1.00 ha farm viz; (i) green gram –mustard- summer

pearl millet (0.24 ha), (ii) groundnut-wheat- fodder pearl millet(0.08 ha), (iii) green gram- castor relay (0.32 ha) and (iv) fodder cowpea - lucerne + chicory (0.06 ha) to ensure annual calorie and nutritional requirement of the family.

The economic analysis of IFS model at SK Nagar revealed that gross and net returns were Rs. 4,18,492 and Rs. 2,04,906 respectively besides employment generation of 337 mandays.. An amount of Rs. 74,418 was saved through on-farm recycling during 2017-18. Detailed economics of IFS model for 2017-18 is given in Table 7.1.50.

The model provided mean gross and net return of Rs.4,35,551/- and Rs. 2,39,444/- (Mean data from 2011-12 to 2017-18). About 44% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 24 t (REY) (Table 7.1.51).

Table 7.1.50 : Economic performance of different modules under IFS model at SK Nagar (2017-18)

Name of component	Year of commencement	Area allotted (m ²)	Green gram equivalent yield (kg/allotted area)	Gross return (Rs./allotted area)	Net returns (Rs./allotted area)
1. Cropping systems	2010-11	7000	3432	137297	48676
2. Multistoried Horticulture Fruits and Vegetables	2010-11	2500	1134	45375	9598
3. Boundary plantation	2010-11		2088	83528	77188
4. Livestock + Vermicompost, compost and nursery unit	2010-11	350	3807	152292	69444
5. Water recharging	2010-11	150		0	0
Total		10000	10462	418492	204906

Table 7.1.51 : Performance of IFS Model at SK Nagar during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
435551	239444	196107	336	59390	40946	89344	44	24



View of multi-storied horticultural unit in IFS model at SK Nagar

14. Western Dry Region

Crop+ Dairy is the pre-dominated farming system of western dry region of Rajasthan with 90% farm families adopting the system. Average land holding of the region ranges in between 0.48 ha (marginal farmer) to 1.44 ha (small farmer) with a family size of 7 members.

Durgapura

The IFS model of Durgapura (1.45 ha) consists of crops, livestock with two cross bred Holstein Frisian (HF) cows and a herd of 6 (5 Female +1Male) *sirohi* breed goats, a unit of 20 birds poultry belonging to Pratap Dhan breed, horticulture (0.25 ha) under drip irrigation system, out of which 0.13 has mixed orchard and in remaining part seasonal vegetables are raised. A unit of vermi-compost and compost are also

established to utilize the available organic waste and excreta in to valuable manure. During 2017-18 in the dairy component HF cows were replaced with Gir cows and Alternative feeding of poultry Kadaknath was attempted using Amaranthus Weed and foliage of harvested groundnut leaves. Besides this an organic kitchen gardening block was started using on farm manures. Economics of different modules of IFS during 2017-18 revealed that a Gross and net return of Rs. 4,68,365 and Rs. 1,65,403 was realized from the IFS model besides employment generation of 940 mandays.

The model provided mean gross and net return of Rs.4,18,665/- and Rs. 2,62,544/- (Mean data from 2011-12 to 2017-18). About 23% of the input cost of the model was realized through recycling farm produce and provided mean system yield of 23 t (REY) (Table 7.1.52).

Table 7.1.52 : Performance of IFS Model at Durgapura during 2011-12 to 2017-18

Gross Return	Net Income	COC	Employment Mandays	Value of Farm labour	Value of Purchased Input	Value of Recycling	Saving through recycling	REY (Based on MSP 2019_20)
418665	156121	262544	587	111737	93140	57667	23	23



View of different modules of IFS model at Durgapura

Kota

Integrated Farming System Model for Small Farmers (1.0 ha) of South-Eastern Humid Plain Zone of Rajasthan initiated at Kota (IFS Model)

during 2016-17 consisted of crop, dairy, vermi-composting, Kitchen gardening, mushroom unit and boundary plantation of Drumstick, Ardu, karonda and lime along with creeping vegetables. Module wise area allocation is given in [Table 7.1.53](#).



View of IFS model at Kota

Table 7.1.53 : Area composition of IFS model at Kota

Components	Area (Sq m)	Area (%)
I. Crops/Cropping Systems	6000	60
Soybean – Wheat	1500	
Sweet Corn+Urdbean (1:1)-Coriander-Summer mungbean	1500	
Urdbean-Mustard-Cowpea (Veg+fodder)	1500	
Sorghum (f)-Makhan grass (f)	1500	
II. Two Tier Horticulture System on drip irrigation	3000	30
Guava+Veg/Flowers	2000	
Lemon+Veg/Flowers	1000	
III. Dairy*	400	4
Cow-1 (Gir)		
Buffalo-1 (Murrah)		
IV. Complementary enterprises	600	6
Vermicompost/Compost Unit	200	
Quality FYM/Biogas Unit	200	
Kitchen garden/Azolla unit/Mushroom unit	200	
V. Boundary plantation (Drumstick/Ardu/Pomegranate/Karonda/Lime/ Creeping vegetables)	On boundaries	

Table 7.1.54 : Summary economics of different modules of IFS model at Kota

Components	Area (ha)	Gross Return (Rs)	
		2016-17	2017-18
Crop components	0.60	113233	107671
Horticulture Components	0.30	9000	14920
Dairy components	0.04	-	-
Complementary enterprises	0.06		
Kitchen Garden		8100	5490
Compost unit		-	
Boundary Plantation	On boundaries	1500	5320
Total Return (Rs)	1.00	131833	133401

The IFS model provided a gross and net return of Rs.1,23,317 and Rs.82,714 respectively besides employment generation of 78 mandays from the

model. The summary of economics of IFS model at Kota during 2016-17 and 2017-18 mean is given in [Table 7.1.54](#).

7.1.2 Analysis of nutrient recycling in different IFS models

The data regarding on-farm nutrient recycling in

terms of N, P₂O₅ and K₂O in different IFS models developed across different agro-climatic zones were compiled and presented in **Table 7.1 57**.

Table 7.1.57 : Nutrient recycling in different IFS models

Location (State)	Area (Ha)	N	P ₂ O ₅	K ₂ O
Assam (Jorhat)	1	359.4	140	398.6
Bihar (Patna)	0.4	44	29.5	31.2
	0.8	56.5	39.6	42.7
Bihar (Sabour)	1	134.5	51.8	104.9
Chhatisgarh (Raipur)	1	264	64	125
Goa	0.5	100	19	60
Gujarat (SK Nagar)	1	120	40	102
Himachal Pradesh (Palampur)	1	80.2	40.1	80.2
Jharkhand (Ranchi)	1	49.52	29.33	39.45
Kerala (Karamana)	0.2	127	70	76
	0.2	72	42	43
	0.2	110	43	52
	0.2	204	83	98
Karnataka (Siruguppa)	1	71.5	39.5	64.5
Madhya Pradesh (Jabalpur)	1	110	55	55
Maharashtra (Parbhani)	1	130	51	42
Maharashtra (Rahuri)	1	67	16	63
Meghalaya (Umiam)	1	76	31	48
Rajasthan (Durgapura)	1.45	158	56.7	105.6
Tamil Nadu (Coimbatore)	1.2	193	103	111
Tamil Nadu (Thanjavur)	0.8	101.6	64.1	85.7
Telangana (Hyderabad)	1	135	77	103
Uttar Pradesh (Faizabad)	1.01	68	24	63
Uttar Pradesh (Varanasi)	1	88.1	38.7	54.8
Uttarakhand (Pantnagar)	1	129	65	134
West Bengal (Kalyani)	0.66	75	33	63
Kanpur (Uttar Pradesh)	1	34	5	5
Modipuram (Uttar Pradesh)	0.7	204	136	187
Ludhiana (Punjab)	1	79	39	87
Hisar (Haryana)	1	99	11	16
Kathalgere (Karnataka)	1	100	200	100

7.1.3 GHG estimation in different IFS models

The data regarding GHG estimation in different IFS models developed across different agro-climatic zones were estimated using GHG calculator developed by IIFSR and presented in following figure in terms of positive and negative

emission IFS models. Estimated the emission from 33 IFS models out of 45 IFS models developed. 22 IFS models offers scope for more intensification as net emission is negative. The mean emission of positive and negative GHG emission models are 1802.5 and -8478.3 kg CO₂ eqv (Table 7.1.58 and Fig 7 and Fig 8).

Table 7.1.58 : Average GHG emission from positive and negative GHG emission IFS models

Category	Number of IFS models	Net emission (kg CO ₂ eqv.)
Net emission (negative / neutral)	22	(-) 8478.3
Net emission (positive)	11	(+) 1802.5

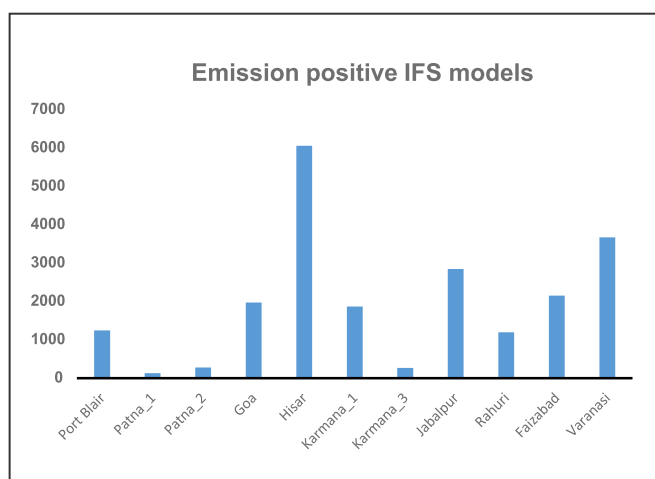


Fig 7. GHG emission from net positive GHG emission IFS models

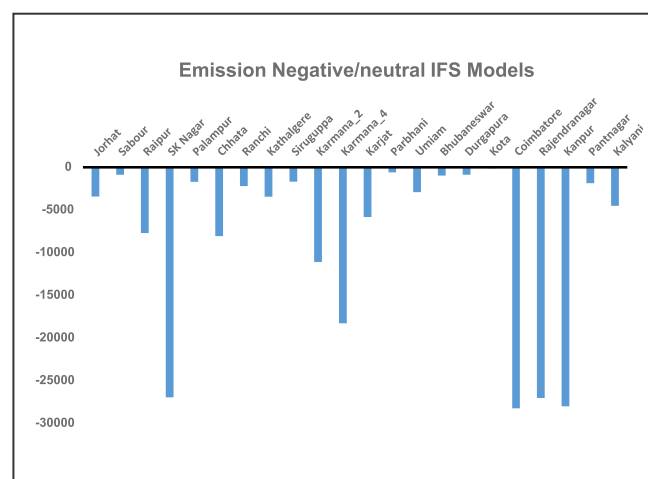


Fig 8. GHG emission from net negative GHG emission IFS models

7.2 CROPPING SYSTEMS MANAGEMENT

7.2.1 CROPPING SYSTEMS DIVERSIFICATION/ INTENSIFICATION

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

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

Year of start : 1990-91

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

Results :

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

Arid Ecosystem

Hisar : Seven cropping systems were evaluated at Hisar. Out of those, Cluster bean-Broccoli-Onion system was found better than others and recorded the highest gross return of Rs. 1,93,879/ha/year followed by Green gram-Mustard+Kasni-fallow system with gross returns of Rs.1,58,674/ha/year. In terms of energy production, pearl millet-wheat-fallow system was better which gave highest energy production of $27.32 \text{ K} \times 10^6$ /ha/year followed by Pearlmillet+ Maize-Wheat+mustard-fallow cropping system ($24.76 \text{ K} \times 10^6$ /ha/year).

S.K.Nagar : Out of eight cropping systems evaluated, the cropping system involving bt cotton + Castor-wheat+Lucerne -green gram recorded the highest gross returns of Rs.5,28,436/ha/year followed by green gram-Lucerne-fallow (Rs 4,12,708/ha/year). Cropping system, bt cotton + Castor – wheat + Lucerne - green gram recorded the highest energy production of $57.77 \text{ K} \times 10^6$ /ha/year.

Locations:

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

Siruguppa : Ten cropping systems were evaluated at Siruguppa. Out of those rice-methi-green gram recorded the highest gross return of Rs. 1,42,776/ha/year closely followed by rice-rice-fallow (Rs.1,31,222/ha/year). With regard to energy production, rice-rice-fallow found the best calorific value of $30.89 \text{ K} \times 10^6/\text{ha/year}$ followed by rice-methi-green gram of the order of $26.92 \text{ K} \times 10^6/\text{ha/year}$.

Semi-Arid Ecosystem

Bichpuri : Ten cropping systems were evaluated at Bichpuri. Out of those, Sorghum-oat fodder-cowpea fodder system was found better than others and recorded the highest gross return of Rs. 5,60,480/ha/year followed by Daincha-Potato-Okra system with gross returns of Rs.3,78,963/ha/year. In terms of energy production, Sorghum-oat fodder-cowpea fodder system was better which gave highest energy production of $111.37 \text{ K} \times 10^6/\text{ha/year}$ followed by Pearl millet-potato-cluster cropping system ($40.15 \text{ K} \times 10^6/\text{ha/year}$).

Coimbatore : Among the seven cropping systems evaluated at Coimbatore, Chilli-Daincha recorded the highest gross return of Rs. 4,94,581/ha/year followed by Beet root-Green gram (Rs.2,80,625/ha/year). With regard to energy production maize +cowpea fodder-pearl millet ($32.21 \text{ K} \times 10^6/\text{ha/year}$) followed by onion-maize ($27.10 \text{ K} \times 10^6/\text{ha/year}$) proved better than other cropping systems.

Indore : Nine cropping systems were evaluated at Indore. Soyabean+maize-green gram+wheat-green pea provided the maximum gross returns of Rs.1,82,391/ha/year closely followed by Soyabean +Maize-wheat+French bean-Green pea (Rs.1,40,563/ha/year). As far as energy production is concerned, Soybean+Maize-wheat+French bean-Green pea recorded the highest calorific value of $30.78 \text{ K} \times 10^6/\text{ha/year}$ followed by soybean +Maize-wheat-fallow of the order of $30.62 \text{ K} \times 10^6/\text{ha/year}$

Junagadh : Ten cropping systems were evaluated at Junagadh. Out of those Groundnut-Onion-Sorghum recorded the highest gross return of Rs. 8,37,205/ha/year closely followed by Groundnut +Lady finger-wheat+chickpea-Sorghum (Rs.7,88,694 /ha/year). With regard to energy production, Groundnut+Lady finger-wheat+chickpea-Sorghum found the best calorific value of $151.64 \text{ K} \times 10^6/\text{ha/year}$ followed by Groundnut-Onion-Sorghum of the order of $107.28 \text{ K} \times 10^6/\text{ha/year}$.

Rahuri : Twelve cropping systems were evaluated at Rahuri. Out of those Soyabean-Onion recorded the highest gross return of Rs. 5,37,827/ha/year closely followed by Maize-Onion (Rs.4,99,996/ha/year). With regard to energy production, Maize-Potato found the best calorific value of $37.22 \text{ K} \times 10^6/\text{ha/year}$ followed by Maize+Soyabean-Potato of the order of $36.48 \text{ K} \times 10^6/\text{ha/year}$.

Rajendranagar : Out of twelve cropping systems evaluated at Rajendranagar, bt cotton+green gram-maize-fallow cropping system recorded the highest gross return of Rs. 1,36,938/ha/year followed by btcotton+soyabean-sesamum +groundnut (Rs.1,36,765/ha/year). With regard to energy production, btcotton+green gram-maize-fallow was found to be the best ($25.72 \text{ K} \times 10^6/\text{ha/year}$).

Parbhani : Among eight cropping systems evaluated Cotton+Soyabean-Cotton-Amaranthus +Green gram found to be the best in terms of gross return of Rs. 5,12,967/ha/year) followed by Maize+Soyabean-Wheat+Chickpea-Okra + Chickpea (Rs. 3,76,928/ha/year). However, as far as highest energy production is concerned, Maize+Soyabean-Sorghum+Chickpea-Okra + Chickpea cropping system stood at highest of the order of $43.36 \text{ K} \times 10^6/\text{ha/year}$ followed by maize +soybean-wheat+chickpea-okra+chickpea ($41.69 \text{ K} \times 10^6/\text{ha/year}$).

Kanpur : Out of ten cropping systems, maize +black gram-potato-onion system recorded highest gross returns of Rs.4,25,942/ha/year followed by maize-mustard-onion (Rs.2,73,112 /ha/year). Rice-wheat-green gram recorded the maximum calorific value of $48.43 \text{ K} \times 10^6/\text{ha/year}$.

Kota : Ten cropping systems were evaluated at Kota. Out of those, Sorghum-bitter gourd-fallow system was found better than others and recorded the highest gross return of Rs. 9,19,191/ha/year followed by Soyabean+Red gram-Oats-Green gram system with gross returns of Rs.7,86,057/ha/year. In terms of energy production also, the same pattern followed and Sorghum-bitter gourd-fallow system was better which gave highest energy production of $186.59 \text{ K} \times 10^6/\text{ha/year}$ followed by Soyabean+Red gram-Oats-Green gram cropping system ($182.75 \text{ K} \times 10^6/\text{ha/year}$).

Ludhiana : Among the twelve cropping systems evaluated at Ludhiana, sorghum+cowpea-wheat+gobhi sarson-fallow attained the highest gross returns of Rs. 9,75,897/ ha/year as well as energy value ($209.47 \text{ K} \times 10^6/\text{ha/year}$) followed by maize+turmeric-wheat+linseed-fallow (Rs 5,10,356 /ha/year).

Sub-Humid Ecosystem

Faizabad : Eight cropping systems were evaluated at Faizabad; out of which Paddy-Chick pea-Maize +Cowpea recorded highest gross return of Rs.6,19,144/ ha/year, which also produced highest energy of the order of $139.61 \text{ K} \times 10^6/\text{ha/year}$, followed by Paddy-Cauliflower-Cowpea (Rs. 4,50,004 /year).

Pantnagar : Among nine cropping systems evaluated at pantnagar, maize+cowpea-pea +toria-groundnut+mentha recorded the highest gross return of Rs. 6,94,910/ha/year followed by rice-potato-cowpea ($6,58,770/\text{ha/year}$). However, as far as energy production is concerned, rice-pea veg-maize cropping system produced maximum

calorific value of the order of $94.44 \text{ K} \times 10^6/\text{ha/year}$ followed by paddy+sesbania-pea veg+Toriam+Maize+Mentha ($70.33 \text{ K} \times 10^6/\text{ha/year}$).

Sabour : Ten cropping systems were evaluated at Sabour. Out of those rice-cabbage+coriander-sesamum found the best in terms of gross return (Rs.6,92,876/ha/year) followed by rice-potato+Radish-Green gram (Rs.2,83,861 /ha/year). Whereas with regards to energy value, rice-cabbage+coriander-sesamum proved to be the best ($55.78 \text{ K} \times 10^6/\text{ha/year}$) followed by rice-maize +pea veg-sorghum+cowpea ($54.84 \text{ K} \times 10^6/\text{ha/year}$).

Ranchi : Out of seven cropping systems evaluated at Ranchi, rice-potato+wheat-green gram found the best in terms of both, gross return (Rs. 2,83,172/ha/year) and energy production ($40.12 \text{ K} \times 10^6/\text{ha/year}$) followed by rice-potato-green gram both in terms of gross returns (Rs. 2,59,056/ha/year) and energy production($33.79 \text{ K} \times 10^6/\text{ha/year}$).

Jabalpur : Out of twelve cropping systems evaluated, rice(basmati)-merigold-sorghum recorded the highest gross return of Rs. 10,71,206 /ha/year followed by rice-pea veg-sorghum (Rs. 10,03,540/ha/year). As far as energy production is concerned, highest energy produced in paddy-gobi sarson-sorghum of the order of $211.58 \text{ K} \times 10^6/\text{ha/year}$ followed by rice-merigold-sorghum ($201.59 \text{ K} \times 10^6/\text{ha/year}$).

Raipur : Eight cropping systems were evaluated at Raipur. Out of those, rice-chickpea-cowpea system was found better than others and recorded the highest gross return of Rs. 90,900/ha/year followed by rice-maize-sesamum system with gross returns of Rs.90,684/ha/year. In terms of energy production also, the same pattern followed and rice-chickpea-cowpea system was better which gave highest energy production of $21.40 \text{ K} \times 10^6/\text{ha/year}$ followed by rice-maize-sesamum cropping system ($21.34 \text{ K} \times 10^6/\text{ha/year}$).

Rewa : Out of ten cropping systems evaluated at Rewa, rice-garlic-fallow recorded the highest gross return of Rs. 6,44,849/ha/year followed by rice-toria-onion (Rs. 3,10,449/ha/year). Rice-potato-wheat followed by rice-green pea-wheat recorded the highest respective calorific values (40.92 and 35.85 K*10⁶/ha/year).

Powerkheda : Out of ten cropping systems evaluated at Powerkheda, soybean-pea-onion provided the highest gross return of Rs. 5,31,748/ha/year followed by soybean-potato-fodder (Rs. 3,38,183/ha/year). Whereas, energy production was maximum with soybean-pea-onion cropping system (49.10 K*10⁶/ha/year) followed by soybean-potato-fodder (37.49 K*10⁶/ha/year).

Chiplima : Among ten cropping system evaluated at Chiplima, rice-maize(cob)+coriander-cow pea+amaranthus recorded the maximum both gross return (Rs. 6,86,120/ha/year) as well as energy value (148.5 K*10⁶/ha/year) followed by rice-maize+radish-okra+amaranthus (Rs. 5,67,830/ha/year).

Kathalgere : Out of eight cropping system evaluated at Kathalgere, Rice-spinach found the best with gross return of Rs.2,56,740/ha/year followed by rice-groundnut (Rs. 1,89,193 /ha /year). With regard to energy production rice-maize (36.69 K*10⁶/ha/year) proved better than others.

Humid Ecosystem

Jorhat : Nine cropping system were evaluated at Jorhat. Out of those, rice-oats-cowpea recorded the highest gross return of Rs. 5,81,771/ha/year followed by Pigeon pea+Daincha-French bean+Toria-Cowpea (Rs.4,93,181/ha/year). Rice-oat-cowpea recorded the highest energy value 116.33 K*10⁶/ha/year followed by cowpea+ paddy-cauliflower+toria-black gram (25.71 K*10⁶/ha/year).

Palampur : Among eight cropping systems evaluated at Palampur, Coleus-pea+coriander-fallow recorded the highest gross return of Rs. 3,07,536/ha/year followed by turmeric-pea-summer squash (Rs. 1,81,621/ha/year). However, highest energy production occurred in rice-wheat-fallow of the order of 29.72 K*10⁶/ha/year followed by 24.39 K*10⁶/ha/year.

R.S. Pura : Among the ten cropping systems evaluated at R.S. Pura, Basmati rice-Oats-Oats recorded the highest gross return of Rs. 6,49,736/ha/year followed by Basmati rice-barley-green gram (Rs.4,18,702/ha/year). With regard to energy production the same pattern followed with Basmati rice-Oats-Oats recorded highest of the order of 155.67 K*10⁶/ha/year followed by Basmati rice-barley-green gram (88.24 K*10⁶/ha/year) proved better than other cropping systems.

Coastal Ecosystem

Bhubaneshwar : Ten cropping system were evaluated at Bhubaneshwar. Out of those rice-maize+kosala-cowpea+amaranthus recorded the highest gross return of Rs.7,38,001/ha/year closely followed by rice-maize+radish-okra+amaranthus (Rs.6,02,547/ha/year). With regard to energy production, rice-maize+kosala-cowpea+amaranthus found the best with calorific value of 152.26 K*10⁶/ha/year followed by rice-maize+radish-okra+amaranthus of the order of 124.18 K*10⁶/ha/year.

Maruteru : Among the nine cropping systems evaluated at Maruteru, rice-soybean recorded the highest gross return of Rs. 1,28,785/ha/year followed by rice-sorghum (Rs.1,28,679/ha/year). With regard to energy production, rice-sorghum recorded highest of the order of 29.72 K*10⁶/ha/year followed by rice-soybean (26.51 K*10⁶/ha/year) proved better than other cropping systems.

Navsari : Ten cropping systems were evaluated at Navsari. Rice-fenugreek(S)-cluster bean provided the maximum gross returns of Rs. 3,93,684/ha/year closely followed by rice-maize sweet corn+ green gram- green gram (Rs. 2,24,420/ha/year). As far as energy production is concerned, Rice-fenugreek(S)-cluster bean recorded the highest calorific value of $39.08 \text{ K} \times 10^6/\text{ha/year}$ followed by rice-sorghum-sorghum of the order of $30.36 \text{ K} \times 10^6/\text{ha/year}$

Karamana : Among seven cropping systems evaluated, rice-rice-cucumber recorded the maximum gross returns (Rs 2,99,970/ha/year) closely followed by rice-rice-amaranthus (Rs 2,71,349/ha/year), which also recorded maximum calorific value ($41.75 \text{ K} \times 10^6/\text{ha/year}$)

Thanjavur : Out of seven cropping system evaluated, green manure-rice-okra recorded the highest gross return (Rs. 1,98,088 /ha/year) followed by green manure-rice-maize+green gram (Rs.1,65,151/ha/year). As far as energy production is concerned, green manure-rice-maize+green gram recorded maximum energy production ($38.19 \text{ K} \times 10^6/\text{ha/year}$) followed by green manure-rice-finger millet of the order of $27.30 \text{ K} \times 10^6/\text{ha/year}$.

Karjat : Among the eleven cropping systems evaluated at Karjat, rice-brinjal recorded the highest gross return of Rs. 4,19,649/ha/year followed by rice-maize sweet corn (Rs.3,20,110/ha/year). With regard to energy production rice-groundnut ($39.71 \text{ K} \times 10^6/\text{ha/year}$) followed by rice-rice ($37.12 \text{ K} \times 10^6/\text{ha/year}$) proved better than other cropping systems.



Crop diversification at Rahuri copy



Sesame + cowpea at Junagadh



General view of crop diversification at Kanpur



Diversification of crop at Indore copy

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
A. ARID ECO SYSTEM							
Hisar (Haryana)							
Pearl millet	Wheat	Fallow	2437	5354	00	119423	27.3
Cotton	Wheat	Fallow	1325	5208	00	139750	22.4
Pearl millet	Barley	Green gram	3037	2895	316	95279	21.7
Cluster bean	Broccoli	Onion	1125	3166	4445	193878	4.0
Green gram	Mustard	Fallow	850	3087	-	158673	19.5
			+ Kasni			+ 00	
Pearl millet	Wheat	Cowpea	2979	3062	337	98144	21.5
Pearl millet	Wheat	Fallow	1933	4750	00	110081	24.7
Maize	+ Mustard		+ 204	+ 118			
Standard Error						8016	1.0
Critical Difference(5%)						17467	2.2
S.K.Nagar (Gujarat)							
Groundnut	Potato	Pearl millet	2125	22981	2113	290156	41.9
Castor	Fallow	Green gram	3264	-	726	163645	16.7
Bt Cotton	Wheat	Green gram	2053	2254	840	528435	57.7
Castor	+ Lucerne		+ 7801	+ 37666			
Green gram	Cotton	Bitter gourd	2635	2573	2618	259149	18.0
Sorghum	Fannel	Fannel	703	1616	-	327018	18.0
	+ Cauliflower			+ 22850			
Green gram	Lucerne	Fallow	7878	656	-	412707	26.4
Pearl millet	Potato	Groundnut	1561	21280	2356	279788	39.6
Bt Cotton	Wheat	Sorghum	2755	3933	8821	321899	53.5
Standard Error						13554	1.2
Critical Difference(5%)						29073	2.6
Sriguppa (Karnataka)							
Paddy	Paddy	Fallow	5109	3817	00	131222	30.8
Paddy	Fallow	Ridge gourd	5886	5606	00	86529	20.3
Paddy	Fallow	Mustard	5473	495	00	80453	18.9
Paddy	Fallow	Board bean	5952	1483	00	87494	20.5
Paddy	Fallow	Indian bean	6299	395	00	92600	21.7
Paddy	Fallow	Coriander	7159	754	00	105242	24.7

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Khariif	Rabi	Summer	Khariif	Rabi	Summer		
Paddy	Spinach	Black gram	6200	1070	00	105268	21.9
Paddy	Methi	Green gram	6960	851	00	142776	26.9
Paddy	Fallow	Paddy	5373	3923	00	78992	18.5
Paddy	Sesbania	Paddy	5704	4047	00	95182	20.3
Standard Error						4367	0.9
Critical Difference(5%)						9175	2.0
B. SEMIARID ECOSYSTEM							
Bichpuri, Agra							
Pearl millet	Wheat	Fallow	2368	4525	-	105035	24.2
Pearl millet	Wheat	Green gram	2438	4560	1610	190663	29.9
Pearl millet	Lentil	Fallow	2812	1768	-	107247	16.2
Soyabean	Wheat	Fallow	1312	3843	-	118776	21.8
	+ Mustard			+ 538			
Pigeon Pea	Wheat	Fallow	2047	4173	-	181646	2.2
Green gram	Mustard	Fallow	1634	2323	-	171354	18.0
Daincha	Potato	Okra	-	36195	7517	378963	37.7
Pearl millet	Potato	Cluster bean -	2460	30064	6013	344796	40.1
Sesamum	Barley	Green gram	1064	3889	1326	174075	23.4
Sorghum	Oat fodder	Cowpea fodder	29785	28477	17868	560480	111.3
Standard Error						9589	1.8
Critical Difference(5%)						20148	3.7
Junagah, Gujarat							
Groundnut	Wheat	Fallow	1851	4722	-	154872	26.8
Groundnut	Onion	Sorghum	1933	29053	23436	837205	107.2
Maize	Chick Pea	Green gram	774	672	950	171045	9.8
Cowpea	+ Amaranthus		+ 3164	+ 121			
Groundnut	Wheat	Sorghum	1427	2136	38683	788693	151.6
Lady finger	+ Chick Pea		+ 3778	+ 278			
Maize	Wheat	Green gram	13889	2874	400	602708	87.2
Soybean	+ Pea	+ Maize	+ 790	+ 267	+ 19872		
Groundnut	Wheat	Brinjal	961	1563	6620	209148	13.5
Red gram		+ Cowpea	+ 00		+ 2259		

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Groundnut	Coriander	Sesamum	1114	723	692	346842	31.3
Maize Sweet corn	+ Pea	+ Cowpea	+ 12222	+ 1018	+ 1202		
Cluster bean	Fannel + Garlic	Sesamum + Sorghum	823	398 + 2541	651 + 9370	345241	40.4
Groundnut	Castor	chilli	1159	2060	1122	211071	17.1
Castor	+ Indian bean	+ Febugreek Leaves	--	+ 1273	+ 1730		
Cotton	Fallow	Onion	1749	--	356	754115	16.2
Groundnut		+ Fannel	+ 1303		+ 9143		
Standard Error						42902	7.5
Critical Difference(5%)						90138	15.8
Coimbatore, Tamil Nadu							
Onion	Maize	--	12198	6142	--	241196	27.1
Beet root	Green gram	--	12658	792	--	280624	8.0
Sunflower	Daincha	--	1799	--	--	71073	11.1
Maize	Pearl millet	--	7126	1696	--	137517	32.2
Cowpea fodder			+ 10713				
Brinjal	Pearl millet	--	19532	1392	--	267564	9.7
chilli	Daincha	--	19022	--	--	494580	5.5
Sorghum	Maize	--	2826	--	--	45927	9.8
	+ Cowpea fodder			--			
Standard Error						22824	1.4
Critical Difference(5%)						49735	3.2
Indore (M.P.)							
Soybean	Wheat	Fallow	1756	4908	--	128498	24.5
Soybean	Green gram	Fallow	1565	726	--	81383	9.1
Soybean	Wheat	Fallow	500	4561	--	138591	30.6
Maize			+ 3705				
Soybean	Green gram	Green pea	839	2136	189	182390	21.8
Maize	+ Wheat		+ 2834	+ 341			
Soybean	Green gram	Cowpea	1203	649	190	84346	9.1
Jowar fodder	+ Mustard	+ Bhindi	+ 225	+ 293	+ 56		
Soybean	Cauliflower	Cowpea	1147	3776	199	99533	13.6

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Amaranthus	+ Wheat	+ Maize	+ 0.0	+ 1705.67	+ 57.0		
Soybean	Pea	Green pea	446	2543	146	137833	22.7
Maize			+ 3697				
Soybean	Wheat	Green pea	482	4073	113	103726	21.5
Maize(Cob)		+ Green gram	+ 3674	+ 207			
Soybean	Wheat	Green pea	390	4530	129	140562	30.7
Maize	+ French bean		+ 3884	+ 33			
Standard Error						10326	1.9
Critical Difference(5%)						21892	4.0
Rahuri (Maharashtra)							
Maize	Potato	--	4709	21771	--	227569	37.2
Maize	Wheat	--	1530	3647	--	126469	25.0
Soybean			+ 1668				
Maize	Garlic	--	4946	65543	--	380810	26.4
Maize	Onion	--	1423	22498	--	419340	26.9
Soybean	+ Cabbage		+ 2127	+ 6140			
Maize	Onion	--	5098	33365	-	499996	34.1
Maize	Potato	--	1725	23765	--	250147	36.4
Soybean			+ 1742				
Soybean	Potato	--	2617	25328	--	262593	35.8
Maize	Chick Pea	--	1715	2568	--	181700	23.7
Soybean	+ Mustard		+ 1801	+ 150			
Soybean	Garlic	--	2750	7690	--	443903	23.0
Maize	Garlic	--	1807	7174	--	423693	25.3
Soybean			+ 2021				
Soybean	Onion	--	2975	35292	--	537827	30.4
Pearl millet	Onion	--	1301	8133	--	252259	23.7
Soybean	+ Chick Pea		+ 1818	+ 1989			
Standard Error						12752	1.1
Critical Difference(5%)						26448	2.4

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
C. SUB-HUMID ECOSYSTEM							
Rajendranagar(Telangana)							
Maize	Sunflower	--	4812	752	--	95387	2.1
Pearl millet	Potato	--	1037	2649	--	44445	7.9
Soybean		+ 388					
Maize	Groundnut	--	5187	882	--	108023	22.7
Pearl millet	Sunflower	--	887	323	--	65392	10.9
Soybean	+ Groundnut	+ 401	+ 704				
Maize	Potato	--	3562	2573	--	79990	16.5
Soybean		+ 435					
Bt Cotton	Sesamum	--	2150	185	--	136764	13.5
Soybean	+ Groundnut		+ 487	+ 582			
Maize fodder	Castor	--	372	952	--	70209	7.5
Soybean	+ Green gram	+ 410	+ 307				
Bt Cotton	Pearl millet	--	2030	1308	--	119497	12.5
Green gram		+ 337					
Soybean	Potato	--	1252	2872	--	56283	8.1
Bt Cotton	Sesamum	--	1987	356	--	112685	9.3
Green gram			+ 234				
Pearl millet	Groundnut	--	1302	934	--	56731	9.9
Bt Cotton	Maize (Green cob)	--	1904	14937	--	136937	25.7
Green gram		+ 218					
Standard Error						5047	0.9
Critical Difference(5%)						10467	1.9
Parbhani (Maharastra)							
Soybean	Sorghum	--	2750	3120	--	127012	22.7
Cotton	--	Groundnut	2701	--	1752	186296	18.9
Soybean	Wheat	Cowpea	2770	3552	00	134587	24.2
Cotton	Cotton	Amaranthus	2906	00	880	512967	37.8
Soybean		+ Green gram	+ 1360		+ 6550		
Pigeon Pea	Pigeon Pea	Cluster bean	2050	00	650	174493	12.8
Soybean		+ Green gram	+ 981		+ 458		

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Maize	Wheat	Okra	4532	1580	7592	376928	41.6
Soybean	+ Chick Pea	+ Chick Pea	+ 984	+ 1528	+ 2310		
Pearl millet	Mustard	--	1610	1582	--	293302	36.5
Soybean	+ Chick	+ Chick Pea	+ 1620	+ 1010	+ 3200		
Maize	Sorghum	Okra	4515	1591	00	312351	43.3
Soybean	+ Chick	+ Chick Pea	+ 1170	+ 1974	+ 2910		
Standard Error						4712	0.5
Critical Difference(5%)						10107	1.2
Kanpur (Uttar Pradesh)							
Paddy	Wheat	--	4952	4380	--	143985	32.2
Paddy	Wheat	--	8119	4690	--	195572	44.3
Paddy	Wheat	Green gram	8381	4810	835	244992	48.4
Maize	Wheat	--	2905	4857	--	118582	26.7
Maize	Mustard	Onion	2950	1785	12928	273111	26.2
Maize	Mustard	Green gram	3071	1925	928	161658	24.0
Maize	Potato	--	3000	20880	--	270039	42.9
Green gram	+ Wheat		+ 381	+ 3235			
Maize	Potato	Onion	3047	24238	13950	425941	42.4
Black gram			+ 452				
Maize	Garlic	Green gram	3125	6714	976	414600	23.6
Basmati Rice	Wheat	Okra	4786	4357	3262	270603	32.7
Standard Error						3179	0.5
Critical Difference(5%)						6525	1.2
Kota (Rajasthan)							
Soybean	Wheat	Fallow	1367	5511	00	127498	24.9
Soybean	Mustard	Cowpea	1568	2207	3406	213778	20.3
Soybean	Oats	Green gram	495	46053	665	786057	182.7
Red gram			+ 1834				
Paddy	Wheat	Green gram	3903	4005	518	149576	29.0
Paddy	Berseem	Fallow	4302	80409	00	195924	27.7
Paddy	Wheat	Fallow	4715	4927	00	149374	33.3

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*103)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Black gram	Pea veg	Green gram	1206	5518	877	250037	22.2
Paddy	+ Coriander		+ 184	+3245			
Maize corn	Fannel	Fallow	3603	201	–	185892	12.9
Maize Sweet	Pea	Onion	11111	1308	5203	281085	20.6
Sorghum	Bitter gourd	Fallow	52631	1162	–	919191	186.5
Standard Error						20159	4.1
Critical Difference(5%)						42356	8.7
Ludhiana (Punjab)							
Paddy	Wheat	Fallow	6510	5440	00	184097	41.3
Basmati Rice	Gobi sarson	Green gram	3980	1880	1080	230320	27.5
Basmati Rice	Radish	Maize	3925	34080	7179	363331	43.9
Maize	Potato	Maize	4874	23059	7225	338109	63.7
Maize	Barley	Fallow	3260	3280	00	486610	72.9
Turmeric	+ Linseed		+14040	+332			
Maize	Wheat	Fallow	3179	3465	00	510355	75.1
Turmeric	+ Linseed		+1448	+325			
Maize	Wheat	Green gram	3125	3210	1048	195652	28.3
Radish	+ Linseed		+ 8400	+ 307			
Groundnut	Wheat	Fallow	1420	4585	00	164195	26.6
Arhar	+ Gobi sarson		+ 425	+ 247			
Maize	Pea	Fallow	3280	9210	00	351649	44.4
Black gram		+ Pea	+ 318	+ 999			
Maize	Chick Pea	Fallow	3140	1080	00	167083	25.2
Arhar	+ Gobi sarson		+ 805	+ 1465			
Maize	Chick Pea	Green gram	23640	325	1104	487466	94.7
Cowpea	+ Gobi sarson		+ 2210	+ 1480			
Sorghum	Wheat	Fallow	54839	4880	00	975897	209.4
Cowpea	+ Gobi sarson		+ 00	+ 220			
Standard Error						14889	3.1
Critical Difference(5%)						30315	9.9

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Kumarganj (Uttar Pradesh)							
Paddy	Wheat	Fallow	4775	4186	00	138215	31.0
PaddyNDR-	Potato	Green gram	5370	24650	1346	334142	46.9
Paddy	French bean	Okra	4973	2640	9784	282710	21.3
Paddy	Mustard	Black gram	5290	2337	1137	221094	34.8
Paddy	Berseem	Berseem seed	5082	37797	191	163424	24.2
Paddy	Chick Pea	Maize + Cowpea	4912	2245	33488 + 1	619143	139.6
Paddy	Lentil	Fodder	5077	1973	54350	242242	26.5
Paddy	Cauliflower	Cowpea	5279	14575	9278	450004	32.3
Standard Error						98547	24.7
Critical Difference(5%)						211383	53.1
Pantnagar, Uttrakhand							
Paddy	Wheat	Fallow	5526	4189		149300	30.2
Paddy	Pea veg	Maize	5374	9936	3528	296000	30.1
Paddy	Pea veg	Fallow	5686	10324	7189	259100	20.3
Paddy	Potato	Cowpea	5708	23322	15382	658700	40.6
Paddy	Pea veg	Maize	5688	10596	18978	522800	90.1
Paddy	Mustard	Cowpea	5660	1748	15000	5379	30.2
Paddy	Pea veg	Maize	4006	8120	10876	619900	70.3
Sesbania	+ Toria	+ Mentha	+ 00	+ 8	+ 104		
Soyabean	Wheat	Fallow	1821	3183	11943	127900	20.5
	+ Mentha		+ 1700				
Maize	Pea veg	Groundnut	10115	8086	1803	694900	60.3
Cowpea	+ Toria	+ Mentha	+ 650	+ 600	+ 6300		
Standard Error						82	0.1
Critical Difference(5%)						174	0.2
Sabour (Bihar)							
Paddy	Wheat	Fallow	6211	4319	--	161495	36.4
Paddy	Maize	Green gram	6061	4154	679	181321	3.7
Paddy	Maize	Cowpea	5812	7718	--	190796	46.5

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Paddy	Maize	Sorghum	6125	9284	--	251472	54.8
	+ Pea veg	+ Cowpea		+ 2041	--		
Paddy	Potato	Green gram	6258	13769	1345	283860	40.2
	+ Radish			+ 4463.33			
Paddy	Cabbage	Sesamum	6175	59149	961	692876	5.5
	+ Coriander			+ 4523			
Paddy	Board bean	Okra	6100	2113	9745	283971	2.5
Paddy	Berseem	Maize	6346	--	--	93286	21.9
		+ Cowpea			--		
Paddy	Mustard	Green gram	6233	1457	954	195410	32.6
Paddy	Chick Pea	Maize	6295	1176	5778	242878	49.2
	+ Linseed			+ 646			
Standard Error						22781	2.2
Critical Difference(5%)						47863	4.6
Ranchi (Jharkhand)							
Paddy	Wheat	Green gram	2273	3274	--	86631	19.1
Paddy	Mustard	Green gram	266	813	713	106437	15.9
Paddy	Linseed	Green gram	2786	697	946	116773	16.4
Paddy	Potato	Green gram	3122	19091	1339	259056	33.7
Paddy	Wheat	Green gram	2873	2357	744	124924	21.3
	+ Mustard			+ 148			
Paddy	Wheat	Green gram	2778	2469	792	126375	21.3
	+ Linseed			+ 106			
Paddy	Potato	Green gram	3333	19394	1170	283171	40.1
	+ Wheat			+ 1695			
Standard Error						9042	1.5
Critical Difference(5%)						19704	3.3
Jabalpur (M.P.)							
Paddy	Wheat	Fallow	4077	3445	00	115921	26.0
Paddy	Chick Pea	Fallow	4116	1238	00	110048	18.7
Paddy	Onion	Green gram	3347	13950	606	260848	20.5
Paddy	Berseem	Fallow	2853	249	00	42361	9.9

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Paddy	Potato	Sorghum	3998	17857	44699	919067	187.1
Paddy	Gobi sarson	Black gram	4155	3904	742	194832	38.0
Paddy	Pea veg	Sorghum	4053	6727	51051	1003540	198.4
Paddy	Potato	Groundnut	4233	14716	1398	231648	36.8
Paddy	Gobi sarson	Sorghum	3959	1120	54962	979079	211.5
Paddy	Gobi sarson	Okra	4233	1108	3724	142940	21.9
Paddy	French bean	Sorghum	4155	4311	43102	993477	168.1
		+ Cowpea			+ 4544		
Paddy	Merigold	Sorghum	3426	5996	54297	1071205	201.5
Standard Error						34783	7.6
Critical Difference(5%)						70819	24.2
Rewa (M.P.)							
Paddy	Wheat	Fallow	4479	5668	--	157956	35.1
Paddy	Chick Pea	Fallow	4500	2186	--	153626	23.4
Paddy	Berseem	Berseem	5331	62889	300	182634	28.5
Paddy	Potato	Wheat	5236	7529	4479	206241	40.9
Paddy	Garlic	Fallow	5089	11925	--	644849	34.9
Paddy	Toria	Onion	5216	756	16069	310448	30.1
Paddy	Barley	Sunhemp Fodder	4458	3680	11358	133042	29.6
Paddy	Green pea	Wheat	4942	3259	4542	201885	35.8
Paddy	Chick Pea	Fallow	4374	1556	--	144976	23.3
	+ Linseed			+ 487			
Paddy	Mustard	Sunhemp Fodder	5363	2730	11789	199322	35.2
Standard Error						16182	1.8
Critical Difference(5%)						34000	3.7
Powerkheda (M.P.)							
Soybean	Wheat	--	680.	4666	--	94708	19.0
Soybean	Chick Pea	--	749	1424	--	77803	8.3
Soybean	Mustard	Green gram	833	1860	791	133332	16.3
Soybean	Pea	Onion	902	12498	11665	531748	49.1

