वार्षिक प्रतिवेदन

Annual Report 2023

ICAR-MGIFRI

भाकृअनुप
ICAR

भा.कृ.अनु.प.-महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान
ICAR-Mahatma Gandhi Integrated Farming Research Institute
MGIFRI
Estd. 2015

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ICAR-MAHATMA GANDHI INTEGRATED FARMING RESEARCH INSTITUTE

Piprakothi, Motihari, Bihar, India

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Indian Council of Agricultural Research

महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान

Mahatma Gandhi Integrated Farming Research Institute
(ICAR-MGIFRI)

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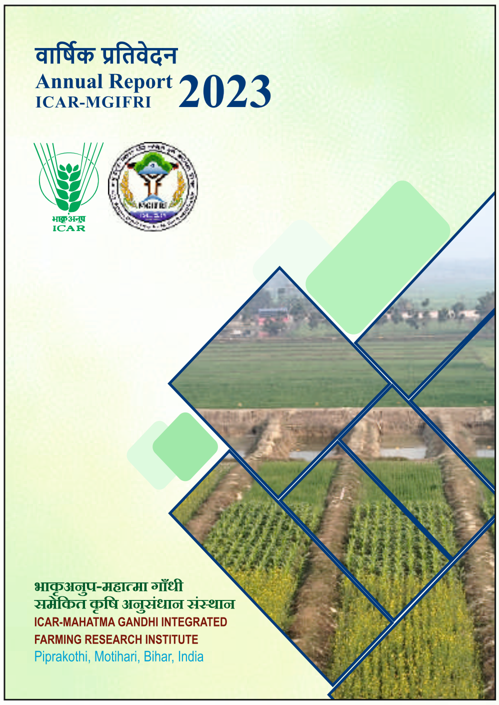
ICAR-MGIFRI, Annual Report 2023



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The Indian Council of Agricultural Research (ICAR) was awarded First Prize for its Tableau, 'Kisan Gandhi' in the Republic Day Parade – 2019; the model has been constructed and inaugurated by Hon'ble Union Minister of State for Agriculture and Farmers Welfare Shri Kailash Choudhary on 18th February 2023 at ICAR-MGIFRI

Preface

Managing natural resources in flood-prone and waterlogged ecosystems is challenging. Waterlogging in Bihar results from high-intensity rainfall, riverine floods due to dyke breaches, and flash floods. These floods are exacerbated by siltation in river catchments, affecting around 11.6 million hectares of potentially productive land in India. Consequently, those potentially productive cultivated lands and agroecosystems are not fully exploited. The ICAR-MGIFRI in Motihari aligns with ICAR's transformation phase. Keeping in mind the NIRA (National priorities, R&D thrust areas, International commitments, Actions required), Scientists of the institute are giving due importance on Diversification and Ecoregional Farming and Demand & Outcome-based research in Farming Systems. The institute is developing Integrated Farming System (IFS) models to address waterlogged ecosystems, incorporating field crops, horticulture, agroforestry, livestock, poultry, and fisheries to enhance farmers' income and nutrition security.

Research at ICAR-MGIFRI involves five major areas: mapping and analyzing flood-prone and waterlogged areas; monitoring soil and nutrient status; developing IFS technologies; managing post-flood crops; and building stakeholder capacity, including farmers. Efforts include on-site research projects, capacitybuilding programs, and direct farmer engagement through ICAR's Farmers' FIRST project and the SCSP scheme. Activities also include on-campus and off-campus training, demonstrations, awareness campaigns, Kisan Gosthi, Krishi Mela, and Field Days. In the past year, an independent administrative cell was established, though 45% of scientific positions remain vacant, hindering full implementation of multidisciplinary research. Efforts are ongoing to fill these vacancies and enhance administrative capacity.

I acknowledge the valuable guidance, suggestion and support by Dr. Himanshu Pathak, Hon'ble Secretary, DARE and Director General, ICAR, Dr. S.K. Chaudhari, Hon'ble, Deputy Director General (NRM), Dr Rajbir Singh, present ADG (A,AF&CC), NRM Division, ICAR, New Delhi and other concerned officials of the Council. I express my sincere thanks to the esteemed Chairman and members of RAC for their valuable guidance, and involved support. I thank all members of IRC, the Chairman and members of different institute committee. I thank the publication committee for putting their efforts in compilation and preparing the Annual Report 2023 of the Institute.