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Paddy	Wheat	Green gram	3152	4743	722	161160	29.7
Soybean	Potato	Fodder	708	33885	39022	338182	37.4
Soybean	Okra	--	819	--	--	123114	9.5
Pigeon Pea			+ 1805				
Paddy	Mustard	Black gram	3110	1777	805	151772	23.1
Paddy	Linseed	Sesamum	3235	1472	--	103209	18.9
Soybean	Potato	--	722	32913	--	266889	35.0
Standard Error						14457	1.4
Critical Difference(5%)						29666	2.9
Chiplima (Orissa)							
Paddy	Groundnut	Fallow	3322	1944	--	130908	22.5
Paddy	Groundnut	Bottle gourd	3014	1518	8919	215349	23.5
	+ Sunflower	+ Amaranthus		+ 460	+ 1203		
Paddy	Groundnut	Cowpea	3318	2125	4309	305272	26.7
	+ Kosala	+ Amaranthus		+ 1647	+ 868		
Paddy	Maize	Lady finger	3047	29285	3772	567830	113.6
	+ Radish	+ Amaranthus		+ 12704	+ 1255		
Paddy	Maize	Cowpea	3549	38264	3189	686119	148.4
	+ Coriander	+ Amaranthus		+ 1174	+ 840		
Paddy	Tomato	Water melon	3127	9399	10894	269568	18.9
	+ Kosala	+ Amaranthus 100-50-50		+ 1370	+ 713		
Paddy	Tomato	Cowpea	3615	10476	5655	365262	20.0
	+ Fenug- reek(S)	+ Amaranthus		+ 600	+ 787		
Paddy	Potato	Pumpkin	3213	6330	7670	211475	21.0
	+ Radish	+ Amaranthus		+ 8813	+ 731		
Paddy	Potato	Green gram	3552	10020	1284	235922	27.8
	+ Kosala	+ Amaranthus		+ 1195	+ 754		
Paddy	Knol Khol	Ridge gourd	3179	6474	4102	171660	14.4
Standard Error						34086	5.3
Critical Difference(5%)						71616	11.1

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Kathalagere (Karnataka)							
Paddy	Paddy	--	5321	5091	--	153071	36.0
Paddy	Paddy	--	5393	5184	--	155496	36.5
Paddy	Groundnut	--	5864	2440	--	189192	34.1
Paddy	Maize	--	5367	5298	--	151226	36.6
Paddy	Soyabean	--	5764	2514	--	154513	30.8
Paddy	Spinach	--	5382	13456	--	256739	25.2
Paddy	Finger millet	--	5386	3212	--	134586	29.1
Paddy	Maize	--	5339.	5251	--	150168	36.4
Standard Error						6594	1.0
Critical Difference(5%)						14144	2.1
Raipur (Chattisgarh)							
Paddy	Wheat	Daincha	6064	00	00	89140	20.9
Paddy	Chick Pea	Cowpea	6183	00	00	90899	21.3
Paddy	Maize	Cluster bean	5464	00	00	80325	18.9
	Sweet corn						
Paddy	Cluster bean	Maize	5681	00	00	83510	19.6
		Sweet corn					
Paddy	Radish	Green gram	5770	00	00	84819	19.9
Paddy	Maize	Sesamum	6169	00	00	90684	21.3
Paddy	Safflower	Cowpea	6037	00	00	88743	20.8
	fodder						
Paddy	Onion	Cowpea	6038	00	00	88763	20.8
Standard Error						4732	1.1
Critical Difference(5%)						10151	2.3
D. HUMID ECOSYSTEM							
Chatha (J&K)							
Basmati Rice	Wheat	Fallow	2500	3416	--	135522	20.4
Basmati Rice	Wheat	Daincha	2666	3645	--	144579	21.8
Basmati Rice	Berseem	Berseem	3833	59375	85	220773	22.7
Basmati Rice	Knol Khol	Cowpea	3729	7854	--	194736	16.2
Basmati Rice	Pea	Bottle gourd	3937	6000	8146	362997	33.5
Basmati Rice	Cauliflower	Cucumber	3604	13750	4916	309387	22.1
Basmati Rice	Barley	Green gram	3854	22291	--	418701	88.2

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Basmati Rice	Broccoli	Black gram	3749	6104	916	397769	18.9
Basmati Rice	Oats	Oats	3916	35416	2583	649736	155.6
Basmati Rice	Potato		3750	20833	5729	319218	38.7
Standard Error						14712	2.8
Critical Difference(5%)						30189	5.9
Jorhat (Assam)							
Paddy	Fallow	Paddy	3433	--	3383	100205	23.5
Paddy	Toria	Black gram	3133	1456	653	129710	20.9
Paddy	Potato	Black gram	2950	8516	606	137573	20.5
Paddy	Oats	Cowpea	2873	27666	6066	581771	116.3
Paddy	Pea veg	Cowpea	3200	1416	5670	218543	15.1
Maize	Cabbage	Black gram	2983	17466	576	260369	22.1
Daincha	+ Toria		+ 7653	+ 733			
Cowpea	Cauliflower	Black gram	6450	9466	593	350921	2.5
Paddy	+ Toria		+ 315	+ 630			
Pigeon Pea	French bean	Cowpea	913	8416	6633	493181	13.6
Daincha	+ Toria		+ 8066	+ 730			
Green gram	chilli	Cowpea	622	6716	5716	429388	21.6
Paddy	+ Toria		+ 2983	+ 850			
Standard Error						13652	2.8
Critical Difference(5%)						28944	6.1
Palampur (Himachal Pradesh)							
Paddy	Wheat	Fallow	3882	4706	0.0	133553	29.7
Paddy	Pea	Summer squash	3598	2651	3446	171546	21.3
Okra	Radish	Onion	947	8087	7026	137340	52.1
Turmeric	Pea	Summer squash	2651	2651	2651	181620	18.0
Paddy	Cabbage	Potato	3882	5303	7623	157998	22.2
Paddy	Spinach	Cucumber	3314	2651	3579	134909	13.0
Paddy	Broccoli	Radish	2841	1591	8630	137609	12.1
Coleus	Pea	Fallow	8144	4640		307536	24.3
	+ Coriander			+ 961.5			

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Khariif	Rabi	Summer	Khariif	Rabi	Summer		
Standard Error						21543	17.7
Critical Difference(5%)						44809	36.9
E. COASTAL ECOSYSTEM							
Bhubaneswar (Odisha)							
Paddy	Groundnut	Fallow	3547	2064	--	139279	23.9
Paddy	Groundnut	Bottle gourd	3713	1653	3263	185447	25.3
	+ Toria	+ Amaranthus		+ 364	+ 1593		
Paddy	Groundnut	Cowpea	3743	2175	2974	287689	28.0
	+ Kosala	+ Amaranthus		+ 1798	+ 1218		
Paddy	Maize	Lady finger	3085	32523	4129	602546	124.1
	+ Radish	+ Amaranthus		+ 7514	+ 1701		
Paddy	Maize	Cowpea	3929	39738	2836	738001	152.2
	+ Kosala	+ Amaranthus		+ 1787	+ 1281		
Paddy	Tomato	Bitter gourd	3395	9046	3962	228589	16.7
	+ Radish	+ Amaranthus		+ 7381	+ 1313		
Paddy	Tomato	Cowpea	4077	10367	3751	347472	19.7
	+ Kosala	+ Amaranthus		+ 1850	+ 1270		
Paddy	Broccoli	Pumpkin	3611	3330	4939	264289	16.7
	+ Radish	+ Amaranthus		+ 5883	+ 1098		
Paddy	Broccoli	Cowpea	3862	4140	4096	379209	18.3
	+ Kosala	+ Amaranthus		+ 1798	+ 861		
Paddy	Knol Khol	Cowpea	3413	3729	3607	213923	16.3
	+ Spinach	+ Amaranthus		+ 1487	+ 1055		
Standard Error						45027	9.4
Critical Difference(5%)						94602	19.8
Maruteru (A. P.)							
Paddy	Maize		6080	1774		113595	27.1
Paddy	Sorghum		6866	1707		128678	29.7
Paddy	Soyabean		5700	193		89164	20.5
Paddy	Black gram		6733	192		108596	23.9
Paddy	Maize		5606	1774		106637	25.4
Paddy	Sorghum		4633	200		71365	16.7

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross	Total
Kharif	Rabi	Summer	Kharif	Rabi	Summer	Return (Rs/kg)	Calories (K*10 ⁶)
Paddy	Soyabean		5513	1720		128785	26.5
Paddy	Black gram		5440	266		93268	19.7
Paddy	Paddy		5080	2281		108216	25.4
Standard Error						12696	3.0
Critical Difference(5%)						26916	6.3
Navsari (Gujarat)							
Paddy	Chick Pea	Fallow	5144	231.67	00	84883	18.6
Paddy	Sorghum	Sorghum	5144	2537	1063	134127	30.3
Paddy	Maize	Green gram	5224	6355	754	224420	28.9
	Sweet corn						
	+ Green gram		+ 137				
Paddy	Fenugreek(S)	Cluster bean	5464	5772	2720	393684	39.0
Paddy	Castor	Castor	5338.	1806	00	147999	26.4
Paddy	Brinjal	Brinjal	5281	5875	00	193324	21.3
	+ Radish			+ 9945			
Paddy	Sunhemp	Groundnut	5041	00	765	106413	21.7
Paddy	Cabbage	Green chillies	5521	10631	880	191755	22.2
Paddy	Maize	Groundnut	5098	6367	754	208013	2.9
	Sweet corn						
Paddy	Lucerne	Lucerne	5829	26177	137	129114	24.3
Standard Error						11612	1.3
Critical Difference(5%)						24397	2.7
Karamana (Kerala)							
Paddy	Paddy	Fallow	4890	3258	—	1197950	28.1
Paddy	Paddy	Amaranthus	5876	5048	8055	271348	41.7
Paddy	Paddy	Amaranthus	5365	4113	5212	211017	35.3
Paddy	Paddy	Cucumber	5769	5348.	9548	299970	39.7
Paddy	Paddy	Cucumber	5318	4059	6159	225931	33.2
Paddy	Paddy	Cowpea fodder	6623	4567	17314	193080	41.4
Paddy	Paddy	Cowpea fodder	5508	4006	32407	193335	38.1
Standard Error						8910	1.6
Critical Difference(5%)						19416	3.6

Crop in Sequence/variety / duration N-P-K(kg/ha)			Yield(kg/ha)			Total Gross Return (Rs/kg)	Total Calories (K*10 ⁶)
Kharif	Rabi	Summer	Kharif	Rabi	Summer		
Thanjavur (T.N.)							
Sunhemp Fodder	Paddy	Black gram		5159	844	118080	20.7
Sunhemp Fodder	Paddy null: 0 150-50-50	Sesamum		4791	675	104211	20.3
Sunhemp Fodder	Paddy	Maize		5313	5589	165151	38.1
		+Green gram			+ 205		
Sunhemp Fodder	Paddy	Bhindi		5528	8169	198088	21.9
Sunhemp Fodder	Paddy	Finger millet		5344	2687	124907	27.3
Sunhemp Fodder	Paddy	Pearl millet		5466	1750	103643	25.2
Sunhemp Fodder	Paddy	Cowpea fodder		5620	00	82618	19.4
Standard Error						4251	0.9
Critical Difference(5%)						9264	2.1
Karjat (Maharashtra)							
Paddy	Groundnut	--	6228.	3203	--	226746	39.7
Paddy	Water melon	--	5897	19873	--	205930	29.5
Paddy	Maize Sweet corn	--	4932	15572	--	320110	36.5
Paddy	Brinjal	--	5500	26571	--	419648	25.4
Paddy	Cabbage	--	5760	19415	--	244855	25.1
Paddy	Maize fodder	--	4927	51219	--	156943	25.2
Paddy	Board bean	--	5886	851	--	108663	20.7
Paddy	Dolichos bean	--	6161	6362	--	244536	24.3
Paddy	Okra	--	5544	11434	--	245012	23.1
Paddy	Bottle gourd	--	5147	27196	--	295963	21.0
Paddy	Paddy	--	5131	5596	--	157691	37.1
Standard Error						9321	0.8
Critical Difference(5%)						19444	1.8

7.3 : 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 nutrient management packages for system-based high value crops
- II. To recycle farm waste to value added compost
- II. To monitor soil health and crop quality and also to develop holistic approach for nutrient, pest and disease management as well as moisture conservation

Year of start : 2003-04

Treatments

- T₁: 50% recommended NPK + Zn + S as per soil test + 50% N as FYM
- T₂: 100% organic nutrient sources as FYM, vermicompost and neem oil cake each equivalent to 1/3 of recommended N dose of crops
- T₃: T₂ + intercropping/trap cropping
- T₄: T₂ + agronomic practices for weed and pest control
- T₅: 50% N as FYM + seed treatment with Azotobacter and PSB + Rock phosphate
- T₆: T₂ + Azospirillum and phosphate solubilizing bacteria (PSB)
- T₇: 100% NPK + Zn + S based on soil test
- T₈: Dummy Plot

Results

I. Rice based cropping system

Chatha

At Chatha centre, in rice-potato-onion/frenchbean system, the highest yield of rice (2.74 t ha⁻¹) and potato (11.39 t ha⁻¹) was recorded under treatment T₃ and T₆ during kharif and rabi seasons,

respectively. The yield increase in these crops over RDF was 3.8% and 16.3%, respectively. During summer season onion was replaced by frenchbean and the highest yield (3.89 t ha⁻¹) was recorded under treatment T₆ receiving 100% organic nutrient sources plus biofertilizers. However, as the yield performances of treatments over the years are concerned, the mean yield for rice, potato and frenchbean were highest under T₂, T₆ and T₂ during kharif, rabi and summer seasons, respectively.

Jorhat

At Jorhat, in rice-toria-blackgram system, highest grain yield of rice was recorded under T₃ at 3.71 t ha⁻¹. During rabi season highest yield of toria was recorded under T₃ at 0.89 t ha⁻¹. Percent increase in crop yield under these two treatments over T₇ were 83.6% and 115.2%, respectively. However, during summer season, highest grain yield of blackgram was recorded under T₄ at 2.69 t ha⁻¹ being 177.5% more as compared with RDF under T₇. The mean yield performances of treatments over the years for rice and toria were highest under T₃, while blackgram yielded highest under T₄.

Kalyani

At Kalyani, in paddy-potato-groundnut system, highest grain yield of paddy (1.97 t /ha⁻¹) was recorded under T₁ while highest potato yield (15.66 t ha⁻¹) was recorded under T₇ and highest groundnut yield (1.66 t ha⁻¹) was also found under T₇ with recommended dose of fertilizers on soil test basis. However, the mean yield performances of treatments over the years for paddy, potato and groundnut were highest under T₁, T₇ and T₇ during kharif, rabi and summer seasons, respectively.

Rewa

At Rewa, in rice-wheat+mustard-fallow system the highest yield of rice (3.60 t ha⁻¹) was recorded under recommended doses of fertilizers (T₇) followed by 3.56 t ha⁻¹ under integrated nutrient

management (T_1). The reduction under INM compared to RDF was 1.05%. The yield of wheat under other organic nutrients management packages were almost at par. Similarly, the yield of wheat during rabi also followed the similar pattern producing 4.05 t ha^{-1} and 3.40 t ha^{-1} under T_7 and T_1 treatments, respectively. However, as the mean yield performances of treatments over the years are concerned, the mean rice (3.52 t ha^{-1}) and wheat (3.80 t ha^{-1}) yields were highest under T_7 (RDF) during kharif and rabi seasons, respectively.

Kumarganj

In rice-mustard-moong system at Kumarganj, the highest yield of all the three crops in the system was recorded highest at 3.16 t ha^{-1} , 4.29 t ha^{-1} and 2.29 t ha^{-1} , respectively under the treatment T_4 with 100% organic nutrient sources. As per mean crop yields over the years rice yield was highest under T_4 whereas mustard and moong yielded highest under T_2 and T_6 , respectively.

II. Miscellaneous cropping system

Parbhani

At Parbhani, in soybean-onion-fallow system, highest yield of soybean (2.73 t ha^{-1}) and onion (19.71 t ha^{-1}) was recorded under recommended dose of fertilizer (T_7) followed by integrated nutrient management (T_1) with yield levels of 2.38 and 18.14 t ha^{-1} for soybean and onion, respectively. Among organic nutrient management packages, the treatment T_6 proved better over others



View of Onion crop at Organic Farming at Parbhani

producing soybean (2.31 t ha^{-1}) and onion (15.86 t ha^{-1}), respectively. As the mean performance of treatments over the years are concerned, T_7 proved superior to all with soybean and onion yields at 2.66 and 22.53 t ha^{-1} , respectively. The performance of IPNS (T_1) was superior over other organic nutrient management packages.

Bichpuri

At Bichpuri, in Clusterbean-potato-onion system the highest yield of clusterbean (8.01 t ha^{-1}), potato (3.75 t ha^{-1}) and onion (1.67 t ha^{-1}) was recorded under the treatments T_1 , T_7 and T_7 , respectively. The recommended doses of fertilizers (T_7) was found superior as compared to organic nutrient management treatment packages for all the crops in the sequence. The mean yield performance over the year for integrated nutrient management (T_1) was also found superior for clusterbean and potato with yield level of (6.20 t ha^{-1}) and (2.04 t ha^{-1}) while onion recorded highest mean yield of (4.87 t ha^{-1}) under RDF (T_7).

Ludhiana

At Ludhiana, in maize-potato-onion system the highest yield of maize (5.76 t ha^{-1}), potato (23.85 t ha^{-1}) and onion (23.14 t ha^{-1}) was recorded under the treatment T_1 . The mean yield performance over the year for integrated nutrient management (T_1) was found superior for maize and onion with yield level of (5.76 t ha^{-1}) and (23.38 t ha^{-1}) while potato recorded highest mean yield of (24.45 t ha^{-1}) under the treatment (T_3).



Parbhani General view of Soybean crop at Parbhani



General view of Organic Farming at Jorhat

Table: Effect of organic nutrient management packages on crop yields (kg/ha) under different cropping systems (2016-17).

Treatment	Crop season	Chatta Rice-Potato- Onion / Frenchbean	Jorhat Rice-Toria- Blackgram	Kalyani Paddy-Potato- Groundnut	Rewa Rice- Wheat+Mustard- Fallow
T ₁	Kharif Rabi Summer	2579 9751 3509	2540 642 2393	1974 13646 1589	3562 3400 -
T ₂	Kharif Rabi Summer	2724 10751 3792	2572 684 2143	1627 10293 1314	2794 2012 -
T ₃	Kharif Rabi Summer	2738 10960 3810	3710 893 2488	1765 5400 2302+0	3132 1543+301* -
T ₄	Kharif Rabi Summer	1989 11036 3696	2623 653 2693	1717 2050 0	2993 2072 -
T ₅	Kharif Rabi Summer	2589 9646 3117	2307 520 2100	1705 9539 1481	2920 1843 -
T ₆	Kharif Rabi Summer	2668 11395 3894	2311 533 2558	1650 10792 1555	3134 2042 -
T ₇	Kharif Rabi Summer	2636 9794 3426	2021 415 2287	1448 15665 1657	3600 4052 -
T ₈	Kharif Rabi Summer	2045 4617 1254	0 0 0	1301 7479 1074	2002 1384 - *Mustard

Treatment	Crop season	Kumarganj Rice-Mustard- Moong	Prabhani Soybean- Onion-Fallow	Bichpuri Clusterbean - Potato-Onion	Ludhiana Maize-Potato- Onion
T1	Kharif Rabi Summer	3057 4243 2108	2385 18136 -	8015 36720 15610	5761 23851 23140
T2	Kharif Rabi Summer	2825 4215 2102	1947 13637 -	7362 28112 13071	5510 22581 21810
T3	Kharif Rabi Summer	2702 1310+390* 675+13700**	2165 14573 -	6832 31124+1905* 12010	4885+360* 21065+32060** 19235+415***+80****
T4	Kharif Rabi Summer	3156 4286 2295	2299 14726 -	7671 35671 14081	5469 22401 22036
T5	Kharif Rabi Summer	2318 3486 1771	1790 12129 -	7200 30170 12905	4013 14963 13825
T6	Kharif Rabi Summer	2838 3876 2138	2308 15859 -	7618 33408 14702	5668 23064 22168
T7	Kharif Rabi Summer	2950 4022 2173	2734 19713 -	7984 37521 16707	4872 19910 19061
T8	Kharif Rabi Summer	1326 3057 1574 *Lentil, **Chilli	2085 13628 -	0 0 0 *Radish	3921 16289 15535 *Radish

7.4 ON-FARM RESEARCH

7.4.1 ON-FARM CROP RESPONSE TO APPLICATION OF NUTRIENTS

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

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

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

Treatments : there are five common treatments at various locations. They are ($N_0P_0K_0$), N, N+P, N+K and N+P+K and all the nutrients are applied as per the recommended rates of crops/cropping systems evaluated at particular location. Two treatments namely, N+P+K+ Supplement of deficient micronutrient based on soil test and farmer's practice were added during 2010-2011.

Locations:

Cropping system	OFR Centre (State)	No. of trials
Rice-rice	Kamrup (Assam), Thiruvalla (Kerala), Paiyur (Tamil Nadu), Karjat (Maharashtra), Seethampeta (Andhra Pradesh), Chettinad (Tamil Nadu.)	132
Rice-wheat	Amritsar (Punjab), Udham singh nagar (Uttarakhand), Katni (Madhya Pradesh), Dindori (Chhattish Garh), Pakur (Jharkhand), Ambedkarnagar & Kanpur Dehat (Uttar Pradesh), Samba (Jammu & Kashmir)	152
Rice-groundnut	Angul (Orissa), Paiyur (Tamil Nadu.)	36
Rice-Gram	Kawardha (Chhattish Garh)	24
Rice-maize	Derol (Gujarat)	12
Rice-green gram	Kendrapara (Orissa), Kakdwip (West Bangal)	48
Rice-fallow-fallow	Warngal (Telangana)	10
Maize-Wheat	Udipur (Rajasthan), Kangra (Himachal Pradesh.), Samba (Jammu & Kashmir)	60
Maize-maize	Derol (Gujarat)	12
Maize-gram	Gadag (Karnatka), Aurangabad (Maharashtra)	36
Cotton-wheat	Sirsa (Haryana), Jagudan(Gujarat)	48
Soybean-gram	Amravati (Maharashtra)	12
Soybean-Wheat	Amravati (Maharashtra)	12
Soybean-onion	Pune (Maharashtra)	24
Finger millet-tomato	Kolar (Karnatka)	12
Cabbage-tomato	Kolar (Karnatka)	12
Groundnut-sorghum	Gadag (Karnatka)	12
Cluster bean-wheat	Fatehpur (Rajasthan)	24
Total		678

Results: The centre-wise details of varieties, nutrients used, crop yield and crop response to NPK application in terms yield difference, and are presented in table 7.4.1. Brief descriptions of centre-wise result are given below.

Rice rice: A total 144 trial conducted at 7 locations comprising of seven NARP zones and it covers Assam, Andhra Pradesh, Tamil nadu, Kerala, Gujarat and Maharashtra state. All location recorded increase in yield due to application of Zn in both season as micronutrient and highest percentage increase in yield over Recommended Fertilizer (NPK only) were recorded at Andhra (High Altitude and Tribal Zone) in kharif (85.0%) as well as rabi (10.2%) season followed by Maharashtra (North Konkan Coastal Zone) in kharif (8.2%) as well as rabi (5.6%) season. Application of Zinc @ 50 kg ha⁻¹ in both the crops resulted in additional yield of 1400 and 642 kg ha⁻¹ in kharif and rabi season over and above the recommended fertilizer at Andhra (High Altitude and Tribal Zone). However, application of recommended dose of fertilizer recorded higher yield over the control at all the fourteen season and seven locations within range of 15% to 245% and highest yield gap 4242 & 4100 kg ha⁻¹ recorded at Special Zone (Thiruvalla) of Kerala in kharif & rabi season, with highest percentage increase 245 & 230% respectively. Followed by North Western Zone (Paiyur) of Tamil Nadu with 3250 kg ha⁻¹ of yield gap in Kharif season and 3634 kg ha⁻¹ in Rabi season exists between recommended fertilizer dose and farmer practices. Application of Zinc @ 50 kg ha⁻¹ in kharif and rabi season resulted in additional yield of 1400 & 642 kg ha⁻¹ over and above recommended dose of fertilizer at High Altitude and Tribal Zone (Seethampeta) of Andhra. Highest system yield 3369 kg ha⁻¹ was recorded at Lower Brahmaputra Valley Zone of (Kamrup) Assam, application of 40:20:20:25 kg NPK Zn ha⁻¹ during kharif and 60:30:30:25 kg NPK Zn ha⁻¹ during rabi gives 1662 kg ha⁻¹ and 1707 kg ha⁻¹

additional yield over the farmer practices which was 86% high in kharif and 60% high in rabi than farmer practices. Followed by North Konkan Coastal Zone of (Palghar) Maharashtra with 3009 kg ha⁻¹ system yield by application of 120:50:50:10 kg NPK Zn ha⁻¹ during kharif and 120:50:50:10 kg NPK Zn ha⁻¹ during rabi gives 1889 kg ha⁻¹ and 1120 kg ha⁻¹ additional yield over the farmer practices which was 45% high in kharif and 32% high in rabi than farmer practices. High response to fertilizer application in Kamrup and Palghar mainly because farmer not apply fertilizers in this region. Except Andhra (High Altitude and Tribal Zone) all other centre observed that application of Zinc along with Recommended dose of Fertilizer (NPK) gives higher yield than farmer practices and ranging from 10-86%. In rice-rice system, Assam there was huge mean system yield gap of 2956 kg ha⁻¹ exists between farmers and recommended nutrient practice. And it further widen up to 3369 kg ha⁻¹ if we consider Zinc application along with recommended dose of NPK. In rice-rice system, across the NARP zones, it was found that mean yield gap of 750 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 816 kg ha⁻¹ is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient.

Rice-wheat : A total 156 trial conducted at 8 locations comprising of 8 NARP zones. Under this total eight states covered which are Punjab, Uttarakhand, Jharkhand, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Jammu Kashmir. At all location there increase in yield was recorded by the application of Zn in both crop as micronutrient and highest percentage increase in yield over recommended fertilizer (NPK only) were recorded at Northern Hill Zone of Chhattisgarh (Dindori) of CG which was 14.5% higher in case of rice and Keymore Plateau Satpora hills Zone (Katni) of MP with 10.9% higher in case of wheat. However, application of recommended dose of fertilizer

recorded higher yield over the control at all the 8 locations within range of 98 to 292% in case of rice and 84 to 368% in case of wheat. Highest yield gap 4288 kg ha⁻¹ in rice and 3723 kg ha⁻¹ in wheat were recorded at Keymore Plateau Satpura hills zone (Katni) of Madhya Pradesh and highest percentage increase in yield 292 in case of rice and 368% in case of wheat were recorded at Central and North Eastern Plateau Zone (Pakur) of Jharkhand. There were huge yield gap recorded in recommended NPK application and farmer practices under both crop at Keymore Plateau Satpura hills zone (Katni) of Madhya Pradesh, In case of rice application of 120:60:40 Kg NPK ha⁻¹ gave additional yield of 4288 kg ha⁻¹ and 2387 kg ha⁻¹ over the control and farmer practice respectively and in wheat application of 120:60:40 Kg NPK ha⁻¹ gave additional yield of (3723 kg and 2491 kg ha⁻¹). Application of 25 kg ha⁻¹ of ZnSO₄ in both season gave additional yield 648 kg and 734 kg ha⁻¹ in case of rice and wheat at Katni. In Central and North Eastern Plateau Zone of (Pakur) Jharkhand 24 trials were conducted and it was found that significantly higher additional yield of 1371 and 1381 kg ha⁻¹ can be obtained from rice and wheat respectively through application of 100:50:25: Kg NPK + 5 kg zinc ha⁻¹ both in rice and wheat, which were contribute 62 and 69% hike in yield over the farmers practice. At Central Plain Zone (Amritsar) of Punjab it was observed that in this zone farmer already using high dose of NPK so there was lower yield recorded at recommended NPK but with application of micronutrient it was recorded higher yield of (391 and 253 kg ha⁻¹) over farmer practices. It was observed that in Uttar Pradesh at Eastern Plain Zone (Ambedkarnagar) significantly higher yield recorded (1622 kg and 1611 kg ha⁻¹) over farmer practices with application of recommended dose of NPK but in Central Plain Zone (Kanpur) only marginal additional yield were recorded by application of recommended dose of NPK over the farmer practices (416 kg and 469 kg ha⁻¹). In rice-

wheat system, across central plateau (Chhattisgarh and Jharkhand) there was huge mean system yield gap of 2503 kg ha⁻¹ exists between farmers and recommended nutrient practice. And it further widen up to 2836 kg ha⁻¹ if we consider Zinc application along with recommended dose of NPK. In rice-wheat system, at Keymore Plateau Satpura hills zone (Katni) of Madhya Pradesh, it was found that mean system yield gap of 4144 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 1382 kg ha⁻¹ is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient. In rice-wheat system, across the NARP zones, it was found that mean yield gap of 2019 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 695 kg ha⁻¹ is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient.

Rice-groundnut: In Mid Central Table Land (Angul) of Orissa, 24 trials were conducted on rice-groundnut system and it was found that significantly higher additional yield of 594 kg ha⁻¹ can be obtained from rice through application of 80:40:40: Kg NPK + 25 kg zinc ha⁻¹. In groundnut, the additional yield over farmer practice was found to be 370 kg ha⁻¹ due to application of 20:40:40: Kg NPK ha⁻¹ along with 250 kg ha⁻¹ gypsum. Application of zinc as micronutrient in rice and gypsum in groundnut gave 12.3 and 17.6 per cent additional yield than recommended NPK.

Rice-gram : A total of 24 trials were conducted in Chhattisgarh plain zone (Kawardha) of Chhattisgarh. Recommended NPK (100:60:40: Kg ha⁻¹) to rice recorded significantly higher grain yield (1393 kg ha⁻¹) than farmer practices, and in case of gram higher yield of 253 kg ha⁻¹ recorded due to application of 20:50:20: Kg ha⁻¹ NPK which was 38 and 20% higher than farmer practices, respectively.

Rice-maize : Total 12 trials were conducted in Middle Gujarat Zone (Derol) of Gujarat. There were huge yield gap in recommended NPK application and farmer practices under both crop. In case of rice application of 50:25:25 Kg NPK ha⁻¹ gave additional yield of 783 kg ha⁻¹ and 272 kg ha⁻¹ over the control and farmer practice respectively which were 81.4 and 18.4% higher over the control and farmer practice respectively. In case of maize application of 120:60:60 Kg NPK ha⁻¹ gave additional yield of 1334 kg ha⁻¹ and 248 kg ha⁻¹ over the control and farmer practice respectively which were 90.2 and 9.7% higher over the control and farmer practice respectively.

Rice-green gram : In East & South Eastern Coastal Plain zone (Kendrapara) of Orissa, 24 trials were conducted and it was found that significantly higher additional yield of 1452 kg ha⁻¹ can be obtained from rice through application of 80:40:40: Kg NPK + 25 kg zinc ha⁻¹. In green gram, the additional yield over farmer practice was found to be 935 kg ha⁻¹ due to application of 20:40:20: Kg NPK ha⁻¹ along seed treatment with Sodium Molybdenum (3 gm/10 kg seed). Application of zinc as micronutrient in rice and Molybdenum in green gram gave 7.19 and 6.13 per cent additional yield than recommended NPK. But response at Coastal saline Zone (Kakdwip) of West Bengal was not so good only 255 & 67 kg ha⁻¹ yield increase was recorded over farmer's practices with RDF. In rice-green gram system, across the NARP zones, it was

found that mean yield gap of 1051 kg ha⁻¹ exists between farmers and recommended nutrient practice. Additional yield of 352 kg ha⁻¹ is possible through application of required quantity of zinc to the system in addition to recommended level of NPK nutrient.

Rice-fallow-fallow : A total of 10 trials were conducted in North Western Zone (Paiyur) of Tamil Nadu. Addition of 50 kg zinc ha⁻¹ along with recommended NPK (120:60:40 Kg ha⁻¹) recorded lower grain yield (309 kg ha⁻¹) as farmer have tendency to apply high dose of fertilizers (170:25:38 NPK Kg ha⁻¹), farmer have strong soft corner for urea application.

Maize-wheat : A total 60 trials were conducted in 3 NARP zones. Sub-mountain and low hills sub-tropical zone (Kangra) of Himachal Pradesh, application of 25 kg Zinc ha⁻¹ recorded additional yield of 246 and 227 kg ha⁻¹ in maize and wheat. It was recorded that application of 90:45:30: Kg NPK + 25 kg zinc ha⁻¹ in maize and 80:40:40: Kg NPK + 25 kg zinc ha⁻¹ in wheat gave significantly higher yield than farmer practices and it was observed 66.7 and 66.5% higher than farmer practices in maize and wheat respectively. At Sub-Humid Southern Plain and Aravalli Hill Zone (Udaipur) of Rajasthan application of 25 kg ha⁻¹ of zinc in addition to recommended NPK in maize and wheat gave additional yield of 277 and 235 kg ha⁻¹ which was 8.7 and 7.3% higher than NPK alone. It was



Crop response to plant nutrients experiment on rice-rice at farmers field, Sivagangai district (Tamil Nadu)



Crop response to plant nutrients experiment in rice-wheat system at Dindori (Madhya Pradesh)

observed that farmer's practices of nutrient management resulted in lower yield (621 and 497 kg ha⁻¹) of maize and wheat compared to application of recommended quantity of NPK. In the subtropical low altitude Zone (Samba) of Jammu & Kashmir application of 60:40:20 Kg NPK + 10 kg zinc ha⁻¹ in maize and 60:30:20 Kg NPK ha⁻¹ in wheat gave significantly higher yield than farmer practices and it was observed 32.2 and 27.9% higher than farmer practices.

Maize-maize : Total 12 trials were conducted in Middle Gujarat Zone (Derol) of Gujarat. There were huge yield gap in recommended NPK application and farmer practices under both season, In case of kharif application of 50:25:25 Kg NPK ha⁻¹ gave additional yield of 770 kg ha⁻¹ and 410 kg ha⁻¹ over the control and farmer practice respectively which were 89.1 and 33.5% higher over the control and farmer practice respectively. In case of rabi RDF gave additional yield of 1020 kg ha⁻¹ and 751 kg ha⁻¹ over the control and farmer practice respectively which were 70.4 and 43.7% higher over the control and farmer practice respectively.

Maize-gram : A total 36 trials were conducted in 2 NARP zones. In Northern dry zone (Gadag) of Karnataka, yield difference between farmers and recommended NPK practices were found to be 783 kg ha⁻¹ in Maize and 93 kg ha⁻¹ in gram. In Aurangabad of Karnataka recommended NPK recorded 1241 kg ha⁻¹ in Maize and 313 kg ha⁻¹ in gram over control which was 59.7 and 72.1% high.

Cotton-wheat : A total 48 trials were conducted in 2 NARP zones. In Western Zone (Sirsa) of Haryana, yield difference between control and recommended NPK practices was found to be 1391 kg ha⁻¹ in Cotton and 3869 kg ha⁻¹ in wheat. Application of micronutrient @ 25 kg ha⁻¹ in both crops in the form of ZnSO₄ resulted in significantly higher yield (311 and 652 kg ha⁻¹ respectively) than application of recommended quantity of NPK alone. In the North

Gujarat Zone (Jagudan) of Gujarat, it was observed that farmer's practices of nutrient management resulted in lower yield (362 and 523 kg ha⁻¹) of Cotton and wheat compared to application of recommended quantity of NPK alone. Application of 15 kg Mn and 25 kg Zinc ha⁻¹ in addition to recommended NPK to Cotton and wheat, respectively recorded additional yield (516 and 902 kg ha⁻¹) than recommended quantity of NPK alone.

Soybean-gram : A total 12 trials were conducted in Western Vidarbha Zone (Amravati) of Maharashtra, It was observed that there was huge yield gap between farmer's practices and recommended nutrient application and which gave (additional yield of 524 and 544 kg ha⁻¹) in soybean and bengal gram respectively as compared to farmer practices. Which were 41.0 and 46.9% higher yield than farmer practices in soybean bengal gram respectively.

Soybean-wheat : A total 12 trials were conducted in Western Vidarbha Zone (Amravati) of Maharashtra, It was observed that farmer's practices of nutrient management resulted in lower yield (492 and 609 kg ha⁻¹) of soybean and wheat compared to application of recommended quantity of NPK. Application of sulphur in addition to recommended NPK resulted additional yield of 243 kg ha⁻¹ in soybean.

Soybean-onion : A total 24 trials were conducted in Western Maharashtra Plain Zone (Pune) of Maharashtra, It was observed that there was huge yield gap between farmer's practices and recommended nutrient application and which gave (additional yield of 787 and 4099 kg ha⁻¹) in soybean and onion respectively as compared to farmer practices. Which were 60.3 and 14.9% higher yield than farmer practices in soybean and onion, respectively.

Fingermillet-tomato : Total 12 trial conducted at Kolar, Karnataka and found that farmer practices

harvesting lower yield by (0.1%) than recommended NPK in case of Fingremillet and higher in tomato (10.1%). By application of micronutrient along with NPK Fingremillet yield can be further increase by 4.6 and tomato yield difference can minimize up to 3.5 percent.

Cabbage-tomato : Total 12 trial conducted at Kolar, Karnataka and found that farmer practices harvesting high yield than recommended NPK application to cabbage and tomato (9.8 and 24.6%), respectively. This difference can be minimized up to (1.3 and 12.1%) by application of micronutrient along with NPK.

Groundnut-sorghum : Application of 25:50:25 Kg NPK + 25 kg Fe ha⁻¹ to groundnut and 50:25:0 Kg NPK + 15 kg Zn ha⁻¹ to Sorghum gave additional yield of 596 and 140 kg ha⁻¹ respectively over the farmer practices at Northern dry zone (Gadag) of Karnataka. And micronutrient contribution in above yield was 223 and 55 kg ha⁻¹ respectively.

Cluster bean-wheat : the yield difference between farmers and recommended nutrient management practices was found to be 285 kg ha⁻¹ in cluster bean and 1114 kg ha⁻¹ in wheat grown in Transitional. Plain Zone of Inland Drainage (Sikar) of Rajasthan. Application of micronutrient recorded marginal increase in cluster bean and wheat yield, 86 and 57 kg ha⁻¹, respectively. The yield difference between control and recommended NPK application was found too high in wheat (2143 kg

ha⁻¹) and moderate in cluster bean (571 kg ha⁻¹).

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

- Across the various NARP zones and cropping systems, Farmer's package resulted in lower yield compared to recommended package owing to the 26, 23, 73 and 100 % lower application of N P₂O₅ K₂O and Micronutrients.
- On-farm system yield gap between recommended dose of N P₂O₅ K₂O + micronutrient and farmer's package was found to be 1572, 2714, 2237 and 1403 kg ha⁻¹ in rice- rice, rice- wheat, maize- wheat and rice-green gram systems respectively.
- Application of micronutrients based on soil test resulted in additional yield of 821, 695, 397 and 352 kg ha⁻¹ in rice-rice, rice-wheat, maize-wheat and rice-green gram systems respectively.
- In all the NARP zones and systems, application of recommended N P₂O₅ K₂O alone or N P₂O₅ K₂O + micronutrient resulted in higher yield and use efficiency of nutrients. Suboptimal application in terms of number and quantity resulted in significantly lower yield and use efficiency of nutrients especially nitrogen.



Nutrients response experiment in rice crop at Pathinamthitta district (Kerala)



Nutrients response experiment in rice at Warangal district (Telangana)

**Table-7.4.1 : Yield potential of different cropping systems under researcher and farmer managed conditions - Year 2016
Report for Grain Yield - Year 2016**

State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status					Yield (kg/ha)													
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Pract Nut	F. SE(d) (M)	CD (5%)	CV	Yield					
																	Gap 1 (kg ha ⁻¹)	Gap 2 (kg ha ⁻¹)	Gap 3 (kg ha ⁻¹)	Gap 4 (kg ha ⁻¹)		
Rice - Rice																						
Andhra Pradesh	High Altitude and Tribal Zone - Rastakuntabail/ Chintapalli/ Seethampeta-API/ 24	Red Soil	6.5	0.6	198	26	369	1430	1610	1728	1499	1647	3047	4538	1119	87	180.92	14.56	217	1400	-2892	-1492
Andhra Pradesh	High Altitude and Tribal Zone - Rastakuntabail/ Chintapalli/ Seethampeta-API/ 24	Red Soil	-	-	-	-	-	2363	3585	6042	5552	6304	6946	7367	2551	197	1083.4	34.93	3942	642	-1063	-420
Assam	Lower Brahmaputra Valley Zone- kamrup (Rural)/ kamrup/ 24	Alluvial	5	1	310	21	279	2012	2432	2817	2941	3410	3585	1923	0	0	0	1398	175	1487	1662	
Assam	Lower Brahmaputra Valley Zone- kamrup (Rural)/ kamrup/ 24	Alluvial	-	-	-	-	-	3029	3251	3564	3797	4332	4570	2863	0	0	0	1303	238	1469	1707	
Maha-rashtra	North Konkan Coastal Zone - Karjat/ Palghar/ 24	Not Available	6.8	0.6	266.2	11.2	171.65	2414	3545	4536	4411	5626	6087	4198	0	0	0	3212	461	1428	1889	
Maha-rashtra	North Konkan Coastal Zone - Karjat/ Palghar/ 24	Not Available	6.8	0.6	266.2	11.2	171.65	2290	3374	4067	3894	4389	4636	3516	0	0	0	2099	247	873	1120	
Kerala	Special Zone / Thiruvalla-KERI/ 24	Not Available	4.1	1.8	296	12	265	1734	2669	4249	4166	5976	6240	5473	0	0	0	4242	264	503	767	

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State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status				Yield (kg/ha)										Yield Gap			
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+	F. Pract	SE (d) (M)	CD (5%)	CV	Yield Gap 1 (kg ha ⁻¹)	Yield Gap 2 (kg ha ⁻¹)	Yield Gap 3 (kg ha ⁻¹)	Yield Gap 4 (kg ha ⁻¹)
Kerala	Special Zone / Thiruvalla-KERI/ 24	Not Available	Umal 90-45-45 / ZnS04(25) 100-50-50	-	-	-	-	1783	2392	4086	3960	5883	6086	5559	0	0	0	4100	213	324	537
Tamil Nadu	South TN 5 & 6/ Chettinad-TN/ 24	Sandy Clay Loam	ADT-36 & BPT 5204/150-50-50/ ZnS04(25) FP 115-50-26	7.0	0.5	220	13	258	3703	4124	4367	4604	5018	5283	4815	774	60	338.77	13.13	1315	203
Tamil Nadu	South TN 5 & 6/ Chettinad-TN/ 24	Sandy Clay Loam	ADT-37/ 150-50-50/ ZnS04(25) FP 115-50-26	-	-	-	-	3743	4273	4527	4743	5220	5450	4970	581	129	436.56	5.30	1477	230	250
Tamil Nadu	North Western Zone - Pajyur/ Pajyur-TN/ 12	Sandy Clay Loam	BPT5204 & Aman/ 150-50-50 ZnS04(25) FP 134-43-41	7.8	0.5	263	24	274	3140	4696	5810	5665	6665	7108	5867	1285	99	322.55	10.83	3525	443
Tamil Nadu	North Western Zone - Pajyur/ Pajyur-TN/ 12	Sandy Clay Loam	ADT-39/ 120-40-40 ZnS04(25) FP 109-35-37	-	-	-	-	3279	4291	5541	5495	6913	7261	5788	1386	151	419.59	9.37	3634	348	1126
Punjab Zone III/	Central Plain Amritsar-PB/ 24	Not Available	PR-124/ 120-30-30 / ZnS04(25) 152-21-0	7.8	0.4	250	31	142	2968	4923	5459	5159	5919	6429	6039	1262	97	393.98	13.21	2951	510
Punjab	Central Plain Zone III/ Amritsar-PB/ 24	Not Available	HD 3086/ 120-30-30 / MnS04(5) 148-53-0	-	-	-	-	2411	3440	3869	3675	4295	4622	4363	897	69	330.12	15.31	1894	327	-68
Uttarakhand	Bhabar and Tarai Zone - Pantnagar/ Udhampur singh nagar/ 12	Alluvial	HKR-47/ 150-60-40/ Sulphar 150-40-25	6.3	0.7	275	18	170	2776	3548	4868	4375	5583	5747	3916	1107	85	10.76	268.01	2806	164

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State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status						Yield (kg/ha)																	
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Pract Nut	F. SE(d) (M)	CD (5%)	CV	Yield			Yield			Yield				
																	Gap 1 (kg ha ⁻¹)	RF vs Control	Mic Nut.	Gap 2 (kg ha ⁻¹)	RF vs Mic	Nut. FP	Gap 3 (kg ha ⁻¹)	RF vs Mic	Gap 4 (kg ha ⁻¹)	RF vs Mic	Nut. FP
Uttarakhand	Bhabar and Tarai Zone - Pantnagar/ Udham singh nagar/ 12	Alluvial	HD 2967/ 150- 60-40/ Sulphar 120- 40-25	--	--	--	--	2915	4180	5109	4874	5875	6233	5194	969	75	11.38	252.35	2960	358	681	1039					
Madhya Pradesh	Keymore Plateu Satpura hills / Kani-MP/12	Not Available	JRH-5/ 120- 60-40/ ZnSO4(25) 80- 30- 0	7.2	6.6	253	10	341	1680	3021	3846	3294	5968	6616	3581	87	62	124	5.34	4288	648	2387	3035				
Madhya Pradesh	Keymore Plateu Satpura hills / Kani-MP/12	Not Available	GW366/ 120- 60-40/ ZnSO4(25) 80- 30- 0	--	--	--	--	--	1690	2862	3593	3049	5413	6147	3656	95	67	134	6.19	3723	734	1757	2491				
Uttar Pradesh	Eastern plain zone Ambedkarnagar- UP/20	Not Available	Sariju-52 150- 60- 60 / ZnSO4(25) 129- 36-0 (9.1)	7.5	0.4	178.3	16.4	173.1	2265.2	3402.6	4354.1	3897.8	5709.6	6185.7	4086.8	--	--	--	--	3444	476	1623	2099				
Uttar Pradesh	Eastern plain zone Ambedkarnagar- UP/20	Not Available	NW-2036 150- 60- 40 / MnSo4 (5) 126- 36-0 (4.1)	7.5	0.4	178.3	16.4	173.1	2137.5	3366.3	4225.6	3778.6	5741.4	6295.5	4129.5	--	--	--	--	3604	554	1612	2166				
Uttar Pradesh	Central Plain Zone Kanpur 24	Not Available	PHB - 71 150- 60- 40 / ZnSO4(25) 199- 64-0	7.9	0.4	187.3	12.6	142.3	2286.9	3252.2	4892.0	3903.5	5406.3	5822.1	4937.3	--	--	--	--	3119	416	469	885				
Uttar Pradesh	Central Plain Zone Kanpur 24	Not Available	K-1006 120- 60- 40 / ZnSO4(0) 143- 61-0	7.9	0.4	187.3	12.6	142.3	2023.7	2433.6	3247.4	2865.8	3718.5	3921.8	3313.1	--	--	--	--	1695	203	405	609				
Chhattisgarh	Northern Hill Zone of Chhattisgarh (CG-3) Dindori 24	Not Available	MTU1010 120- 60- 40 / ZnSO4(25) 50- 23-0 (0)	--	--	--	--	--	1967.6	2602.8	3471.3	3230.8	3898.1	4465.2	2926.5	--	--	--	--	1931	567	972	1539				
Chhattisgarh	Northern Hill Zone of Chhattisgarh (CG-3) Dindori 24	Not Available	JW3211 120- 60- 40 / ZnSO4(25) 60- 23-0 (0)	--	--	--	--	--	1887.3	2816.3	3460.7	3399.5	4166.2	4405.2	3036.9	--	--	--	--	2279	239	1129	1368				

State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)													
				pH	OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Nut	F. Pract	SE(d) (M)	CD (5%)	CV	Yield			
																			Gap 1 (kg ha ⁻¹)	RF	vs Control	Yield Gap 2 (kg ha ⁻¹)
Jharkhand	Central and North Eastern Plateau Zone Pakur 24	Not Available	Naveen 100-50-25 / ZnS04(5) 60-30-0 (0)	-	-	-	-	-	884.2	1880.3	2939.4	2173.9	3464.1	3569.4	2198.1	-	-	-	2580	105	1266	1371
Jharkhand	Central and North Eastern Plateau Zone Pakur 24	Not Available	K-9107 100-50-25 / ZnS04(5) 60-30-0 (0)	-	-	-	-	-	706.5	1641.5	2849.3	1950.3	3303.4	3394.3	2013.3	-	-	-	2597	91	1290	1381
Jammu & Kashmir	Subtropical low altitude Samba 12	Not Available	B-370 30-20-10 / ZnS04(10) 24-14-0 (0)	7.2	3.0	229.0	14.6	122.2	1246.8	1663.2	2256.4	1989.1	2662.1	2743.5	2182.1	-	-	-	1415	81	480	561
Jammu & Kashmir	Subtropical low altitude Samba 12	Not Available	WH1105 100-50-25 / ZnS04(0) 56-26-0 (0)	7.2	3.0	229.0	14.6	122.2	1255.3	1620.9	2333.2	2032.3	2805.7	2890.0	2204.7	-	-	-	1550	84	601	685
Rice- Groundnut																						
Odisha	Mid-Central Table Land Zone - Mahispat/ Angul-ORI 24	Mixed Red & Black	Pooja/ 80-40-40/ ZnS04(25) 70-40-30	6.0	0.6	235.0	13.0	135.0	3992	3928	4612	4515	5218	5434	4840	688	487	955	1226	216	378	594
Odisha	Mid-Central Table Land Zone - Mahispat/ Angul-ORI 24	Mixed Red & Black	Devi/ 20-40-40/ Gypsum(250) 15-35-35	6.0	0.6	235.0	13.0	135.0	1208	1547	2094	1899	2339	2469	2099	41	29	57	1131	130	240	370
Tamil Nadu	North Western Zone - Payur/ Payur-TN/ 12	Sandy Loam	BPT5204 & Aman/ 150-50-50 ZnS04(25) FP 127-35-34	7.8	0.5	263	24	274	3138	3824	5087	4778	6113	6500	5332	1285	99	322.55	2975	387	782	1168
Tamil Nadu	North Western Zone - Payur/ Payur-TN/ 12	Sandy Clay Loam	TMV-71 20-50-75 Borax(25) FP 35-34-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status					Yield (kg/ha)														
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Nut	F. Pract	SE(d) (M)	CD (5%)	CV	Yield Gap 1 (kg ha ⁻¹)	Yield Gap 2 (kg ha ⁻¹)	Yield Gap 3 (kg ha ⁻¹)	Yield Gap 4 (kg ha ⁻¹)		
Rice - Gram																							
Chhattisgarh	Chhattisgarh plain zone Kawardha 24	Not Available	Karmasuri 100-60-40/ ZnSO4(20) 60-40-30	7.3	0.6	251.9	12.5	306.5	2032	3066	4344	3436	5042	5143	3649	-	-	3010	101	1393	1495		
Chhattisgarh	Vaibhav 20-50-20/ 18-46-0 24	Not Available	Karmasuri 100-60-40/ ZnSO4(20) 60-40-30	7.3	0.6	251.9	12.5	306.5	510	738	1269	1055	1516	1532	1263	-	-	1006	16	253	269		
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/ 12	Alluvial	GR-9 50-25-25/ ZnSO4(25) 70-10-0	6.43	0.63	200	26.23	258	962	1235	1390	1547	1745	1943	1473	0	0	783	198	272	470		
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/ 12	Alluvial	PAC-740 120-60-60/ ZnSO4(25) 130-40-0	6.43	0.63	200	26.23	258	1478	2326	2574	2679	2813	2946	2564	0	0	1334	134	248	382		
Rice - Green Gram																							
Odisha	East & South Eastern Coastal Plain / Kendrapara-OR/ 24	Not Available	Ranidhana/ 80-40-40/ ZnSO4(25) 35-30-15	5.8	0.6	281	16	172	2959	3578	3886	4305	4825	5173	3721	832	64	11	253	1867	347	1104	1452
Odisha	East & South Eastern Coastal Plain / Kendrapara-OR/ 24	Not Available	Local/ 20-40-20 / Sodium molybdate (3 gm/10 kg seed) 35-30-15	..	..	..	..	..	1846	2461	3091	2966	3676	3873	3000	158	12	14.98	67.67	1829	197	675	873
West Bengal	Coastal saline Zone W.B./ Kakdwip-WB/ 24	Coastal Saline Soil	Ranjit/ 80-40-40/ ZnSO4(20) 55-35-0	4.9	1	264	19	213	3066	3605	4000	4087	4461	4594	4206	0	0	0	1395	133	255	388	

State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status					Yield (kg/ha)																									
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Pract Nut	F. SE(d) (M)	CD (5%)	CV	Yield Gap 1			Yield Gap 2			Yield Gap 3			Yield Gap 4								
																	RF	vs	Control	RF+	Mic	Nut.	vs	RF	RF+	Mic	Nut.	vs	RF	RF+	Mic	Nut.	vs	FP
West Bengal	Coastal saline Zone W.B./ Kakdwip-WB/ 24	Coastal Saline Soil	Chait Moong/ 20-40-40/ control 15-42-0	-	-	-	-	617	706	834	801	906	932	839	0	0	0	289	26	67	93													
Telangana	CT Zone / Warangal- Telangana/ 10	Red Sandy	wgl32/100/ 120-60-40/ ZnS04/50/ 170-25-38	7.7	0.72	200	44	261	2312	3109	3531	3698	4025	4268	4577				1713	243	-552	-309												
				Rice - Fallow - Fallow																														
Rajasthan	Sub-Humid Southern Plain and Aravalli Hill Zone - Udaipur/ Udaipur-RJ/ 24	Not Available	Nathi/ 90-35-30/ ZnS04/25/ FP 57-20-0	7.9	0.4	221	16	200	763	1617	2883	2363	3181	3458	1831	920	71	133.59	10.27	2419	277	1350	1627											
				Maize - wheat																														
Rajasthan	Sub-Humid Southern Plain and Aravalli Hill Zone - Udaipur/ Udaipur-RJ/ 24	Not Available	Raj 4238/ 120-40-30/ control 74-17-0	-	-	-	-	-	1223	2388	2988	2756	3240	3475	2354	728	56	127.13	8.54	2017	235	885	1121											
Jammu & Kashmir	Subtropical low altitude Samba 12	Not Available	Kanchan 60-40-20/ ZnS04/10/ 24-23-0 (0)	7.2	3.0	229.0	14.6	122.2	1277.5	1880.0	2534.5	2247.3	2913.9	3032.5	2293.3	-	-	-	1636	119	621	739												
Jammu & Kashmir	Subtropical low altitude Samba 12	Not Available	PBW175 60-40-20/ ZnS04(0) 29-22.0 (0)	7.2	3.0	229.0	14.6	122.2	1225.2	1686.0	2241.8	2098.3	2593.7	2680.7	2096.5	-	-	-	1369	87	497	584												
Himachal Pradesh	Submontane lowhills subtropical Kangra 24	Not Available	Hybrid (Kanchan Polo) 90-45:30 ZnS04(25)	5.7	0.5	228.5	19.9	110.4	1674.2	2081.4	2573.0	2466.6	3173.2	3419.4	2051.1	-	-	-	1499	246	1122	1368												
Himachal Pradesh	Submontane lowhills subtropical Kangra 24	Not Available	HPW-155 80-40:40 ZnS04(25)	5.7	0.5	228.5	19.9	110.4	1551.6	1965.7	2394.3	2363.9	2954.3	3180.9	1910.1	-	-	-	1403	227	1044	1271												

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State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose)	Initial Soil Status					Yield (kg/ha)														
				pH	OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Nut	F. Pract	SE(d) (M)	CD (5%)	CV	Yield				
																			Gap 1 (kg ha ⁻¹)	Gap 2 (kg ha ⁻¹)	Gap 3 (kg ha ⁻¹)	Gap 4 (kg ha ⁻¹)	
Maize-Maize																							
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/ 12	Alluvial	GM-6 50-25-25/ ZnSO4(25) 70-10-0	6.97	0.73	231.5	23.57	281	865	1065	1258	1400	1635	1811	1225	0	0	0	770	176	410	586	
Gujarat	Middle Gujarat Zone - Anand/ Derol, Gujarat/ 12	Alluvial	PAC-740 120-60-60/ ZnSO4(25) 130-40-0	6.97	0.73	231.5	23.57	281	1449	1664	2201	2093	2469	2899	1718	0	0	0	1020	430	751	1181	
Maize - Gram																							
Karnataka	Northern dry zone / ARS Gadag/ 12	Deep Black soil	NK - 6240/ 150-75-37.5 / ZnSO4(25) 130-58-30	8.6	0.6	108	12	699	2226	3208	3927	4008	5319	5990	4536	245	173	343	14.38	3093	671	783	1454
Karnataka	Northern dry zone / ARS Gadag/ 12	Deep Black soil	JG 11/ 25-50-0/ ZnSo4(15) 60-58-0	-	-	-	-	-	450	538	625	666	848	992	750	60	42	83	21.12	398	144	98	242
Maharashtra	Aurangabad 24		Pioneer 3540 120-60-60 61-48-45	-	-	-	-	-	2080	2661	2993	2839	3321	3469	2919	-	-	-	-	1241	148	402	550
Maharashtra	Aurangabad 24		BDN-797 19-36-8.8/	-	-	-	-	-	435	577	701	617	748	776	610	-	-	-	-	313	28	139	166
Cotton - wheat																							
Haryana	Western Zone - Sirsa/ Sirsa-HR/ 24	Not Available	Bio 6588/ 175-60-60/ ZnSO4(21%) 175-60-30	8.4	0.2	121	10	252	601	1322	1784	1623	1992	2176	1865	0	0	0	1391	184	127	311	
Haryana	Western Zone - 24	Not Available	WH2967/ ZnSO4(21%) 150-60-0	-	-	-	-	-	1125	3275	4580	4270	4994	5393	4741	0	0	0	3869	399	253	652	
Gujarat	North Gujarat Agroclimatic Zone / Jagudan/ 24	Alluvial	BG II/ 180-40-40/ Mgso4(15kg) 141-50-0	7.77	0.5	196	21	248	790	1402	1607	1685	1931	2084	1568	516	40	196.73	21.99	1140	154	362	516

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State	NARP Zone/ Centers/ No. of Trails	Soil Type	Variety/ Recommended Fertilizer Dose/ Micro. Dose FP (Fert. Dose) pH	Initial Soil Status				Yield (kg/ha)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
				OC (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Control	N	NP	NK	NPK	NPK+ M. Nut	F. Pract	SE(d) (M)	SE (M)	CD (5%)	CV	Yield																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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7.4.2 : DIVERSIFICATION OF EXISTING FARMING SYSTEMS

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

Objectives

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

Year of start : 2013-14

The experiment in farming systems perspective entitled “Diversification of existing farming systems under marginal households” was initiated with the background that 63 % households in India are in marginal category with average land holding size of 0.38 ha having lesser marketable surplus affecting the livelihood and are most vulnerable to climate related risks. The assumptions made are marginal households are having family members of 5 with crop + livestock as the dominant farming systems and if these system is diversified, sufficient marketable surplus can be generated for sustainable livelihood.

Modules : The experiment was designed with

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

Farming System	Notation	Module name	Details
Existing	M0	Bench mark	Recording of bench mark data on crop, livestock, other components and household as a whole
Improved	M1	Cropping system diversification	Most efficient cropping systems was introduced keeping in view of the farmers resources, perception, willingness, market and requirement of other components in the system besides improving the practices of existing systems
	M2	Livestock diversification	Mineral mixture + deworming+ round the year fodder production + introduction of location specific low cost livestock components viz., Backyard poultry, duckery, piggery & goat

	M3	Product diversification	Preparation of mineral mixture/value addition of market surplus products/kitchen/roof gardens
	M4	Capacity building	Training of farm households on farming systems especially on newly added practices & components and assessing its impact

Households : Twenty four marginal households were selected for experiment in all the locations. The average holding size of in the study locations ranged from 0.20 to 1.00 ha in various farming systems. Physical and technical inputs were provided during 2013-14 to 2015-16 in different modules. During 2016-17, physical and technical inputs were not provided to assess the impact of the interventions and continuation of interventions by farmers and its effect on net income. The impact study involved 692 households with mean holding size of 0.76 ha. At very few locations and farming systems, the size of holding of farming system was higher than 1 ha due to non-availability of marginal households.

Locations : During 2016-17, impact of physical and technical interventions made during 2013-14 to 2015-16 were measured in 29 districts covering 21 States in various farming systems. The details of district, State, farming systems, size of holding, number of households in each farming systems in which impact assessment were made given in Table 7.4.2. Three districts namely Fatehpur (Rajasthan) and Muzaffarnagar (Uttar Pradesh) have partially implemented the interventions and hence, the impact study was not undertaken and not included in this report.

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

family consumption for food, feed, seed etc from the total production), cost (total cost of the system including all components and diversification), returns (calculated by deducting the total cost from gross returns of the system) and profit (calculated by deducting the cost of the system from the gross income obtained from marketable surplus) were used for comparison of existing with improved (diversified) system and also different farming systems during the intervention period of 2013-14 to 2015-16. Farming system with more than one household was subjected to ANOVA and paired t-test analysis. Paired t-test has been carried out for comparing existing and diversified systems with respect to production, marketable surplus, cost, return and profit. Similarly, one-way ANOVA has been carried out to identify the best farming system with respect to production, marketable surplus, cost, return and profit for the district.

The impact study was carried out with structured proforma by collecting the data on interventions made during 2013-14 to 2015-16, continuation, partial continuation and rejection of interventions during 2016-17 and its impact on income during the impact year. Result of net income obtained during the impact year was compared with intervention period and increase in net income over benchmark was worked out with mean net income obtained during intervention and impact period (Table 7.4.2).

Results

Farming system wise net income obtained during intervention and post intervention period along with improvement over benchmark net income is

given in Table 7.4.2. State and district wise summary of results is explained briefly below.

Andhra Pradesh

Srikakulam : Field crop (0.64 ha) + livestock farming system was found to be dominant in the district having mean area of 0.64 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 72697/year during 3 years of intervention period. During impact assessment year, net income of Rs 85,141 was recorded which is 17 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + livestock farming system resulted in 1.89 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 40208 from 0.64 ha). Additional return of Rs 35,601 was obtained with the investment of Rs 8225 on critical inputs related to interventions. The return over cost of intervention was found to be 4.32. In the third year, the income could be doubled due to the diversification of existing farming systems in the marginal farm households.

Assam

Kamrup : Among the 3 farming systems studied, field crop (1.10 ha) + dairy (cow 1-2 no's) + goat (3-5 no's) + poultry (5-15 no's) + fishery was found better in terms of improvement in net income over benchmark. The mean area of the 10 households where in the system was studied is found to be 1.10 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 79810/year during 3 years of intervention period. During impact assessment year, net income of Rs 94,197

was recorded which is 18 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + poultry + fishery farming system resulted in 1.71 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 51750 from 1.10 ha). Additional return of Rs 36,525 was obtained with the investment of Rs 13000 on critical inputs related to interventions. The return over cost of intervention was found to be 2.81. In field crops + dairy + piggery + poultry farming system, though the mean net income was lesser than the field crop + dairy + goat + poultry + fishery, the return over investment on critical intervention was found to be higher (5.71).

Bihar

Purnea : Among the 4 farming systems studied, field crop (0.65 ha) + dairy (cow 1 no's) + goat (2-3 no's) + poultry (14-15 no's) found better in terms of improvement in net income over benchmark. The mean area of the 2 households where in the system was studied is found to be 0.65 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,53,015/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,54,700 was recorded which is marginally higher over intervention period. This indicates that the interventions were effective and farmers have continued most of the interventions during the post intervention impact assessment year without any physical and technical input support. Low cost diversification options in field crop + dairy + goat + poultry farming system resulted in 3.55 times improvement in net income over a period of 4 years (including post

intervention period) compared to benchmark income (Rs 46425 from 0.65 ha). Additional return of Rs 1,18,236 was obtained with critical inputs related to interventions. The income could be more than doubled in the first year itself with interventions in farming systems perspective.

Chhattisgarh

Kawardha: Among the 4 farming systems studied, field crops (0.82 ha)+ dairy (cow 1)+ fishery +goat (3-4 no's) +poultry (8-10 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.82 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 96446/year during 3 years of intervention period. During impact assessment year, net income of Rs 89900 was recorded which is lesser by 6.8 %. This indicates that the farmers have partially discontinued few interventions which were not effective during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + fishery + goat + poultry farming system resulted in 1.81 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 55750 from 0.82 ha). Additional return of Rs 45,090 was obtained with the investment of Rs 3650 on critical inputs related to interventions. The return over cost of intervention was found to be 12.35. The income could be doubled in the second year with interventions in farming systems perspective.

Gujarat

Panchmahal : Among the 6 farming systems studied, field crops (0.84 ha)+dairy (buffalo 1 no's) +poultry (6-7 no's) was found better in terms of improvement in net income over benchmark. The

mean area of the household where in the system was studied is found to be 0.84 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 69577/year during 3 years of intervention period. During impact assessment year, net income of Rs 46120 was recorded which is lesser by 33 %. This indicates that the farmers have either discontinued or partially discontinued the interventions during the post intervention impact assessment year. Panchmahal is the tribal belt of Gujarat where in the investment capacity is very low. As a result, without the support of physical and technical inputs, the farmers have discontinued the interventions. Low cost diversification options in field crop + dairy + poultry farming system resulted in 1.99 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 23485 from 0.84 ha). Additional return of Rs 23,149 was obtained with the investment of Rs 4510 on critical inputs related to interventions. The return over cost of intervention was found to be 5.13. The income could be doubled in the second year with interventions in farming systems perspective. The return over cost of critical intervention was also found to be better (7.8) in field crop + poultry + goat farming system.

Mehsana : Field crops (0.98 ha) + dairy (cow 1-2 no's + buffalo 3 no's) farming system was found to be dominant in the district having mean area of 0.98 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 138710/year during 3 years of intervention period. During impact assessment year, net income of Rs 133243 was recorded which is lesser by 3.9 % over intervention period. This indicates that the farmers have discontinued or partially discontinued few interventions during the post intervention impact assessment year. Low cost

diversification options in the field crop + dairy farming system resulted in 1.46 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 109376 from 0.98 ha). Additional return of Rs 50,767/year was obtained with the investment of Rs 11244 on critical inputs related to interventions. The return over cost of intervention was found to be 4.52.

Haryana

Sirsa : Field crops (0.58 ha) + dairy (cow 1 no's+ buffalo 1 no's) farming system was found to be dominant in the district having mean area of 0.58 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 64,726/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,13607 was recorded which is higher by 75 % over intervention period. This indicates that the farmers have continued all the interventions besides improving the interventions through their innovations during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.53 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 71,559 from 0.58 ha). Additional return of Rs 38,076/year was obtained with the investment of Rs 14,159 on critical inputs related to interventions. The return over cost of intervention was found to be 2.69.

Himachal Pradesh

Kangra : Among the 2 farming systems studied excluding the field crops alone practiced by one household of study, field crops (0.70 ha)+dairy (cow 1 no's+ buffalo 1-2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household

where in the system was studied is found to be 0.70 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 33804/ year during 3 years of intervention period. During impact assessment year, net income of Rs 39545 was recorded which is higher by 17 %. This indicates that the farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.55 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 22,465 from 0.70 ha). Additional return of Rs 12,323 was obtained with the investment of Rs 3465 on critical inputs related to interventions. The return over cost of intervention was found to be 3.56. The income could be nearly doubled in the third year with interventions in farming systems perspective. The return over cost of critical intervention was found to be 3.80 in field crop alone.

Jammu and Kashmir

Samba: Among the 4 farming systems studied, field crops (0.59 ha) + dairy (cow 1-2 no's + buffalo 1-2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.59 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 136971/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,25,248 was recorded which is lesser by 8%. This indicates that the farmers have either discontinued or partially continued the few interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 2.08 times

improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 57,391 from 0.59 ha). Additional return of Rs 61,949 was obtained with the investment of Rs 3,169 on critical inputs related to interventions. The return over cost of intervention was found to be 19.55. The income could be doubled in the first year itself with interventions in farming systems perspective. The return over cost of critical intervention was found to be 20.80 in field crop + dairy +poultry farming system.

Jharkhand

Pakur : Among the 2 farming systems studied, field crops (0.83 ha) + pig was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.83 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,98,089/ year during 3 years of intervention period. During impact assessment year, net income of Rs 58,618 was recorded which is lesser by 70%. This indicates that the farmers have either discontinued or partially discontinued the most of the interventions during the post intervention impact assessment year. Pakur is the tribal belt of Jharkhand where in the investment capacity is very low. As a result, without the support of physical and technical inputs, the farmers have discontinued the interventions. Low cost diversification options in field crop + pig farming system resulted in 2.47 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 31,938 from 0.83 ha). Additional return of Rs 31,938 was obtained with the investment of Rs 8,639 on critical inputs related to interventions. The return over cost of intervention was found to be 3.70. The income could be doubled in the first year itself with

interventions in farming systems perspective. The field crops + dairy (1 cow) resulted in 2.19 times improvement in net income over benchmark year.

Karnataka

Kolar : Among the 7 farming systems studied, field crops (0.60 ha) + dairy (cow 1 no's+ buffalo 1 no's)+ sheep (5 no's)+ sericulture was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.60 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 5,04,958/ year during 3 years of intervention period. During impact assessment year, net income of Rs 11,90,367 was recorded which is higher by 135%. This indicates that the farmers have continued all the interventions with innovations and more integration during the post intervention impact assessment year. Kolar is the best known for resources and sericulture contributed for most significant improvement in net income. Low cost diversification options in field crop + dairy + sheep + sericulture farming system resulted in 1.66 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 6,07,656 from 0.60 ha). Additional return of Rs 4,00,599 was obtained with the investment of Rs 11,885 on critical inputs related to interventions. The return over cost of intervention was found to be 33.71. The income could be nearly doubled in the third year with interventions in farming systems perspective. The field crops + dairy (1 cow) + 3 to 4 sheep farming system also resulted in 1.57 times improvement in net income over benchmark year.

Gadag : Field crop (1.14 ha) + dairy (1 cow, 1 buffalo) farming system was found to be dominant in the district having mean area of 1.14 ha. The interventions made in different modules of crop,

livestock, product diversification and capacity building resulted in mean net income of Rs 83,877/year during 3 years of intervention period. During impact assessment year, net income of Rs 87,297 was recorded which is 4 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.71 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 40,053 from 1.14 ha). Additional return of Rs 28,546 was obtained with the investment of Rs 6,080 on critical inputs related to interventions. The return over cost of intervention was found to be 4.70. In the fourth year, the income could be doubled due to the diversification of existing farming systems in the marginal farm households.

Kerala

Pathinamthitta : Among the 3 farming systems studied, field crops (1 ha) + horticulture + poultry was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 1 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,27,879/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,15,385 was recorded which is lesser by 10 %. This indicates that the farmers have partially continued or discontinued the few interventions during the post intervention impact assessment year. Low cost diversification options in field crop + horticulture +poultry farming system resulted in 2.87 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs

37,597 from 1 ha). Additional return of Rs 70,290 was obtained with the investment of Rs 14,282 on critical inputs related to interventions. The return over cost of intervention was found to be 4.92. The income could be doubled in the first year itself with interventions in farming systems perspective. The field crops + horticulture + dairy and field crops + horticulture + dairy + poultry farming system resulted in 12 and 6 % improvement in net income during post intervention period indicating farmers have continued the interventions without physical and technical inputs in these farming systems.

Madhya Pradesh

Dindori : Field crops (0.76 ha) +dairy (cow 1-2 no's+buffalo 1 no's) farming system was found to be dominant in the district having mean area of 0.76 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 1,34,811/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,10,950 was recorded which is 17% lesser over intervention period. This indicates that the interventions were either discontinued or partially discontinued during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 4.33 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 33,420 from 0.76 ha). Additional return of Rs 1, 11,198 was obtained with the investment of Rs 9,746 on critical inputs related to interventions. The return over cost of intervention was found to be 11.41. The income could be doubled in the first year itself due to the diversification of existing farming systems in the marginal farm households.

Maharashtra

Palghar : Among the 3 farming systems studied, field crops (0.40 ha) + dairy (cow 2 no's+ buffalo

1 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.40 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,09,649/ year during 3 years of intervention period. During impact assessment year, net income of Rs 1,40,409 was recorded which is higher by 28 %. This indicates that the farmers have continued most of the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.52 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 79,014 from 0.40 ha). Additional return of Rs 41,425 was obtained with the investment of Rs 11,181 on critical inputs related to interventions. The return over cost of intervention was found to be 3.70. The other farming system involving field crops + dairy + poultry resulted in 1.44 times improvement in net income over benchmark and return over investment of 2.93.

Pune : Field crops (0.53 ha)+dairy (cow 1-2 no's+ buffalo 1 no's) farming system was found to be dominant in the district having mean area of 0.53 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 1,27,819/year during 3 years of intervention period. During impact assessment year, net income of Rs 2,30,230 was recorded which is 80% higher over intervention period. This indicates that the interventions were continued with innovations during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.38 times improvement in net income over a period of 4 years (including post intervention period) compared to

benchmark income (Rs 1,39,748 from 0.53 ha). Additional return of Rs 53,743 was obtained with the investment of Rs 4,563 on critical inputs related to interventions. The return over cost of intervention was found to be 11.78. The income could be nearly doubled in the fourth year due to the diversification of existing farming systems in the marginal farm households.

Amravati : Among the 5 farming systems studied, field crops (0.73 ha) +goat (2-3 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.73 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,12,637/year during 3 years of intervention period. During impact assessment year, net income of Rs 93,833 was recorded which is lesser by 17%. This indicates that the farmers have either discontinued or partially discontinued the few interventions during the post intervention impact assessment year. Low cost diversification options in field crop + goat farming system resulted in 2.69 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 35,358 from 0.73 ha). Additional return of Rs 59,751 was obtained with the investment of Rs 10,907 on critical inputs related to interventions. The return over cost of intervention was found to be 5.48. Income could be doubled in the first year itself in the farming system with critical interventions. In field crop + dairy + goat + poultry, the net income during impact year increased by 26 % over the intervention period indicating continuation of interventions by farmers.

Aurangabad : Field crops (0.73 ha) +dairy (1 cow and 1 buffalo) farming system was found to be dominant in the district having mean area of 0.73 ha. The interventions made in different modules of

crop, livestock, product diversification and capacity building resulted in mean net income of Rs 63,016/year during 3 years of intervention period. During impact assessment year, net income of Rs 72,630 was recorded which is 15% higher over intervention period. This indicates that the interventions were continued during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.26 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 56,751 from 0.73 ha). Additional return of Rs 14,580 was obtained with the investment of Rs 27,819 on critical inputs related to interventions. The return over cost of intervention was found to be 0.52. The income could be nearly doubled in the third year due to the diversification of existing farming systems in the marginal farm households.

Odisha

Angul : Among the 4 farming systems studied, field crops (0.83 ha) + dairy (cow 1-2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.83 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 59,358/year during 3 years of intervention period. During impact assessment year, net income of Rs 45,831 was recorded which is lesser by 22.8 %. This indicates that the farmers have partially discontinued few interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.66 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 31,729 from 0.40 ha). Additional return of Rs 21,079 was obtained with the investment of

Rs 4,565 on critical inputs related to interventions. The return over cost of intervention was found to be 4.62. The net income could be doubled in second year under the system. Field crops + dairy + poultry farming system recorded 9 % improvement in net income during the post intervention period over intervention period indicating continuation of interventions by farmers in this farming system.

Kendrapara : Among the 6 farming systems studied, field crops (1.61 ha) +dairy (2 no's) +fishery+ poultry was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 1 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,38,625/ year during 3 years of intervention period. During impact assessment year, net income of Rs 3,41,217 was recorded which is higher by 146 %. This indicates that the farmers have continued all the interventions with innovations during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + fishery + poultry farming system resulted in 2.54 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 44,741 from 1 ha). Additional return of Rs 68,998 was obtained with the investment of Rs 11,528 on critical inputs related to interventions. The return over cost of intervention was found to be 5.99. The net income could be doubled in second year under the system. The other system which performed better in terms of improvement in net income over bench mark was field crops (1.84 ha)+dairy (cow 2 no's)+goat (3-4 no's)+poultry.

Punjab

Amritsar : Field crops (1.08 ha) + dairy (1 cow + 3-4 buffaloes) farming system was found to be dominant in the district having mean area of 1.08

ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 1,21,672/year during 3 years of intervention period. During impact assessment year, net income of Rs 2,22,866 was recorded which is 83 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.65 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,08,049 from 1.08 ha). Additional return of Rs 70,300 was obtained with the investment of Rs 10,000 on critical inputs related to interventions. The return over cost of intervention was found to be 7.03. The income could be doubled in fourth year due to the diversification of existing farming systems in the marginal farm households.

Rajasthan

Udaipur : Among the 3 farming systems studied, field crops (0.60)+dairy (1 cow + 1 buffalo) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.60 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 91,165/year during 3 years of intervention period. During impact assessment year, net income of Rs 93,687 was recorded which is higher by 2.8%. This indicates that the farmers have continued majority of the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.99 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark

income (Rs 45,000 from 0.60 ha). Additional return of Rs 44,774 was obtained with the investment of Rs 7,600 on critical inputs related to interventions. The return over cost of intervention was found to be 5.89. The net income could be doubled in second year under the system. The other two farming systems namely field crops alone and field crops + dairy + goat recorded reduction in net income to the tune of 1.8 to 2% during impact period indicating the partial discontinuation of interventions.

Tamil Nadu

Sivagangai/Pudukottai : Field crops (0.63 ha)+dairy (2 to 3 cows) farming system was found to be dominant in the district having mean area of 0.63 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 1,00,831/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,31,050 was recorded which is 30% higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.95 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 60,162 from 0.63 ha). Additional return of Rs 57,261 was obtained with the investment of Rs 10,645 on critical inputs related to interventions. The return over cost of intervention was found to be 5.38. The income could be doubled in the first year itself with the interventions.

Krishnagiri / Dharmapuri : Among the 3 farming systems studied, field crops (0.64 ha)+dairy (cow 2-3 no's)+poultry (17-18 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be

0.64 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 1,09,610/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,02,540 was recorded which is lesser by 6.5%. This indicates that the farmers have partially discontinued the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + poultry farming system resulted in 1.82 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 59,194 from 0.64 ha). Additional return of Rs 48,649 was obtained with the investment of Rs 6,250 on critical inputs related to interventions. The return over cost of intervention was found to be 7.70. The net income could be doubled in the first year itself under the system. Marginal improvement of net income (1.9%) was observed in field crops + dairy + goat + poultry system during impact period compared to intervention period indicating the continuation of interventions by farmers in this farming system.

Telangana

Warangal : Among the 4 farming systems studied, field crops (0.91 ha)+ dairy(cow 1-2 no's + buffalo 1-2 no's)+ goat/sheep (35-40 no's)+poultry (7-8



Diversification with Bt cotton at Panchmahal district (Gujarat)

no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.91 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 74,466/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,74,000 was recorded which is higher by 133%. This indicates that the farmers have continued the interventions with innovations during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + poultry farming system resulted in 2.61 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 50,667 from 0.91 ha). Additional return of Rs 81,806 was obtained with the investment of Rs 11,395 on critical inputs related to interventions. The return over cost of intervention was found to be 7.18. The net income could be doubled in the second year under the system. Among the other systems, field crops + dairy + goat/sheep recorded better net income improvement (2.60 times).

Uttar Pradesh

Ambedkarnagar : Among the 2 farming systems studied, field crops (0.38 ha)+dairy (1 cow + 1-2



Monitoring of farming system diversification study at Amravati district (Maharashtra) by Dr A.S. Panwar, Director, ICAR-IIFSR and Dr N. Ravisankar, PS & PI (OFR)

buffalo) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.38 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 54,069/year during 3 years of intervention period. During impact assessment year, net income of Rs 71,748 was recorded which is higher by 32%. This indicates that the farmers have continued the interventions with innovations during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.85 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 36,729 from 0.38 ha). Additional return of Rs 31,176 was obtained with the investment of Rs 3,150 on critical inputs related to interventions. The return over cost of intervention was found to be 9.90. The net income could be doubled in the third year under the system.

Kanpur Dehat : Among the 4 farming systems studied, field crops (0.76 ha)+ dairy (1 cow + 2 buffalo)+ goat (2-3 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.76 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 65,778/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,53,116 was recorded which is higher by 133%. This indicates that the farmers have continued the interventions with innovations during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 2.09 times improvement in net income over a period of 4 years (including post intervention period)

compared to benchmark income (Rs 49,815 from 0.76 ha). Additional return of Rs 54,320 was obtained with the investment of Rs 7008 on critical inputs related to interventions. The return over cost of intervention was found to be 7.75. The net income could be doubled in the third year under the system.

Uttarakhand

Nainital : Among the 4 farming systems studied, field crops (0.20 ha) + dairy (2 buffalo)+ poultry (11 no's)+ goat (4 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.20 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 81,176/year during 3 years of intervention period. During impact assessment year, net income of Rs 88,992 was recorded which is higher by 10%. This indicates that the farmers have continued the interventions with innovations during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + poultry + goat farming system resulted in 5.69 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 15,574 from 0.20 ha). Additional return of Rs 73,086 was obtained with the investment of Rs 3,620 on critical inputs related to interventions. The return over cost of intervention was found to be 20.19. The net income could be more than doubled in the first year itself under the system. Field crops (0.23 ha) + dairy (1 cow + 1-2 buffalo) + goat (4-5 no's) also resulted in better improvement of net income (4.97 times) over benchmark.

West Bengal

South 24 Paragnas : Among the 9 farming systems studied, field crops (0.27)+dairy (1 no's) + poultry

(2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.27 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 32,300/year during 3 years of intervention period. Low cost diversification options in field crop + dairy + poultry farming system resulted in 2.89 times improvement in net income over a period of 3 years compared to benchmark income (Rs 11,175 from 0.27 ha). Additional return of Rs 21,125 was obtained with the investment of Rs 3,133 on critical inputs related to interventions. The return over cost of intervention was found to be 6.74. The net income could be more than doubled in the first year itself under the system. The other farming systems having potential for doubling farmers income with critical farming system specific interventions in the district are field crops + dairy, field crops + dairy + poultry + fishery, field crops + dairy + fishery and field crops + dairy + goat + fishery.

The results across the locations are summarized below

- Across the farming systems studied in different districts, States, the mean benchmark net income recorded was found to be Rs 84,882 from 0.76 ha (2013-14).

- During the intervention period (with physical and technical inputs based on critical constraints) of 3 years (2013-14, 2014-15 and 2015-16), the mean net income recorded was found to be Rs 1,32,669/year from 0.76 ha. The cost of intervention on critical inputs was found to be Rs 7892.
- During the post intervention period (2016-17, without physical and technical inputs), net income of Rs 1,67,613 from 0.76 ha was recorded which is 21% higher than the intervention period. Therefore, the study explicitly concludes that the interventions have been continued by the farmers during the post intervention period.
- On an average the income across the farming systems, districts and States increased by 1.93 times over benchmark income in a period of 4 years (including the impact study period). On an average, additional income of Rs 50,985 have been recorded with additional cost of Rs 7892 only. Thus, the return over investment on critical input based interventions in farming systems perspective was found to be 7.38.

Based on the above findings, it can be concluded that the farmers income can be doubled in a span of 4 years by appropriate interventions based on critical interventions and diversification of farming systems in marginal households.



Diversification through Intensification in existing crops at Mehsana district (Gujarat)



Diversification through Intensification in existing crop at Pune district (Maharashtra)

Table 7.4.2. Comparison of net income during intervention (with physical and technical inputs) and post intervention (impact year, i.e without physical and technical inputs) period due to diversification of farming systems in marginal households with location specific module based low cost interventions in different districts

Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
1	Andhra Pradesh	Srikakulam	Field crops (0.64) + livestock	24	0.64	40208	8225	66554	71040	80499	85141	75809	1.89
2	Assam	Kamrup	Field crops (0.80) +dairy (cow 1-2) + goat (7-8)+ poultry (4-20)	8	0.80	46000	10020	66020	73083	78645	77562	73828	1.60
			Field crops (1.10) +dairy (cow 1-2) + goat (3-5) + poultry (5-15) + fishery	10	1.10	51750	13000	74730	89806	94365	94197	88275	1.71
			Field crops (0.90) + dairy (cow 1-2) + piggery (2-3) + poultry (5-15)	6	0.90	45555	5300	64200	72341	83419	83295	75814	1.66
3	Bihar	Purnea	Field crops (0.65)+ dairy (cow 2)	4	0.65	34765	3424	118178	123560	124271	123490	122375	3.52
			Field crops (0.59)+ Dairy (cow 1-2+ buffalo 0-1) +goat (2-3)	16	0.59	40883	3897	101893	125690	127203	125810	120149	2.94

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
4	Chhattis garh	Kawardha	Field crops) (0.65)+ dairy (cow 1)+goat (2-3)+ poultry (14-15)	2	0.65	46425	4132	170608	176800	156537	154700	164661	3.55
			Field crops (0.60)+ dairy (cow 2) + fishery	2	0.60	50900	4070	134545	138820	141010	139205	138395	2.72
			Field crops (0.72)+dairy (cow 1)+ poultry (8)	5	0.72	50560	3150	61310	80866	77650	82787	75653	1.50
			Field crops (0.81)+ dairy (cow 1)+ goat (8)+poultry (10)	17	0.81	61125	3400	78383	107800	100900	100878	96990	1.59
			Field crops (0.80)+ dairy (cow 2)+ goat (4-5) + poultry (8-10)+ piggyery	1	0.80	65200	3600	82575	122275	130850	119000	113675	1.74
			Field crops (0.82)+ dairy (cow 1)+ fishery + goat (3-4)+ poultry (8-10)	1	0.82	55750	3650	80705	114705	118050	89900	100840	1.81

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
5	Gujarat	Panchmahal	Field crops (1.06)+dairy (cow 0-1+ buffalo 2)+ goat (4-5)+ poultry (5-6)	7	1.06	54555	5025	76946	90551	97721	88559	88444	1.62
			Field crops (0.69)+dairy (cow 1-2+ buffalo 1-2)+goat (3-4)	7	0.69	56985	4958	75995	85914	90864	81877	83663	1.47
			Field crops (0.90)+dairy (cow 0-1+ buffalo 2-3)	7	0.90	32804	4314	52754	61184	66244	60548	60183	1.83
			Field crops (0.84)+dairy (buffalo 1)+ poultry (6-7)	1	0.84	23485	4510	37144	48291	54981	46120	46634	1.99
			Field crops (0.84)+ poultry (12)+goat (8)	1	0.84	56872	4613	83433	93795	99815	94675	92930	1.63
			Field crops (0.54)+goat (4)	1	0.54	18930	4550	27158	34947	38627	33265	33499	1.77
			Field Crops (0.98) +Dairy (Cow 1-2+ buffalo 3)	24	0.98	109376	11244	203704	135335	168291	133243	160143	1.46
		Mehsana											

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
6	Haryana	Sirsa	Field crops (0.58) + dairy (cow 1 +buffalo 1)	24	0.58	71559	14159	108564	114042	102325	113607	109635	1.53
7	Himachal Pradesh	Kangra	Field crops alone (0.60)	1	0.60	9230	3332	15564	19023	28836	24080	21876	2.37
			Field crops (0.70)+dairy (cow 1+ buffalo 1-2)	14	0.70	22465	3465	27630	30228	41748	39545	34788	1.55
			Field crops (0.67)+dairy (cow 1+ buffalo 1)+ goats/sheep (2-3)	9	0.67	32656	4931	26512	36252	40453	36425	34911	1.07
8	Jammu and Kashmir	Samba	Field crops (0.59) + dairy (cow 1-2+ buffalo 1-2)	15	0.59	57391	3169	124542	116241	111328	125248	119340	2.08
			Field crops (0.85) + dairy (cow 1) + poultry	2	0.85	83800	3542	152650	158962	158100	160240	157488	1.88
			Field crops (0.58) + dairy + goat	6	0.58	67867	3654	89555	96056	82765	82911	87822	1.30
			Field crops (0.50)+dairy + goat + poultry	1	0.50	55588	3199	83569	70032	68471	69056	72782	1.31

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
9	Jharkhand	Pakur	Field crops (0.73)+ dairy (cow 1)	12	0.73	18858	8119	34600	39125	49408	41718	41213	2.19
			Field crops (0.83)+ piggyery	12	0.83	21702	8639	50720	42600	62622	58618	53640	2.47
10	Karnataka	Kolar	Field Crops (0.96) + dairy (cow 1-2)	8	0.96	260234	13340	337892	433847	260854	318242	337709	1.30
			Field crops (1.10)+dairy (cow 2-3+ buffalo 1)+ sericulture + goat /sheep (5-6)+ poultry (7-8)	2	1.10	538045	9753	617350	589588	661927	721500	647591	1.20
			Field Crops (1.03)+ dairy (cow 2)+ Sheep + poultry (3)	6	1.03	954419	35070	1026875	1246982	1332820	1439446	1261531	1.32
			Field crops (1.60)+ dairy (cow 1-2+ buffalo 1) + sheep (8-10) + poultry (10) + sericulture	2	1.60	538045	9753	617350	589588	661927	721500	647591	1.20
			Field crops (0.75)+sericulture + dairy	2	0.75	348312	4407	305024	411008	380752	403597	375095	1.08

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
11	Kerala	Pathinam-thitta	Field crops (0.90) + dairy (cow 1) +sheep (3-4)	2	0.90	355597	8887	510261	835160	387064	499313	557950	1.57
			Field crops (0.60) +dairy (cow 1 + buffalo 1)+ sheep (5)+ sericulture	2	0.60	607656	11885	791493	949986	1101172	1190367	1008255	1.66
			Field crops (1.14) +dairy (cow 1 + buffalo 1)	24	1.14	40053	6080	54,979	67429	64,691	87297	68599	1.71
			Field crops (1.00) + horticulture + poultry	13	1.00	37,597	14282	99114	105893	111154	115385	107887	2.87
			Field crop (1.18)+ horti-culture + dairy(cow 1-2)	6	1.18	54164	15662	142076	149482	159552	166769	154470	2.85
12	Madhya Pradesh	Dindori	Field crops (1.46) + horti culture + dairy (cow 2) + poultry	5	1.46	61129	15632	142654	147068	153845	161239	151202	2.47
			Field crops (0.76) +dairy (cow 1.2+ buffalo 1)	24	0.76	33420	9746	138086	141501	187934	110950	144618	4.33

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
13	Maharashtra	Palghar	Field crops (0.4) + dairy (cow 2+ buffalo 1)	13	0.40	79014	11181	99634	106469	135242	140409	120439	1.52
			Field crops (0.38) + dairy (cow 1+ buffalo 4)+ poultry (2)	11	0.38	79014	11913	85269	96358	134922	139340	113972	1.44
		Pune	Field crops (0.53)+dairy (cow 1-2+ buffalo 0-1)	24	0.53	139748	4563	158735	180434	204564	230230	193491	1.38
			Field crops (0.74)+ dairy (cow/ buffalo 1-2)	18	0.74	56907	9450	82983	70505	69690	64294	71868	1.26
		Amravati	Field crops (0.73) +goat (2-3)	3	0.73	35358	10907	80846	85762	119993	93833	95109	2.69
			Field crops (0.80)+ dairy (cow 2)+ goat +poultry	1	0.80	107000	15028	204560	110850	73810	112207	125357	1.17
			Field crops (0.80) + poultry (6)	1	0.80	38000	10042	55836	50794	37996	43302	46982	1.24
			Field crops (0.85) + dairy (cow 1) + horticulture)	1	0.85	40400	10278	58369	48582	28489	46548	45497	1.13

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
		Aurangabad	Field crops (0.73)+dairy (cow 1, buffalo 1)	24	0.73	56751	27819	67657	44294	100744	72630	71331	1.26
14	Odisha	Angul	Field crops (0.83)+dairy (cow 1-2)	12	0.83	31729	4565	54878	64692	45831	45831	52808	1.66
			Field crops (0.89)+dairy (cow 2-3)+poultry (25-30)	10	0.89	40230	5108	61566	68267	60911	60911	62914	1.56
			Field crops (0.80)+poultry (2)	1	0.80	33200	3829	47033	54153	44357	44357	47475	1.43
		Kendrapara	Field crops only (0.80)	1	0.80	50300	6439	71403	113659	64341	64341	78436	1.56
			Field crops (1.12)+dairy (cow 2)	11	1.12	45423	9530	74792	71016	108966	254774	84925	1.87
			Field crops (1.18)+dairy (cow 2)+goat (12-15)	4	1.18	57683	11363	91991	96736	139153	327880	109293	1.89
			Field crops (0.88)+dairy (cow 2)+fishery	4	0.88	47565	7646	70563	80559	104942	256064	85355	1.79
			Field crops (0.70)+dairy (cow 1)+goat (3)+fishery	2	0.70	58070	8933	80419	83753	110328	274500	91500	1.58

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (1.84)+dairy (cow 2)+goat (3-4)+poultry (410)	2	1.84	71762	17944	111418	115949	198762	426129	142043	1.98
			Field crops (1.61)+dairy (2)+fishery+ poultry	1	1.61	44741	11528	81329	103901	155987	341217	113739	2.54
			Field crops (1.08) + dairy (cow 1 + buffalo 3-4)	24	1.08	108049	10000	153908	165634	170989	222866	178349	1.65
15	Punjab	Amritsar	Field crops (1.08) + dairy (cow 1 + buffalo 3-4)	24	1.08	108049	10000	153908	165634	170989	222866	178349	1.65
			Field crops alone (0.70)	2	0.70	50000	5350	60000	91000	88502	82495	80499	1.61
			Field crops (0.60)+ dairy (cow 1 + buffalo 1)	7	0.60	45000	7600	63000	101000	101409	93687	89774	1.99
			Field crops (0.68)+ dairy (cow 1-2+ buffalo 1) + goat (3-4)	15	0.68	52000	14600	70000	102700	108879	101532	93860	1.80
16	Rajasthan	Udaipur	Field crops (0.68)+ dairy (cow 1-2+ buffalo 1) + goat (3-4)	15	0.68	52000	14600	70000	102700	108879	101532	93860	1.80
			Field crops (0.77) + dairy (cow 2) + poultry (15)	24	0.79	60162	10645	172597	124327	41716	131050	117423	1.95
			Field crops (0.77) + dairy (cow 2) + poultry (15)	24	0.79	60162	10645	172597	124327	41716	131050	117423	1.95
17	Tamil Nadu	Sivagangai / Pudukottai	Field crops (0.77) + dairy (cow 2) + poultry (15)	24	0.79	60162	10645	172597	124327	41716	131050	117423	1.95

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
		Krishnagiri /Dharmapuri	Field crops (0.63)+dairy (cow 2 -3)	10	0.63	68308	5758	102580	80125	83640	85420	87941	1.29
			Field crops (0.64)+dairy (Cow 2-3)+ poultry (17-18)	9	0.64	59194	6250	103690	117560	107580	102540	107843	1.82
			Field crops (0.78)+dairy (cow 3 -4) + goat (2-3) + poultry (11-12)	5	0.78	91004	7975	104056	92960	103345	102050	100603	1.11
18	Telangana	Warangal	Field crops (0.90)+ dairy (cow 1+ buffalo 1-2)	11	0.90	32548	11900	38347	90572	66002	87000	70480	2.17
			Field crops (0.90)+dairy (cow 1+ buffalo 1-2) +poultry (6-7)	5	0.90	39312	8958	42540	99228	76785	96775	78832	2.01
			Field crops (0.85)+dairy (cow 1- buffalo 1-2) + goat/sheep (40-50)	3	0.85	47167	13310	77224	108675	143695	160200	122449	2.60

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (0.91)+dairy (cow 1-2+ buffalo 1-2) + goat/sheep (35-40) +poultry (7-8)	5	0.91	50667	11395	85299	117636	152955	174000	132473	2.61
19	Uttar Pradesh	Ambedkar-nagar	Field crops alone (0.30)	1	0.30	17951	1911	28795	29565	32548	33261	30303	1.69
			Field Crops (0.38)+dairy (cow 1+ buffalo 1-2)	19	0.38	36729	3150	57062	68428	74383	71748	67905	1.85
		Kanpur Dehat	Field crops alone (0.80)	3	0.80	28867	4303	34919	39664	49955	62460	46750	1.62
			Field crops (0.85)+ dairy (cow 1+ buffalo 1-2)	8	0.85	57207	6687	74834	78645	97929	149926	100334	1.75
20	Uttara khand	Nainital	Field crops (0.76)+ dairy (cow 1+ buffalo 2)+ goat (2-3)	8	0.76	49815	7008	66556	85156	111713	153116	104135	2.09
			Field crops (0.33)+ goat (2-3)	5	0.33	31800	4859	43310	50339	37591	58034	47319	1.49
			Field crops (0.36)+ dairy (cow 1-2 + buffalo 1-2)	19	0.36	27568	4250	79453	91929	69161	62564	75777	2.75

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
21	West Bengal	South 24 Parganas	Field crops (0.40) + dairy(buffalo 1)+ poultry	1	0.40	30660	3910	55498	59325	22580	19889	39323	1.28
			Field crops (0.20) + dairy(buffalo 2)+ poultry (11)+ goat(4)	1	0.20	15574	3620	71987	92420	101241	88992	88660	5.69
			Field crops (0.23) + dairy (cow 1 + buffalo 1-2)+ goat (4-5)	3	0.23	14390	4065	64489	86423	70498	64556	71492	4.97
			Field crops (0.20)+dairy (1)	1	0.20	12967	4513	12925	40181	32523	-	28543	2.20
			Field crops (0.27)+dairy (1) +poultry (2)	1	0.27	11175	3133	23125	35742	38033	-	32300	2.89
			Field crops (0.54)+dairy (2) + poultry (7) + fishery	7	0.54	47898	5227	105864	118681	93996	-	106180	2.22
			Field crops (0.59)+dairy (2) +goat (2) + poultry (2) + fishery	2	0.59	67477	5428	112538	103909	133683	-	116710	1.73

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (0.57)+ fishery	2	0.57	49534	7874	60927	89513	62776	-	71072	1.43
			Field crops (0.34)+dairy (2)+ fishery	7	0.34	19854	4303	37303	36542	49578	-	41141	2.07
			Field crops (0.43)+ poultry(4) + fishery	2	0.43	69725	4850	132061	115709	65034	-	104268	1.50
			Field crops (0.67)+goat (2)+ fishery	1	0.67	52648	6200	47925	75012	65545	-	62827	1.19
			Field crops (0.80)+dairy (2)+goat (6)+ fishery	1	0.80	54195	5264	193371	44691	85420	-	107827	1.99

7.4.3 : ON-FARM EVALUATION OF FARMING SYSTEM MODULES

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

Objectives

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

Year of start : 2011-12

Modules: The experiment was designed with holistic approach where in improvement of productivity of existing components of the farming system was concentrated by appropriate interventions besides farmer opinion based

introduction of new components in optional module. Benchmarking of all components was done before making interventions in different modules. Four modules comprising of **crop** (low cost interventions in existing cropping systems based constraint analysis), **Livestock** (low cost interventions in existing livestock components based on constraint analysis), **On farm processing & value addition** (on farm agro processing and value addition of marketable surplus produces) and **optional** (Introduction of additional components based on households perception) were implemented in 2 farm households in each village comprising of 1 marginal and small household. The experiment was implemented in randomly selected 12 marginal farm households in each district. The general guidelines used for designing the modules are given below

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) and South 24 Parganas (West Bengal) where in all the selected 12 households belong to marginal. The average holding size of households in the study locations ranged from 0.27 to 1.90 ha for small households. A total of 342 households have been covered for impact assessment.

Locations: During 2016-17, impact of physical and technical interventions made during 2011-12 to 2015-16 were measured in 29 districts covering 21 States in various farming systems. Past three years data were used for assessing the net income during intervention period. The details of district, State, farming systems, size of holding, number of households in each farming systems in which impact assessment were made given in Table 7.4.3. Two districts namely fathepur (Rajasthan)

and Muzaffarnagar (Uttar Pradesh) have partially implemented the interventions and hence, the impact study was not undertaken and not included in this report.

Data analysis methodology: Based on the benchmark data, farming systems practiced by the households were identified and grouped in to different farming system categories such as field crops+ dairy, field crops + dairy+ goat etc as given in Table 7.4.3. Four parameters namely production (on equivalent basis of base pre-dominant crop), marketable surplus (calculated by deducting the family consumption for food, feed, seed etc from the total production), cost (total cost of the system including all components and diversification) and profit (calculated by deducting the cost of the system from the gross income obtained from marketable surplus) were used for comparison of existing with improved system and also different farming systems during the intervention period of 2013-14 to 2015-16.

The impact study was carried out with structured proforma by collecting the data on interventions made during 2013-14 to 2015-16, continuation, partial continuation and rejection of interventions during 2016-17 and its impact on income during the impact year. Result of net income obtained during the impact year was compared with intervention period and increase in net income over benchmark was worked out with mean net income obtained during intervention and impact period.

Results

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

Andhra Pradesh

Srikakulam : Field crops (0.66 ha) + dairy (1 to 2

cow + 2 buffaloes) farming system was found to be dominant in the district having mean area of 0.66 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 85019/year during 3 years of intervention period. During impact assessment year, net income of Rs 94103 was recorded which is 11% higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 2 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 43570 from 0.66 ha). Additional return of Rs 43,720 was obtained with the investment of Rs 4260 on critical inputs related to interventions. The return over cost of intervention was found to be 10.26. In the third year, the income could be doubled due to interventions made in existing farming system components with holistic approaches.

Assam

Kamrup : Among the 4 farming systems studied, field crops (1.62 ha)+ dairy (2 cow) + poultry (18 no's)+pig(2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.62 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 1,41,321/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,76,191 was recorded which is 25 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + poultry + pig farming system resulted in 2.16 times improvement in net income

over a period of 4 years (including post intervention period) compared to benchmark income (Rs 69550 from 1.62 ha). Additional return of Rs 80,489 was obtained with the investment of Rs 2500 on critical inputs related to interventions. The return over cost of intervention was found to be 32.20. The income could be doubled in third year.

Bihar

Purnea : Among the 5 farming systems studied, interventions made in field crops alone system (0.95 ha) was more effective in terms of improvement in net income (2.24 times) over benchmark. Among the other systems integrated with components, it was found that field crops (1.25 ha)+ dairy+ goat (2-3 no's) + poultry +fishery and field crops (1.13 ha)+ dairy (1-2 cow)+ goat (4-5 no's) were found to record 1.74 times improvement in net income over benchmark. The interventions made in different modules using holistic approach in the two farming systems resulted in mean net income of Rs 87,943 and 85,921/year respectively during 3 years of intervention period. During impact assessment year, net income of Rs 94,980 and 93,310 was recorded which is 8 to 9 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in these farming systems resulted in 1.74 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 51693 from 1.25 ha and Rs 50446 from 1.13 ha respectively). Additional return of Rs 38,010 and 37,322 was obtained with the investment of Rs 4830 and 4813 respectively on critical inputs related to interventions. The return over cost of intervention was found to be 7.87 and 7.75 respectively.

Chhattisgarh

Kawardha : Among the 4 farming systems studied,

field crops (1.05 ha)+ dairy (2 cows)+goat (3-4 no's)+poultry was found better in terms of improvement in net income over benchmark. The mean area of the where in the system was studied is found to be 1.05 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 1,74,443/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,75,680 was recorded which is marginally (1%) higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + poultry farming system resulted in 2.48 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 70570 from 1.05 ha). Additional return of Rs 1,04,183 was obtained with the investment of Rs 11,325 on critical inputs related to interventions. The return over cost of intervention was found to be 9.20. The income could be doubled in second year.

Gujarat

Panchmahal : Among the 5 farming systems studied, field crops (0.40 ha)+dairy (1 cow+ 2 buffalo) was found better in terms of improvement in net income over benchmark. The mean area of the 10 households where in the system was studied is found to be 0.40 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 39,240/year during 3 years of intervention period. During impact assessment year, net income of Rs 39,120 was recorded with no change over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy farming system resulted in 1.85 times improvement in net

income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 21,250 from 0.40 ha). Additional return of Rs 17,960 was obtained with the investment of Rs 7750 on critical inputs related to interventions. The return over cost of intervention was found to be 2.32. The income could be doubled in third year.

Mehsana : Field crops (1.13 ha) +dairy (1 cow + 1-2 buffalos) farming system was found to be dominant in the district having mean area of 1.13 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 1,37,743/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,77,588 was recorded which is 29 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.45 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,02,170 from 1.13 ha). Additional return of Rs 45,535 was obtained with the investment of Rs 49,098 on critical inputs related to interventions. The return over cost of intervention was found to be 0.92.

Haryana

Sirsa : Field crops (0.85 ha) + dairy (1-2 cows + 2-3 buffaloes) farming system was found to be dominant in the district having mean area of 0.85 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 1,16,643/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,30,210 was recorded which is 12 % higher over intervention period. This indicates that the interventions were effective and

farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.64 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 79,197 from 0.85 ha). Additional return of Rs 51,013 was obtained with the investment of Rs 6128 on critical inputs related to interventions. The return over cost of intervention was found to be 8.32.

Himachal Pradesh

Kangra : Among the 2 farming systems studied, field Crops (0.57 ha) +dairy (1-2 cow/buffalo)+ goats (2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 0.57 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 51,725/year during 3 years of intervention period. During impact assessment year, net income of Rs 48,890 was recorded which is 5% lower over intervention period. This indicates that the few interventions were discontinued fully or partially during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 2.22 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 23,016 from 0.57 ha). Additional return of Rs 28,001 was obtained with the investment of Rs 4814 on critical inputs related to interventions. The return over cost of intervention was found to be 5.82. The income could be doubled in first year itself.

Jammu and Kashmir

Samba : Field crops (1.14 ha) +dairy (1-2 cow + 1 buffalo) farming system was found to be dominant in the district having mean area of 1.14 ha. The interventions made using holistic approach

(improving the existing farming system components of a household) resulted in mean net income of Rs 1,08,263/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,14,226 was recorded which is 6 % higher over intervention period. This indicates that the interventions were effective and farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.37 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 79,891 from 1.14 ha). Additional return of Rs 29,863 was obtained with the investment of Rs 7,503 on critical inputs related to interventions. The return over cost of intervention was found to be 3.98.

Jharkhand

Pakur : Among the 2 farming systems studied, field crops (1 ha) + goat was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 60,543/year during 3 years of intervention period. During impact assessment year, net income of Rs 74,495 was recorded which is 23 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 3.25 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 19,700 from 1 ha). Additional return of Rs 44,331 was obtained with the investment of Rs 18,823 on critical inputs related to interventions. The return over cost of intervention was found to be 2.36. The income could be doubled in the first

year itself with critical interventions in this farming system.

Karnataka

Kolar : Among the 4 farming systems studied, field crops (0.84 ha) + dairy (2-3 cows + 1 buffalo) + goat (1 no's) + sheep (5-6 no's) + poultry (6-7 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 0.84 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 3,01,355/year during 3 years of intervention period. During impact assessment year, net income of Rs 4,15,150 was recorded which is 38 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + sheep + poultry farming system resulted in 1.9 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,73,172 from 0.84 ha). Additional return of Rs 1,56,632 was obtained with the investment of Rs 15,663 on critical inputs related to interventions. The return over cost of intervention was found to be 10. The income could be doubled in the second year with critical interventions in this farming system.

Gadag : Field crops (1.30 ha) + dairy (1-2 cows + 1 buffalo) farming system was found to be dominant in the district having mean area of 1.30 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 86,220/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,24,146 was recorded which is 44 % higher over intervention period. This indicates that the interventions were effective and farmers have

continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 2.43 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 39,312 from 1.30 ha). Additional return of Rs 56,390 was obtained with the investment of Rs 3960 on critical inputs related to interventions. The return over cost of intervention was found to be 14.24. In the second year, the income could be doubled due to interventions made in existing farming system components with holistic approaches.

Kerala

Pathinamthitta : Among the 3 farming systems studied, field crops and horticulture (1.23 ha) + dairy + poultry was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.23 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 3,14,045/year during 3 years of intervention period. During impact assessment year, net income of Rs 3,48,282 was recorded which is 11 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + horticulture + dairy + poultry farming system resulted in 2.86 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,12,709 from 1.23 ha). Additional return of Rs 2,09,896 was obtained with the investment of Rs 26,465 on critical inputs related to interventions. The return over cost of intervention was found to be 7.93. The income could be doubled in the first year itself with critical interventions in this farming system.

Madhya Pradesh

Dindori : Field crops (1.20 ha) + dairy (1-2 cows + 1-2 buffaloes) farming system was found to be dominant in the district having mean area of 1.20 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 1,22,749/year during 3 years of intervention period. During impact assessment year, net income of Rs 93,810 was recorded which is 24% lesser over intervention period. This indicates that the few interventions were discontinued fully or partially during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.98 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 58,231 from 1.20 ha). Additional return of Rs 57,284 was obtained with the investment of Rs 9748 on critical inputs related to interventions. The return over cost of intervention was found to be 5.88. In the second year, the income could be doubled due to interventions made in existing farming system components with holistic approaches.

Maharashtra

Palghar : Among the 3 farming systems studied, field crops (0.40 ha) + dairy (2 cows) + goat (6 no's) + poultry was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 0.40 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 58,954/year during 3 years of intervention period. During impact assessment year, net income of Rs 96,965 was recorded which is 64 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post

intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + poultry farming system resulted in 1.75 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 39,210 from 0.40 ha). Additional return of Rs 29,247 was obtained with the investment of Rs 4610 on critical inputs related to interventions. The return over cost of intervention was found to be 6.34. The income could be doubled in the fourth year with critical interventions in this farming system.

Pune : Field crops (0.74 ha) +dairy (1-2 cows + 1 buffalo)farming system was found to be dominant in the district having mean area of 0.74 ha. The interventions made using holistic approach (improving the existing farming system components of a household) resulted in mean net income of Rs 1,39,805/year during 3 years of intervention period. During impact assessment year, net income of Rs 2,94,484 was recorded which is 111 % higher over intervention period. This indicates that the interventions were continued fully with innovations during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted in 1.97 times improvement in net income over a period of 4 years (including

post intervention period) compared to benchmark income (Rs 90,417 from 0.74 ha). Additional return of Rs 88,058 was obtained with the investment of Rs 2500 on critical inputs related to interventions. The return over cost of intervention was found to be 35.22. In the fourth year, the income could be doubled due to interventions made in existing farming system components with holistic approaches.

Amravati : Among the 4 farming systems studied, field crops (1.30 ha) + dairy (1 cow) + goat (3 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.30 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 60,438/year during 3 years of intervention period. During impact assessment year, net income of Rs 79,469 was recorded which is 31 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 2.41 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark



Improving profitability and livelihood with intervention of pig at Kamrup district, Assam



Improve the family nutritive value through papaya in Kitchen garden at Kamrup district (Assam)

income (Rs 27,000 from 1.30 ha). Additional return of Rs 38,186 was obtained with the investment of Rs 12,902 on critical inputs related to interventions. The return over cost of intervention was found to be 2.96. The income could be doubled in the first year itself with critical interventions in this farming system.

Aurangabad : Among the 2 farming systems studied, field crops (1.01) + dairy (1-2 cow + 1 buffalo) + goat (2 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.01 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 1,02,165/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,24,342 was recorded which is 22 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 4.46 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 24,138 from 1.01 ha). Additional return of Rs 83,571 was obtained with the investment of Rs 11,567 on critical inputs related to interventions. The return over cost of intervention was found to be 7.22. The income could be doubled in the first year itself with critical interventions in this farming system.

Odisha

Angul : Among the 2 farming systems studied, field crops (1.22 ha)+dairy (3-4 cows)+poultry (65 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.22 ha. The interventions made in different modules using holistic approach of

farming system resulted in mean net income of Rs 98,930/year during 3 years of intervention period. During impact assessment year, net income of Rs 75,053 was recorded which is 24 % lesser over intervention period. This indicates that the some interventions were discontinued or partially discontinued during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + poultry farming system resulted in 2.05 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 45,445 from 1.22 ha). Additional return of Rs 47,516 was obtained with the investment of Rs 5839 on critical inputs related to interventions. The return over cost of intervention was found to be 8.14. The income could be doubled in the first year itself with critical interventions in this farming system.

Kendrapara : Among the 6 farming systems studied, field crops (1.20 ha)+dairy(1 cow)+goat (4 no's)+poultry (20 no's) was found better in terms of improvement in net income over benchmark. The mean area of the households where in the system was studied is found to be 1.20 ha. The interventions made in different modules using holistic approach of farming system resulted in mean net income of Rs 74,244/year during 3 years of intervention period. During impact assessment year, net income of Rs 1,13,364 was recorded which is 53 % higher over intervention period. This indicates that the interventions were effective and farmers have continued all the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat + poultry farming system resulted in 3.40 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 24,725 from 1.20 ha). Additional return of Rs 59,299 was obtained with the investment of Rs 15,299 on critical inputs related to interventions. The return over cost of

intervention was found to be 3.88. The income could be doubled in the first year itself with critical interventions in this farming system.

Punjab

Amritsar : Field crops (0.96 ha) +dairy (1 cow + 3-4 buffaloes) farming system was found to be dominant in the district having mean area of 0.96 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 134834/year during 3 years of intervention period. During impact assessment year, net income of Rs 105857 was recorded which is lesser by 21 % over intervention period. This indicates that the farmers have discontinued or partially discontinued few interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted reduction in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 1,30,488 from 0.96 ha).

Rajasthan

Udaipur : Among the 3 farming systems studied, field crops (0.80)+ dairy (2 cows) +goat (4-5 no's) was found better in terms of improvement in net income over benchmark. The mean area of the

household where in the system was studied is found to be 0.80 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 80245/year during 3 years of intervention period. During impact assessment year, net income of Rs 79463 was recorded which is marginally lower. This indicates that the farmers have either discontinued or partially continued the few interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 1.74 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 46000 from 0.80 ha). Additional return of Rs 34050 was obtained with the investment of Rs 9200 on critical inputs related to interventions. The return over cost of intervention was found to be 3.70. The income could be doubled in the third year with interventions in farming systems perspective.

Tamil Nadu

Sivagangai / Pudukottai : Field crops (1.25 ha) + dairy (2 cows)+ poultry (18 no's) farming system was found to be dominant in the district having mean area of 1.25 ha. The interventions made in different modules of crop, livestock, product



*Kitchen garden intervention at Samba district
(Jammu and Kashmir)*



*Kitchen garden for vegetable production at
Mehsana district (Gujarat)*

diversification and capacity building resulted in mean net income of Rs 127982/year during 3 years of intervention period. During impact assessment year, net income of Rs 146510 was recorded which is higher by 14 % over intervention period. This indicates that the farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy + poultry farming system resulted 1.7 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 78150 from 1.25 ha). Additional return of Rs 54464 was obtained with the investment of Rs 10900 on critical inputs related to interventions. The return over cost of intervention was found to be 5. The income could be doubled in the first year due to the interventions in the existing farming systems of marginal and small farm households.

Dharmapuri / Krishnagiri : Among the 2 farming systems studied, field crops (1.36 ha) +dairy (2-3 cows)+goat (3-4 no's) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 1.36 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 109204/year during 3 years of intervention period. During impact assessment year, net income of Rs 122845 was recorded which is 12 % higher . This indicates that the farmers have continued the most of the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + goat farming system resulted in 3.48 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 32328 from 1.36 ha). Additional return of Rs 80287 was obtained with the investment of Rs 10979 on critical inputs related to interventions. The return over cost of intervention was found to be 4.33. The income could be doubled in the first

year itself with interventions in farming systems perspective.

Telangana

Warangal : Field crops (1.26 ha) + dairy (1-2 cows and 1-2 buffalo)+ poultry (7-8 no's)+ goat (34 no's) farming system was found to be dominant in the district having mean area of 1.26 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 174443/year during 3 years of intervention period. During impact assessment year, net income of Rs 175680 was recorded which is marginally higher over intervention period. This indicates that the farmers have continued the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy + poultry + goat farming system resulted 2.48 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 70570 from 1.26 ha). Additional return of Rs 104183 was obtained with the investment of Rs 11325 on critical inputs related to interventions. The return over cost of intervention was found to be 9.20. The income could be doubled in the second year due to the interventions in the existing farming systems of marginal and small farm households.

Uttar Pradesh

Ambedkarnagar : Field crops (0.73 ha)+ dairy (1 cow +1-2 buffalo) farming system was found to be dominant in the district having mean area of 0.73 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 96856/year during 3 years of intervention period. During impact assessment year, net income of Rs 80738 was recorded which is lower by 17 % over intervention period. This indicates that the farmers have discontinued or partially discontinued few interventions during the post

intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted 2.18 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 38639 from 0.73 ha). Additional return of Rs 45431 was obtained with the investment of Rs 7135 on critical inputs related to interventions. The return over cost of intervention was found to be 6.37. The income could be doubled in the first year due to the interventions in the existing farming systems of marginal and small farm households.

Kanpur Dehat : Field crops (1.05 ha)+ dairy (1 cow + 1-2 buffalo)farming system was found to be dominant in the district having mean area of 1.05 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building resulted in mean net income of Rs 110427/year during 3 years of intervention period. During impact assessment year, net income of Rs 140608 was recorded which is higher by 27 % over intervention period. This indicates that the farmers have continued most of the interventions during the post intervention impact assessment year. Low cost diversification options in the field crop + dairy farming system resulted 1.61 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 73256 from 1.05 ha). Additional return of Rs 44716 was obtained with the investment of Rs 5969 on critical inputs related to interventions. The return over cost of intervention was found to be 7.49. The income could be doubled in the first year due to the interventions in the existing farming systems of marginal and small farm households.

Uttarakhand

Nainital : Among the 3 farming systems studied, field crops (0.40 ha)+ dairy (1 buffalo) + horticulture + goat (15 no's) +poultry (15 no's) was

found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.40 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 139416/year during 3 years of intervention period. During impact assessment year, net income of Rs 193558 was recorded which is 39 % higher . This indicates that the farmers have continued the most of the interventions during the post intervention impact assessment year. Low cost diversification options in field crop + dairy + horticulture + goat + poultry farming system resulted in 2.30 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 66555 from 0.40 ha). Additional return of Rs 86397 was obtained with the investment of Rs 4588 on critical inputs related to interventions. The return over cost of intervention was found to be 18.83. The income could be doubled in the second year with interventions in farming systems perspective.

West Bengal

South 24 Paragnas : Among the 3 farming systems studied, Field crops (0.27) + dairy (1 no's) + poultry (12 no' s) was found better in terms of improvement in net income over benchmark. The mean area of the household where in the system was studied is found to be 0.27 ha. The interventions made in different modules of crop, livestock, product diversification and capacity building of the farming system resulted in mean net income of Rs 65336/year during 3 years of intervention period. During impact assessment year, net income of Rs 154702 was recorded which is 137 % higher. This indicates that the farmers have continued the most of the interventions with innovations during the post intervention impact assessment year. Low cost

diversification options in field crop + dairy + poultry farming system resulted in 6.14 times improvement in net income over a period of 4 years (including post intervention period) compared to benchmark income (Rs 14279 from 0.27 ha). Additional return of Rs 73398 was obtained with the investment of Rs 4599 on critical inputs related to interventions. The return over cost of intervention was found to be 15.96. The income could be doubled in the first year itself with interventions in farming systems perspective.

The results across the locations are summarized below.

- Across the farming systems studied in different districts, States, the mean benchmark net income recorded was found to be Rs 62550/year from 0.96 ha (2011-12).
- During the intervention period (with physical and technical inputs based on critical constraints) of 3 years (2013-14, 2014-15 and 2015-16), the mean net income recorded was found to be Rs 1,14,039/year from 0.96 ha. The cost of intervention on critical inputs was found to be Rs 10590.
- During the post intervention period (2016-17, without physical and technical inputs), net income of Rs 1,29,202 from 0.96 ha was recorded which is 12.63 % higher than the intervention period. Therefore, the study explicitly concludes that the interventions have been continued by the farmers during the post intervention period by the marginal and small households barring few locations due to constraints of input availability.
- On an average the income across the farming systems, districts and States increased by 2.11 times over benchmark income in a period of 4 years (including the impact study period). On an average, additional income of Rs 55,235 have been recorded with additional cost of Rs 10590 only on critical inputs. Thus, the return over investment on critical input based interventions in farming systems perspective was found to be 7.08.
- Based on the above findings, it can be concluded that the farmers income can be doubled in a span of 4 years by appropriate interventions based on critical interventions using holistic approach of farming systems in marginal and small farm households.



Intervention of Vanaraja birds under livestock diversification at Warangal district (Telangana)



Vermicompost intervention at Warangal district (Telangana)

7.4.3 Comparison of net income during intervention (with physical and technical inputs) and post intervention (impact year, i.e without physical and technical inputs) period due to improvement of existing farming systems in marginal and small farm households with location specific low cost interventions in different districts

Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
1	Andhra Pradesh	Srikakulam	Field crops (0.66)+dairy (cow 1-2 + buffalo 2)	12	0.66	43570	4260	78265	85534	91258	94103	87290	2.00
2	Assam	Kamrup	Field crops (1.90)+ dairy (cow 1)+ poultry (20) +fishery	1	1.90	64300	5700	83300	94322	177622	154721	127491	1.98
			Field crops (1.50)+ dairy (cow 4)+goat (20)+poultry (15)	2	1.50	65200	3950	76200	87613	163813	128271	113974	1.75
			Field crops (1.43)+ dairy (cow 2)+goat (2)+poultry (80)+pig(2-3)	3	1.43	48667	3400	66667	82356	149023	83271	95329	1.96
			Field crops (1.62)+ dairy (cow 2)+ poultry (18) +pig(2)	6	1.62	69550	2500	99550	112432	211982	176191	150039	2.16
3	Bihar	Purnea	Field crops alone (0.95)	1	0.95	43915	4758	70890	112450	105230	104720	98323	2.24
			Field crops (1.25)+ dairy + goat (2-3) + poultry +fishery	1	1.25	51693	4830	75890	92590	95350	94980	89703	1.74

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (1.30)+ dairy (cow 1-2)	6	1.30	47045	4675	62670	81680	83100	87352	78701	1.67
			Field crops (1.13)+ dairy (cow 1-2)+ goat (4-5)	3	1.13	50446	4813	72450	90328	94985	93310	87768	1.74
			Field crops (0.70)+ dairy + goat (2-3) + poultry	1	0.70	47361	5009	60750	77715	80575	82745	75446	1.59
			Field crops alone (1.20)	1	1.20	63100	3900	78200	100380	107050	90453	94021	1.49
4	Chhattisgarh	Kawardha	Field crops (1.05)+ dairy (cow 2)+goat (3-4)+poultry (18)	3	1.05	70570	11325	133733	207766	181831	175680	174753	2.48
			Field crops (1.17)+ dairy (cow 1-2)	7	1.17	78910	3900	100400	125825	122300	121489	117504	1.49
			Field crops (0.80)+ dairy (cow 1)+ poultry (18)+ horticulture+ fishery	1	0.80	111900	8900	136700	185490	190300	152296	166197	1.49
			Field crops (1.04)+dairy (buffalo 2-3)+ goat(5-6)+ poultry (6-7)	6	1.04	55855	10950	82490	101314	111414	86912	95533	1.71
5	Gujarat	Panchmahal											

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (0.72)+dairy (buffalo 3)+goat (4-5)	3	0.72	44093	9600	67718	85038	93938	70984	79420	1.80
			Field crops (0.90)+dairy (buffalo 1)+poultry (5)	1	0.90	34805	10500	52255	64615	71815	53237	60481	1.74
			Field crops (0.40)+dairy (cow 1+ buffalo 2)	1	0.40	21250	7750	31600	40160	45960	39120	39210	1.85
			Field crops (0.84)+poultry (5)	1	0.84	34705	6300	45622	54386	59486	48655	52037	1.50
		Mehsana	Field crops (1.13)+dairy (cow 0-1 + buffalo 1-2)	12	1.13	102170	49598	153445	126048	133738	177588	147705	1.45
6	Haryana	Sirsa	Field crops (0.85)+dairy (cow 1-2 + buffalo 2-3)	12	0.85	79197	6128	121264	98457	130210	-	116643	1.47
7	Himachal Pradesh	Kangra	Field Crops (0.77)+dairy (cow/buffalo 1-2)	9	0.77	32656	5457	61223	67625	69180	58995	64256	1.97
			Field Crops (0.57)+dairy (cow/buffalo 1-2)+goats (2)	3	0.57	23016	4814	45092	52052	58033	48890	51017	2.22

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase over income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
8	Jammu and Kashmir	Samba	Field crops (1.14) +dairy (cow 1-2 + buffalo 0-1)	12	1.14	79891	7503	104956	112066	107767	114226	109754	1.37
9	Jharkhand	Pakur	Field crops (1.00) + goat	6	1.00	19700	18823	58530	43900	79200	74495	64031	3.25
			Field crops (1.42) + pig	6	1.42	29652	26959	73855	50500	103012	65512	73220	2.47
10	Karnataka	Kolar	Field crops (0.88) + dairy (cow 2-3)	7	0.88	129334	16523	128895	158983	123394	171954	145807	1.13
			Field crops (0.50) +dairy (cow 2 + buffalo 1)+ sericulture	1	0.50	152591	25840	182031	206577	198596	170423	189407	1.24
			Field crops (0.84) + dairy (cow 2-3 + buffalo 1)+ goat (1) + sheep (5-6)+ poultry (6-7)	3	0.84	173172	15663	305199	394271	204595	415150	329804	1.90
		Gadag	Field crops (0.27) +dairy (cow 2 + buffalo 2)+ poultry (2)	1	0.27	83226	9742	86306	110642	169675	42533	102289	1.23
			Field crops (1.30) + dairy(cow 1-2 + buffalo 1)	12	1.30	39312	3960	55868	106763	96029	124146	95702	2.43

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
11	Kerala	Pathinamthitta	Field crops (1.31)+ horticulture+ dairy	5	1.31	35592	28314	52364	74192	87180	96391	77532	2.18
			Field crops + horticulture + dairy + poultry	2	1.23	112709	26465	292805	314118	335214	348282	322605	2.86
			Horticulture + dairy	5		132940	24226	306661	346454	384302	406815	361058	2.72
12	Madhya Pradesh	Dindori	Field crops (1.20) + dairy (cow 1-2 + buffalo 1-2)	12	1.20	58231	9748	103101	128061	137087	93810	115515	1.98
13	Maharashtra	Palghar	Field crops (0.76) + dairy (buffalo 2)	7	0.76	71345	7885	93473	100495	137085	151125	120545	1.69
			Field crops (0.52) +dairy (cow 1-2)+ poultry (23-24)	4	0.52	62022	6035	85056	85350	87082	85190	85670	1.38
			Field crops (0.40) +dairy (cow 2)+goat (6)+ poultry (14)	1	0.40	39210	4610	55856	58272	62735	96965	68457	1.75
		Pune	Field crops (0.74) +dairy (Cow 1-2 + buffalo 0-1)	12	0.74	90417	2500	113352	148711	157353	294484	178475	1.97

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
14	Odisha	Amravati	Field crops (1.2) + goat (5)	1	1.2	43550	10920	111382	73647	135965	87565	102140	2.35
			Field crops (1.08) +dairy (cow 1-2)	8	1.08	40640	7297	62984	90194	76574	136902	91664	2.26
			Field crops (1.40) +dairy (cow 1) + poultry (4)	1	1.40	54500	17686	154320	71346	108442	78755	103216	1.89
			Field crops (1.30) +dairy (cow 1) + goat (3)	2	1.30	27000	12902	51350	37540	92426	79469	65196	2.41
			Field crops (0.64)+dairy (cow 0-1)	9	0.64	75158	11262	108745	76598	216435	164340	141530	1.88
		Angul	Field crops (1.01)+dairy (Cow 1-2 + buffalo 0-1) +goat (2)	3	1.01	24138	11567	89111	58561	158823	124342	107709	4.46
			Field crops (1.18)+dairy (buffalo 0-1)	4	1.18	36366	4463	61540	47312	61966	51306	55531	1.53
			Field crops (1.22)+dairy (cow 3-4)+ poultry (65-66)	8	1.22	45445	5839	93404	114678	88708	75053	92961	2.05
		Kendrapara	Field crops (0.64)+dairy (cow 4)	1	0.64	36768	13874	52389	78967	130467	153546	103842	2.82

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
			Field crops (0.95)+dairy (cow 2)+goat (2) + fishery	3	0.95	40329	12067	46702	85015	105048	119333	89025	2.21
			Field crops (1.08)+dairy (cow 2)+ poultry (10)	1	1.08	46700	18700	111256	135482	143227	173906	140968	3.02
			Field crops (1.20)+dairy (cow 1)+goat (4)+poultry (20)	1	1.20	24725	15299	53050	71761	97922	113364	84024	3.40
			Field crops (0.68)+dairy (cow 2 -4)+ poultry (14) +fishery	2	0.68	59960	12705	72672	99988	114200	135670	105633	1.76
15	Punjab	Amritsar	Field crops (0.91)+dairy (cow 2)+goat (1-2)+poultry (9)+fishery	4	0.91	62086	19186	102654	151272	154953	172925	145451	2.34
			Field crops (0.96) +dairy (cow 0-1+ buffalo 3-4)	12	0.96	130488	12000	139885	133079	131538	105857	127590	0.98
16	Rajasthan	Udaipur	Field crops (0.58)+ dairy (buffalo 1)	2	0.58	42400	9950	72,564	49365	70,742	58380	62763	1.48
			Field crops (0.80)+ dairy (cow 2)+goat (4-5)	9	0.80	46000	9200	74450	77180	89,106	79463	80050	1.74

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Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
17	Tamil Nadu	Sivagangai / Pudukottai	Field crops (0.60)+ dairy (buffalo1) + poultry (18)	1	0.60	42400	9350	59026	66560	72925	62869	65345	1.54
			Field crops (1.25) + dairy (cow 2)+ poultry (18)	8	1.25	78150	10900	175130	160483	48333	146510	132614	1.70
		Dharmapuri / Krishnagiri	Field crops (1.02) +dairy (cow 2 - 3)	10	1.02	46086	10979	82526	79815	75785	81855	79995	1.74
			Field crops (1.36) +dairy (cow2-3)+ goat (3-4)	2	1.36	32328	18530	120229	112177	95208	122845	112615	3.48
18	Telangana	Warangal	Field crops (1.28)+ dairy (cow 0-1 buffalo 1)+ poultry (7-8)	10	1.28	71367	10800	128118	197490	137299	144800	151927	2.13
			Field crops (1.26) + dairy (cow 1-2 buffalo 1-2)+ poultry (7-8)+ goat (34-35)	2	1.26	70570	11325	133733	207766	181831	175680	174753	2.48
19	Uttar - Pradesh	Ambedkar-nagar	Field crops (0.73)+ dairy (cow 0-1 + buffalo 1-2)	10	0.73	38639	7135	67664	77694	96856	94065	84070	2.18
		Kanpur Dehat Dehat	Field crops (1.05)+ dairy (Cow 0- 1 + buffalo 1-2)	12	1.05	73256	5969	102665	106411	122205	140608	117972	1.61

Contd/

Sl. No	State	District (s)	Farming System	Number of farm house holds	Mean Area (ha)	Bench mark net income (Rs) (before refinement)	Cost incurred on interventions (Rs)	Net income (Rs) after interventions (Refined farming systems)					Increase in net income over benchmark (Number of times)
								2013-14 (Intervention year)	2014-15 (Intervention year)	2015-16 (Intervention year)	2016-17 (Impact year)	Mean	
20	Uttara-khand	Nainital	Field crops (0.72) + dairy (cow 1 +buffalo 1)+ horticulture	10	0.72	77277	5310	117096	143765	182976	129667	143376	1.86
			Field crops (1.00) + dairy (cow 3 + buffalo 1)+ horticulture + fishery (pond 1)	1	1.00	272077	5045	283286	272563	306437	255446	279433	1.03
21	West Bengal	South 24 Parganas	Field crops (0.40)+ dairy (buffalo 1)+ horticulture + goat (15) + poultry (15)	1	0.40	66555	4588	76245	122883	219120	193558	152952	2.30
			Field crops (0.58)+dairy (3)+ fishery	7	0.58	30,608	5950	129548	110328	110402	161778	128014	4.18
			Field crops (0.53)+dairy (2)+ poultry (14) +fishery	4	0.53	35359	8095	91996	117567	154335	164939	132209	3.73
			Field crops (0.27) + dairy (1)+ poultry (12)	1	0.27	14279	4599	23364	75877	96767	154702	87677	6.14

7.4.4 FRONTLINE DEMONSTRATION ON FARMING SYSTEMS INVOLVING OILSEEDS

During 2017-18, a total of 179 FLDs on farming systems involving oilseeds and five trainings on New technologies and development in oilseeds

cultivation for extension officers/input dealers were organized by AICRP-IFS centres. The brief report is given below.

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

Agro Ecosystem	Name of Centre (State)	Crop/cropping system (s)	Number of demonstrations conducted
1. Arid	Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice	12
		Urid / Moong (Kh) – Mustard (Rb)	12
2. Semi-Arid	Patiala (Punjab)	Gobhi-sarson	15
	Lalsot-Dausa (Rajasthan)	Pearl millet -Mustard	12
	Medak (Telangana)	Rice - groundnut	10
		Rice - Mustard	10
	Modipuram (Uttar Pradesh)	Mustard	20
	Gajularega (Andhra Pradesh)	Sunflower (R)	19
		Sesame (S)	19
3. Sub humid	Kankar (Chhattisgarh)	Rice – linseed (Oilseed)	27
	Pantnagar (Uttarakhand)	Rice - mustard	5
	Nalanda (Bihar)	Mustard	5
4. Humid	Umiam (Meghalaya)	Toria	4
	Bilaspur (Himachal Pradesh)	Maize-Gobhi sarson	4
	Jammu (J&K)	Gobhi-sarson	2
		Mustard	3
Total			179

I. FLDs on farming systems involving oilseeds

During 2017-18, FLD's were conducted at 12 OFR centres of All India Coordinated Research Project on Integrated Farming Systems (AICRP on IFS) in four agro ecosystems viz., Arid, Semi-Arid, Sub Humid, and Humid; covering 12 states. Crops/cropping systems in which FLDs were conducted are given in Table 7.4.4.1. In Arid ecosystem, a total of 24 demonstrations were conducted at Adiya Patan (Gujarat). Under Semi-Arid ecosystem, total demonstrations were conducted out of which the highest (38) demonstrations were done at Gajularega (Andhra Pradesh) centre followed by Medak (Telangana). Under Sub humid agro-ecosystem, 27, 5 and 5 demonstrations were conducted at Kankar (Chhattisgarh), Pantnagar (Uttarakhand) and Nalanda (Bihar) centres, respectively. Under humid ecosystem, 4, 4 and 5 demonstrations were conducted at Umiam (Meghalaya), Bilaspur (Himachal Pradesh) and Jammu (J&K) centres, respectively. In total, 179 demonstrations were conducted during 2017-18.

Major cropping systems in which oilseed crops were tested are hybrid castor without sunhump in farmers practice and with sunhump in improved practice and urd/moong (*kharif*)–mustard (*rabi*) in arid ecosystem. In Semi-Arid ecosystem, gobhi – sarson, pearl millet–mustard, rice – groundnut rice – mustard cropping systems and mustard, Sesame and sunflower crops were tested in the FLDs. Rice – linseed, rice – mustard cropping systems and mustard crop alone were tested in field demonstrations in Sub Humid region. In Humid region, maize–gobhi sarson system and gobhi sarson and mustard crops were demonstrated in the FLDs. Total of 12 demonstrations each were conducted on systems involving hybrid castor and mustard crops in Arid Agro Ecosystem. The systems involving linseed

crop was undertaken in 27 demonstrations while gobhi sarson crop was taken in 21 demonstrations. There were only two treatments taken for comparison, i.e. farmers practice (FP) and improved practice (IP) especially in Adiya Patan (Gujarat) centre in arid Agro-ecosystem.

Crop varieties along with other management practices adopted in farmers and improved practice under various cropping systems are presented in Table 7.4.4.2. Gujarat is leading state in castor seeds production in India and has contributed 71% of total production of castor seed in India in 2007-08, followed by Rajasthan (16%), Andhra Pradesh (9%) and other states (4%). Mehsana and Banaskantha is the largest castor producing districts in Gujarat. In Gujarat castor cultivation comes from 6 districts of North Gujarat, viz., Mehsana, Banaskantha, Sabarkantha, Gandhinagar, Patan and Kutch. Keeping above facts in mind, a total of 24 demonstrations were conducted to improve farmer's income. The interventions included hybrid castor without sunhump green manuring in farmers practice and with sunhump green manuring in improved practice having 12 demonstrations, inclusion of rabi mustard oil seed crop after harvest of the Urd in kharif in 12 demonstrations. At Patiala (Punjab), 15 demonstrations were conducted in Gobhi-sarson crop with intervention of maintaining the spacing of 45 x 10 cm by thinning. The improved variety of mustard (NRCD-2) was introduced in the pearl millet-mustard cropping system at Lalsot – Dausa (Rajasthan) centre. Similarly at Medak centre at Telangana, improved varieties of ground nut (K-6) and mustard (varuna) were introduced in the rice-ground nut and rice- mustard cropping systems, respectively. At Kankar (Chhattisgarh) improved variety of linseed (RLC-92) was introduced in rice-linseed cropping system.

Table: 7.4.4.2 Details of interventions made under FLDs on farming systems involving oilseeds

Agro Ecosystem (Centre)	Cropping system		Particulars of package	Farmer Practice		Improved Practice	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi
1.Arid							
Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice	-	Sole castor	Green manuring (GM)	-	GM by sunhemp	-
	Urid / Moong	Mustard	-	Urid	-	Mustard	-
2. Semi Arid							
Patiala (Punjab)	-	Gobhi-sarson	Spacing	-	Broadcasting no thinning	-	45 X 10 maintain by thinning
Lalsot – Dausa (Rajasthan)	Pearlmillet	Mustard	Variety	Local	Improved	-	NRCDR-2
Medak (Telangana)	Rice	Groundnut	Variety	-	K-6	-	60 X 20 Line maintained
	Rice	Mustard	Variety	-	Varun	-	45 X 20 Line maintained
Gajularega (Andhra Pradesh)	-	Sunflower	Variety	-	Private Hybrid	-	Kranti 999
	-	Sesame (S)	Variety	-	Hybrid	-	YLM-66
3. Sub Humid							
Kankar (Chhattisgarh)	Rice	Linseed	Variety	Local	Improved variety	-	RLC-92
Pantnagar (Uttarakhand)	Rice	Mustard	Variety	-	Improved variety	-	Pant Pili Sarson-1
Nalanda (Bihar)	-	Mustard	Spacing	-	Improved variety	-	Ganga
4. Humid							
Umiam (Meghalaya)	-	Toria	Variety	Local	TS-38	-	TS-38 Line sowing
Bilaspur (Himachal Pradesh)	Maize	Gobhi-sarson	Variety	Hybrid	Hybrid	HPN-3	HPN-3
Jammu (J&K)	-	Gobhi-sarson	Variety	Local	Improved		GSC-7
	-	Mustard	Variety	Local	Improved	-	RH-749

Improved yellow mustard variety (Pant Pili Sarson-1) was introduced in rice-yellow mustard cropping system in Pantnagar (Uttarakhand). Likewise in Umiam (Meghalaya), toria variety TS-38 and line sowing of the crop was taken as an intervention. Improved gobhi sarson variety GSC-7 was introduced at Jammu (J&K) FLD centre in place of the existing local variety.

Results

Yield : The influence of different improved production practices on the yield of different crops is presented in Table 7.4.4.3. At Adiya Patan (Gujarat), 18.35 % increase in hybrid castor yield was observed due to improved practice over farmer's practice. Likewise at Patiala (Punjab), 20.63% improvement in gobhi sarson yield was seen due to maintenance 45 x 10 spacing by thinning. The introduction of improved mustard variety (NRCDR-2) in pearl millet-mustard system has increased yield by 25.18% at Lalsot – Dausa (Rajasthan). At Pantnagar (Uttarakhand) also, 21.26 % yield increase was seen with replacement of existing mustard variety with Pant Pili Sarson-1, a yellow sarson variety. Enhancement in yields of toria (27.34%) was found at the Umiam (Meghalaya) centre due to introduction of new variety TS-38 and line sowing of the crop as compared to the local variety. Likewise at Jammu (J&K), introduction of gobhi sarson variety GSC-7 and improved fertilizer management (60:40:20 kg/ha NPK+100 kg gypsum/ha) has enhanced yield of gobhi sarson by 120.10% under Humid agro-ecosystem.

Cost of cultivation : At Adiya Patan (Gujarat), green manuring with sunhemp in Hybrid castor as an improved practice has increased cost of cultivation by 16% as compared to farmers practice involving no green manuring with

sunhemp (Table 7.4.4.4). The introduction of improved mustard variety (NRCDR-2) in pearl millet-mustard system has increased cost of cultivation from Rs 23500/ha in farmers practice to Rs 26600/ha in improved practice. At Gajularega (Andhra Pradesh), replacement of sunflower hybrid with Kranti 999 variety and sesame hybrids with YLM-66 variety has enhanced cost of cultivation by 13.79 and 11.65% in respective crop. Likewise at Jammu (J&K), introduction of gobhi sarson variety GSC-7 and improved fertilizer management (60:40:20 kg/ha NPK+100 kg gypsum/ha) has enhanced cost of cultivation from Rs. 6000/ha to Rs. 7000/ha.

Gross and net returns : Gross and net returns were higher in improved package for all the crops at all locations due to increase in yield (Table 7.4.4.5 and 7.4.4.6). During 2017-18, total 12 demonstrations involving Hybrid castor were conducted at Adiya Patan (Gujarat) centre. The mean data of 12 demonstrations revealed that green manuring with sunhemp in hybrid castor gave 18.03 and 19.67% higher gross and net returns than green manuring without sunhemp in hybrid castor. Likewise at Patiala (Punjab), 17.01 and 45.81% improvement in gross and net returns of gobhi sarson were seen due to maintenance 45 x 10 spacing by thinning. The introduction of improved mustard variety (NRCDR-2) in pearl millet-mustard system has increased gross returns (from Rs 55080 to Rs 68960/ha) and net returns from Rs 31580 to 42360/ha. Likewise at Jammu (J&K), introduction of gobhi sarson variety GSC-7 and improved fertilizer management (60:40:20 kg/ha NPK+100 kg gypsum/ha) has enhanced gross return of gobhi sarson by 120.15% as well as net returns by 251.70% over farmers practice under Humid agro-ecosystem.

Table 7.4.4.3: Influence of farmers and improved practices on grain or pod yield (kg/ha) of various crops under FLD

Agro Ecosystem (Centre)	Cropping system		No. of demonst-rations	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice		12	2691	-	3185	-	18.35	
	Urid / Moong	Mustard	12	-	-	809	1669	-	-
2. Semi Arid									
Patiala (Punjab)	-	Gobhi-sarson	15	-	1260	-	1520	-	20.63
Lalsot – Dausa (Rajasthan)	Pearlmillet	Mustard	12	-	1378	-	1725	-	25.18
Medak (Telangana)	Rice	Groundnut	10	5858	-	5858	2625	-	-
	Rice	Mustard	10	5820	-	5821	790	-	-
Gajularega (Andhra Pradesh)	-	Sunflower	19	-	1030	-	1880	-	82.52
	-	Sesame (S)	19	-	475	-	870	-	83.15
3. Sub Humid									
Kankar (Chhattisgarh)	Rice	Linseed	27	-	-	-	839	-	-
Pantnagar (Uttrakhand)	Rice	Mustard	5	-	1552	-	1882	-	21.26
Nalanda (Bihar)	-	Mustard	5	-	-	-	1266	-	60.24
4. Humid									
Umiam (Meghalaya)	-	Toria	4	-	490	-	624	-	27.34
Bilaspur (Himachal Pradesh)	Maize	Gobhi-sarson	4	1516	498	2769	1144	82.65	129.72
Jammu (J&K)	-	Gobhi-sarson	2	-	662	-	1457	-	120.10
	-	Mustard	3	-	721	-	1009	-	39.94

Table 7.4.4.4: Influence of farmers and improved practices on cost of cultivation (Rs/ha) of various crops under FLD

Agro Ecosystem (Centre)	Cropping system		No. of demonstrations	Farmer Practice (FP)		Improved Practice (IP)		% increase (FP)	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice		12	42132	-	48741	-	16.00	-
	Urid / Moong	Mustard	12	-	-	20360	27063	-	-
2. Semi Arid									
Patiala (Punjab)	-	Gobhi-sarson	15	-	32813	-	30725	-	-6.79
Lalsot – Dausa (Rajasthan)	Pearlmillet	Mustard	12	-	23500		26600	-	13.19
Medak (Telangana)	Rice	Groundnut	10	48808	-	48808	34465	-	-
	Rice	Mustard	10	46595	-	46595	14405	-	-
Gajularega (Andhra Pradesh)	-	Sunflower	19	-	14500	-	16500	-	13.79
	-	Sesame (S)	19	-	10300	-	11500	-	11.65
3. Sub Humid									
Kankar (Chhattisgarh)	Rice	Linseed	27	-	-	-	-	-	-
Pantnagar (Uttrakhand)	Rice	Mustard	5	-	-	-	-	-	-
Nalanda (Bihar)	-	Mustard	5	-	-	-	-	-	-
4. Humid									
Umiam (Meghalaya)	-	Toria	4	-	-	-	13526	-	-
Bilaspur (Himachal Pradesh)	Maize	Gobhi-sarson	4	-	-	-	-	-	-
Jammu (J&K)	-	Gobhi-sarson	2	-	6000	-	7000	-	16.67
	-	Mustard	3	-	5633	-	6718	-	19.26

Table 7.4.4.5: Influence of farmers and improved practices on gross returns (Rs/ha) of various crops under FLD

Agro Ecosystem (Centre)	Cropping system		No. of demonst-rations	Farmer Practice		Improved Practice		% increase	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice		12	102527	-	121014	-	18.03	-
	Urid / Moong	Mustard	12	-	-	32690	60075	-	-
2. Semi Arid									
Patiala (Punjab)	-	Gobhi-sarson	15	-	46571	-	56117	-	17.01
Lalsot – Dausa (Rajasthan)	Pearlmillet	Mustard	12	-	55080	-	68960		25.20
Medak (Telangana)	Rice	Groundnut	10	192930	-	192930	181320	-	-
	Rice	Mustard	10	118930	-	118930	176395	-	-
Gajularega (Andhra Pradesh)	-	Sunflower	19	-	36050	-	65800	-	82.52
	-	Sesame (S)	19	-	24700	-	45240	-	83.15
3. Sub Humid									
Kankar (Chhattisgarh)	Rice	Linseed	27	-	-	-	-	-	-
Pantnagar (Uttrakhand)	Rice	Mustard	5	-	-	-	-	-	-
Nalanda (Bihar)	-	Mustard	5	-	-	-	-	-	-
4. Humid									
Umiam (Meghalaya)	-	Toria	4	-	-	-	29548	-	-
Bilaspur (Himachal Pradesh)	Maize	Gobhi-sarson	4	-	-	-	-	-	-
Jammu (J&K)	-	Gobhi-sarson	2	-	10720	-	23600	-	120.15
	-	Mustard	3	-	11667	-	16333	-	40.00

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

Agro Ecosystem (Centre)	Cropping system		No. of demonstrations	Farmer Practice (FP)		Improved Practice (IP)		% increase (FP)	
	Kharif	Rabi		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1.Arid									
Adiya _ Patan (Gujarat)	Hy. castor without sunhump in Farmers practice & with sunhump in improved practice		12	60395	-	72273	-	19.67	-
	Urid / Moong	Mustard	12	-	-	13752	33012	-	-
2. Semi Arid									
Patiala (Punjab)	-	Gobhi-sarson	15	-	13759	-	25392		45.81
Lalsot – Dausa (Rajasthan)	Pearlmillet	Mustard	12	-	31580	-	42360		34.14
Medak (Telangana)	Rice	Groundnut	10	109658	-	109658	83955	-	-
	Rice	Mustard	10	57930	-	57930	82852	-	-
Gajularega (Andhra Pradesh)	-	Sunflower	19	-	25550	-	53300	-	108.61
	-	Sesame (S)	19	-	16400	-	35740	-	117.93
3. Sub Humid									
Kankar (chhattisgar)	Rice	Linseed	27	-	-	-	-	-	-
Pantnagar (Uttrakhand)	Rice	Mustard	5	-	39980	-	53147	-	32.93
Nalanda (Bihar)	-	Mustard	5	-	-	-	-	-	-
4. Humid									
Umiam (Meghalaya)	-	Toria	4	-	-	-	16022	-	-
Bilaspur (Himachal Pradesh)	Maize	Gobhi-sarson	4	-	-	-	36923	-	-
Jammu (J&K)	-	Gobhi-sarson	2	-	4720	-	16600	-	251.70
	-	Mustard	3	-	6033	-	9617	-	59.41

Results for large scale application

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

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

Sl. No.	Crop	Location (ecosystem)	Improved Package	Increase in yield (%)	Increase in returns (%)
1.	Mustard	Lalsot- Dausa (Semi Arid)	Variety NRCRD-2 + 60:40:0 kg NPK/ha	25.18	34.14
		Pantnagar (Sub humid)	Variety: Pant Pili Sarson-1 + 90:40:20:30 kg NPK/ha	21.26	32.93
		Jammu (Humid)	Variety:RH-749 + 60:30:15 + gyp 100 kg/ha	39.94	59.41
2.	Hybrid Castor	Adiya (Arid)	Green manuring with sunhemp	18.35	19.67
3.	Sesame	Gajularega (Semi Arid)	YLM-66 variety	83.15	117.93
4.	Sunflower	Gajularega (Semi Arid)	Hy.: Kranti 999	82.52	108.61
5.	Gobhisarson	Patiala (Semi Arid)	Variety: GSC 7 + 100: 30:0 kg/ha + Two sprays: Actara 25WG 1.0 liter/ha and Nuvan 85 SL @ 500 ml/ha	20.63	45.81
		Bilaspur (humid)	Improved variety HPN-3	129.72	-
		Jammu (Humid)	Variety: GSC-7 + 60:40:20 + gyp 100 kg/ha	120.10	251.70
6.	Toria	Umiam (Humid)	Variety :TS-38	27.34	-

II. Training on New technologies and development in oilseeds cultivation

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

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

Sl. No.	Location (State)	Title of training	Period	Number of participants		
				Extension officials	Input dealers	Total
1.	Gajularega (Andhra Pradesh)	Interaction on pros and causes of non traditional crop of Sesame in the tribal tracts of AP	2017	28	-	28
		Field day on Sunflower	Rabi, 2017-18	30	-	30

2.	Nalanda (Bihar)	New Technologies and development in oilseeds cultivation	21 - 22.02.2018	20	-	20
3.	Adiya (Gujarat)	Training on oilseeds base cropping system in different blocks of Patan district.	Kharif - 2017-18	30	1	31
		Awareness of technology	Kharif - 2017-18	20	-	20
4.	Lalsot, Dausa (Rajasthan)	Field's day	13-03-2018	56	-	56
5.	Dharmapuri and Krishnagiri (T.N.)	Front Line Demonstration on Oilseeds other than Groundnut	23 - 24.03.2017	20	-	20
Total				76	11	87

GLIMPSES OF FLDS AND TRAININGS



FLD on Mustard in Bihar



FLD on Linseed in Chhattisgarh



Training for extension officers organized in Andhra Pradesh



Training for extension officers organized in Bihar

7.4.5 : SCHEDULED TRIBE COMPONENT (STC/TSP)

Under scheduled tribe component, on-farm research programmes on nutrient response of cropping systems, diversification and improvement of existing farming systems were undertaken at 7 identified OFR centres in 7 States with the participation of tribal households. Further, on-farm participatory research in tribal farming systems through Cluster approach were undertaken in 7 States.

Objectives

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

Year of start : 2015-16

Households : As per the tribal sub plan guidelines, tribal households have been selected for characterization, identification of constraints and technological interventions. A criteria of 100 households or 40 ha was used for the identifying the tribal cluster for interventions.

Locations : During 2016-17, the programme undertaken in 15 locations in 14 states using the balance funds available from previous years under TSP. It includes 7 OFR centres namely Srikakulam (Andhra Pradesh), Kawardha (Chhatisgarh), Panchmahal (Gujarat), Pakur (Jharkhand), Dindori (Madhya Pradesh), Palghar (Maharashtra) and Udaipur (Rajasthan) and 7 cluster programmes at Carnicobar (Andaman and Nicobar Islands), Kanker (Chhatisgarh), Chamba (Himachal Pradesh), Samba (Jammu and Kashmir), BR hills (Karnataka), Coimbatore (Tamil Nadu), Nainital (Uttarakhand) and Bali Island (West Bengal).

Results

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

On-Farm Research programmes under Scheduled Tribe component

Kawardha (Chhatisgarh) : In rice-chickpea system, higher grain and straw yield was achieved with application of 100:60:40 kg of NPK + 20 kg ZnSO₄ for *kharif* and 20:50:20 kg of NPK/ha for *rabi*. The system yield increase was found to be 225 % over control and 39 % over farmers' practice. Response of nutrient in terms of kg/kg was higher in NPK + ZnSO₄ (15.40). Crop, livestock and processing modules gave additional return of 25 to 35% higher over existing systems in marginal households. The highest mean net income was obtained from crop + dairy + goat + pig + poultry after four years of intervention (Rs. 1,19,000 against Rs 65,200 in benchmark) in marginal households. Crop, livestock and processing modules gave additional return of 30 to 35% higher over existing farming system in small households. The highest mean net income was obtained from crop + horticulture+ dairy + goat+ pig+ poultry+ fishery farming system (Rs. 1,81,000 against Rs 1,11,900 in benchmark) in small farm households.

Pakur (Jharkhand) : Significantly higher grain and straw yield of rice (3.6 & 4.6 t/ha) and wheat yield (3.3 t/ha) was obtained with application of 100:50:25 kg NPK/ha. Nutrient response of 14.78 kg grain/kg nutrient applied was registered in rice-wheat system. Inclusion of improved variety and livestock components in the existing farming system gave total productivity of 7.8 t REY/ha, net return of Rs 48,192/ha in crop + goat system in marginal households. Interventions made in crop + pig and crop + goat farming system in small households resulted in higher net income compared to existing farming systems in small households.

Dindori (Madhya Pradesh) : Application of 120:60:40 kg NPK/ha + Zn to both rice and wheat, resulted in maximum REY (9.5 t/ha), net returns

(Rs. 79,379 /ha) and B:C ratio (2.37) followed by NPK alone (8.6 t/ha, Rs. 71,923/ha) and B:C ratio (2.30).

Udaipur (Rajasthan) : Application of 90 kg N, 35 kg P_2O_5 and 30 kg K_2O /ha along with 25 kg $ZnSO_4$ to maize and 120 kg N, 40 kg P_2O_5 and 30 kg K_2O /ha to wheat significantly improved grain and stover/straw yields of maize and wheat. The % increase in grain yield of maize due to application of NPK+Zn was 353, 113, 20, 46 and 8 over control, N, NP, NK and NPK, respectively. The respective increase in grain yield of wheat was 184, 46, 16, 26 and 7 %. Significantly higher net returns (Rs 91,284/ha) and benefit: cost ratio (1.9:1) was also obtained with NPK + Zn application. Impact assessment of interventions made in five promising farming systems on marginal farmers' fields was undertaken without supplying any physical and technical inputs. The results revealed that crop+ dairy + goat farming system was the best having highest net income of Rs 1, 01,532. It was also observed that the households were recycling products and by-products of the different enterprises maintained at their farms. It was also observed that during all the four years, the farming system having crop + dairy + goat recorded more net average income of Rs 95,778 over other two farming systems which shows that the households having this farming system can earn about 184 % more income in comparison to bench mark income. However, the interventions in rest two farming systems viz. crop alone and crop + dairy were also enable to improve the net income by 161 and 199 per cent over bench mark income. Pooled results of four years experimentation on improving existing farming systems indicated that the farmers having crop + dairy + goat system recorded the highest net income of Rs 80,050. It was also observed that there was graded increase in net income year after year and the households having more number of live enterprises could harness the highest advantages of the farming

system modules. The income increase due to interventions was found to be 174 %.

Srikakulam (Andhra Pradesh) : NPK + Zn recorded significantly higher grain yield during *kharif* & *rabi* (4881 and 6582 kg ha⁻¹ respectively). NPK + Zn recorded higher system yield (11463 kg ha⁻¹) and higher system net returns (Rs 1,10,980 ha⁻¹). Nutrient response values for N, P, K and Zn were found to be 13.9, 6.0, 11.0 and 3.5 kg grain/kg respectively. B:C ratio was higher in NPK (1.54) followed by NPK + Zn (1.53) and NK (1.34). After four years of interventions, in crop + livestock farming system, the net income improvement in crop, livestock and product diversification module were found to be Rs 1,01,030, 29,300 and 23,640 over bench mark income of Rs. 40,968, 14,838 and 0 respectively. System net income improvement was found to be Rs. 1,54,270 against benchmark income of Rs. 55,506 in marginal households. Impact assessment indicates the interventions such as improved varieties of rice such as MTU1001, MTU1010, MTU1121 instead of old traditional varieties, balanced nutrient application (80-60-50-50 kg NPK & Zn/ha), deworming and mineral mixture for buffalos, kitchen gardening and vermicomposting were adopted by 100 % farmers during post intervention period without any physical and technical input. After four years of interventions, in crop + livestock farming system, the net income improvement in crop, livestock, processing and optional modules were Rs. 76,846, 28,200, 23,900 and 18,650 compared to bench mark income of Rs. 42, 800, 10,770, 0 and 0 respectively. System net income improvement was found to be Rs. 1,47,596 over benchmark income of Rs. 53570 in small households. Impact assessment indicated farmers adopted 100% successfully the interventions like rice improved varieties such as MTU1001, MTU1010, MTU1121 instead of old traditional varieties, rice balanced nutrient application (80-60-50-50 NPK & Zn/ha), deworming and mineral mixture for buffalos,

kitchen gardening, vermicomposting, teak, sandalwood plantation and perennial vegetable plants like moringa, curry leave plantation on field bunds during post intervention period without any physical and technical input.

Palghar (Maharashtra): Application of recommended NPK + Zn recorded highest gross returns (Rs.1, 84,235/ha), net returns (Rs. 74,141/ha) and net returns per rupee invested (0.67) from rice- rice system. The nutrient response in terms of grain yields (kg/kg) was highest in NPK + Zn (14.13). In crop diversification module, the interventions like improved varieties, small equipment's for weed control and harvesting indicated 100% adoption by farmers followed by balanced application of fertilizers (83.3 %). In case of balanced application of fertilizers and use of plant protection measures for rice, cowpea and cluster bean crops, the partial adoption was recorded due to high cost of these interventions. In case of livestock diversification, interventions with Konkani Kanyal goat and supply of forage crop planting material (Jaywant) were the most significant interventions. The interventions viz mineral mixture and growing forage crop was discontinued by 42 and 25 % marginal households due to high cost and unavailability of seed material respectively. In case of product diversification module, 100% households continued the interventions. Interventions made in improving the existing farming systems in small households, it was found that interventions in cropping system module such as improved varieties of crops, small equipment's for weed control and harvesting showed 100% adoption in case of rice crop. Balanced application of fertilizers recorded 100% adoption in case of cowpea and cucumber crops while, it was 58.3% in case of rice. The mean total net income from crop + dairy, crop + dairy + poultry and crop + goat + poultry farming systems was Rs. 71,345, 62,022 and 39,210 respectively. Supply of mineral mixture and forage crop seed had partial

adoption in case of livestock module. All the households continuation of interventions made in processing and optional (kitchen garden) modules.

Panchmahal (Gujarat) : In maize-maize cropping system, the highest yield of *kharif* and *rabi* crops as well as maize equivalent yield was recorded in NPK+ ZnSO₄. It was however at par with application of NPK and NK. In rice-maize system, the highest yield of *kharif* and *rabi* crops as well as rice equivalent yield was recorded with NPK+ ZnSO₄. The highest system net return of Rs. 37,611 was recorded with NPK+ZnSO₄.

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

Bali Island (West Bengal) : Nineteen types of farming systems were found in 120 number of farm households and crop + dairy + sheep system recorded the maximum gross return (Rs 41,824/ household) in bench mark. Interventions in crop module comprised of *kharif* rice, boro rice, potato, sunflower, khesari, chilli, water melon and other vegetables contributed for additional income of Rs 6317, 949, 1104, 1463, 3937, 9375, 15,551 and 289 /household respectively. Interventions made in dairy, poultry, duckery, goat and sheep contributed income of Rs 4751, 3981, 2660, 5912 and 2654/household respectively. Two trainings on backyard poultry and green fodder cultivation have been imparted. Training on fisheries was organized in collaboration with ICAR-CIFA, Bhubaneswar.

Kanker (Chhatisgarh) : Fish cum duck model demonstrated in the tribal villages resulted in net income of Rs. 1,60,000/year. Crop diversification model under upland situation with *Semialata* cultivation for lac production and intercropping with vegetables and hybrid maize cultivation also demonstrated. Crop + fish cum duck + dairy + poultry + vermicomposting in 2.4 ha area resulted in gross income of Rs. 13,98,000 with diversified

farming system approach. One ha IFS model comprising of rice + vegetable + vermicomposting + poultry + goatery + piggery + azolla resulted in net income of Rs 1,45,130. Rice - vegetable + backyard poultry + piggery + goatry + vermicomposting in 0.60 ha resulted in net income of Rs. 1,65,670. Rice + vegetable + poultry + fish cum duck + goatery + piggery + dairy + Azolla in 2.0 ha area recorded net income of Rs. 3,03,700. Another model of 2 ha comprising rice + vegetable + fish + backyard poultry + goat + vermicomposting + azolla resulted in net income Rs. 1,95,400. Rice + vegetable + poultry + fishery + goatery + azolla in 2 ha area resulted in net income of Rs. 2,77,950. Rice + vegetable + backyard poultry + goat + piggery + vermi compost + azolla resulted in net income of Rs. 2,57,250. Another model of 2 ha comprising of rice-chickpea + backyard poultry + fish + piggery + goatry + azolla resulted in net income of Rs 1,56,600.

Coimbatore (Tamil Nadu) : Activities were carried out at Sembukkarai and Dhoomanur villages of Periyanaickenpalayam block of Coimbatore district. A total of 45 farm households were covered under the programme and total area works out to 46 ha. Assets worth of Rs. 44,488 was created for each household. As a result of replacement of local varieties with improved varieties and timely farm operation in the cluster by supply of need-based inputs and tools/ implements, the mean yield level of all crops increased by 15.6% in the cluster. The interventions also ensured nutritional security due to the supply of vegetable seeds and poultry birds. Knowledge level also increased due to capacity building programmes and exposure visits. Sheep and poultry components have been integrated and it is expected to give additional income of Rs 19,950/household in 7 months (Rs.14700 from sheep +Rs.5250 from poultry).

Kolar (Karnataka) : Interventions were undertaken in IFS perspective by integrating 275 honey bee

boxes and 20 honey extractors to 275 tribal families for effective demonstration of honey bee rearing in the cluster. Integrated 4750 Swarnadhara poultry chicks along with scientific and modern poultry rearing equipment's and 1850 kgs of poultry feed. The eggs of swarnadhara chicks have been utilized for family consumption. Also integrated 146 sheep of improved breed in the cluster. Provided training on improved honey bee rearing and honey extraction techniques and established market linkage for honey. The division of honey bee colonies is fetching Rs. 1500 per colony and natural honey extracted by them (organic honey as it is devoid of any pesticides) is fetching very good market price of Rs.250 to 300/kg of honey. This has resulted in livelihood improvement to greater extent.

Port Blair (A&N Islands) : Six tuhets (Kinmai, Kimios, Small Lapathy, Big Lapathy, Kinyuka and Sawai) in Carnicobar and 1 village (Harminder bay) in Little Andaman were covered. A total 45 tribal households through IFS and 500 no's by input distribution was made. Increased consumption of vegetables, fruits and greens, egg and meat was observed due to on farm production. Four trainings such as backyard poultry farming, pig management, natural resource management and organic farming, 2 field days and 1 scientist-farmer interaction were organized.

Nainital (Uttarakhand) : New cluster work initiated from August 2017. Study area encompasses the tribal farming systems of Tarai and Bhabhar Zone of Uttarakhand. The total sample comprises of a clustered sample of 100 tribal farm households using purposive sampling frame in Ramnagar block. In the study area three farming systems namely crop (rice -wheat) + livestock (80% households), crop (rice-wheat/mustard/lentil) + livestock (10% households) and crop (rice-wheat) + vegetables (potato/onion/turmeric) + livestock (10% households) were found.

Jammu (J&K) : Programme is operated in the village Meencarka and Badikhad of Samba district of Jammu region. About 100 farmers were selected in three cluster viz. meencharka, khatana and badikhad having average holding of 0.57, 0.41 and 0.48 ha respectively and the area is under rainfed. Five farming systems namely crop +dairy, crop +dairy +goat, crop +goat and crop only were identified. Major cropping system is maize-wheat. High yielding maize (Kanchan) and wheat (PBW644 & PBW 175), more than 800 plants of mango, guava, lemon and kinnow, 1500 chicks of vanaraja have been integrated with the existing tribal farming systems for improving productivity. Poultry enterprise with 1200 birds have been

started by two unemployed tribal youth who have realized net profit of Rs 26,000 per lot in 32-38 days.

Palampur (Himachal Pradesh) : Four farming systems such as field crops + dairy, field crops + dairy + horticulture, field crops + dairy + goat/sheep and field crops + dairy + goat /sheep+ horticulture were found in the clusters among which 39 % household were practicing field crops + dairy + goat/sheep followed by 28 % households practicing field crops + dairy + goat /sheep+ horticulture. Constraint based critical interventions were initiated. A total of 3 training programmes were also organized through which 75 farmers were trained.



Distribution of seeds in Nainital district (Uttarakhand)



Poultry intervention in BR Hills (Karnataka)



Apiary intervention in BR Hills (Karnataka)





Scientific cultivation of vegetables and poultry intervention in Bali Island (West Bengal)



Fish cum duckery and vermicompost in Kanker (Chhattisgarh)



Community nursery at Kanker (Chhattisgarh)



Vegetable production under Homestead integrated farming systems with water harvesting at Carnicobar (A&N Islands)



Coconut dehusker to reduce drudgery at Carnicobar (A&N Islands)

8

GENERAL/
MISCELLANEOUS

8.1 LIST OF PUBLICATION

8.1.1 RESEARCH PAPERS

Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
A & N ISLANDS, PORTBLAIR				
T.P.Swarnam, A.Velmurugan, Sanjay Kumar Pandey and S. Dam Roy (2016).	Enhancing nutrient recovery and compost maturity of coconut husk by vermi-composting technology.	<i>Bioresource Technology</i> ,	207:76-84.	11.65
A.Velmurugan, T.P.Swarnam, S.K.Ambast and Navneet Kumar (2016).	Managing waterlogging and soil salinity with a permanent raised bed and furrow system in coastal lowlands of humid tropics.	<i>Agricultural Water management</i>	168:56-67.	8.85
T.P.Swarnam, .Velmurugan, T.Subramani, M.S.Kundu, R.Kirubasankar, Awnindra K. Singh, I. Jaisankar and S.Dam Roy (2016).	Agrobiodiversity management in integrated farming system for food and nutritional security.	<i>Vegetos</i>		4.0
Velmurugan, A., Jaisankar, I. and Swarnam, T.P. (2017).	Imparting climate resilience to island farming system through bio shield	<i>Journal of the Andaman Science Association</i>	22(1):35-43	3.94
Swarnam, T.P., Velmurugan, A., Ravisankar, N., Jaisankar, I. and Singh, A.K. (2017).	Environmental change resilience in agriculture through farm diversification	<i>Trends in Biosciences</i>	10(48):9641-9645.	3.68
Swarnam, T.P., Ravisankar, N., Velmurugan, A., Jaisankar, I., Ajit Waman and Panwar, A.S. (2017)	Cultivation of horticultural crops pays	<i>Indian Horticulture, Special Issue, Sep-Oct. 28-32.</i>	-	2.86
AAU, JORHAT				
Baishya, A., Gogoi, Bhabesh, Hazarika, J., Hazarika, J.P., Bora, A.S., Das, A.K., Borah, M. and Sutradhar, P. 2017.	Comparative assessment of organic, inorganic and integrated management practices in rice (<i>Oryza sativa</i>)-based cropping system in acid soil of Assam	<i>Indian Journal of Agronomy</i>	62(2):118-126	5.46
Baishya, A., Sutradhar, P., Borah, M., Gogoi, Bhabesh, Hazarika, J., Bora, A.S., Borah, B. and Ekka, S. 2017.	Impact of Scientific Interventions into Existing Farming Systems on Productivity, Soil Properties and Income Enhancement of Tribal Farmers of Jorhat District of Assam	<i>Indian Journal of Ecology</i>	44(4): 813-820	4.96

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Baishya, A., Gogoi, Bhabesh, Bora, A.S., Hazarika, J., Borah, M., Das, A.K., and Sutradhar, P. 2017	Soil fertility and on-farm crop response to NPK and Zn fertilization in rice-rice cropping sequence of Lower Brahmaputra Valley Zone of Assam.	<i>Agricultural Science Digest</i>	37(2):87-93	4.21
ANGRAU, MARUTERU				
Srinivas M., Kumari MBGS, Anusha B. , Srinivas,Ch.and Satyanarayana PV	Response of machine transplanted rice to different levels of nutrients under coastal irrigated ecosystem	<i>Journal of Rice Research</i>	Vol. 9 (2) : 55-58	3.22
G. Lakshmi Bhavani, Ch. Pulla Rao, M. Srinivas and Prasad PRK	Effect of N, P and K application on yield and nutrient uptake of machine transplanted rice	<i>The Andhra Agricultural Journal</i>	Vol. 64 (3): 511-514	4.14
M. Srinivas, KLY Tejaswini, I. Sudheer kumar and PV Ramanarao	Sustainable agriculture -A way to sustain life	<i>International Journal of Multidisciplinary advanced experimental Research</i>	Vol. 3, Issue II (2). Pp: 90 -101	--
KLY Tejaswini, Srinivas Manukonda and PV Ramana Rao	Intercropping – Objectives, principles, advantages and disadvantages	<i>International Journal of Multidisciplinary advanced experimental Research</i>	Volume 3, Issue II (2). Page No: 75-84	--
R. Saitha and M. Srinivas	On-farm evaluation of low input rice production system under tankfed system	<i>International Journal of Farm Sciences</i>	Vol. 7(2): 94-96	4.01
BAU, SABOUR				
Prashant Kumar, Sanjay Kumar, M. Ghosh, K. Sar, R. Kumar, S.K. Dutta and Vivek (2017)	Performance of rice under various establishment methods and different cropping system in Indo-Gangetic plains	<i>International journal of Pure and applied Bioscience.</i>	Vol. 5(5)	5.40
S. Tyagi, Sanjay Kumar, M.K. Singh and S.Kumar (2017)	System of root intensification in mustard: climate change mitigation and climate resilience strategy	<i>Indian J. of Ecology</i>	(44) (Special issue 4)	4.96
R. Kumar, S. Shambhavi, K. Beura, Sanjay Kuamr and Ravi Gopal Singh (2017)	Soil microbial budgeting as influenced by contrasting tillage and crop diversification under rice based cropping systems in Inceptisol of Bihar	<i>Journal of pure and applied microbiology ,</i>	Vol. 11 (1) 539-547	4.00

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
D.K.Mahto, R.P.Sharma, S.K. Chaudhry, S.K.Yadav&Vikas Kumar (2017)	Effect of balance nutrition on productivity, soil fertility and economics of rice (Orizasativa L.) Maize (Zea mays L.) cropping system under kosi zone of Bihar	<i>Research Journal of Chemical and Environmental Sciences</i>	Vol.5 (5) October	4.64
S. K. Chaudhary, S. K. Yadav, D. K. Mahto, R. P. Sharma and Mahesh Kumar (2018)	Response of Growth, Yield Attributes and Yield of Cabbage (Brassica oleracea var. capitata) to Different Organic and Inorganic Sources of Nutrients in Magadha Plain of Bihar	<i>International Journal of Current Microbiology and Applied Sciences</i>	ISSN: 2319-7706 Special Issue-7 pp. 4748-4756	5.38
D. K. Mahto, S. K. Chaudhary, S. K. Yadav, Vikash Kumar, R. P. Sharma and Mahender Pal (2018)	Response of Nitrogen, Phosphorus, Potassium and Zinc Nutrition on Rice (Oryzasativa L.) – Maize (Zea mays L.) Cropping System	<i>International Journal of Current Microbiology and Applied Sciences</i>	ISSN: 2319-7706 Special Issue-7 pp. 5182-5188	5.38
Santosh Kumar Chaudhary, Sushil Kumar Yadav, Dilip Kumar Mahto and NehaSinha (2018)	Effect of diversification and intensification of ricewheat cropping system on weed dynamics in different vegetable based crop sequences in Nalanda District of South Bihar	<i>Journal of Pharmacognosy and Phytochemistry</i>	SP1: 3258-3260	5.21
D.K.Mahto, SK Chaudhary, SK Yadav, Vikash Kumar, RP Sharma (2018)	On farm crop response to plant nutrients in rice-maize cropping system	<i>Journal of Pharmacognosy and Phytochemistry</i>	SP1: 3261-3264	5.21
ICAR-PATNA				
Kumar Sanjeev, Shivani, Mishra J S, Kumar Santosh, Kumar Ujjwal and Bharti R C. 2018.	Efficacy of pre- and post-emergence herbicides on complex weed flora in direct-seeded rice (Oryza sativa) in the eastern plains.	<i>Indian Journal of Agricultural Sciences</i>	88 (3): 387-92.	6.22
Kumar Sanjeev, Shivani, Kumar Santosh, Mondal S., Singh S. S. and Singh K. M. 2017.	Economics and yield response in rice (Oryza sativa)–wheat (Triticum aestivum) cropping system as influenced by different tillage and sowing methods in Eastern Region	<i>Indian Journal of Agronomy</i>	62(4): 394-400	5.46
Kumar Sanjeev, Shivani, B.P. Bhatt and Abhay Kumar. 2018.	Enhancement in livelihood of resource poor farmers through Integrated Farming Systems in the eastern region.	<i>Multilogic in Science</i>	8: Special Issue (D): 111-114	5.20

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Kumar Sanjeev, Shivani, Samal S K, Dwivedi S K, Manibhushan. 2017.	Enhancement in productivity and income sustainability through Integrated Farming system approaches for small and marginal farmers of Eastern India	<i>Journal of AgriSearch</i>	4(2): 85- 91	4.41
Dwivedi, S.K., Basu Sahana, Kumar Santosh, Kumar Gautam, Ved Prakash, Kumar Sanjeev, Mishra, J.S., Bhatt, B.P., Malviya, N., Singh, G.P. and Arora, A. 2017.	Heat stress induced impairment of starch mobilization regulates pollen viability and grain yield in wheat: Study in Eastern Indo-Gangetic Plains	<i>Field Crops Research</i>	206: 106-114	9.03
IGKV, RAIPUR				
Kumar, Sunil, Bhambri, M.C., Porte, S.S., Kanwar, P.C., Sahu, P.L. and Navrang, S. (2016)	Integrated farming system is an utmost elementary tools for fulfilment of socio-economic conditions of small and marginal farmers	A review. Progressive Research – An international journal.	Vol. 11 (special - II): 1049-1053.	3.84
Banjara, T. R., Pali, G. P. Shrivastava, G. K., Chitle, S. and Kumar, Sunil	Effect of tillage practices on productivity potential, economics and energetic of rabi crops in rice-based cropping system.	<i>Green Farming ISSN 0974-0775</i>	Vol. 7 (4) : 864-868	4.79
Jha, S.K., Singh, A.P., Pandey, N and Kumar, Sunil. 2016	Effect of different seed rates and weed management practices on economics of broadcast direct seeded rice in Chhattisgarh.	<i>Journal of Agriculture Issues ISSN 0971-3395</i>	21 (1): 38-42.	3.14
Chitle, S., Pali, G.P. Kumar, Sunil, Singh, A.K. and Ekka, N. 2016.	Effect of nutrient management in soybean (Glycine max) based cropping system in Vertisols.	<i>Journal of Agriculture Issues ISSN 0971-3395</i>	21 (2): 15-18	3.14
Chandrakar, C.K. Shrivastava G.K., D. Sharma, S.K. Dwivedi, K.K. Pandey and A.K. Thakur	Effect of different agro-techniques on weed control efficiency, yield and nutrient uptake in potato crop	<i>Research in Environment and Life Sciences</i>	1373 November, 2016	3.74
SDAU, S K NAGAR				
A. K. Saini, P.K. Patel and K.M. Patel (2017)	Impact assessment of diversified source of plant nutrition and management practices on sustainability and profitability of potato crop	<i>Trends in Biosciences</i>	10(2), pp. 884-888	3.94

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
A.M. Patel, P.K. Patel, A.K. Saini and K.M. Pate(2017)	Management of cropping systems for resource conservation	<i>Green Farming</i>	8 (4), 962-965	4.38
A.M. Patel, P.K. Patel, A.K. Saini and K.M. Patel(2017)	Long term integrated nutrient management in pearl millet – wheat cropping system under North Gujarat Agro-Climatic Region	<i>Trends in Biosciences</i>	10(24), pp. 5155-5157	3.94
Jitendra Singh, A.M. Patel, B.S. Rathore, Shaukat Ali and B.L. Yadav (2017)	Nutrient uptake and physico-chemical properties of soil as influenced by Bt cotton (<i>Gossypium hirsutum</i> L.) based cropping systems under different spacings	<i>Advance Research Journal of Crop Improvement</i>	7(2), pp. 180-186	3.86
R. D. Bedse, A. M. Patel, C. H. Raval, B. S. Rathore AND K. G. Vyas	Forage equivalent yield, quality, soil status and economics of maize (<i>Zea mays</i> L.) as influenced by intercropping of cowpea (<i>Vigna unguiculata</i> L.) and fertility levels during kharif season	<i>Res. on Crops</i>	16 (2) : 236-242 (2015)	4.75
R.D. Bedse, A.M. Patel, C.H. Raval and K.G. Vyas	Yield, quality and economics of forage maize (<i>Zea mays</i> L.) as influenced by intercropping of cowpea (<i>Vigna unguiculata</i> L.) and fertility levels during kharif season	<i>Green Farming</i>	6(5)): 1046-1050 (2017)	4.38
Shaukat Ali, A.M.Patel, Jitendra Singh and B.L. Yadav, B.L	Influence of resource conservation techniques on organic carbon and physico-chemical properties of soil	<i>Green Farming</i>	7(2)), 316-321 (2017)	4.38
Shaukat Ali, A.M.Patel, J.C. Patel, Jitendra Singh and B.L. Yadav	Effect of resource conservation techniques on soil fertility and nutrients uptake	<i>Trends in Biosciences</i>	8(13), 3406-3412, (2017)	3.94
A.M. Patel, P.K. Patel, A.K. Saini and K.M. Patel	Sustainability of farm and farmers through eco-friendly IFS approach.	<i>Indian Agriculturist</i>	60 (1&2), pp. 15-19 (2017)	4.11
B. L.Yadav, A. M. Patel, B. S. Patel, Shaukat Ali and Jitendra Singh	Quality and soil fertility as influenced by different row spacing and intercropping systems in Rabi fennel (<i>Foeniculum vulgare</i> Mill.)	<i>Advance Research Journal of Crop Improvement</i>	8(1)), pp. 75-79 (2017)	3.86

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
J. Singh, B. S. Patel, G. N. Patel and S. Ali	Studies on inter/mix cropping systems of Mustard [Brassica juncea (L.) Czern & Coss] + Lucerne (Medicago sativa) under agro climatic conditions of Northern Gujarat	<i>Journal of Oilseeds Research</i>	29 (1), 106-108 (2017)	5.02
R.R.Patel, S.P.Pandya & P.K.Patel	Characterization of Farming System in North west Agro Climatic zone of Gujarat State.	<i>Gujarat Journal of Extension Education</i>	27(2),2016, PP.206-208	3.86
D.B.Patel, S.P.Pandya & R.R.Patel	Association Between Socio-Personal Characteristics and Knowledge, Attitudes of Farmers towards wheat cultivation	<i>International Journal of Agricultural Sciences</i>	8(22),2016, PP.1423-25	4.20
Patel R.R., P.K.Patel, Patel R.M. and Patel A.S	Characterization of Farming System in South Gujarat Agro Climatic zone of Gujarat State,	<i>International Research Journal of Agricultural Economics & Statistics</i>	8(1), 2017 PP.117-120	4.24
JAU, JUNAGADH				
R.M. Solanki, M.S. Vasava and B.S. Gohil (2017).	Influence of drip irrigation and fertility levels on growth, yield and water use efficiency of drilled rabi fennel (<i>Foeniculum vulgare</i> Mill.)	<i>International Journal of Science, Environment and Technology</i>	Vol. 6, No 3, 2017, 1972 – 1978 2277-663X	
NAU, NAVSARI				
Desai, L.J., Thanki, J.D. Gudadhe, N.N. and Pankhaniya, R.M. 2016.	Sustainable productivity and profitability of diversified rice-based cropping systems under south Gujarat condition	<i>International Journal of Science, Environment and Technology</i>	5(3):1100–1107.	3.98
HAU HISAR				
Kumar, Amit, Kumar, Pawan, Kumar, Mukesh and Kumar, Naresh	Impact of Various Sources of Nutrients on Yield and Yield Attributes of Pearl millet (<i>Pennisetum glaucum</i> L.)-Wheat (<i>Triticum aestivum</i> L.) Cropping System	<i>Int. Arch. App. Sci. Technol.</i>	8(3): 61-66, 2017	4.45

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Kumar, Amit, Kumar, Pawan, Kumar, Mukesh and Kumar, Naresh	Sustaining Productivity, Available Nutrient and Microbial Status of Soil through INM in Pearlmillet (<i>Pennisetum glaucum</i> L.) -Wheat (<i>Triticum aestivum</i> L.) Cropping System	<i>Int. J. Pure & App. Biosci.</i>	5(5): 1150-1155(2017)	4.74
Babli, Malik, Priti, Kumar, Pawan and Singh, Ajay	Influence of Various Nutrient Sources on Nutrient Content Uptake of Wheat in Pearlmillet - Wheat Cropping Sequence	<i>Int. J. Pure & App. Biosci.</i>	5(4): 2165-2168 (2017)	4.74
Babli, Kumar, Pawan and Nanwal, R. K.	Canopy temperature, excised leaf water retention, productivity and quality of wheat as affected by various nutrient sources in Pearl millet-wheat cropping system	<i>Journal of Applied and Natural Science</i>	9(2): 846 - 850 (2017)	3.73
Babli and Kumar, P.	Productivity and Economics of wheat in Pearl millet-wheat cropping system.	<i>Indian Journal of Ecology</i>	44(4), 105-108 (2017)	4.96
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SK Sharma, SC Negi SS Rana, Rajju Priya Soni and Mittu Katoch 2017.	Evaluation of maize-based cropping sequences on cultivators fields in low hills subtropical zone of Himachal Pradesh.	<i>Green Farming</i>	8(4): 877-881	4.38
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OUAT,BHUBANESWAR				
K N Mishra, A K Patra, L M Garnayak, A K Mohanty, S K Swain	Long term effects of integrated nutrient management on productivity and soil properties of rice (<i>Oryza</i> <i>sativa</i>)–rice cropping system in coastal Odisha.	<i>Indian Journal of Agronomy</i>	62(3): 239-246 (2017)	5.46
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D.V. Mali, V. K.Kharche, S. D. Jadhao, P. W. Deshmukh, B. V. Saoji, P. V. Mohod	Soil physical properties under long term use of organic in conjunction with chemical fertilizers in sorghum-wheat cropping sequence in Inception	<i>J. Agric. Res. & Tech. Jan., 2016</i>	41(1): 12-17	4.18

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MAU, PARBHANI				
W. N. Narkhede, R. N. Khandare 2016	Evaluation of organic and integrated nutrient management on productivity, economics and soil health in soybean (Glycine max) Onion (Allium cepa cropping) sequence	<i>Indian Journal of Ecology</i>	vol. 43 (Special issue-1) 404-409	4.96
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MPKV, RAHURI				
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R. P. Andhale, M. B. Dhonde, A. B. Dhage, B. G. Rathod, S. R. Patil, V. S. Patil A. D. Tambe	Long-term Effect of Integrated Nutrient Management on Productivity and Soil fertility In Sorghum- Wheat Cropping System	<i>J. Agric. Res. Technol.</i>	2017, 42(3): 191-196	4.39
Pinjari S. S., Gangawane S. B., Mhaskar N. V., Chavan S. A., Mahadkar U. V. and Rajemahadik V. A. (2016).	"Management of weed flora with herbicides in direct seeded rice under lateritic soils".	<i>"Indian J. weed Science"</i>	48(4) Pp 364-368.	
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R.K. Sonawae, L.S. Chavan and U.V. Mahadkar (2017)	Effect of integrated nutrient management on uptake of major nutrients and protein content by Pigeonpea (<i>Cajanus cajan</i> L. Millsp.).	<i>Multilogic in Science.</i>	6(19) : 134-138.	
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S. M. Sawant, S. B. Bhagat and A. V. Dahiphale (2016)	Effect of different nitrogen levels on yield, nutrient uptake and quality parameters of fodder oat varieties under lateritic soil of Konkan region	<i>Progressive Research</i>	11(6):3786-3789	
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PAU, LUDHIANA				
Kumar R, Singh D, Walia S S and Singh R	Strategies for accelerated adoption of improved farm technologies and allied enterprises for income enhancement	<i>Indian Journal of Economics and Development</i>	12 (1a): 519-524 (2016)	4.82
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Rajni, Singh S and Walia S S	Productivity and economics of improved interventions in existing farming system modules of Punjab	<i>Indian Journal of Extension Education</i>	52(1&2): 117-120 (2016)	5.32
Sandhu P S and Walia S S	Role of integrated nutrient management in resilience performance of rice in central Punjab	<i>The Ecoscan</i>	10(1&2): 259-263 (2016)	4.65

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Sandhu P S and Walia S S	Weed dynamics in rice-wheat cropping system under long term integrated nutrient management experiment	<i>Ecology, Environment and Conservation</i>	22(September suppl): S73-S77 (2016)	4.89
Singh A, Walia S S, Kumar R and Brar A S	Growth and productivity of Turmeric (<i>Curcuma longa</i> L.) as influenced by different types of planting material and growth regulators	<i>Indian Journal of Ecology</i>	43(2): 593-595 (2016)	4.86
Singh G, Walia S S and Singh Sompal	Interactive effects of organic and inorganic sources of nutrition on growth of baby corn and post harvest soil properties.	<i>Agricultural Research Journal</i>	53(1): 121-123 (2016)	4.71
Singh G, Walia S S, Gill R S and Saini K S	Influence of integrated nutrient management of baby corn (<i>Zea mays</i> L.) on soil health	<i>Journal of Soils and Crops</i>	26(1): 21-24 (2016)	4.46
Walia S S, Aulakh C S, Gill R S, Dhawan V and Kaur J	Intensive integrated farming system approach- A vaccination to cure agrarian crisis in the Punjab.	<i>Indian Journal of Economics and Development</i>	12 (1a): 451-455 (2016)	4.82
Walia S S, Chopra S and Singh J	Effect of different seed rates, weed control methods and irrigation intervals on growth, yield and water productivity of direct seeded rice (<i>Oryza sativa</i>) under irrigated conditions of Punjab	<i>Indian Journal of Ecology</i>	43(S-1): 140-143 (2016)	4.96
Kaur J, Gosal S K and Walia S S	Correlation of methanotrophs and soil enzymes with available nutrients in long term green manured rice rhizospheric soil	<i>Microbiology Research Journal International</i>	19(1): 1-10 (2017)	
Todar Mal, Walia S S and Kaur A	Evaluation of grain quality of maize, rice and wheat under different tillage, mulching and fertilizer management practices	<i>Chemical Science Review and Letters</i>	6 (21): 88-93 (2017)	5.21
Walia S S, Aulakh C S, Dhawan V and Kaur J	Bio-intensive complementary cropping systems to revitalize sustainability and profitability in Punjab agriculture	<i>Indian Journal of Economics and Development</i>	13 (2a): 392-396 (2017)	4.82

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Singh Satpal, Rajni and Walia S S	Evaluation and analysis of gaps in adoption of improved pulse production technology in Punjab	<i>Indian Research Journal of Extension Education</i>	17(2): 69-72 (2017)	4.81
Kaur H, Gosal S K and Walia S S	Synergistic effect of organic, inorganic and biofertilizers on soil microbial activities in rhizospheric soil of green pea	<i>Annual Research & Review in Biology</i>	12(4):1-11 (2017)	4.79
Aulakh C S, Kaur P, Walia S S, Gill R S, Sharma S and Buttar G S	Productivity and quality of basmati rice (<i>Oryza sativa</i>) in relation to nitrogen management	<i>Indian Journal of Agronomy</i>	61(4): 467-473 (2016)	5.46
Walia S S and Dhawan V	Effect of Inoculation with <i>Penicillium Bilaii</i> on Maize (<i>Zea mays</i>) and Rice (<i>Oryza sativa</i>).	<i>Indian Journal of Ecology</i>	44 (Special issue-5): 578-581 (2017)	4.96
Talwar D, Singh Kulbir and Walia S S	Influence of Biofertilizers on Microbial Count and Nutrient uptake of kharif onion (<i>Allium cepa</i> L.)	<i>International Journal of Agriculture, Environment and Biotechnology</i>	10(3): 289-294 (2017)	4.69
Kumar R, Kumar J, Brar A S, Walia S S and Gill B S	Effect of straw mulch and integrated nitrogen management on yield and quality of turmeric under North Indian plains	<i>Indian Journal of Horticulture</i>	74(2): 240-244 (2017)	6.15
Singh Balwinder, Aulakh C S and Walia S S 2017.	Productivity and water use of organic wheat–chickpea intercropping system under limited moisture conditions in Northwest India	<i>Renewable Agriculture and Food Systems</i>	doi:10.1017/S1742170517000370: 1-10	7.33
Brar A, Gosal S K and Walia S S	Effect of biofertilizer and farmyard manure on microbial dynamics and soil health in maize (<i>Zea mays</i> L.) rhizosphere	<i>Chemical Science Review and Letters</i>	6 (23): 1524-1529 (2017)	5.21
Singh G, Walia S S and Singh Sompal	Effect of integrated nutrient management on Agro climatic environment and yield of baby corn (<i>Zea mays</i> L.) in northwestern India	<i>Journal of Agro-meteorology</i>	19 (4): 355-358 (2017)	6.40

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Singh G, Walia S S and Kumar B	Agronomic and genetic approaches to improve nutrient use efficiency and its availability in baby corn (<i>Zea mays</i> L.).	<i>Frontiers in Crop Improvement</i>	Acceptance letter No. 2017 dated 09-07-2017	3.62
Singh D, Kumar R, Walia S S, Brar A S and Singh R	Productivity and economics of turmeric (<i>Curcuma longa</i> L.) in response to nitrogen applied through different sources in conjunction with bio-fertilizer consortium	<i>Journal of Applied and Natural Science</i>	9 (1):497-501 (2017)	4.84
Singh G and Walia S S (2017)	Effect of integrated nutrient management on micro-climatic environment, quality and yield of baby corn (<i>Zea mays</i> L.)	<i>Indian Journal of Agronomy</i>	Acceptance letter No. ISA/2017 dated 26-9-2017	5.46
Todar Mal, Walia S S and Saini K S	Productivity and economics of different cropping systems in relation to tillage, mulching and fertilizer management practices in North-Western Indo-Gangetic Plains of India	<i>Indian Journal of Agricultural Sciences</i>	Acceptance letter No. 2017 dated 20-10-2017	6.22
AU, KOTA				
Jat, H.S., Jat, R.K., Singh, Y., Parihar, C.M., Jat, S.L., Tatarwal, J.P., Sidhu, H.S. and Jat, M.L.	Nitrogen management under conservation agriculture in cereal-based systems	<i>Indian Journal of Fertilizers</i>	12 (4): 76-91 (2016)	2.80
Meena, B.S., Tatarwal, J.P., Meena, D.S. and Singh, Pratap.	On farm wheat (<i>Triticum aestivum</i>) productivity, profitability and soil health as influenced by different sowing and nutrient management practices in vertisols of south-eastern Rajasthan	<i>Annals of Agricultural Research</i>	38 (1): 38-49 (2017)	4.01
MPUAT, UDAIPUR				
Hari Singh, S.S. Burark, G.L. Meena, Bharat Bhusan and Kamlesh Kumar	Constraints faced by the household in existing farming system in Chittorgarh and Banswara districts of southern Rajasthan	<i>Journal of Animal Research</i>	6: 1-5 (229-233)	5.68

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
N K Jain, Hari Singh, L N Dashora and S L Mundra	Diversification and intensification of maize-wheat cropping system for sustainable productivity and profitability.	<i>Indian Journal of Agronomy.</i>	60(1): 38-44	5.46
N K Jain, Hari Singh, L N Dashora and S L Mundra	Maize (Zea mays) –wheat (Triticum aestivum) cropping system: Intensification through introduction of pulses.	<i>Indian Journal of Agronomy</i>	60(3): 347-351.	5.46
Singh Hari and Burark, S.S	Income and Employment Generation Under Existing Farming Systems in tribal Dominated Banswara Districts of Southern Rajasthan.	<i>Economic Affairs</i>	vol.61(1) pp.119-125	4.82
Hari Singh, S.S. Burark, S.K. Sharma, D.K. Jajoria and R.P. Sharma	Economic Evaluation of Farming Systems for Agricultural Production in Southern Rajasthan.	<i>Economic Affairs</i>	Vol. 62, No. 1, pp.47-53	4.82
N.K. Jain, Hari Singh and L.N. Dashora	On–farm response of maize – wheat cropping system to fertilizer NPK input.	<i>Research on crops</i>	13(2): 475-480.	4.75
Jain, N K and Hari Singh	Productivity and energy budget of Maize (Zea mays)- Wheat (Triticum aestivum)cropping system as influenced by NPK fertilization.	<i>Current Advances in Agricultural Sciences</i>	5(2) 193-196	4.69
Singh, Hari, Burark, S.S., Pant, D.C., Jain, H.K. and Choudhary J. L.	Economics of Existing Farming Systems in Banswara district of Southern Rajasthan.	<i>J. Agric. Res. Technol.</i>	40(2):299-305	4.18
N.K. Jain and Hari Singh	On –farm Performance of Fenugreek (Trigonella foenum - graecum) Genotypes to various Fertility Levels	<i>Annals of Agri-Research</i>	19 (2):222-223	4.01
Jain, N K and Hari Singh	Sustainable production of Maize (Zea mays)- Wheat (Triticum aestivum)cropping system through agronomic management.	<i>Progressive Research</i>	: pp 250- 252.	3.84
N.K. Jain and Hari Singh	Production Potential and Sustainability of Maize (Zea mays) – Wheat (Triticum aestivum) Cropping System as Influenced by Balanced fertilization.	<i>Progressive Research</i>	9(1):74-77	3.84

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Singh, Hari, Sharma, S.K., Dashora, L.N., Jajoria, D.	Economics of farming systems in South-East Rajasthan	<i>Ind. J. Extn. Educ & R.D.</i>	22:98-102.	3.24
Hari Singh,, S.K. Sharma, L.N. Dashora, S.S. Burark and G. L. Meena	Characterization and Economics of Farming Systems in South Rajasthan	<i>Annals of Arid Zone</i>	52(1): 67-70	3.02
PJTSAU, RAJENDRANAGAR				
Ranjith. M., Sridevi. S., Ramana. M.V and Chandrasekhar Rao. P2016	Physico- chemical properties, Nutrient status and soil enzyme activity of Bt cotton growing soils of Warangal District.	<i>Advances in Life Sciences,</i>	5(20): 9408-9414	3.15
Prasadini. P.P, Sridevi. S and Anusha, S.V2016	Nutrient removal and soil fertility status on application of organic sources to Tomato	<i>Journal of Research ANGRAU</i>	44 (3&4): 153-156	3.60
Sunitha Rani. M., Sridevi. S., Padmaja. G. and Ramulu. V. 2016	Effect of monocropping of Bt cotton on soil physical, chemical and biological properties.	<i>Advances in Life Sciences</i>	5(21): 10101-3.1510107	3.15
Mahendar, B., Goverdhan. M., Sridevi, S and Ramana .M.V2017	Influence of iron and zinc management on drymatter production and nutrient removal by rice (<i>Oryza sativa</i> .L) and soil fertility status under aerobic cultivation.	<i>Chemical Science Review and Letters.</i>	6 (24) : 2627-2635	5.21
Madhu, M., Ramana, M. V and Sridevi, S. 2017	Economics of zero-tilled rabi castor (<i>Ricinus communis</i> L.) under the influence of different preceding crops.	<i>Indian Journal of Dryland Agricultural Research and Development</i>	32 (2): 13-17.	4.58
Spandana Bhatt.P., Yakadri.M., Madhavi.M., Sridevi, S. and Rani.P. L2017	Productivity of Transplanted Rice as influenced by herbicide combinations.	<i>Indian Journal of Weed Science.</i>	49(2) : 128-131	5.17
Madhu. M., Venkata Ramana. M and Sridevi .S2017	Performance of rabi castor (<i>Ricinus communis</i> L) under zero tilled conditions after different preceding crops.	<i>Indian Journal of Dryland Agriculture and Development</i>	32(1): 71-74.	4.58

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Chowdary, K. A., Umadevi, M., Bharath, T. and Sridevi, S. 2017	Leaf area index and quality of Sorghum influenced by irrigation under poor quality water with different management practices	<i>Research in Environment and Life Sciences</i>	10 (5): 476-479	3.74
Spandana Bhatt. P, Yakadri. M., Madhavi. M., Sridevi. S and Rani, P. L. 2017	Efficacy of herbicides on the soil microflora during the crop growth of transplanted rice.	<i>International Journal of Agricultural Science and Research.</i>	7(3): 163-172	4.13
Sunitha Rani. M, Sridevi, S, Padmaja. G, Praveen Kumar. Y and Ramulu. V. 2017	Response of Bt cotton and changes in soil properties under different fertilizer management practices in rainfed black soils.	<i>Green Farming (An International Journal)</i>	8(1): 87-92.	4.38
Madhu. M., Venkata Ramana. M and Sridevi .S2017	Influence of different preceding crops and N levels on productivity and profitability of zero till rabi castor (<i>Ricinus communis</i> L.)	<i>Journal of Oilseeds Research</i>	34(3):137-140	5.02
M.Goverdhan Md.Lateef Pasha2018	Effect of different levels of Nitrogen and seed rates on growth and yield of non traditional crop wheat (<i>Triticum aestivum</i>) in Telangana	<i>International Journal of Chemical studies</i>	14(1):158-162	5.31
Md.Latheef pashal and P.Raghu ramireddy 2016	Performance of Kharif Rice (<i>Oryza sativa</i> L) under Different Nursery Densities and Plant Population	<i>International Journal of Bio-resource and Stress Management,</i>	7(1) 60-65.	4.65
D.Rakesh, P.Raghu ramireddy and Md.Latheef pasha 2017	Study of aerobic rice under varying fertility levels in relation to Iron application	<i>International JI of current microbiology and applied sciences</i>	6(10):2928-2943	5.38
Goverdhan, M., Latheef Pasha, Md., Sridevi, S and Pragathi kumari, Ch2018.	Integrated Farming approaches for doubling the income of small and marginal farmers.	<i>International Journal of current microbiology and applied sciences</i>	7(3): 3353-3362.	5.38
Latheef Pasha, Md and Raghu Rami Reddy, P. 2018	Effect of different N and P levels on yield, nutrient uptake and N use efficiency of transplanted rice under canal commands of irrigated eco systems.	<i>International Journal of current microbiology and applied sciences</i>	7(3): 1323-1332.	5.38

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Latheef Pasha, Md., Sridevi, S., Goverdhan, M., Raghu Rami Reddy and Pragathi kumari, Ch2018.	Farmers Participatory evaluation on performance of redgram + soy bean intercropping vis-à-vis sole cotton under rainfed medium soils of Telangana.	<i>International Journal of current microbiology and applied sciences.</i>	7(4): 1002-1009.	5.38
Latheef Pasha, Md., Sridevi, S., Ramana, M.V., Raghu Rami Reddy, P and Goverdhan, M. 2018	Influence of balanced fertilization on productivity, economics and soil fertility of rice-rice (<i>Oryza Sativa</i> L.) cropping systems under southern deccan plateau of Telangana.	<i>Journal of crop and weed</i>	14(1): 158-162.	5.28
Mohammed Latheef Pasha and pakanati Raghu Rami Reddy. 2018	Response of rice to different N and P levels under irrigated condition.	<i>Journal of Pharmacognosy and Phyto-chemistry</i>	7(3): 675-678.	5.21
TNAU, COIMBATORE				
K.Sathiya Bama, E. Somasundaram, S.D. Sivakumar K.R. Latha	Soil health and nutrient Budgeting as influenced by different cropping sequences in an Vertisol of Tamil Nadu	<i>International Journal of Chemical Studies</i>	5(5).486-491	5.31
K. Sathiya Bama E. Somasundara K.R. Latha R. Sathya Priya	Soil health and carbon stock as influenced by farming practices in Vertisol of Tamil Nadu	<i>International Journal of Chemical Studies</i>	5(5): 2313-2320	5.31
NDUAT, FAIZABAD				
Alok Kumar and N.B. Singh	Long term nutrient management for enhancing soil quality and productivity of rice-wheat cropping system.	<i>Indian journal of fertilizers</i>	12 (8) 24-29 (2016)	
CSAUAT KANPUR				
Sanjai Chaudhary, Naushad Khan, Uday Pratap Singh, Ram Pyare, Y.K Singh, A.K Sirivastava, V.K.Verma and Gautam Veer Chauhan 2017	Effect of integrated nutrient management on productivity and economics of wheat (<i>Triticum aestivum</i> L.)	<i>Indian Journal of Agronomy</i>	67 (4) : 476-480	5.46
U.S.Tiwari, Karam Husain, Y.K.Singh, Jitendra Singh and A.K.Tripathi 2017	Effect of inorganic, organic and integrated nutrient management on productivity profitability and soil health in maize (<i>Zea mays</i>)-potato (<i>Solanum tuberosum</i>) - onion (<i>Allium cepa</i>) cropping system in central plain zone of Uttar Pradesh	<i>Current Advances in Agricultural Sciences</i>	9 (1) : 55-59	4.69

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
GBPUAT, PANTNAGAR				
AshutoshBarthwal, A.K. Bhardwaj, SumitChaturvedi and T. Pandiaraj	Site specific NPK recommendation in wheat (<i>Triticumaestivum</i>) for sustained crop and soil productivity in Mollisols of Tarairegion.	<i>Indian Journal of Agronomy</i>	58(2): 4-10	5.46
Netam, C.R., Singh, R., Thakur, A.K. and Netam, A.K.	Effect of crop-establishment methods and weed management options on weed dynamics and productivity of rice.	<i>Indian Journal of Agronomy</i>	61(3):326-330	5.46
Rawat, D.; Singh, A.P.; Bhatt, S.C. and Supriya	Impact of resource conservation technologies and fertilizer doses on rice under Mollisols of Uttarakhand	<i>Advances in Life Sciences</i>	5(5): 1652-1657	3.15
S. Sarvade, H. S. Mishra, Rajesh Kaushal, SumitChaturvedi, SalilTewari and T. A. Jadhav	Performance of wheat (<i>Triticumaestivum</i> L.) crop under different spacings of trees and fertility levels	<i>African Journal of Agricultural Sciences</i>	9(9), pp. 866-873	
Singh, A.P.; Singh, R.; Chaturvedi, S. & Singh, V.	Soil fertility and crop productivity under integrated nutrient supply system in a permanent plot experiment	<i>Environment and Ecology</i>	34 (2A): 703-706	4.18
Singh, D.K.; Singh, R.; Singh, G.; Singh, A. P.; Chaturvedi, S. and Rathi, A.	Influence of rice (<i>Oryzasativa</i>)-wheat (<i>Triticumaestivum</i>) system diversification on productivity and profitability under GarhwalHimalyan region	<i>Indian Journal of Agronomy</i>	61 (4): 425-428	5.46
Arora, G., Chaturvedi, S., Kausal, R., Tewari, S.K. and Chaturvedi, O.P.	Growth, Biomass, Carbon Stocks and Sequestration in Age Series <i>Populusdeldoides</i> Plantations.	<i>Turkish Journal of Agriculture and Forestry</i>	38: 550-560	7.29
Bhatt, M.; Singh, A.P. and Yadav, S.K.	Long-term effect of fertilizer application and their substitution practices on soil available N, P and K under the surface and sub-surface layer of soil	<i>International Journal of Tropical Agriculture</i>	34 (7): 2427-2432	3.49
Singh, D.K.; Singh, R.; Singh, G.; Singh, A. P.; Chaturvedi, S.; Singh, J Rathi, A; and. Singh, M.	Diversification of rice (<i>Oryzasativa</i>)-wheat (<i>Triticumaestivum</i>) system and its influence on productivity, profitability and energetic under on-farm situation	<i>Indian Journal of Agronomy</i>	62 (3): 255-259	5.46
Singh, D.K.; Singh, G.; Singh, R.; Singh, A. P.; Chaturvedi, S.; Singh, M.	Himalyas farmer participatory evaluation of balanced application of nutrients in rice (<i>Oryzasativa</i>)-wheat (<i>Triticumaestivum</i>) system in Kumaon hills.	<i>Indian Journal of Agronomy</i>	62 (4): 401-406	5.46

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Singh, A.; Singh S.V. Chaturvedi, S; Singh, R; Singh, A.P.; Dhyani, V.C. and Singh, D.K.	Tillage and nutrient management modules for increased growth and productivity of wheat (<i>riticumaestivum</i> L.)	<i>Journal of Pharmacognosy and Phytochemistry</i>	SP1: 1735-1738	5.21
Chaturvedi, S; Singh, R; Singh, A.P.; Pramanick, B.; Singh, D.K. and Dhyani, V.C.	Establishment and tillage practices affects crop performance, soil properties, energy generation and economics under rice-wheat cropping system in Central Himalayan tarai region	<i>Journal of Pharmacognosy and Phytochemistry</i>	SP1: 1793-1802	5.21
S. Sarvade, H. S. Mishra, Rajesh Kaushal, SumitChaturvedi and SalilTewari.	Wheat (<i>Triticumaestivum</i> L.) Yield and Soil Properties as Influenced by Different Agri-silviculture Systems of Terai Region, Northern India.	<i>International J. of Bioresource and Stress Management</i>	5 (3), 350-355	4.65
T. Pandiaraj, A. K. Bhardwaj and SumitChaturvedi	Energy Budgeting and Economics of Rice Based Cropping System under Resource Conservation Technologies in Foothill of Himalayan Region	<i>Journal of Experimental Agriculture International</i>	18(1): 1-12, 2017	4.38
T Pandiaraj, AK Bhardwaj and SumitChaturvedi	Tillage, mulching and fertility effects on vegetable pea production under conservation agriculture after rice cultivation in Indo-gangetic plains	<i>Journal of Pharmacognosy and Phytochemistry</i>	7(1): 188-193.	5.21
T. Pandiaraj, A. K. Bhardwaj and Sumit Chaturvedi	Effect of Resource Conservation Technologies against Climate Change for Higher Productivity of Summer Greengram (<i>Vignaradiata</i> (L.) Wilczek)	<i>Int. J. Curr. Microbiol .App. Sci</i>	6(4): 789-800	5.38
Singh, R; Pramanick, B.; Singh, A.P.; Chaturvedi, S; Singh, D.K.; Neelam and Singh, G.	Integrated Farming System: A Prospective Approach towards Sustainable Agriculture	<i>International Journal of Tropical Agriculture</i>	36(3): 763-769	3.49
Singh, D.K.; Kumar, P. and Bhardwaj, A.K.	Diversification and intensification of rice-wheat cropping system under Garhwal Himalayas.	<i>Journal Farming Systems Research & Development</i>	18(2):278-284	*
Kumar, P. and Singh, D.K...	Diversification of rice-wheat cropping system and its economics in Garhwal region of Uttarakhand	<i>Journal Farming Systems Research & Development</i>	18(2):328-331	*

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Kumar, P.; Singh, D.K. and Sharma, M.	Response of late sown wheat varieties to different dates of sowing	<i>Journal Farming System Research & Development</i>	18(2):405-408	*
Kumar, P. and Singh, D.K..	Performance of promising urdbean genotypes under organic mode in Garhwal Himalayas.	<i>Pantnagar J. Research</i>	11(2): 309-311.	4.60
Chandra, H.; Aditay, J.P. and Singh, D.K.	Evaluation of wheat genotypes for different morpho-physiological traits at different planting dates in Himalayan foothills.	<i>Progressive Research</i>	8 (Special): 64-68	3.84
Kumar, A. and Singh, D.K.	Studies on seed rate, row spacing and varieties in chickpea under late planting conditions.	<i>Progressive Research</i>	8 (Special): 215-216.	3.84
Kumar, A. and Singh, D.K.	Effect of seed rate, row spacing and variety on growth, yield and nutrient uptake of late sown chickpea.	<i>Progressive Research</i>	8 (Special): 21-24.	3.84
Singh, D.K.; Kumar, P. and Bhardwaj, A.K.	Evaluation of Agronomic Management Practices on Farmers' Fields under Rice-Wheat Cropping System in Northern India.	<i>International Journal of Agronomy.</i>	http://dx.doi.org/10.1155/2014/740656	*
Singh, D.K. and Kumar, P.	Influence of diversification of rice (<i>Oryzasativa</i>) –wheat (<i>Triticumaestivum</i>) system on productivity, energetics and profitability under on-farm conditions.	<i>Indian Journal of Agronomy</i>	59(2):200-203.	5.46
Singh, K., Chandra, H, Singh, D.K., Singh, R. and Kumar, M.	Studies on integrated nutrient management in maize crop	<i>Journal Farming System Research & Development</i>	20(2):137-148	*
Singh, K., Joshi, Y.P., Chandra, H., Singh, D.K., Singh, R. and Kumar, M.	Effect of integrated nutrient management on growth, productivity and quality of sweet sorghum (<i>Sorghum bicolo</i>)	<i>Indian Journal of Agronomy.</i>	60(2):291-296.	5.46
Singh, R., Rekha, Gupta, A., Chaturvedi, S., Singh, A.P. and Singh, D.K. 2015.	Evaluation of metsulfuron methyl 10%+ carfentrazone ethyl 40% 50 DF against broad leaf weeds in wheat	<i>Journal of Environment and Bio-sciences.</i>	29(2):377-381	4.43

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Authors	Title of Paper	Journal	Volume, Number Pages	NAAS rating
Singh, D.K., Singh, G.D., Suresh Ram and Kumar, P. 2015.	Performance and pod borer incidence in gram genotypes under Doon Valley conditions	<i>Journal Farm-ing System Research & Development</i>	21(1):7-11	*
Singh, D.K., Singh, R., Singh, G.D., Singh, A.P., Chaturvedi, S. and Rathi, A	Influence of rice (Oryzasativa) - wheat (Triticumaestivum) system diversification on productivity and profitability under Garhwal Himalayan region.	<i>Indian J Agronomy</i>	61 (4): 425-428.	5.46
Singh, D.K., Singh, G.D., Singh, R., Singh, A.P., Chaturvedi, S., Singh, J., Rathi A. and Singh, M. 2017.	Diversification of rice (Oryzasativa)–wheat (Triticumaestivum) system and its influence on productivity, profitability and energetics under on-farm situation.	<i>Indian Journal of Agronomy</i>	62 (3): 255-259 (sep 2017)	5.46
Singh, D.K., Singh, G.D., Singh, R., Singh, A.P. Chaturvedi, S. and Singh, M.	Himalayas farmer participatory evaluation of balanced application of nutrients in rice (Oryzasativa)–wheat (Triticumaestivum) system in Kumaon hills	<i>Indian Journal of Agronomy</i>	62 (4): 401-406	5.46

8.1.2 : PAPER PRESENTED IN SEMINAR/SYMPOSIA

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8.1.2 PAPER PRESENTED IN SEMINAR/SYMPOSIA

Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
IGKV RAIPUR					
S.S.Porte B.Sachidanand and H.K.Rai	2017	28-29, October	Effect of targeted yield based nutrient application on potassium fractions in a Vertigo under rice-wheat cropping sequence pp. 50-51	National Conference On Managing Soil health for sustainable and Nutritional food Production. Jabalpur	G.K.V. Society Agra (U.P) and J.N.K.V.V. Jabalpur (M.P)
Shyamlal , S.S. Porte and Tarun suryavanshi	2017	28-29, October	Integrated farming systems: An strategy for resource conservation and Environmental sustainability pp 51	National Conference On Managing Soil health for sustainable and Nutritional food Production ,Jabalpur	G.K.V. Society Agra (U.P) and J.N.K.V.V. Jabalpur (M.P)
S.S. Porte Shyamlal , Tarun suryavanshi, G.Jatav and Phoolchand Kanwar	2017	28-29, October	Vermin composting and its role in the integrated nutrient management pp. 52.	National Conference On Managing Soil health for sustainable and Nutritional food Production. Jabalpur	G.K.V. Society Agra (U.P) and J.N.K.V.V. Jabalpur (M.P)
Tarun suryavanshi , Shyamlal, S.S. Porte	2017	28-29, October	Effective irrigation management for wheat crops pp. 52-53	National Conference On Managing Soil health for sustainable and Nutritional food Production .Jabalpur	G.K.V. Society Agra (U.P) and J.N.K.V.V. Jabalpur (M.P)
PAU LUDHIANA					
Walia S S, Dhawan V, Kashish and Dhawan A K	2017	19th -21st September	Organic agriculture as a remunerative enterprise	National conference on Alternate Farming Systems to Enhance Farmers' Income, Solan, HP	YSP University of Horticulture and Forestry, Nauni, Solan, HP
Dhawan V, Walia S S and Dhawan A K	2017	19th -21st September	Eco-friendly agriculture in mitigating effects of climate change. Proc. National Conference on Alternate Farming Systems to Enhance Farmers' Income	National conference on Alternate Farming Systems to Enhance Farmers' Income, Solan, HP	YSP University of Horticulture and Forestry, Nauni, Solan, HP
Gurbrinder Singh and Walia S S	2017	19th -21st September	Green fodder production under hydroponic conditions to digestibility of nutrients and milk production in lactating animals.	National conference on Alternate Farming Systems to Enhance Farmers' Income, Solan, HP	YSP University of Horticulture and Forestry, Nauni, Solan, HP

Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
Walia S S, Aulakh C S and Gosal S K	2017	19th -21st September	Integrated farming systems for income enhancement	National conference on Alternate Farming Systems to Enhance Farmers' Income, Solan, HP	YSP University of Horticulture and Forestry, Nauni, Solan, HP
KAU KARAMANA					
John, J.	2016	20-22 October	A prominent component in integrated farming systems	National Conference Tropical Tuber Crops for the Sustenance and Welfare of Tribal Communities, Thiruvananthapuram, Kerala	Indian Society for Root Crops, Kerala,
John, J., Meera, A.V., Sudha, B., Jacob D. and Sajeena,	2017	22-23 February	Performance of different integrated farming system models in southern district of Kerala.	National seminar on Biodiversity Conservation and Farming Systems for Wetland Ecology, Kumarakom, Kottayam	Regional Agricultural Research Station, Kerala Agricultural University, Kumarakom, Kottayam
Jacob, D., Mathew, T., John, J., Sudha, B. and Meera, A.V.	2017	22-23 February	Intensification of rice-rice-fallow system with vegetables in summer under humid tropical irrigated lowlands	National seminar on Biodiversity Conservation and Farming Systems for Wetland Ecology, 22-23 February 2017, Kumarakom, Kottayam.	Regional Agricultural Research Station, Kerala Agricultural University, Kumarakom, Kottayam
CCSHAU HISAR					
Sanjay K. Kashyap, Kiran K. Khokhar , Dev Raj, Pawan Kumar	2017	8-11 November	Long Term Effect of Organic Manure Application on Organic Carbon Pool, Soil Enzymatic Activity and Yield of Wheat in Pearl Millet - Wheat Cropping System.	3rd International Conference on Bio-resource and Stress Management at Jaipur Rajasthan from 8- 11th November, 2017	RKM Foundation, Kolkata; Society of Bio-resource and Stress Management, Kolkata and ICAR, N. Delhi.
Prasad, G., Chand, M., Kumar Pawan and Singh, A	2017	26-28 October	Effect of sowing dates on yield attributes and yield in maize (Zea mays L.) hybrids in Kharif season	International conference on advances in agricultural and biodiversity conservation for sustainable development held from October 26-28, 2017 at Meerut (UP).	-

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
MAU PARBHANI					
A. S. Karle, P. S. Chavan and D. N. Gokhale	2017	14-16 December	Response of Fertility Levels and Micronutrients on Profitability of Soybean (Glycine max (L.) Merrill) under Rainfed Conditions in Marathwada	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors. Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
A. S. Karle, G. S. Khazi, D. N. Gokhale and R. N. Khandare	2017	14-16 December	Impact of Integrated Weed Management Practices on Weed and Crop Parameters in Soybean + Pigeopea Intercropping System in Vertisol of Marathwada	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
P. S. Chavan, A. S. Karle and G. S. Khazi	2017	14-16 December	Yield Maximization of Soybean (Glycine max (L.) Merrill) under Rainfed Conditions with High Fertility.	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
G. S. Khazi, A. S. Karle, D. N. Gokhale, W. N. Narkhede and B. V. Asewar.	2017	14-16 December	Effect of Integrated Weed Management Practices on Weed Dynamics of Soybean + Pigeonpea Intercropping System in Vertisol of under Marathwada	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
C. B. Patil, A. S. Karle and D. N. Gokhale	2017	14-16 December	Effect of Weather Parameters on Safflower cultivars under Different Sowing	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
W. N. Narkhede, R. N. Khandare, D. N. Gokhale, A. S. Karle and G. S. Khazi,	2017	14-16 December	Effect of Bio-Intensive Cropping Systems on Productivity, Economics and Soil Nutrient Status in Central Plateau Zone of Maharashtra	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
W. N. Narkhede, R. N. Khandare, D. N. Gokhale, A. S. Karle and G. S. Khazi,	2017	14-16 December	Effect of Bio-Intensive Cropping Systems on Productivity, Economics and Soil Nutrient Status in Central Plateau Zone of Maharashtra	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
R. N. Khandare, V. A. Kadam, G. K. Gaikwad and, A. S. Karle	2017	14-16 December	Effect of Different Organic, Inorganic Nutrient Sources and INM on Yield Attributes and Yield of Soybean (<i>Glycine max</i> (L.) Merrill) and Soil properties under Aberrant Weather Condition in Vertisol,	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
A. A. Chavan, N. K. Kalegore, S. U. Pawar, I. A. B. Mirza and, A. S. Karle	2017	14-16 December	Evaluation of Different Levels and Sources of Sulphur under Moisture Stress Condition in Niger.	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
R. N. Khandare, N.B. Rathod and A. S. Karle	2017	14-16 December	Influence of different nutrient sources on soil properties, production and economics of onion under vertisol	International Seminar on Global Climate Change: Implications for Agriculture and Water sectors, Aurangabad, Maharashtra	Walmi, Aurangabad, Maharashtra
PJTSAU RAJENDERANAGAR					
Ramana, M.V., Sridevi, S., Goverdhan, M., Suresh, K. and Pragathi Kumari, Ch.	2017	11-14 December	Livelihood improvement and sustainable soil management through integrated farming systems under ID situations of Telanagana.	82nd Annual Convention of Soil Science & National Seminar on Developments in Soil Science, Kolkata.	Amity University, Kolkata.
Sridevi, S., Ramana, M.V., Goverdhan, M and Suresh, K	2017	11-14 December	Response of crops and soil fertility changes under long-term organic farming in maize-onion sequence	82nd Annual Convention of Soil Science & National Seminar on Developments in Soil Science, Kolkata.	Amity University, Kolkata.

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
AU KOTA					
Tetarwal, J. P., Jatav, R. S., Ram, Baldev, Chaudhary, H. R. and Singh, Pratap	2017	1-2 February	Crop Diversification Options through Fennel in South-Eastern Humid Ecologies of Rajasthan	National Seminar on "Research and Developmental Advances in Spices, Medicinal & Aromatic Crops Cultivation, Processing and Trade for Prosperity of Indian Farmers	Agriculture University, Jodhpur (Rajasthan),
Ram, Baldev., Punia, S. S., Tetarwal, J. P., Meena, D. S., Narolia, R. S. and Chaudhary, H. R	2017	1-2 February	Medicinal and Economic Value of Lathyrus (Lathyrus sativus L.) in India	National Seminar on "Research and Developmental Advances in Spices, Medicinal & Aromatic Crops Cultivation, Processing and Trade for Prosperity of Indian Farmers	Agriculture University, Jodhpur (Rajasthan),
Tetarwal, J. P., Jatav, R. S., Ram, Baldev, Chaudhary, H. R. and Singh, Pratap	2017	3-4 March	Intensive cropping systems diversified through fodder crops for enhancing productivity vis-à-vis to promote IFS for small & marginal farmers of S-E Rajasthan.	National Symposium on "New directions in managing forage resources and livestock productivity in 21st century: challenges and opportunities" Gwalior	RVSKVV, Gwalior (MP),
DBSKKV KARJAT					
Mhaskar N. V., Pawar L. G., Chavan L. S. and Jondhale D.G	2017	28-29 August	Site-specific nutrient management for yield maximization, economic returns and soil fertility in rice-rice cropping sequence in Konkan	International Conference on "Advances in potassium research for efficient soil and crop management" New Delhi	http://www.ipni.net/ IPNI, New Delhi
Mhaskar N. V., Chavan S. A., Chavan L. S. and Haldankar P. M.	2017	28-29 August	Role of potassium in plant nutrition and its deficiency symptoms".	International Conference on "Advances in potassium research for efficient soil and crop management" New Delhi	http://www.ipni.net/ IPNI, New Delhi

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
Mhaskar N. V., Suja G., Haldankar P. M. and Malse K.V.	2017	28-29 August	Potassium: The key nutrient for tuber crops – An overview".	International Conference on "Advances in potassium research for efficient soil and crop management" New Delhi	http://www.ipni.net/ IPNI, New Delhi
Chavan L. S., Jondhale D. G., Mhaskar N. V., Karle S. S. and Diwate S. A	2017	23-24 October	Management of cropping systems resource conservation and mitigation of effects of climate change.	National seminar on "Impact of agricultural rechnologies in enhancing growth and income" held at Jammu	SKUAST,Jammu
Jondhale D. G., Chavan L. S., Mhaskar N. V., Karle S. S. and Pawar H. D	2017	23-24 October	Performance of cropping systems under organic, inorganic and integrated packages for soil health	National seminar on "Impact of agricultural rechnologies in enhancing growth and income" held at Jammu	SKUAST,Jammu
Diwate S. A., Chavan L. S., Jondhale D. G., Mhaskar N. V. and Karle S. S	2017	23-24 October	Integrated nutrient management for rice-sweet corn cropping system to sustain soil fertility	National seminar on "Impact of agricultural rechnologies in enhancing growth and income" held at Jammu	SKUAST,Jammu
Chavan L. S., Jondhale D. G., Mhaskar N. V. and Diwate S. A	2017	23-24 October	Integrated farming system model for small and marginal farmers	National seminar on "Impact of agricultural rechnologies in enhancing growth and income" held at Jammu	SKUAST,Jammu
Mhaskar N. V	2017	23-25 October	Studies on arecanut based tuber and spice intercropping systems for sustainable production, enhancing income and soil health	International Conference & Expo on "Agriculture and veterinary sciences: Research and technology" Hyderabad	PJTSAU Rajenderanagar Hyderabad

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
Mhaskar N. V	2017	23-25 October	Diversification by vegetable crops in rice based cropping system for higher productivity and profitability	International Conference & Expo on "Agriculture and veterinary sciences: Research and technology" Hyderabad	PJTSAU Rajenderanagar Hyderabad
Mhaskar N. V., Prabhudesai S. S., Haldankar P. M., Bharani A. and Mahadkar U. V	2017	6-9 December	Sustainable tuber production of cassava under integrated nutrient management	National Conference on "New vistas in vegetable research towards nutritional security under changing climate scenario" Coimbatore	Tamil Nadu Agricultural University, Coimbatore
Mhaskar N. V., Dademal A. A., Kasture M. C. and Haldankar P. M	2017	6-9 December	Precision management of resources through intercropping of tuber and spice crops in arecanut garden for enhancing farmers income	National Conference on "New vistas in vegetable research towards nutritional security under changing climate scenario" Coimbatore	Tamil Nadu Agricultural University, Coimbatore
Deogharkar S. S., Naik K. V., Mhaskar N. V., Desai V. S. and Baikar A. A	2017	6-9 December	Screening of sweet potato cultivars against sweet potato weevil, <i>Cylas formicarius</i> (Fabricius)	National Conference on "New vistas in vegetable research towards nutritional security under changing climate scenario" Coimbatore	Tamil Nadu Agricultural University, Coimbatore
Deogharkar S. S., Naik K. V., Mhaskar N. V. and Desai V. S	2017	6-9 December	Eco-friendly management against sweet potato weevil	National Conference on "New vistas in vegetable research towards nutritional security under changing climate scenario" Coimbatore	Tamil Nadu Agricultural University, Coimbatore
Gudadhe P. S., Meshram N., Mhaskar N. V., Sanap P. B., Mahale D. M., Salvi B. R. and Haldankar P. M	2017	14-16 December	Impact of enriched micronutrients on quality, growth attributes and productivity of <i>Manihot esculenta</i> (Cassava) in acid alfisol.	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
Mhaskar N. V., Chavan L. S., Chavan S. A., Mahadkar U. V. and Haldankar P. M.	2017	14-16 December	Impact of climate change on agriculture	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Mhaskar N. V., Haldankar P. M., Salvi B. R. and Gudadhe P. S	2017	14-16 December	Climate resilient, sustainable and economical viable tuber crops production under Konkan region of Maharashtra	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Jondhale D. G., Chavan L. S., Mhaskar N. V., and Pawar H. D.	2017	14-16 December	Integrated nutrient management for rice – sweet corn cropping system to sustain soil fertility and minimizing climatic risks.	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Jondhale D. G., Chavan L. S., Mhaskar N. V., and Pawar H. D	2017	14-16 December	Mitigation of climate change through resource conservation and management of cropping systems	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Chavan L. S., Jondhale D. G., Mhaskar N. V., and Pawar H. D	2017	14-16 December	Integrated farming system model for small and marginal farmers to mitigate effects of climate change	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
UAHS, KATHALAGERA					
Kumara, O., Sannathimmappa, H.G., Vijay S. Danaraddi, Akshatha, S. and Rajini, S.R	2017	15-17 February	Sustainable production in Paddy- Maize cropping system through long-term integrated farming system	National symposium on advances in agriculture through sustainable technologies and holistic approaches International centre Dona Paula, Goa	Society for Advancement of Human and Nature (SADHNA), Solan, HP and ICAR-Central Coastal Agricultural Research Institute, Ela, Old Goa.

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Author	Year	Date	Title of The Paper	Conference Name and venue	Organized by
Kumara, O., Sannathimmappa, H.G., Vijay S. Danaraddi, Rajini, S.R. and Akshatha, S	2017	15-17 February	Paddy based diversified cropping system in southern transition zone of Karnataka	National symposium on advances in agriculture through sustainable technologies and holistic approaches International centre Dona Paula, Goa	Society for Advancement of Human and Nature (SADHNA), Solan, HP and ICAR-Central Coastal Agricultural Research Institute, Ela, Old Goa.
JAU, JUNAGADH					
R.M. Solanki and B.K. Sagarka	2017	28-30 May	Response of Drilled Rabi Fennel to Drip Irrigation and Fertigation	National conference on Technological Changes and innovations in agriculture for Enhancing Farmers Income, Junagadh	Junagadh Agricultural University Junagadh
PDKV, AKOLA					
Saoji B. V., B. S. Morwal D. S. Kankal and O. S. Rakhonde	2017	14-16 December	Integrated farming system model for livelihood security of small and marginal farmers of Vidarbha region of Maharashtra	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Guldekar V. D., S. M. Bhojar, B. V. Saoji, A. V. Priyanka, D. S. Kankal and R. D. Walke	2017	14-16 December	Assessment of nutrient status of Western part of the Central Research Station	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Saoji B. V., D. S. Kankal O. S. Rakhonde and B. S. Morwal	2017	14-16 December	Soil fertility status as influenced by nutrient recycling of organic components in integrated farming system model	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra
Tupe A. R., S. T. More, V. M. Bhale, M. Y. Ladole and B. V. Saoji	2017	14-16 December	Evaluation of sowing time for kharif groundnut and validation by DSSAT-4.5	International seminar on "Global climate change : Implications for agriculture and water sectors" held at Aurangabad	Mahatma Gandhi Mission, Aurangabad - Maharashtra

8.3 : TRAINING, GROUP MEETING, WORKSHOP ORGANIZED

The Annual Group Meeting of ICAR-AICRP on Integrated Farming Systems was organized during 03-05 November 2017 at Rajasthan Agricultural Research Institute (RARI), Durgapura, Jaipur under Sri Karan Narendra Agriculture University, Jobner (Rajasthan) in which review of on-going research programmes of onstation and on-farm centres including Tribal Sub Plan, administrative, financial issues were undertaken.

The inaugural programme of the workshop started with ICAR song and lighting of lamp. Dr P.S. Rathore, Vice Chancellor, SKNAU, Jobner welcomed the guests and delegates. He briefly informed about research activities being carried out by the university and the importance of systems research for enhancing the sustainability and income of the farmers. Dr. N.S. Rathore, Deputy

Director General (Education), ICAR New Delhi graced the inaugural programme as Chief guest. The session was also attended by Dr. S. Bhaskar, ADG (Agronomy, Agroforestry and Climate Change), ICAR, New Delhi as guest of honour, Dr. A.S. Panwar, Director, ICAR-IIFSR, Dr. P.L. Saroj, Director, ICAR- Central Institute of Arid Horticulture, Bikaner, Dr. S.J. Singh, Director, RARI, Jaipur and Dr V.K. Yadav, Director (Research), SKNAU, Jobner. Dr N.S. Rathore highlighted the fact that agriculture is on crossroads and emphasized on integrated approach than isolated approach with right kind of transformation for farmers empowerment. He also emphasized that integrated farming systems is the only way by which the vision of Hon'ble Prime Minister on doubling farmers income can be achieved. He further asked the group scientists to establish the farmer friendly IFS models throughout



India to show case the technologies. Dr. P.S. Rathore, emphasized about the importance of IFS approach in changing scenario of water scarcity and nutritional deficiency particularly in rainfed ecosystem. Dr. S. Bhaskar, ADG (Agronomy Agroforestry & Climate change), ICAR highlighted the need for upscaling of IFS with special reference to small holder farming system to spread the benefits of IFS. Dr. A.S. Panwar, Director, ICAR-IIFSR while welcoming the guests, presented the brief achievements of the scheme. Dr. P.L. Saroj highlighted about the importance and role of horticulture especially arid fruits in IFS for doubling farmers's income & need for diversification. Dr. V.K. Yadav & Dr. S.S. Singh, highlighted the activities of the SKNAU and progress of IFS research activities in Rajasthan. In the inaugural session, Annual Report (2015-16) of the scheme and publications brought out by the centres were also released by dignitaries

Recommendations

On-station Research

1. Water and energy efficient cropping and farming systems for different regions should be identified.
2. Suitable and effective IFS modules should be documented for large scale up-scaling and its efficient adoption among the farmers of the region.
3. Economic benefits of organic waste recycling in terms of reducing the use of the chemical fertilizers should be quantified. Scientific management of different categories of organic wastes for recycling must be evaluated in farming systems perspective.
4. Input-output relationship with resource recycling, water cycle, energy flow and family labour vis-à-vis hired labour should

be analysed for all the farming system models.

5. A common base year should be identified for all the centres for comparing the trends of economic benefits of IFS and change in farmers income.
6. All the centres should explore the opportunity for funding from other sources like RKVY by submitting suitable research proposals on IFS.

On-Farm Research

7. Green-house Gas (GHG) estimation of rice-rice-fallow cropping system in different regions should be made by using on-farm data.
8. Integrated pest management and integrated disease management packages must be added as interventions. Interventions within the farming systems should be uniform.
9. Discontinued and failed interventions along with reasons in each module should be documented and communicated to the Director (Research) of respective universities and other appropriate university authorities for undertaking further research and improvement of techniques and products.
10. Documentation of outcomes of last 5 years of study in English and local languages along with good photographs of successful interventions continued by farmers should be made. All the centres should publish farming system wise folder/pamphlet. Uniform format including size and design should be followed by all the centres. ICAR-IIFSR should design a format for its preparation and publication.

11. Existing excel data sheets of On-Farm Research 2 and 3 experiments should be refined to catch important parameters to work out different indices and delete irrelevant items. A group of OFR Agronomists/ Agricultural Economists comprising of Dr Manabendra Ray, Dr M. T. Sanjay, Dr D.K. Singh, Dr RR Patel, Dr D. Jacob, Dr L.N. Dashora and Dr Lateef Pasha along with Dr (Mrs) Cini Varghese, ICAR-IASRI and Dr N. Ravisankar, NPI (OFR) should meet and refine the data sheet by June 2018.

12. Linking the products to market, households to bank and also issue of soil health cards should be given more emphasis in Tribal sub plan activities.

General

13. Parameters and indices for identifying the ecological, economic, social and sustainability benefits of IFS should be finalized.

14. All the centres should make a document highlighting achievements of 7 years (2010-11 to 2016-17) of research on IFS programme by including on-station and on-farm data with proper acknowledgement to funding provided by ICAR-IIFSR under AICRP on IFS.

15. Three days training on “GHG emission/ carbon sequestration estimation using version of excel tool” should be organized for both on-station and on-farm centres.

16. Design of alternative farming systems at the district level using Farm Design tool may be explored. Workshop/hands-on training for preparing farming system typology and its validation may be organized by involving national and international experts.

9

APPENDICES

APPENDIX I

APPENDIX I: INITIAL SOIL PARAMETERS FOR ON-STATION EXPERIMENTAL SITES DURING 2016-17

Name of CSR centre	Experiment no	PH	EC (m mhos/cm)	O.C.%/g/kg	Available nutrient kg/ha		
					N	P	K
Rajendranagar	1(a)	7.72	0.27	0.51	210	32.0	288
Maruteru	1(a)	-	-	0.9	-	38.0	314
Rudrur	1(a)	6.68	0.55	0.46	-	39.6	305
Sabour	1(a)	7.5	0.13	0.63	213	23.6	226
Hisar	1(a)	7.8	0.21	0.46	170	12.7	292
Raipur	1(a)			0.49	248	18.6	262
Palampur	1(a)	5.6		0.99	293	63.1	11
Jammu	1(a)	8.4		0.55	216	23.0	119
	OF	8.1		0.51	210	14.7	114
Ranchi	1(a)	6.0		0.38	225	20.0	115
S.K.Nagar	1(a)			0.33	195	15.9	198
Junagarh	1(a)			0.68	190	9.5	140
Navsari	1(a)			0.59	194	18.2	153
Kathalagere	1(a)	6.1	0.20	0.60		22.0	197
Siruguppa	1(a)	8.2	0.38	0.65	177	19.3	348
Jabalpur	1(a)	7.7	0.48	0.68	266	9.2	300
Rewa	1(a)	7.7	0.53	0.65	260	9.0	295
	OF	7.3	0.46	0.56	224	8.2	315
Indore	1(a)	7.5	0.45	0.34	150	8.0	440
Rahuri	1(a)	8.0	0.26	0.62	178	7.0	585
Karjat	1(a)	7.0	0.30	0.97	217	18.4	199
Bhubaneswar	1(a)	6.7	0.27	0.69	212	15.7	189
Chiplima	1(a)	6.1	0.41	0.58	315	16.0	210
Ludhiana	1(a)	7.8	0.40	0.38	242	47.5	100
	OF	7.5	0.20	0.39	179	22.3	136
Durgapura	1(a)	8.2	0.28	0.22	NR	38.1	180
Coimbatore	1(a)			0.60	252	23.9	482
Kanpur	1(a)	8.1	0.18	0.45	NR	11.5	205
Faizabad	1(a)	7.3	0.11	0.51	142	18.0	136

APPENDIX II

APPENDIX II A : WEATHER PARAMETERS (MONTHLY AVERAGES RAINFALL) AT DIFFERENT FARMING SYSTEM CENTERS DURING 2016-17

	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Total
Akola	376.1	91.0	130.8	87.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.0	772.8
Bhubneswar	206.4	272.5	229.7	141.4	11.7	0.0	0.0	0.0	45.4	29.2	27.5	170.4	1134.2
Coimbatore	23.9	4	6.3	70.7	18.9	45	26.4	0	63	20.5	38.6	34.2	351.5
Chiplima	291	645.8	736.5	24.7	3.2	0	32.4	0	27.4	0	36	266	2063.0
Durgapura	188	230	37.6	11.6	0	0	22.4	0	10.2	3.2	17.2	77.8	598.0
Faizabad	378.5	111.8	87.6	35.1	0.0	0.0	16.8	0.0	0.7	0.0	10.6	71.9	713.0
Goa	850.7	522.3	245.6	124.3	29.2	0	0	0	0	0	79.1	1012.7	2863.9
Hisar	244.8	80.4	2.8	12.0	0.0	0.0	41.2	0.0	7.5	1.0	10.9	283.8	684.4
Indore	459.5	342.9	44.7	17.1	0.0	0.0	0.0	0.0	0.0	0.0	7.1	245.9	1117.2
Jabalpur	778.7	614.1	116	0.0	0.0	0.0	3.4	13.2	2.8	0.0	0.0	59.4	1587.6
Jammu	378.4	337.5	103.7	1.2	0	0	143.8	31.4	40.4	23.4	11.4	236.4	1307.6
Jorhat	380.1	149.3	249.2	78.5	16.5	43.5	49.5	39.4	148.8	209.1	249.7	267.5	1881.1
Junagadh	280.3	355.6	274.1	133.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	147.8	1190.8
Kalyani	386.0	442.4	191.7	101.4	16.6	0.0	0.0	0.0	11.2	0.3	119.4	197.7	1466.7
Kanpur	307.3	157.1	236.0	34.0	0.0	0.0	28.2	0.0	0.6	7.3	14.7	50.6	835.8
Karmana	132.2	38.9	3.6	34.8	42.9	19.6	20.1	0.0	65.5	15.5	89.9	230.9	693.9
Kathalagere	93.0	42.0	103.0	31.5	0.0	2.2	0.0	0.0	0.0	15.0	17.0	76.0	379.7
Karjat	1407.6	1045.3	570.3	76.9	0.0	0.0	0.0	0.0	0.0	0.0	35.4	247.0	3382.5
Kota	243.8	755.5	77.2	51.6	0.0	0.0	9.4	0.0	12.0	0.0	0.0	50.0	1199.5
Ludhiana	305.5	87.6	15.0	0.0	2.0	0.0	46.1	5.2	40.8	14.8	31.6	127.0	675.6
Modipuram	288.1	209.4	23.7	1.2	0.0	0.0	65.0	1.3	19.0	8.1	17.4	60.9	694.1
Maruteru	168.2	136.0	236.6	41.4	4.0	13.2	0.0	0.0	0.0	0.0	12.0	180.4	791.8
Navsari	497.0	196.0	529.0	96.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	295.0	1617.0
Palampur	1062.8	616.6	131	3.2	0	7.2	182.8	44.4	50.8	63.4	123	137.2	2422.4
Parbhani	407.2	93.7	324.9	166.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	259.8	1252.0
Patna	248.9	146.8	375	96.6	0	1.1	1.0	0.0	11.4	6.6	29.0	119.5	1035.9
Pantnagar	100.4	42.45	35.45	0	0.0	0.0	0	0	0.7	0.25	1.1775	1.1775	181.6
Portblair	425.3	325.3	956.1	358.8	167.0	444.7	94.7	0.6	6.8	94.7	178.2	622.5	3674.7
Powarkheda	914.9	372.5	38	39.3	0	0	0	0	0	0	4	92.3	1461.0
Rahuri	30.0	222.0	186.6	49.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	114.2	602.8
Rudrur	156.5	143.8	400.2	101.02	0.0	0.0	0.0	0.0	0.35	0.0	0.0	134.6	936.5
Raipur	214.7	224.5	213.8	0	0	13.8	0	0	3.5	18.2	20.8	177.4	886.7
Rajendranagar	144.7	180.6	391.6	32.2	0.0	2.0	0.0	0.0	5.6	4.2	61.8	213.4	1036.1
Ranchi	445.6	357.4	247.5	19.3	0.0	0.0	0.0	0.0	6.0	3.1	38.2	NR	1117.1
Rewa	304.2	700.7	271.3	113.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	1418.8
Sabour	309.8	70.4	320.9	31.2	0.0	0.0	12.4	0.0	9.7	12.4	105.7	43.5	916.0
Siruguppa	124.8	42.2	101.2	4.0	3.3	1.8	0.0	0.0	0.0	0.0	0.0	0.0	277.3
Thanjavur	40.9	120.6	131.2	70.5	25	61.4	71.1	0	49.4	0	7.6	85.4	663.1
SK Nagar	155.1	331	0	90.4	0	0	0	0	0	0	3	156.8	736.3
Umiam	457.4	219.2	396.4	142	9	7.7	26.4	0	60.3	195	137.4	445.6	2096.4
Varanasi	473.4	403	211.7	5.4	0	0	1	0	0	0	2.20	48.90	1145.6

APPENDIX II A : MAXIMUM AND MINIMUM TEMPERATURE (°C) JUNE 2016 TO JUNE 2017

Name of CSR centre	July		August		September		October		November		December		January		February		March		April		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
Akola	30.0	24.3	30.6	23.8	31.1	23.2	31.4	18.7	31.1	11.2	29.9	9.8	29.4	10.8	33.7	14.6	37.1	18.4	41.9	24.9	43.0	28.8	36.8	25.4
Bhubneswar	32.1	25.7	31.8	25.5	31.5	25.3	32.2	22.6	31.0	17.9	30.1	14.8	29.7	14.4	33.3	18.7	34.7	22.6	36.9	26.3	38.6	26.7	35.5	26.5
Coimbatore	31.3	23.7	32.5	23.7	32.3	22.4	32.5	22.5	32.3	21.6	29.9	20.3	30.5	20.1	32.4	19.6	34.4	22.8	36.4	24.4	35.4	24.6	31.8	23.9
Chiplima	32.0	22.7	32.5	21.8	32.3	21.8	32.2	20.5	28.5	14.5	27.5	10.1	26.7	10.3	29.9	13.4	31.2	15.2	40.1	23.9	41.6	26.4	36.4	25.5
Durgapura	33.8	27.5	30.9	24.7	34.6	24.2	34.2	21.4	29.8	13.2	26.8	11.0	21.7	9.0	26.8	11.8	31.5	16.6	39.0	23.6	41.1	26.6	37.7	25.8
Faizabad	31.7	25.9	33.2	26.3	32.6	25.6	32.6	19.2	28.0	12.0	20.5	9.7	21.2	7.7	26.7	10.2	32.1	14.5	38.3	21.9	39.1	24.9	37.5	26.8
Goa	29.0	23.1	29.8	23.6	29.7	24.5	31.9	23.5	34.8	20.1	38.5	19.8	34.5	19.0	35.5	21.0	35.0	22.3	34.8	25.3	35.0	25.7	30.6	23.5
Hisar	35.1	26.1	34.0	25.6	35.2	24.2	34.6	18.4	29.3	10.6	24.2	7.5	18.6	6.9	24.3	7.8	29.0	11.3	38.6	18.9	40.8	24.4	37.2	25.6
Indore	28.6	24.2	26.7	23.1	30.3	24.0	31.1	21.0	29.3	10.9	26.9	9.1	24.3	10.3	29.9	13.5	34.5	19.0	39.2	25.7	42.3	31.4	35.0	27.1
Jabalpur	30.7	23.8	29.2	23.1	31.4	23.6	31.0	16.2	28.7	9.0	25.4	6.6	23.9	8.8	27.1	9.5	31.2	12.0	40.3	26.8	41.4	28.5	39.7	22.6
Jammu	34.1	25.0	33.3	24.5	34.0	24.0	32.4	17.5	26.3	9.5	22.8	6.0	17.6	6.8	22.5	8.6	26.3	10.4	34.4	16.0	37.8	20.4	36.5	23.6
Jorhat	31.6	25.2	34.3	25.2	32.2	25.1	31.8	22.7	28.8	16.5	26.3	11.9	25.2	9.4	26.8	13.0	26.3	15.5	28.6	20.2	30.4	22.7	32.3	25.2
Junagadh	31.5	24.2	30.2	24.7	31.9	24.0	32.8	21.4	33.9	14.8	32.5	13.4	29.9	11.9	34.3	15.2	36.7	18.7	39.3	22.0	40.5	24.7	37.0	26.6
Kalyani	31.9	26.2	31.9	26.1	33.1	26.4	32.7	24.1	29.7	17.7	26.5	13.2	28.0	10.9	28.0	15.2	28.0	20.5	36.2	25.9	36.3	25.7	35.0	27.0
Kanpur	32.2	25.7	32.7	26.7	33.1	25.2	33.7	19.3	29.3	12.6	22.5	9.3	21.1	8.1	25.8	10.5	31.4	14.8	39.0	27.5	39.8	25.4	38.1	27.2
Karmana	30.5	24.6	30.5	25.1	30.4	24.8	30.3	24.1	30.8	24.0	30.9	23.2	30.8	22.6	31.1	22.0	31.9	24.6	32.5	25.9	32.2	25.3	30.6	24.9
Kathalagere	26.0	23.0	29.0	23.0	27.0	23.0	30.0	23.0	31.0	21.0	30.0	20.0	30.0	19.0	33.0	19.0	33.0	22.0	38.0	25.0	37.0	25.0	32.0	25.0
Karijat	28.5	24.3	27.4	24.4	29.1	23.7	32.3	21.5	34.8	14.5	35.1	14.0	34.1	13.7	37.3	16.3	37.7	19.0	40.6	22.9	39.5	25.6	33.2	25.2
Kota	33.0	26.8	31.3	25.2	34.7	25.9	34.8	23.3	32.0	14.3	26.7	8.5	21.6	7.6	26.0	9.3	32.3	14.0	39.1	20.1	41.8	23.4	39.5	22.5
Ludhiana	33.5	27.3	33.3	26.2	34.0	25.5	32.7	19.0	27.7	12.0	22.2	8.6	18.2	7.6	23.1	9.3	27.2	12.5	36.9	20.0	38.8	25.1	36.7	26.2
Modipuram	33.2	24.6	34.4	25.8	34.4	24.3	33.0	18.7	28.4	10.6	23.1	8.0	20.7	7.8	24.6	9.5	29.2	13.5	37.7	19.8	38.4	22.8	36.7	24.4
Maruteru	31.4	27.5	31.2	27.2	30.0	26.6	30.5	24.6	30.1	20.8	28.6	20.5	28.4	20.3	30.3	21.8	31.5	24.1	33.7	26.6	36.6	28.2	32.9	27.5
Navsari	29.7	24.8	29.7	24.9	30.1	23.6	32.0	20.5	33.0	14.5	32.1	13.6	30.8	13.4	33.4	15.4	35.0	18.1	35.6	22.1	35.0	26.2	33.0	26.1
Palampur	27.1	18.6	26.3	18.7	26.7	16.9	25.8	13.0	23.0	8.4	20.2	6.1	15.1	5.6	19.2	7.7	21.4	9.4	28.1	14.8	30.1	17.4	29.5	18.8
Parbhani	30.5	23.1	31.2	21.9	29.9	21.8	31.5	18.5	30.8	11.1	28.8	10.1	29.4	10.2	33.7	13.5	36.9	16.8	41.1	20.8	41.8	26.6	34.5	24.0
Patna	32.2	25.9	32.7	26.9	30.7	25.8	31.8	23.0	28.4	15.5	20.5	11.9	21.8	10.4	26.3	12.2	30.7	17.3	36.1	23.4	36.0	25.6	35.7	27.4
Pantnagar	33.3	24.9	31.7	25.7	32.1	23.2	32.7	13.5	26.1	9.8	20.0	6.5	18.2	4.3	21.2	8.5	25.6	7.9	34.6	16.9	36.0	19.7	32.9	24.3
Portblair	30.6	25.2	31.0	25.2	29.5	24.0	31.0	24.3	31.0	25.1	29.3	24.1	27.2	21.3	30.7	24.2	31.9	24.1	32.4	25.7	32.4	25.8	30.3	24.7
Powarkheda	31.8	22.9	31.3	22.2	32.6	22.0	32.4	17.6	31.0	11.6	26.5	8.5	31.0	8.0	35.0	18.0	41.0	23.0	43.0	28.0	45.9	33.6	43.5	23.0
Rahuri	32.2	22.7	32.1	22.2	32.5	22.1	33.9	13.0	30.3	11.4	49.8	10.9	30.3	9.5	34.6	13.5	37.6	16.4	40.7	19.7	40.2	24.2	35.5	22.5
Raipur	33.6	25.1	32.3	24.7	33.5	24.6	33.9	19.4	31.9	15.5	31.2	10.8	30.5	9.0	34.9	14.0	38.6	19.6	43.2	24.3	42.9	29.5	42.5	22.8
Rajendranagar	30.2	22.8	30.6	22.8	28.5	22.0	30.2	18.5	30.3	12.8	29.0	11.3	29.3	12.2	32.7	13.6	35.7	18.2	38.5	19.0	39.7	24.6	33.0	23.2
Ranchi	30.0	21.4	30.4	21.5	29.9	21.6	28.8	17.0	26.4	9.9	24.9	6.0	24.5	6.0	27.7	10.5	30.7	13.7	37.7	19.9	38.3	21.9	NR	NR
Rudrur	30.2	21.3	31.9	21.2	31.3	20.7	32.2	23.7	32.8	19.5	32.0	17.3	31.9	17.5	33.9	19.3	20.7	37.0	30.9	40.9	24.2	41.8	23.3	31.6
Rewa	32.7	25.2	31.0	23.9	32.8	24.3	32.5	18.6	29.7	10.5	25.1	8.7	22.6	8.1	27.1	9.4	31.2	11.8	40.9	18.6	42.4	23.5	41.9	25.5
Sabour	31.9	25.5	32.4	25.8	31.2	24.6	31.5	21.7	28.9	14.1	22.6	9.6	22.6	7.8	26.3	9.7	29.9	15.1	34.7	21.6	35.3	23.8	34.4	25.8
Siruguppa	31.0	23.0	31.0	23.0	29.0	22.0	31.0	20.0	30.0	18.0	30.0	17.0	30.0	18.0	34.0	19.0	37.0	23.0	40.0	27.0	39.0	28.0	33.0	25.0
Thanjavur	35.7	27.2	36.6	27.2	35.2	25.8	34.1	25.3	31.0	23.3	30.1	22.1	29.0	21.0	32.2	20.2	34.9	24.2	38.7	26.8	38.1	28.0	36.1	27.6
SK Nagar	33.4	26.3	31.0	25.1	32.9	24.8	34.3	20.8	33.2	13.6	30.8	10.8	28.1	10.7	31.7	11.7	36.0	16.2	40.1	20.6	41.7	23.8	39.5	26.3
Umiam	27.6	19.4	27.6	19.0	28.0	18.1	27.7	15.4	25.7	10.5	23.4	7.2	22.1	5.5	24.6	8.0	24.2	10.6	25.6	13.8	27.8	15.8	28.3	17.9
Varanasi	32.3	26.2	31.8	25.7	41.3	25.4	32.2	21.0	28.2	13.7	21.2	11.3	22.1	9.9	26.4	11.8	31.9	15.8	39.0	22.8	40.1	25.6	39.0	26.9

APPENDIX III

CENTRE-WISE STAFF POSITION

1. AAU JORHAT (ASSAM) 2017-18

Main Centre, Jorhat

Chief Agronomist	Dr.Ajit Baishya
Jr. Agronomist	Mrs. J. R. Hazarika
Jr. Soil Scientist	Mr. Bhabesh Gogoi
Jr.Economist	Mrs. M. Borah
Technical Asstt.	Mr. K. K. Bordoloi
Field assistant	Mr. P. Dutta
Field assistant	Mr. D. R. Sharma
Jr. Steno/UDC	Vacant
Messenger	Vacant

On-Farm Centre, Karimganj

Agronomist	Mr. Ajoy Sankar Bora
Field assistant	Mr. R. Borah
Field assistant	Mr. D. Sarma
Field assistant	Mr. L. Khaund
Field assistant	Mr. A.K.Borthakur
Field assistant	Mr. B. Barman
Field assistant	Vacant
Jr.Stenographer	Mrs. H. Kalita
Driver	Sri Suresh Boro
Watchman	Sri Bishnu Rabha

2. ANGRAU, HYDERABAD (A.P.) 2017-18

Sub Centre, Maruteru

Agronomist	Dr. M. Srinivas
Technical Asstt.	A. S. Saibaba Reddy
Field assistant	Md.Khaja Babu
Field assistant	K. Viswanadham
LDC/Typist	M.Neelima
On-Farm Centre, Seetampet	
Agronomist	Dr.K.Tejeswara Rao/ Dr.D.Nagrjuna/ Dr. M.M.V.Srinivasa Rao
Field assistant	Mr.N.Murali Mohan Rao
Field assistant	Mr. B.V.A. Satyanarayana
Field assistant	Mr. A.V.Ramana
Field assistant	Mr. K.Gopi

Field assistant	Mr.M.Nageswar Rao
Field assistant	Mr.T.D.M.Murthy
Jr.Stenographer	Vacant
Driver	Vacant
Watchman	Vacant

3. BAU, Sabour (BIHAR) 2017-18

Main Centre, Sabour

Chief Agronomist	Dr. Sanjay Kumar
Jr. Soil Scientist	Sri Anupam Das
Jr. Agronomist	Dr. Sushant
Technical Asstt.	Mr.K.R.Raman
Field assistant	Vacant
Field assistant	Mr.Rajeev Kumar
Jr. Steno/UDC	Mr. A. P. Yadav
Watchman	Mr. Ganesh Ram

On-Farm Centre, Patna

Agronomist	Dr. D.K. Mahto
Technical Asstt.	Vacant
Field assistant	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

4. IGKV, RAIPUR (CHHATISSGARH) 2017-18

Main Centre, Raipur

Chief Agronomist	Dr. M.C. Bhambri
Jr. Soil Scientist	Mr.S.S. Porte
Jr. Agronomist	Mr. Sunil Kumar
Technical Asstt.	Mr. B.K.Chandrakar
Field assistant	Mr.Dilip Kumar Verma
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Messenger	Shri Shivcharan yadav

On-Farm Centre, Kawardha

Agronomist	Shri Anil Kumar Netam
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

Technical Asstt.	Shri K. K. Sarvaiya
Field assistant	Mr. C.T.Dalwadi
Field assistant	Vacant
Jr. Steno/UDC	Vacant
7. NAU, NAVSARI (GUJARAT)	
Sub Centre, Navsari	
Agronomist	Dr. L.J.Desai
Technical Asstt.	Vacant
Field assistant	K.G.Parmar
Field assistant	K.M. Patel
Jr. Steno/UDC	Vacant

5. SDAU, S.K. NAGAR (GUJARAT) 2017-18

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

On-Farm Centre, Jagudan

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

6. JAU, JUNAGADH (GUJARAT) 2017-18**Sub Centre, Junagadh**

Agronomist	Dr. P.J. Gohil
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8. AAU, ANAND (GUJARAT) 2017-18**On-Farm Centre, Devgadhi Baria**

Agronomist	Vacant
Field assistant	Mr. D.J. Gohil
Field assistant	Mr.V.H. Rathva
Field assistant	Mr. P.G. Solanki
Field assistant	Mrs. R.S. Thakor
Field assistant	Mr. K.B. Raval
Field assistant	Mr. S.M. Asari
Jr.Stenographer	Vacant
Driver	Mr. B.S.Patel
Watchman	Vacant

9. CCS HAU, HISAR (HARYANA) 2017-18**Main Centre, Hisar**

Chief Agronomist	Dr. Pawan Kumar
Asstt. Agronomist	Dr. V.S. Hooda
Sr. Soil Scientist	Dr. M.K. Sharma
Technical Asstt.	Vacant
Technical Asstt.	Vacant
Field Assistant	Sh Rajbir
Field Assistant	Sh. Bajrang
Jr. Steno/UDC	Vacant
Messenger	Vacant

OFR Centre

Agronomist	Vacant
Jr. Scientist (Ag. Econ.)	Dr. Gulab Singh
Field Assistant	Mr. Mahinder Singh
Field Assistant	Sh. Sadi Lal

Field Assistant	Sh. Hariom	Field assistant	Mr.A.W. Katoch
Field Assistant	Mr.Sube Singh	Field assistant	Mr.Ashwani Sharma
Field Assistant	Mr.Sat Narain	Field assistant	Mr.Ghulam Mohd.
Field Assistant	Sh. Gaya Lal	Field assistant	Mr.Jai Krishan Baru
Clerk	Vacant	Jr. Steno/UDC	Mrs. Pardeep Kour
Driver	Vacant	Driver	Mohd.Saleem
Watchman	Vacant	Watchman	Mohd. Yaqoob

10. CSK HPKV, PALAMPUR (H.P.) 2017-18

Main Centre, Palampur

Chief Agronomist	Dr.S.C Negi
Jr. Soil Scientist	Dr. Sanjay K Sharma
Scientist	Dr.Pawan Pathania
Technical Asstt.	Mr. Deep Raj
Technical Asstt.	Sh. Manohar Lal
Field assistant	Mr. Mani Raj
Field assistant	Mr.Bikram Singh
Jr. Steno/UDC	vacant

On-Farm Centre, Kangra

Agronomist	Dr.S.K.Sharma
Field assistant	Sh. Ramesh Chand
Field assistant	Sh. Gurmeet Singh
Jr. Steno/UDC	Mr.Saran Das
Driver	Sh.AshokKumar
Messenger	Vacant

11. SKUAST, Jammu (J & K)

Main Centre, Chatta, Jammu

Chief Agronomist	Prof. Dileep Kachroo
Jr. Soil Scientist	Dr.N. P.Thakur
Jr. Agronomist	Dr. Vijay Khajuria
Technical Asstt.	Mr.Mahesh Kumar
Technical Asstt.	Mr.Parshotam kumar
Field assistant	Mr. Bishan Lal
Field assistant	Mr. Ramesh Lal
Jr. Steno/UDC	Mrs. Rajni Bharti
Messenger	Mr.Tarsem Singh
OFR Centre, Jammu	
Agronomist	Dr. A.K.Gupta
Field assistant	Kuldeep Sharma
Field assistant	Dheeraj Rajwal

12. BAU, Ranchi (JHARKHAND)

Main Centre, Ranchi

Chief Agronomist	Dr. M. S. Yadava
Jr. Soil Scientist	Mr. A. N. Puran
Jr. Agronomist	Mr.R.P.Manjhi
Technical Asstt.	Mr.Rakesh Mitra
Field assistant	Mr.M.Munda
Field assistant	Mr.Raju Gari
Jr. Steno/UDC	Mr. S. S. Jha
Messenger	Mrs.Deomani Devi

On-Farm Centre, Pakur

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

13. UAHS, Shivamoga 2017-18

Main Centre, Kathalelgere

Chief Agronomist	Dr. Kumara O
Jr. Soil Scientist	Ms.Rajini S R
Jr. Agronomist	Dr.H.G.Sannathimmappa
Technical Asstt.	Mr.Vijay S Danaraddi
Technical Asstt.	Mr.Sanjeev
	Kyathappanavar
Field assistant	Mr.Rajappa N

Field assistant	Mr.P. Maheshwarappa	Watchman	Mr. M.F. Niranjan
Jr. Steno/UDC	Vacant		
Messenger	Mr.Chandra Naik		

14. UAS,Banglore (KARNATAKA)**On-Farm Centre, Banglore**

Agronomist	Dr.M.T.Sanjay
Jr.Scientist	Vacant
Field assistant	Mr. Manjunatha. N
Field assistant	Mr. Puttaswamy
Field assistant	Mr. Basavaraja
Field assistant	Mr. Nagaraja. B
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

15 UAS Raichur 2017-18**Main Centre, Siruguppa**

Chief Agronomist	Dr.Basavarajappa M.A
Jr. Soil Scientist	Dr.Ashok Kumar Gaddi
Jr. Economist	Dr.Prabhuling Tewari
Technical Asstt.	Mr.Erappa Yankannvar
Technical Asstt.	Mr.Bhimanna Hugar
Field assistant	Mr.Somanagouda H
Field assistant	Mr.Gangadhar Swami S.

16. UAS Dharwad (KARNATAKA)**On-Farm Centre, Gadag (KARNATAKA)**

Agronomist	Dr. S.M. Hiremath/ Dr. V.V. Angadi
Field assistant	Mr.V.H.Jamadar
Field assistant	Mr. V.K. Hiremath
Field assistant	Mr.V.D.Kalawad
Field assistant	Mr. V.G. Chickmath
Field assistant	Mr. Anand Gouda Patil
Field assistant	Mr. Manoj Nandikolmath
Jr. Steno/UDC	Mr.R.N.Vagole
Driver	Vacant

17. KAU,THRISSUR (KERALA)**Main Centre, Karmana (Thiruvandrum)**

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

On-Farm Centre, Thiruvella

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

18. JNKVV,Jabalpur(M.P.) 2017-18**Main Centre, Jabalpur**

Chief Agronomist	Dr.V.K.Shukla
Jr. Soil Scientist	Vacant
Scientist Agronomy	Dr. R.P.Sahu
Technical Asstt.	Dr.S.K.Vishwakarma
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Messenger	Mr.N.L.Bhumiya

Sub Centre, Rewa

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

Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Mr.S.K.Upadhyay

Sub Centre, Powerkheda

Agronomist	Dr. V.K. Singh
Tech.Assistant	Sh.P.S.Yadav
Field assistant	Vacant
Field assistant	Mr.Sudhir Dubey
Jr. Steno/UDC	Mrs.Sushila Jhariya

On Farm Centre, Dindori

Agronomist	Mr.D.N.Shriniwas
Jr.Economist	Vacant
Field assistant	Mr.V.R.Ghorke
Field assistant	Mrs.Jaya Kori
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

On Farm Centre, Katni

Agronomist	Dr. B. D. Ghode
Technical Asstt.	Vacant
Field assistant	Shri M. S. Prajapati
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Driver	Vacant
Watchman	Vacant

19. RMVRSUA&T GWALIAR, (M.P.)**Sub Centre, Indore**

Agronomist	Dr. S.K. Choudhary
Technical Asstt.	Shri N.K. Sinha
Field Assistant	Vacant
Field Assistant	Vacant

LDC	Vacant
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20. MPKV,RAHURI (MAHARASHTRA)**Main Centre, Rahuri**

Chief Agronomist	Dr. B.S.Raskar
Jr. Agronomist	Vacant
Jr.Soil Scientist	Dr.V.S.Patil
Tech. Assistant	Mr.A.B.Dhage
Field Assistant	Mr.B.K.Jadhay
Field Assistant	Mr. K.T. Thorat
Jr.Stenographer	Mr.A.M.Chavan
Messenger	Vacant

On Farm Centre, Ganeshkhind (Pune)

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	Miss. Chaskar
Driver	Vacant
Watchman	Vacant

21. DDPKV,AKOLA (MAHARASHTRA)**Main Centre, Akola**

Chief Agronomist	Dr. N D. Parlawar / Dr. (Mrs.) Mangala R. Ghanbahadur
Jr. Agronomist	Mr.B.S. Morwal
Jr.Soil Scientist	Mr.O.S.Rakhonde
Jr.Res. Assistant	Mrs. P. N. Kalane
Field Assistant	Mr.M.M.Deshmukh
Field Assistant	Vacant
Jr.Stenographer	Mr.B.W.Ahir
Messenger	Mrs. L.P. Ingle

Sub Centre, Hiwara

Agronomist	Dr.Varsha V.Tapre
Technical Assistant	Mr. A. B. Thakare

Field Assistant	Mr.S.D.Kadam
Field Assistant	Mr. R. S. Ghorpade
Field Assistant	Miss. Jyoti G. Khillare
Field Assistant	Miss Sharda G. Bunde
Field Assistant	Vacant
Field Assistant	Vacant
Driver	Vacant
Jr.Stenographer	Mrs. N. M. Akhatkar
Watchman	Mr.Y.S.Ghonmode

22. MAU,PARBHANI (MAHARASHTRA)

Main Centre, Parbhani

Chief Agronomist	Dr.W.N.Narkhede
Jr.Economist	Vacant
Jr.Soil Scientist	Mr. R. N. Khandare
Jr.Stenographer	Vacant
Tech. Assistant	Vacant
Field Assistant	Mr.G.Y.Sonwane
Field Assistant	Vacant
Messenger	Vacant

On Farm Centre, Aurangabad

Agronomist	Prof. S. B. Pawar (Additional charge)
Tech. Assistant	Dr. D. P. Deshpande
Field Assistant	Vacant
Field Assistant	Mr. S. K. Choudhari
Field Assistant	Mr. B. N. Ambad
Field Assistant	Mr. R. P. Kerai
Field Assistant	Mr. B. S. Kakade
Field Assistant	Mr. S. S. Mundhe
Jr.Stenographer	Vacant

23.DBS KKV,DAPOLI(MAHARASHTRA) 2017-18

Main Centre, Karjat

Chief Agronomist	Dr. L. S. Chavan
Jr. Soil Scientist	Dr.D.G.Jondhale
Jr. Agronomist	Dr.N V Mhaskar
Technical Asstt.	Dr. H. D. Pawar
Technical Asstt.	Shri. D. J. Shet
Field assistant	Shri. N.P. Patil

Field assistant	Shri. J.P. Hambir
Jr. Steno/UDC	Shri. R.L. Bivalkar
Messenger	Shri. L.N. Hambir

On Farm Centre, Palghar

Agronomist	Dr.S.B.Bhagat
Field Assistant	Shri. S.V. Kamble
Field Assistant	Shri. V.S. Daphal
Field Assistant	Shri. V. N. Patil
Field Assistant	Shri. S.D. Phale
Field Assistant	Shri. S.R. Iware
Field Assistant	Shri. G. N. Totkar
Jr.Stenographer	Shri. K.P. Malche
Driver	Vacant
Messenger	Vacant

24. OUAT,BHUBNESWAR (ORISSA) 2017-18

Main Centre, Bhubaneswar

Chief Agronomist	Dr.Rabindra Kumar
	Paikaray
Jr. Agronomist	Dr.Alok Kumar Patra
Jr. Soil Scientist	Dr.Kshitiendra Narayan Mishra
Tech. Assistant	Mr.Dilip Kumar Rout
Tech. Assistant	Mr.Trinatha Rautaray
Field Assistant	Mr.Pratap Chandra Behera
Field Assistant	Mr.Mrutunjaya Rout
Jr.Stenographer	Mr.Samir Kumar Mallick
Messenger	Mr.Gandharba Mahabhoi

Sub Centre, Chiplima

Agronomist	Mr.Jayadev Halder
Tech. Assistant	Mr.Prafulla Kumar Mohanty
Field Assistant	Mr.Jaikrushna Behera
Field Assistant	Mr.Brajabandhu Chhanda
Jr.Stenographer	Mr.Pradip Kumar Samal
Agronomist	Dr.Tushar Ranjan Mohanty

On Farm Centre, Kendujhar

Jr.Economist	Vacant	Field assistant	Mr.Gurdip Singh
Field Assistant	Mr.Kasinath Mallick	Field assistant	Mr.Sukhdev Singh
Field Assistant	Mr Basanta Kumar Das	Field assistant	Vacant
Field Assistant	Vacant	Field assistant	Mr Harjit Singh
Field Assistant	Mr.Dinesh Kumar	Jr.Stenographer	Mrs.Sukhdeep Kaur
	Pattanayak	Driver	Mr.Avtar Singh
Field Assistant	Mr.Sujoy Kumar Dhir	Watchman	Mr.Danial
Field Assistant	Vacant		
Jr.Stenographer	Mr.Fulendu Kumar		

26. AU, Kota 2017-18**Sub Centre, Kota**

Driver	Mr.Baidhar Behera	Agronomist	Dr. J. P. Tetarwal
Watchman	Mr.Purna Chandra Barik	Tech. Assistant	Vacant
		Field Assistant	Dr. Revati Singh Jatav
		Field Assistant	Vacant
		Jr.Stenographer	Sh. Abdul Salim

On Farm Centre, Kalahandi

Agronomist	Dr.Bhabani Shankar Nayak
Field Assistant	Mr.Trilochan Sahoo
Field Assistant	Vacant
Field Assistant	Mr.Udaya Nath Mishra
Field Assistant	Mr.Kanhu Charan Lenka
Field Assistant	Mr. Ananda Chandra Sahu
Field Assistant	Vacant
Jr.Stenographer	Mr.Basant Kumar Nayak
Driver	Mr.Kailash Candra Mallick
Watchman	Mr.Dibakar Mallick

Main Centre, Ludhiana

Chief Agronomist	Dr.Sohan Singh Walia
Agronomist	Dr.C.S.Aulakh
Jr.Soil Scientist	Dr.Roopinder Singh
Tech. Assistant	Mr.Surender Kumar Sharma

Field Assistant	Mr.Balbair Singh
Field Assistant	Mr.Baljit Singh
Field Assistant	Mr.Prem Prakash
Jr.Stenographer	Mr.Ram Ji Dass
Watchman	Mr.Jagmohan Singh

On Farm Centre, Amratsar

Agronomist	Dr.Harpreet Singh
Field Assistant	Mr.Amrik Singh
Field assistant	Mr.Tarseem Dass

27. MPUAT,Udaipur (RAJASTHAN) 2017-18**On Farm Centre, Udaipur**

Agronomist	Dr. L N Dashora
Jr.Economist	Mr.Hari Singh
Field Assistant	Mr.N.S.Jhala
Field Assistant	Mr.Ramji Lal
Field Assistant	Mr.Madan Lal
Field Assistant	Mr.A.S.Rathore
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr.Vishal Ajmera
Driver	Mr. Yogesh Chandra
Damami	
Watchman	Mr. Shanker Lal Nagda

28. SKNAU, Jobaner, (RAJASTHAN)**Main Centre, Durgapura**

Chief Agronomist	Dr. R. Sammauria
Jr. Agronomist	Dr. O.P.Meena
Technical Asstt.	Shri Ram Lal Nehra
Field assistant	Vacant
Field assistant	Sh. Nonand Singh
Jr. Steno/UDC	Vacant
Messenger	Vacant

On-Farm Centre, Fatehpur (Sikar)

Sr. Agronomist	Vacant
Agri Supervisor	Mr.Banwari Lal
Agri Supervisor	Mr.Chaju Ram Jat
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Agri Supervisor	Vacant
Driver	Vacant
Jr. Steno/UDC	Vacant
Watchman	Vacant

29. PJTSAU, Rajendernagar, Hyderabad 2017-18**Main Centre, Rajendranagar**

Chief Agronomist	Dr.M.Goverdhan
Jr. Agronomist	Dr.Ch.Pragathi Kumari
Jr. Soil Scientist	Dr. S.Sridevi
Technical Asstt.	C.Madhusudhan
Field assistant	Vacant
Field assistant	Vacant
Jr. Steno/UDC	Vacant
Messenger	Vacant

Sub Centre, Rudrur

Agronomist	Smt.Firdoz Shahana
Technical Asstt.	Vacant
Field assistant	M.Shekar
Field assistant	Vacant
LDC/Typist	Vacant

On-Farm Centre, Medak

Agronomist	Dr.Md Lateef Pasha
Jr.Economist	Vacant
Field assistant	Md.Munawer
Field assistant	Sri. P.Yadagiri
Field assistant	S.Aziz Hasan
Field assistant	S.Hasham
Field assistant	K.Praveen Kumar
Field assistant	Vacant
Jr.Stenographer	A.Vijay / D.Sanjay singh
Driver	Sri. Shaik Shabbir
Watchman	Vacant

30 .TNAU, COIMBATORE(TN) 2017-18**Main Centre, Coimbatore**

Chief Agronomist	Dr.K.R.Latha
Jr.Soil Scientist	Dr.K.Sathiya Bama
Jr. Agronomist	Dr.V.Vasuki
Jr.Economist	Vacant
Tech. Assistant	Mr. P.K. Chandrakumaran
(Senior Research Officer)	
Field Assistant	Vacant
Field Assistant (Skilled worker)	Vacant
Assistant (Administrative)	Tmt.R.Chellammal
Messenger	Vacant

Sub Centre, Thanjavur

Agronomist	Dr.S. Porpavai
Tech. Assistant	Vacant
Field Assistant	M.Periyasamy
Field Assistant	M.Palanisamy
Jr.Stenographer (Junior Assistant)	Mrs.S.Shanthi

On farm ,OFR Centre I -Bhavanisagar

Agronomist	Dr.N.Satheeshkumar
Tech. Assistant	Vacant
Field Assistant	Th. A.Gowthaman
(Junior Agricultural Officer)	
Field Assistant	Th. K.Manigandan
(Senior Agricultural Officer)	
Field Assistant	Th.C.Marruthachalam
(Agricultural Supervisor)	
Field Assistant (Asst. Agrl. Officer)	Th. R. Rajesh
Field Assistant (Asst. Agrl. Officer)	Ms. A. Kasthuri
Field Assistant (Asst. Agrl. Officer)	Th. M. Vijay
Field Assistant (Asst. Agrl. Officer)	Th. S.Sakthivel
Jr.Stenographer	M. Karunakaran
Driver	Vacant
Messenger	Th.N.Vengatesan

On farm,OFR Centre II - Yethapur

Agronomist	Dr.D.Raja
Tech. Assistant	Vacant
Field Assistant (Agricultural Supervisor)	Mr.V.Sekar
Field Assistant	Mr.A.Ravichandran
(Agricultural Supervisor)	

Field Assistant (Agricultural Supervisor)	Mr.A.Murugan
Field Assistant (Asst. Agrl. Officer)	Mr.C.Muthulakshmi
Driver	Mr.P.Govindaraju
Messenger	Vacant

31. CSAUAT,KANPUR (U.P.)**Main Centre, Kanpur**

Chief Agronomist	Dr. Karam Husain
Jr. Soil Scientist	Dr.U.S.Tiwari
Jr. Agronomist	Dr. Y.K. Singh
Technical Asstt.	Mr. U. S. Yadav
Field assistant	Sri. Virendra Singh
Field assistant	Mr. Anil Kumar Singh
Jr. Steno/Sr. Clerk	Sri. Krishan Prakash
Messenger	Mr. Vijay Bahadur

On Farm Centre, Daleep Nagar

Agronomist	Vacant
Field Assistant	Mr. Sudhir Pratap Singh
Field Assistant	Mr. Jagdish Chandra
Field Assistant	Mr. R.B.Yadav
Field Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Vacant
Driver	Mr. Vijay Kumar
Watchman	Sri. Maan Singh

32. NDUAT,FAIZABAD(U.P.) 2017-18**Main Centre, Faizabad**

Chief Agronomist	Dr.N.B.Singh
Jr. Soil Scientist	Dr. Alok Kumar
Jr. Agronomist	Dr. R. A. Yadav
Technical Asstt.	Mr. Ishwar Nath Singh
Technical Asstt.	Mr. A. P. Singh
Field assistant	Vacant
Field assistant	Mr. R. A. Pandey
Jr. Steno/UDC	Vacant
Messenger	Mr. Jag Jeevan

On Farm Centre, Ambedkar Nagar

Agronomist	Vacant
Field Assistant	Mr. A.N.Pandey
Field Assistant	Mr. P.C.Tripathi
Field Assistant	Mr. Ashutosh Singh
Field Assistant	Mr. V.B.Singh
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr.Ram Lal Yadav
Driver	Mr.J.P.Yadav
Watchman	Mr.S.P.Singh

33. BHU,Varanasi (UP) 2017-18**Sub Centre, Varanasi**

Agronomist	Dr.J.S.Bohra
Tech. Assistant	Vacant
Field Assistant	Vacant
Field Assistant	Vacant
Jr.Stenographer	Mr.Mohan Ram

34. RBS COLLEGE,BICHPURI(AGRA)

Agronomist	Dr.S.B.Singh
Tech. Assistant	Dr.Rahul Pundir
Field Assistant	Vacant
Field Assistant	Dr.Susheel Kumar Singh
Jr.Stenographer	Dr.Bhumi Raj Singh

35. GBPUAT,PANTNAGAR (UTTARAKHAND)**Main Centre, Pantnagar**

Chief Agronomist	Dr.Rohitashav Singh
Jr.Soil Scientist	Dr.Ajeet Pratap Singh
Jr. Agronomist	Dr. Dinesh kumar Singh
	*working In-charge OFR
Tech. Assistant	Mr.Y.S.Khokar
Field Assistant	Mr.A.K.Tiwari
Field Assistant	Mr.M.P.Singh
Jr.Stenographer	Vacant
lab.Attendent	Mr.Laloo Singh

On Farm Centre, Jeolikot (Nainital)

Agronomist	Dr.Purushottam Kumar
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Jr. Scientist(Economics)	Vacant	Technical Asstt.	Mr.Basudeb Datta
Field Assistant	B.C.Mishra	Field assistant	Vacant
Field Assistant	K.S.Mishra	Field assistant	Contractual
Field Assistant	Bahali Shah	Jr. Steno/UDC	Smt. Sonali Rakhit
Field Assistant	Ashok Kumar	Supporting staff	Smy. Debosree Das
Field Assistant	M.G.Singh	On-Farm Centre, Kakdwip	
Field Assistant	Vacant	Agronomist	Dr.Manabendra Ray
Driver	Harikesh	Jr. Economist	Dr.Soumitra Chatterjee
Jr.Stenographer	Vacant	Field assistant	Mr.A.K.Bhaumik
Supporting Staff(Watchman)	Ram Nihor	Field assistant	Mr.K.Maiti
		Field assistant	Mr.N.Das
		Field assistant	Contractual
		Field assistant	Contractual
		Field assistant	Contractual
		Jr. Steno/UDC	Mr.Nilanjan Mukherjee
		Driver	Vacant
		Supporting staff	Mr. Chandan Tudu

36. BCKV,Kalyani 2017-18**Main Centre, Kalyani**

Chief Agronomist	Dr. Swapan Kumar
	Mukhopadhyay
Jr. Soil Scientist	Dr. Sushanta Saha
Technical Asstt.	Vacant

APPENDIX IV

APPENDIX IV: SOIL FERTILITY STATUS AND NUTRIENT UPTAKE 2016-17

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

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Bhubaneswar	Summer	OC %	0.86	0.85	0.75	0.68	0.80	0.73	0.76	0.75	0.82	0.83		
		N	308.4	305.5	298.2	280.3	297.5	281.3	299.3	286.8	300.7	301.3		
		P	14.3	13.9	14.1	13.2	13.7	12.6	13.8	12.8	14.2	14.2		
Chiplima	Summer	K	133.1	135.6	131.3	127.3	132.3	128.7	132.0	128.2	134.5	134.8		
		OC%	0.85	0.89	0.82	0.74	0.84	0.75	0.83	0.78	0.86	0.84		
		N	293.7	293.1	296.0	276.7	293.1	272.8	286.4	272.4	292.0	293.3		
Coimbatore	Summer	P	13.0	13.0	14.2	12.8	13.1	12.1	13.1	12.5	13.4	13.6		
		K	143.6	140.0	148.7	132.5	136.9	132.7	136.4	132.5	143.8	145.8		
		O.C.%	0.57	0.6	0.56	0.6	0.58	0.57	0.58					
Faizabad	Summer	N	209	233	225	218	223	227	218	242				
		P	21.1	26.1	24.2	23.6	25.1	24.6	23.7	27.3				
		K	231	272	263	248	252	234	241	268				
Hisar	Kharif	OC%	0.45	0.39	0.46	0.48	0.45	0.46	0.42					
		N	158.7	144.7	151.7	154	144.7	140	135.3					
		P	17.3	17.3	17.3	19	19	20.3	16.7					
		K	212.9	239.7	221	268.9	250.3	229.9	237.2					
Rabi	Rabi	OC%	0.47	0.43	0.49	0.48	0.45	0.47	0.42					
		N	161	161	161	172.7	161	170.3	154					
		P	15.3	16	16.7	19.7	14.7	16	16					
		K	233.9	239.2	245.4	247.1	253.4	255.7	242.7					
Summer	Summer	OC%	NA	NA	0.48	0.49	NA	0.44	NA					
		N	NA	NA	163.3	175	NA	172.7	NA					
		P	NA	NA	10	13	NA	14	NA					
		K	NA	NA	242.8	254.5	NA	256.4	NA					
Jabalpur	Kharif	OC G/KG	6.74	6.56	7.98	7.87	7	7.86	6.71	7	6.62	6.59	6.68	6.72
		N	251	242	279	276	262	276	251	278	249	246	249	251

Contd..../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Jammu	Summer	P	13	12	21	13	10	11	14	17	19	22	16	14
		K	301	327	326	327	390	326	327	350	376	415	378	330
		OC%	0.54	0.66	0.65	0.64	0.62	0.5	0.62	0.62	0.6	0.61		
		N	217	240	232	220	236	228	230	225	212	202		
Jorhat	Kharif	P	19.6	26.2	24.7	21.2	22.5	22.8	21.5	23.1	23.4	24.2		
		K	120	130	134	122	124	128	130	122	127	125		
		OC%	0.63	0.633	0.637	0.64	0.646	0.65	0.685	0.68	0.67			
		N	225	232.5	235	233	238.8	246.8	245	256.7	240.5			
Junagadh	Rabi	P	8.1	9.4	9.5	9.8	10.2	12.2	11.7	13.5	12.3			
		K	78.7	88.8	87.8	93.6	95.6	117.9	113	126.8	102			
		OC%	0.63	0.64	0.64	0.65	0.65	0.65	0.69	0.68	0.68			
		N	222	227.5	225.2	228	232.5	230.3	235	255.5	235			
Kannur	Summer	P	8	8.6	8.5	9.2	9.5	11.5	11	12	11.2			
		K	76	85.2	80	88.4	91.5	106.5	102.2	115	95.5			
		OC%	0.64	0.653	0.654	0.657	0.669	0.675	0.713	0.697	0.7			
		N	217.2	225.8	220.8	225.2	230.7	234.5	231.5	241.3	231.7			
Karamana	Rabi	P	7.5	8.2	8.3	8.6	9.3	10.5	10.1	11.8	10.8			
		K	75.7	81.4	76.4	84.8	88	96.8	91.8	101.3	88.8			
		OC%	0.75	0.71	0.79	0.75	0.75	0.67	0.7	0.76	0.71	0.71		
		N	257	259	261	249	257	252	246	265	262	253		
Kannur	Summer	P	28.69	25.24	28.45	24.56	27.89	23.82	23.29	22.59	29.21	27.87		
		K	206	211	177	216	197	214	206	216	221	235		
		OC%	0.52	0.54	0.62	0.53	0.52	0.6	0.56	0.57	0.61	0.53		
		N	218	224	237	221	219	232	228	230	234	220		
Karamana	Summer	P	13.85	14.6	14.95	13.7	13.6	14.35	13.85	14.1	14.55	13.7		
		K	214	217	223	212	215	221	216	218	222	215		
		OC%	1.66	0.895	1.35	1.216	1.022	0.974	1.514					
		N	246.7	221.61	238.33	217.4	183.98	217.43	229.97					
Karamana	Rabi	P	27.64	35.11	32.89	34.14	32.35	32.26	28.8					
		K	79.89	93.89	115.81	134.32	140.63	95.35	92.92					

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Kathalagere	Kharif	OC%	0.51	0.51	0.56	0.51	0.58	0.51	0.53	0.51				
		N	0	0	0	0	0	0	0	0				
		P	24.67	25.51	30.14	24.48	29.49	24.68	25.9	25.84				
	Summer	K	165.28	163.81	185.41	165.13	184.12	170.42	158.86	170.54				
		OC%	0.52	0.52	0.55	0.51	0.57	0.51	0.52	0.52				
		N	0	0	0	0	0	0	0	0				
Kota	Summer	P	25.87	26.56	29.27	26.76	28.43	25.8	26.42	27.42				
		K	169.0	162.1	183.4	171.1	182.7	172.7	160.1	173.9				
		OC%	0.64	0.67	0.69	0.64	0.68	0.69	0.71	0.66	0.64	0.62		
Ludhiana	Rabi	N	402.3	428.2	451.2	402.3	442.5	451.2	462.6	422.4	405.2	385.1		
		P	18.4	21.6	23.6	24.7	20	20.6	24.7	19.6	23.7	19.7		
		K	435.7	451.3	545.3	428	441.7	515	523.3	533.7	465	444.3		
Navsari	Rabi	OC%	0.48	0.58	0.49	0.48	0.49	0.52	0.43	0.52	0.5	0.55	0.54	0.56
		N	232.9	241	243.2	222.5	240.3	245.3	254.6	254.4	216.1	235.6	240.6	240.9
		P	39.7	47.5	43.5	45.9	42.7	47	44.5	45.9	49.2	40.8	45.1	48.9
Palampur	Kharif	K	98.4	101.1	91.9	96.5	89.8	91.1	95.8	102.9	94.3	91.6	103.4	101.2
		OC%	0.66	0.60	0.65	0.65	0.64	0.62	0.67	0.61	0.63	0.65		
		N	271.7	272.3	270.3	272.3	271.3	273.3	274.3	275	273	276.3		
Parbhani	Summer	P	35.9	35.3	33.9	33.4	37.7	36.7	37.4	37.2	36.4	36.5		
		K	230.3	245	212.7	201.7	193	234	273	262	216	259.7		
		OC%	1.27	1.15	1.18	1.24	1.02	1.15	1.22	1.28				
	Rabi	N	187.2	313.3	287.1	218.4	259.4	318.5	265.4	203.4				
		P	65.4	53.5	57.2	75.3	58.9	65.4	77.4	56.2				
		K	139.1	119.4	145.4	173.4	187.6	114.7	152.1	141.2				
	Summer	OC%	1.3	1.3	1.4	1.5	1.3	1.4	1.4	1.5				
		N	165.8	321.8	272.5	221.1	301.6	304.8	221.7	226.3				
		P	72.6	50.32	65.75	91.2	74.35	67.66	77.42	83.8				
	Rabi	K	151.72	86.35	176.5	116.24	166.5	195.1	128.65	168.25				
		OC%	0.57	0.61	0.6	0.59	0.61	0.63	0.56	0.54				
		N	181.2	184	182.5	181.2	187	177.2	171	164.5				

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Pantnagar	Kharif	P	13.95	15.1	13.7	13.5	14.6	12.5	13.2	10.2				
		K	362.6	368	363.42	363.62	371	365.5	350	360.2				
	Rabi	OC%	0.74	0.69	0.78	0.74	0.75	0.84	0.89	0.9	0.89			
		N	111.12	108.51	110.33	113.06	114.71	113.49	93.83	177.66	353.36			
		P	20.27	389.97	21.94	18.76	26.87	33.45	32.47	20.62	75.98			
		K	303.68	341.67	336.84	343.62	351.93	1043.86	722.79	250.93	312.87			
		N	84.9	360.19	304.56	382.15	387.33	62.47	278.18	67.1	342.19			
		P	17.82	57.65	58.03	102.24	60.68	15.13	30.61	17.83	47.53			
		K	362.16	365.43	308.07	885.43	637.53	205.81	341.96	304.74	270.03			
		N	-	75.37	468.87	596.33	639.93	294.25	281.3	-	123			
		P	-	14.4	76.82	109.88	114.03	63.52	74.95	-	28.78			
		K	-	154.51	416.92	556.31	409.24	89.79	214.49	34.88	73.86			
Powerkheda	Rabi	OC%	6.72	6.53	7.96	7.84	6.98	7.83	6.69	6.98	6.59	6.57		
		N	249	240	277	274	259	275	250	277	247	244		
		P	13.1	12	20.6	12.6	10.2	11.5	14.4	17.3	19.2	20.1		
		K	305	331	329	332	394	331	331	353	379	419		
Rahuri	Kharif	OC%	0.62	0.63	0.64	0.63	0.62	0.64	0.65	0.63	0.67	0.66	0.61	0.63
		N	207	210	201	220	216	210	220	204	216	201	216	210
		P	13	13	13	12	13	14	14	13	14	14	13	11
		K	500	534	504	537	518	523	532	538	545	575	567	564
	Rabi	OC%	0.64	0.65	0.62	0.64	0.63	0.66	0.67	0.66	0.68	0.65	0.64	0.6
		N	198	202	192	211	208	202	211	195	208	192	208	202
Raipur	Rabi	P	12	12	13	12	13	13	14	11	13	13	13	11
		K	493	526	497	511	519	530	538	530	538	567	560	556
	Summer	OC%	0.68	0.67	0.67	0.67	0.66	0.67	0.67	0.66				
		N	276	273	278	266	279	274	276	278				
		P	26.24	26.77	24.63	25.24	26.04	25.35	25.4	26.28				
		K	300	302	303	298	306	298	300	299				
	Summer	OC%	0.67	0.67	0.65	0.65	0.66	0.67	0.66	0.66				
		N	284	286	280	272	282	285	278	280				
		P	27.91	27.75	26.4	25.94	28	27.09	27.32	26.36				
		K	327	304	314	307	314	314	310	313				

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rajendranagar	Kharif	OC%	0.68	0.67	0.66	0.66	0.67	0.67	0.67	0.67				
		N	274	279	270	267	268	273	272	265				
		P	24.68	24.43	23.5	24.58	24.79	25.04	24.63	24.49				
	Rabi	K	270	286	295	282	287	286	278	288				
		OC%	0.51	0.53	0.57	0.56	0.52	0.61	0.52	0.55	0.51	0.56	0.59	0.58
		N	185.4	215.5	227.9	240.6	238.3	206.1	231	211.2	230.4	222.9	227	191.9
Rewa	Summer	P	34.9	38	39.5	37.2	35.8	27.4	37.1	27.5	41.8	33.7	37.2	33
		K	247.3	248.8	255.9	232.3	223	228.6	244.3	240.6	281.6	232.7	247.7	260.7
		OC%	0.56	0.59	0.44	0.55	0.53	0.58	0.54	0.57	0.55	0.47	0.5	0.59
	Rabi	N	189.3	209.3	207.7	210.8	203.1	223.3	221.3	194.1	196.4	203.9	200.1	191.4
		P	28.3	38.1	34.2	38.6	30.8	33.1	30.5	32.4	34.5	28.2	29	34.9
		K	242.7	257	261.8	258.9	257	286.3	254.5	237.2	287.8	270.6	277.2	265
Rudrur	Rabi	OC%	6.07	6.26	6.41	6.17	6.6	6.61	6.43	5.96	6.64	6.23		
		N	226	232	241	231	244	247	244	224	253	233		
		P	9.7	9.3	9.4	9.8	9.6	10	10.3	9.9	9.9	10.1		
	Rabi	K	295	287	317	295	289	292	294	288	285	288		
		OC%	0.52	0.55	0.58	0.61	0.5	0.64	0.6	0.57	0.61	0.49	0.62	0.58
		N	220.5	204.5	187.3	188.2	214	196.8	186.7	178.4	180.3	227.3	195.9	200.3
Sobour	Rabi	P	36.4	37.2	43.8	42.7	34.9	43.5	36.5	38.1	43.1	38.8	36.5	45.3
		K	472.1	456.5	506.6	388.4	358.7	401.4	408.7	427.1	418.2	463.3	425	406.4
		OC%	0.52	0.46	0.44	0.5	0.48	0.49	0.52	0.46	0.5	0.47		
	Rabi	N	225.5	208.6	253.7	218.2	203.1	281.9	282.1	242.6	253.9	253.9		
		P	26.7	24.2	23.6	26.1	24.8	25.4	26.6	36.9	32	30.7		
		K	188.9	228.1	189.7	178.1	196.2	191.3	198.5	233.5	239.5	198		
Siruguppa	Rabi	OC%	0.68	0.67	0.76	0.7	0.67	0.73	0.81	0.82	0.79	0.7		
		N	183	181	202	174	189	202	220	230	185	183		
		P	11.6	13.7	16.4	14.3	12.5	16.7	19.7	17.9	12.5	14.9		
	Summer	K	357	393	391	377	375	367	389	376	396	386		
		OC%	Fallow	0.344	0.351	0.352	0.346	0.349	0.339	0.347				
		N		226.00	224.67	225.33	222.67	224.67	226.67	225.33				

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Thanjavur	Kharif	P		24.27	24.6	24.38	24.6	23.62	24.67	24.04				
		K		242	240	242.67	242.33	244.33	244.33	240.33				
		OC%	0.54	0.53	0.53	0.57	0.53	0.55	0.55					
		N	315	256	310	295	312	334	319					
	Rabi	P	19	19.6	19.3	21.1	21.3	21.5	20.6					
		K	283	273	280	278	289	293	290					
		OC%	0.54	0.54	0.58	0.57	0.57	0.59	0.59					
		N	223	231	232	227	231	235	234					
	Summer	P	20.4	20.2	19.8	20.7	21.5	21	21.4					
		K	199	200	203	206	208	206	206					
		OC%	0.57	0.53	0.53	0.52	0.53	0.54	0.58					
		N	234	216	216	206	211	220	232					
Varanasi	Kharif	P	20.2	19.5	19.6	19.8	21.1	20.6	21.6					
		K	187	195	195	191	195	193	199					
		OC%	0.36	0.36	0.35	0.36	0.37	0.34	0.36	0.39	0.39	0.37		
		N	183.9	188.1	179.7	213.2	196.5	225.7	183.9	225.7	225.7	196.5		
	Rabi	P	21.7	23.3	22.4	21.4	22.5	22.7	21.8	21.89	22.66	23.81		
		K	121.52	112.82	114.69	111.14	116.89	117.82	1112.19	116.41	110.13	113.38		
		OC%	0.39	0.34	0.34	0.34	0.35	0.37	0.35	0.34	0.33	0.36		
		N	229.9	234.1	217.4	200.6	217.4	238.3	225.7	196.5	183.9	209		
	Summer	P	21.3	22.2	22.3	22.5	22.3	22.3	22.2	22.6	22.6	23.6		
		K	129.1	121.74	117.11	112.26	117.67	118.23	115.81	119.24	119.69	118.5		
		OC%	0.41	0.37	0.38	0.35	0.35	0.32	0.36	0.36	0.35	0.37		
		N	192	204.8	196.5	209	200.6	209	204.8	209	213.2	200.6		
		P	21	23.7	23.8	23.2	23.1	22.2	22.5	21.7	24.57	23.74		
		K	193.2	121.8	120.9	119.3	119.1	121.07	118.2	123.42	119.24	118.31		

APPENDIX IV: SOIL FERTILITY STATUS AND NUTRIENT UPTAKE 2016-17
Table B : Nutrient uptake N P and K Kg/Ha in exp no. (a)

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Bhubneshwar	Kharif	N	59.95	61.88	63.81	52.61	66.01	57.77	69.26	60	64.69	58.09		
		P	17.23	18.08	19.08	15.54	19.82	17.16	20.86	17.01	19.21	17.3		
		K	73.17	72.67	77.45	66.87	77.79	71.9	82.7	71.46	75.21	68.67		
	Rabi	N	101.75	99.27	111.99	207.24	60.1	195.76	33.2	442.2	391.64	100.85		
		P	11.95	13.24	13.67	38.54	10.73	35.74	4.35	59.76	44.09	18.07		
		K	29.57	44.21	33.83	190.23	46.15	206.78	53.16	342.92	272.86	99.1		
	Summer	N	0	23.62	173.45	88.85	150.47	40.42	194.24	25.92	220.47	209.48		
		P	0	2.76	13.85	18.92	11.35	8.6	13.83	1.9	16.72	15.84		
		K	0	8.39	86.24	102.54	74.29	17.97	96.72	20.91	108.93	104.2		
Chiplima	Kharif	N	54.94	50.92	55.69	52.82	59.19	50.51	59.64	54.47	60.35	55.58		
		P	16.12	15.05	16.66	16.13	17.49	14.86	17.26	16.29	18.45	16.94		
		K	65.07	60.81	65.66	66.96	71.19	59	69.67	65.73	74.47	69.2		
	Rabi	N	93.27	99.54	106.21	376.36	50.41	32.73	38.26	226.85	73.25	36.29		
		P	11.33	11.99	13.18	86.91	30.33	4.38	4.36	43.78	14.4	6.15		
		K	25.8	79.01	30.94	368.26	66.65	52	57.42	268.07	151.21	40.25		
	Summer	N	0	63.71	58.33	36.45	45.24	68.5	77.59	40.93	38.05	36.85		
		P	0	35.63	10.27	11.29	8.69	23.47	14.1	13.65	5.06	13.79		
		K	0	23.71	27.22	46.13	21.11	35.13	36.61	33.56	11.97	18.42		
Coimbatore	Kharif	N	142.7	142.8	122.9	728.2	334.6	411.7	283.2					
		P	43.7	33.1	25.9	90.8	10.9	29.1	62.3					
		K	276.4	32.4	122.5	285.9	182.8	497.8	91					
	Summer	N	292.3	105.7	434.2	62.7	80.8	391.2	908.9					
		P	76.6	7	44.2	17	10.4	31.5	148.8					
		K	104.1	31.8	320.1	115.3	41	355.3	472.7					
	Kharif	N	74.44	45.56	89.32	69.67	79.59	94.86	48.28					
		P	18.5	8.98	22.58	11.63	13.09	23.23	15.3					
		K	148.1	84.24	180.51	92.23	60.83	188.92	129.27					

Contd..../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rabi		N	125.93	127.81	71.49	204.6	120.68	65.66	122.94					
		P	22.93	20.6	14.29	28.63	27.92	13.37	19.83					
		K	153.96	156.41	127.68	324.11	111.43	143.86	181.1					
Summer		N	NA	NA	15.98	58.24	NA	24.9	NA					
		P	NA	NA	2.56	14.09	NA	2.65	NA					
		K	NA	NA	15.12	43.74	NA	22.18	NA					
Jammu	Kharif	N	37.3	28.62	45.23	46.98	55.54	48.24	53.12	43.33	55.44	44.28		
		P	7.38	6.21	11.17	12.6	13.36	11.45	13.29	10.84	12.15	10.32		
		K	49.0	40.9	65.7	71.2	82.2	66.6	75.2	58.6	67.8	67.7		
Jorhat	Kharif	N	49.9	51.9	51.5	48.81	52.3	332.37	121.95	205.69	82.84			
		P	18.31	16.38	17.14	14.5	14.92	73.22	35.55	59.24	22.05			
		K	28.58	25.73	24.44	22.35	25.46	209.45	77.57	101.98	51.83			
Rabi		N	0	43.38	157.43	200.33	58.63	135.24	83.43	85.26	73.93			
		P	0	43.38	157.43	200.33	58.63	135.24	83.43	85.26	70.6			
		K	0	62.9	34.27	181.5	51.51	141.36	96.55	95.96	94.12			
Summer		N	22.79	7.98	7.44	61.04	57.66	9.84	8.91	67.79	64.93			
		P	14.65	7.39	2.9	16.93	16.13	4.39	3.39	20.76	21.91			
		K	22.54	4.9	5.17	53.31	52.35	6.73	6.16	57.39	70.07			
Junagadh	Summer	N	201.4	178.01	101.94	236.34	137.34	156.31	187.32	106.7	103.8	146.32		
		P	30.76	55.47	40.92	77.55	31.97	18.49	41.07	27.83	12.33	27.47		
		K	109.62	158.39	97.01	175.07	146.16	93.23	91.24	75	49.52	109.62		
Kanpur	Summer	N	0.52	0.54	0.62	0.53	0.52	0.6	0.56	0.57	0.61	0.53		
		P	218	224	237	221	219	232	228	230	234	220		
		K	13.85	14.6	14.95	13.7	13.6	14.35	13.85	14.1	14.55	13.7		
Karamana	Kharif	N	214	217	223	212	215	221	216	218	222	215		
		P	7	8.86	8.36	9.62	8.18	11.35	8.58					
		K	28.22	34.16	29.5	34.69	28.14	38.58	30.59					
Rabi		N	34.42	59.91	45.82	56.95	42.85	53.37	47.44					

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Kathalagere	Summer	P	7.51	10.75	9.34	11.28	9.24	9.35	9.15					
		K	12.54	18.56	14.16	18.71	14.52	14.51	14.35					
		N		20.8	12.55	8.38	5.16	38.29	72.24					
		P		3.5	2.3	1.81	1.19	6.35	12.43					
		K		11.87	6.56	5.9	3.96	15.58	37.69					
		N		62.56	78.53	72.55	76.14	60.8	71.42	61.08				
Kota	Kharif	P	24.7	27.41	26.42	25.28	32.25	26.29	26.07	28.08				
		K	48.85	30.56	41.56	34.61	40.04	26.67	37.02	23.7				
		N	59.87	60.61	40.33	56.16	38.02	78.1	31.3	26.46				
		P	31.24	14.95	54.47	13.25	91.4	18.46	25.64	27.24				
		K	90.96	94.88	32.86	68.41	26.99	132.84	38.96	62.22				
		N	115.36	124.79	134.91	55.89	67.54	141.57	65.87	82.32	83.56	56.06		
Ludhiana	Rabi	P	15.31	15.86	16.42	9.95	13.49	17.33	7.96	27.94	29.11	16.03		
		K	59.58	63.17	83.11	85.65	100.86	118.96	47.3	92.68	109.99	102.53		
		N	178.08	71.04	28.96	131.5	86.93	149.15	72.75	57.6	65.66	32.15		
		P	45.09	24.19	15.91	31.27	19.28	36.06	12.71	14.18	11.12	7.62		
		K	203.12	51.7	88.56	162.2	266.36	169.98	40.3	20.17	38.27	41.77		
		N		69.11	33.64	25.22	0	0	47.46	0	22.18	0		
Ludhiana	Summer	P	0	10.51	3.76	3.24	0	0	6.32	0	10.56	0		
		K	0	59.59	23.24	16.85	0	0	32.28	0	13.69	0		
		N	142.71	95.03	96.39	136.46	117.41	107.06	106.93	62.67	96.78	94.62	436.770	
		P	38.23	26.89	28.19	37.25	34.06	34.78	36.33	26.19	29.06	26.39	53.23	0
		K	115.12	89.83	106.66	135.44	131.13	130.31	127.55	59.28	54.33	54.52	147.330	
		N		73.71	127.47	258.69	73.77	79.25	83.03	104.05	368.52	33.08	15.45	97.7
Ludhiana	Rabi	P	37.7	31.32	35.02	26.91	27.95	27.12	29.19	32.67	145.36	16.66	7.54	43.46
		K	101.1	114.57	354.3	326.24	76.45	80.93	83.89	105.82	314.08	46.02	21.61	81.62
		N		53.02	156.04	140.58	0	0	41.76	0	0	0	31.12	0
		P	0	17.42	49.54	50.62	0	0	15.54	0	0	0	12.98	0
		K	0	40.68	148.34	167.08	0	0	37.94	0	0	0	37.86	0
		N												

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Navisari	Kharif	N	79	83.8	83.1	79.5	78.3	79.1	78.3	85.3	78.3	94.8		
		P	16.2	16.3	16.3	17.7	17.5	18	15.2	17.2	18.2	19.8		
		K	71.3	71.7	75.6	77.8	78.4	82.2	75.3	82.2	77.5	88.3		
	Rabi	N	6.9	81.9	96	45.5	53.5	69.4	0	22.4	31.7	52.3		
		P	0.7	18.1	17.8	4.6	6.1	23.1	0	3.9	7.6	8.5		
		K	1.4	125.2	48.5	6.8	9.7	80.2	0	29.2	32.3	58.8		
	Summer	N	0	23.9	44	13.3	0	0	71.7	46.7	66.2	15.6		
		P	0	4.2	5.8	1.9	0	0	9.3	6.4	8	2.8		
		K	0	23.8	25.6	19.7	0	0	26.3	29.4	46	17.3		
Palampur	Kharif	N	57.3	52.6	9.1	23.8	49.4	42.3	45.6	25				
		P	19.9	17.2	3.1	8.8	19.2	15.6	14.8	9.5				
		K	36.6	39.9	6.7	14.4	35.4	28.8	31.7	14.9				
	Rabi	N	126.7	34.4	28.2	45.6	11.3	5.9	46.4	77.3				
		P	18.4	4.9	4.1	10.6	1.9	1.2	10.5	18.9				
		K	33.6	5.5	8.4	9.7	1.6	1.3	9.1	18.6				
	Summer	N	0	11.8	0	5.2	52.3	9.8	6.9	5.8				
		P	0	4.4	0	4.4	5.2	1.9	1.2	0.6				
		K	0	6.1	0	6.7	6.6	5.6	3.3	5.1				
Pantnagarh	Kharif	N	111.12	108.51	110.33	113.06	114.71	113.49	93.83	177.66	353.36			
		P	20.27	389.97	21.94	18.76	26.87	33.45	32.47	20.62	75.98			
		K	303.68	341.67	336.84	343.62	351.93	1043.86	722.79	250.93	312.87			
	Rabi	N	84.9	360.19	304.56	382.15	387.33	62.47	278.18	67.1	342.19			
		P	17.82	57.65	58.03	102.24	60.68	15.13	30.61	17.83	47.53			
		K	362.16	365.43	308.07	885.43	637.53	205.81	341.96	304.74	270.03			
	Summer	N	0	75.37	468.87	596.33	639.93	294.25	281.3	0	123			
		P	0	14.4	76.82	109.88	114.03	63.52	74.95	0	28.78			
		K	0	154.51	416.92	556.31	409.24	89.79	214.49	34.88	73.86			
Powarkheda	Kharif+Rb+Summ	N	117	100	152	107	221	281	54	179	115	255		
		P	16	9	15	9	40	25	13	36	29	29		

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rahuri	KH+Rb+Summ	K	59	66	106	69	205	240	42	226	166	224		
		N	212	190	254	197	220	170	251	231	250	243	274	263
		P	30	18	23	37	48	25	52	24	45	30	44	50
	Kharif	K	160	126	158	184	290	135	295	168	310	185	302	310
		N	136.18	149.37	139.87	177.54	150.5	166.82	173.38	168.68	180.85	189	192.97	105.31
		P	64.96	35.9	65.33	40.17	68.41	48.86	26.46	40.07	28.85	47.38	30.89	19.54
Rahuri	Rabi	K	113.6	80.44	116.08	92.47	121.09	92.71	71.24	90.52	75.87	113.07	81.21	119.2
		N	186.39	85.09	35.07	140.76	73.71	218.32	238.89	191.67	45.04	42.2	76.41	143.27
		P	42.58	30.97	8.2	52.92	29.1	43.79	48.94	29.39	9.46	7.97	29.41	28.51
	Kharif	K	36.25	58.98	30.61	154.52	91.34	43.11	45.22	132.12	37.1	35.41	94.25	99.1
		N	116.2	132.26	121.3	113.3	128.22	124.32	127.28	119.47				
		P	30.81	29.56	28.14	37.44	33.27	30.23	30.37	32.54				
	Rabi	K	134.66	131.11	123.38	121.25	130.27	133.16	126.13	127.54				
		N	65.04	72.98	187.41	-	89.94	187.75	60.39	81.4				
		P	20.82	10.66	55.09	-	11.02	45.78	17.34	23.66				
	Summer	K	51.07	29.69	182.86	-	108.3	171.16	78.56	76.78				
		N	39.01	52.58	82.02	-	106.17	-	63.76	85.91				
		P	6.07	7.53	12.21	-	7.55	-	9.64	12.36				
Rajendranagar	Kharif	K	14.09	41.48	78.68	-	51.81	-	79.33	71.35				
		N	99.9	53.6	106	49.4	99.6	107.3	108.2	136.2	77.1	130.3	38.2	113.3
		P	28.2	7.1	35.1	6.3	26.7	8.9	26.4	9.7	5.8	9	8.2	7.6
	Rabi	K	96.6	47	101.1	44.6	86.5	63.3	87.5	69.7	28.9	69.7	50.2	57.8
		N	29.4	11.1	39.6	46.2	11.3	33.1	66.7	37.9	8.4	13.3	49.6	76
		P	5	1.4	4.2	6	1.5	4	9	7.7	1.8	2.4	4.9	19.5
Rewa	Kharif+Rb+Summ	K	11.9	13.7	12.3	17.3	13.9	11.9	35.4	71.2	16.5	7.7	14.5	100.6
		N	247	185	303	298	217	244	281	316	178	287		
		P	67	49	45	64	48	42	69	68	46	59		
		K	332	211	204	429	252	319	380	355	206	346		

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Rudrur	KH+Rb+Summ	N	165.97	290.67	250.38	341.85	243.4	406.68	186.96	213.16	264.35	235.36	239.28	236.66
	P		64.26	96.81	77.44	44.98	67.24	69.25	53.43	69.11	82.03	73.44	82.28	68.71
	K		158.38	201.814	213.61	153.74	130.66	188.47	100.29	187.92	212.39	235.67	207.62	197.09
Sabour	Kharif	N	115.6	114.1	108.2	113.8	117.7	113.8	112.5	117.5	115.4	117.1		
	P		34.7	34.5	32.9	33.5	35.1	33.8	33.3	35	34.5	34.9		
	K		139	139.5	130	134.6	141.7	135.2	132.3	140.9	138.5	140.9		
Rabi		N	107.5	101	159.5	150.6	96.4	205.4	99.6	347.9	64.7	39.7		
	P		29.1	25	42.2	42	35	90.5	8.2	8.2	15.4	13.5		
	K		126.2	116.2	120.1	93.6	110.6	223.6	11.9	17.9	19.7	26.4		
Summer		N	0	24.8	7.2	29.9	47.4	25.4	36.9	8.3	32.9	6.6		
	P		0	3.1	1.5	8.5	6.2	5.6	12.9	2.1	4.5	1.5		
	K		0	5.7	2.8	17.9	11.2	4.9	44.3	5.1	8	4.6		
Siruguppa	Kharif	N	94	102	104	107	113	124	111	120	95	98		
	P		26	32	35	34	39	34	36	29	31	31		
	K		126	136	131	133	152	149	142	150	125	125		
Rabi		N	64	23.9	23.7	43.9	15.7	12.1	50	39.2	65.7	66		
	P		19.1	4.4	2.6	7.1	2	3.5	7	5.5	15.3	17.5		
	K		88.6	52.1	12.3	32.4	9.1	18.5	25.1	22.6	89.4	95.7		
S.K. Nagar	Kharif	N	79.05	83.68	74.84	83.63	31.5	59.52	58.07	92.05				
	P		13.08	16.14	13.26	15.29	5.04	12.53	18.01	15.67				
	K		52.01	53.18	48.11	43.27	25.26	79.55	51.39	41.25				
Rabi		N	109.69	0	115.47	92.62	72.96	82.84	96.89	96.3				
	P		41.37	0	29.34	16.25	24.54	17.96	39.79	18.75				
	K		110.11	0	83.88	53.2	52.79	39.95	103.63	73.01				
Summer		N	70.17	37.37	45.77	26.71	0	0	103.68	78.1				
	P		20.22	5.71	6.19	7.57	0	0	13.6	13.53				
	K		21.61	28.78	31.17	24.76	0	0	49.82	69.2				
Thanjavur	Kharif	N	102.17	100.03	103.53	103.17	103.3	99.73	105.27					
	P		5.63	5.5	5.1	7	5.97	6.2	8.6					

Contd.../-

Name of CSR centre	Season	Nut/treat	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Varanasi	Rabi	K	60.07	58.87	61.07	62.97	60.57	58.87	63.83					
		N	62.5	57.4	63.4	65.77	64.37	65	67.6					
		P	7.6	7.17	8.4	9.47	10.87	9.47	7.6					
	Summer	K	35.6	34	40.3	45.1	42.77	43.2	29.83					
		N	21.8	7.77	88.63	69.77	23.73	25.33	56.43					
		P	1.07	1.13	8.02	13.69	5.86	2.92	6.07					
	Kharif	K	6.27	4.88	17.95	72.83	44.35	12.08	35.3					
		N	72.1	74.2	61.1	71.7	75.7	73	76.2	73.7	73.9	72.8		
		P	11.3	11.4	11.1	10.7	11.5	11.1	11.4	10.8	10.7	11.3		
	Rabi	K	93.2	100.7	105.3	95.5	101.9	93.6	104.5	95.3	93	97		
		N	114.1	117.3	71.7	117.5	69.8	53.7	54	111.8	107.8	67		
		P	20	21	12.9	21.6	12.2	10.4	10.5	18.7	18.3	16		
Summer	Summer	K	120.4	125.4	73	126.2	72.5	66.5	66.9	89.1	86.7	54.5		
		N	0	23.4	45.7	118.6	134	121.4	133.1	135.8	117.6	111		
		P	0	2.6	5.2	16.5	18.4	18	18.2	24	16.1	15.7		
		K	0	6.4	12.4	72.2	83.8	157	80.8	166.7	70.4	70.3		

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ANNEXURES

ANNEXURE I

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ANNEXURE II

PRICE (RS./Q) & CALORIE PER 100 GM FOR 2017-18

Crops	Price (Rs./q) 2016-17	Price (Rs./q) 2017-18	Cal./ 100gm
All Fodders	165	180	16
All green manuring	275	280	16
Amaranthus	1375	1400	49
Arhar/Pigeonpea/			
Redgram	5560	5675	335
Ashwagandha	13750	13750	45
Baby Corn	2200	2450	125
Barley	1325	1410	336
Beetroot	1890	2080	25
Berseem (seed)	13750	15120	344
Bitter Gourd	550	650	25
Blackgram/Urad	5000	5600	347
Bottle gourd (Lauki)	810	925	12
Brinjal	1275	1350	24
Broccoli	3800	3850	45
Buck Wheat			346
Cabbage	825	875	27
Capicum	2400	2600	24
Carrot	770	850	48
Cassava	1480	1630	134
Castor	3850	4235	440
Cauliflower	900	1000	66
Chandrasur	2480	2550	300
Chillies(green)	2600	2700	29
Clusterbean / Gaur	1440	1490	35
Coleus	1980	2000	86
Coriander(S)	4400	4200	288
Coriander(L)	1460	1480	49

Crops	Price (Rs./q) 2016-17	Price (Rs./q) 2017-18	Cal./ 100gm
Jute stalk**	3500	3600	350
Kalongi			656
Kasni	2750	2980	33
Knolkhol	960	1020	43
Ladyfinger	1430	1550	35
Lentil /Masur	3950	4350	343
Linseed	3780	4050	530
Lucerne grain			23
Maize(Grain)	1365	1425	342
Maize (green cobs)	0.80/ cob or 300/q	1.20/ cob or 410/q	125
Maize Sweet Corn	1590	1750	342
Marigold	2310	2375	4
Mentha		500	48
Methi			333
Rapeseed& Mustard	3700	4100	541
Gobi sarson/Hayola	2475	2650	541
Niger Seed	3925	4050	515
Oat	1380	1450	374
Onion (big)	1290	1400	50
Pea	2850	2875	315
Pea (veg.)	1700	1900	93
Pearlmillet/Bajra	1330	1425	361
Potato	750	925	97
Pumpkin	920	1020	25
Radish (White)	410	450	17
Ragi/Fingermillet	1725	1850	328
Rajgira	4850	4875	319

Crops	Price (Rs./q) 2016-17	Price (Rs./q) 2017-18	Cal./ 100gm
Cotton(F-4/1180)	3860	3860	332
Cotton (H-1380)	4160	4160	332
Cowpea/Lobia(S)	2600	2600	323
Cowpea (Veg.)pod	1540	1540	48
Cucumber	1430	1430	13
Cumin/SiyaZeera	4800	4950	356
Dolichosbean(pod)/ LabLab	2420	2550	48
EFY(Kalyani)	1980	2050	79
Fennel grain	6800	6900	31
Fennugreek (seed)	4750	4950	333
Fennugreek leaves/spinach	1320	1450	49
Field bean	2600	2750	48
Fieldpeas/Veg.peas	1650	1850	93
Frenchbeans	2640	2690	26
Garlic	4780	4950	145
Ginger			67
Gram/Chickpea/ Bengalgram	4000	4550	360
Greengram/Moong	5225	5575	334
Groundnut	4220	4650	567
Guar	1800	2000	93
Horsegram	3100	3300	321
Indian bean	2000	2200	26
Isabgol	9400	9600	124

* Fair and remunerative price

Prices in bold are minimum support prices (MSP)

Crops	Price (Rs./q) 2016-17	Price (Rs./q) 2017-18	Cal./ 100gm
Rajmash/Rajmah	3320	3580	346
Rice(coarse)*	1470	1550	346
Ricebean fodder	180	190	16
Ridge /Round gourd	1530	1550	17
Safflower	3700	4300	356
Sesamum/Gingely/ Til	5000	5400	563
Sorghum/Jowar	1625	1750	349
Soyabean (b)	2775	2850	432
Soyabean (y)	2775	2850	432
Sugar beat	650	750	48
Sugarcane*	255	275	34
Summer Squash	1250	1320	16
Sunflower	3950	4300	620
Rice Basmati	3200	1590	346
Sweet Potato	1100	1200	120
Tomato (green)	1200	1450	23
Toria/Raya/Ridgeguard	3500	3900	541
Turmeric			349
Wheat	1625	1735	346
White gingely	6700	6900	563
Yam	1825	1950	79
Yardlong/Asaparagus bean	1750	1825	85

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	<i>Trachyspermum copticum</i>	Ajwain
2	Ashwagandha/ Indian Ginseng	<i>Withania somnifera</i> (L.) Dunal	Ashwagandha
3	Barley	<i>Hordeum vulgare</i> L.	Jau
4	Black caraway/ Fennel flower	<i>Nigella sativa</i> Sumac	Kalongi
5	Black gram	<i>Phaseolus mungo</i> L.	Urd/ Urd bean
6	Bottle gourd	<i>Lagenaria siceraria</i> (Mol.)/ <i>L. vulgaris</i> L.	Lauki
7	Brinjal/ Egg plant	<i>Solanum melongena</i> L.	Baigan
8	Broccoli	<i>Brassica oleracea</i> (L.) var. <i>italica</i>	Hari Phool Gobhi
9	Cabbage	<i>Brassica oleracea</i> (L.) var. <i>capitata</i>	Band gobhi/ Patta gobhi
10	Castor	<i>Ricinus communis</i> L.	Arandi
11	Cauliflower	<i>Brassica oleracea</i> L. var. <i>botrytis</i>	Phool Gobhi
12	Chickpea	<i>Cicer arietinum</i> L.	Chana
13	Chickpea/ Bengal gram	<i>Cicer arietinum</i> L.	Chana
14	Chicory	<i>Cichorium intybus</i> L.	Kasni
15	Chilli	<i>Capsicum annum</i> L.	Mirch
16	Cluster bean	<i>Cyamopsis tetragonoloba</i> L. Taub.	Guar/ Guar bean
17	Coriander	<i>Coriandrum sativum</i> L.	Dhania
18	Cotton	<i>Gossypium hirsutum</i> L.	Kapaas
19	Cowpea	<i>Vigna unguiculata</i> (L) Walp.	Lobia
20	Cumin	<i>Cuminum cyminum</i> L.	Jeera
21	Egyptian clover	<i>Trifolium alexandrinum</i> L.	Berseem
22	Fenugreek	<i>Trigonella foenum-graecum</i> L.	Methi
23	Finger millet	<i>Eleusine coracana</i> (L.) Gaertn.	Ragi/ Mandua
24	Garden Cress/ Water Cress	<i>Lepidium sativum</i> L.	Chandrasur
25	Garlic	<i>Allium sativum</i> L.	Lahsun
26	Garlic	<i>Allium sativum</i> L.	Lehsun
27	Green gram	<i>Phaseolus radiatus</i> (L.) Wilczek.	Moong/ Moong bean
28	Groundnut	<i>Arachis hypogea</i> L.	Moongfali
29	Hyacinth bean/ indian bean	<i>Dolichos lablab</i> L./ <i>D. purpureus</i> / <i>Lablab purpureus</i>	Seim
30	Indian Mustard	<i>Brassica juncea</i> Coss.	Sarson/ Raya
31	Indian rape	<i>Brassica campestris</i> L. var. <i>Toria</i>	Toria

S.N.	Common name	Botanical name	Hindi Name
32	Lady's finger/ Okra	<i>Abelmoschus esculantus</i> Moench.	Bhindi
33	Lentil	<i>Lens culinaris</i> Medikus	masoor
34	Linseed/ Flax/ Flax seed	<i>Linum usitatissimum</i> L.	Alsi
35	Maize/ Corn	<i>Zea mays</i> L.	Makka
36	Marigold	<i>Calendula officinalis</i> L.	Gainda
37	Mustard	<i>Brassica campestris</i> L. var. Yellow sarson/ Brown sarson	Sarson
38	Oat	<i>Avena sativa</i> L.	Jaee
39	Onion	<i>Allium cepa</i> L.	Pyaz
40	Pearl millet	<i>Pennisetum americanum</i> L.	Bajra
41	Pea/ Vegetable Pea	<i>Pisum sativum</i> L.	Matar
42	Pigeon pea	<i>Cajanus cajan</i> (L) Milsp.	Arhar/ Tuar
43	Potato	<i>Solanum tuberosum</i> L.	Aloo
44	Psyllium	<i>Plantago ovata</i> Forssk.	Isabgol
45	Pumpkin	<i>Cucurbita pepo</i> Duch.	Kaddu
46	Radish	<i>Raphanus sativus</i> L.	Mooli
47	Rape/ Oilseed rape	<i>Brassica napus</i> var. napus	Gobhi Sarson
48	Red/ Purple Amaranth	<i>Amaranthus cruentus</i> L.	Chaulai/ Ramdana/ Rajgira
49	Rice/ Paddy	<i>Oryza sativa</i> L.	Dhan
50	Ridge gourd/ Sponge gourd	<i>Lufa acutangula</i> / <i>L. aegyptica</i> / <i>L. cylindrica</i>	Torai
51	Sesame	<i>Sesamum indicum</i> L.	Til
52	Sorghum	<i>Sorghum bicolor</i> (L.) Moench.	Jowar
53	Soybean	<i>Glycine max</i> L. (Merr.)	Soybean
54	Spinach	<i>Spinacia oleracea</i> L.	Palak
55	Sugar beet	<i>Beta vulgaris</i> L.	Chukander
56	Sugarcane	<i>Saccharum officinarum</i> L.	Ganna
57	Sunflower	<i>Helianthus annus</i> L.	Surajmukhi
58	Sunhemp	<i>Crotalaria juncea</i> L.	Sanai
59	Sweet potato	<i>Ipomoea batatas</i> (L.) Lam.	Sakarkand
60	Tomato	<i>Solanum lycopersicum</i> L./ <i>Lycopersicon esculentum</i> / <i>L. lycopersicum</i>	Tamatar
61	Turmeric	<i>Curcuma longa</i> L.	Haldi
62	Wheat	<i>Triticum aestivum</i> L. emend. Fiori & Paol.	Gehun

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Notes

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