Date: 05 April 2024
Motihari, Bihar

(K.G. Mandal)
Director

कार्यकारी सारांश

कम लागत वाले उपकरणों और मशीनरी का डिजाइन और विकास

इस अनुसंधान परियोजना मे दो उदेश्यों पर काम किया गया है: सबसे पहले तालाबों के लिए सेंसर आधारित स्वचालित जल गहराई माप प्रणाली को डिजाइन करना, उपयोगकर्ता के अनुकूल मोबाइल ऐप इंटरफेस के माध्यम से सटीक माप और वास्तविक समय की निगरानी में महत्वपूर्ण प्रगति हासिल करना । दूसरे में, फसल उत्पादन से सम्बंधित छोटी मशीनों की डिजाईन तैयार कर उन्हें विकसित करना है, बैटरी चालित वीडर, मल्टी-रो मैनुअल सीड ड्रिल, मार्किंग टूल और फिंगर वीडर सहित चार कम लागत वाले मैनुअल टूल और मशीनरी के विकास का उद्देश्य दक्षता बढ़ाना और लागत कम करना है। कृषि में ये नवाचार खरपतवार नियंत्रण से लेकर सटीक बीज रोपण तक विशिष्ट चुनौतियों का समाधान करते हैं और टिकाऊ जल संसाधन प्रबंधन को आगे बढ़ाने और व्यावहारिक, लागत प्रभावी समाधानों के माध्यम से फसल उत्पादन को अनुकूलित करने के लिए एक व्यापक दृष्टिकोण का प्रदर्शन करते हैं।

हॉर्टी-आधारित आईएफएस मॉडल के विकास के लिए भूमि आकार निर्धारण

वर्ष 2023 के दौरान सभी मॉडल में, विभिन्न फसलों के बीच मक्का का प्रदर्शन एवम उपज अन्य फसलों की तुलना में बेहतर पाया गया, जबकि सब्जी फसलों में टमाटर ने अन्य सब्जी फसलों की तुलना में बेहतर प्रदर्शन किया। विभिन्न फलों की फसलों में पपीते का प्रदर्शन अन्य फलों की फसलों (अमरूद और सहजन) की तुलना में बेहतर पाया गया। प्रति इकाई क्षेत्र का शुद्ध लाभ सबसे अधिक पपीता में (94 रुपये/ वर्ग मीटर), उसके बाद अमरूद और सहजन से पाया गया। शुद्ध रिटर्न मॉडल I (₹11.09/ वर्ग मीटर) में अधिकतम और उसके बाद मॉडल II (₹10.88/ वर्ग मीटर) में पाया गया. इस वर्ष कम वर्षा के कारण संकेन (धंसे हुए) बेड से उपज एवम शुद्ध लाभ कम पाया गया।

प्रमुख फल और सब्जी फसलों की तुराई उपरांत नुकसान का अध्ययन

वर्ष 2023 के दौरान, मोतिहारी के पूर्वी चंपारण जिले के प्रमुख फलों जैसे आम और लीची और सब्जियों क्रमशः टमाटर, भिंडी और फूलगोभी में कटाई के बाद के नुकसान का अध्ययन तिरकोलिया, पिपराकोठी, चकिया/पिपरा और मधुबन ब्लॉक के 3-3 गांवों से किया गया था । यह अध्ययन 25-30 किसानों, 10-15 थोक विक्रेताओं और 30 खुदरा विक्रेताओं के साथ संरचित अनुसूची यानी प्रश्नावली आधारित सर्वेक्षण के माध्यम से किया गया । कटाई के 3 दिन बाद लीची में 36.8% और आम में 25.9% नुकसान पाया गया । अधिकतम नुकसान खुदरा विक्रेताओं के स्तर पर पाया गया, जो लीची में 21% और आम में 12% था। सब्जियों के मामले में, कटाई के बाद का कुल नुकसान भिंडी (27.15%) में सबसे अधिक पाया गया, इसके बाद फूलगोभी (26.15%) का स्थान रहा । क्षेत्रीय स्तर पर फसलोपरान्त हानियों के प्राथमिकता वाले संभावित कारक फसल कटाई,उठाई-धराई अर्थात हैंडलिंग से संबंधित कौशल और ज्ञान की कमी हो सकती है, जबकि थोक और खुदरा स्तर पर भंगुरता (खराब होने) और उचित भंडारण सुविधा की कमी फलों और सब्जियों में कटाई के पश्चात होने वाली हानियों का मुख्य कारण रही। सामाजिक-जनसांख्यिकीय आंकड़ों से पता चलता है कि अधिकांश सब्जी उत्पादक (76%) छोटे और मध्यम जमीनधारक श्रेणी के थे, जबकि फल उत्पादक 70% मध्यम से वृहद जमीनधारक श्रेणी के थे।

जैविक चावल-मछली बतख आईएफएस मॉडल

कार्बनिक, कार्बनिक + रासायनिक और रासायनिक पोषक तत्व स्रोतों का रबी एवं धान की फसलों पर अध्ययन से पता चला कि रासायनिक स्रोतों से पोषक तत्वों की प्रतिपूर्ति करने से रबी फसलों (गेहूं, मक्का और सरसों) तथा धान की पैदावार, कार्बनिक स्रोतों द्वारा पोषक तत्वों की प्रतिपूर्ति करने की अपेक्षा अधिक प्राप्त हुई। जबकि, कार्बनिक स्रोतों द्वारा पोषक तत्वों की प्रतिपूर्ति करने पर मसूर की तुलनीय उपज प्राप्त हुई। धान की कटाई के समय कार्बनिक पोषक तत्वों के स्रोतों वाले प्लॉट में मिट्टी में जैविक कार्बन और नमी की मात्रा अधिक पायी गई। । बाँध के एक तरफ लगाए गए केलो से 800 दर्जन केले के फल प्राप्त हुए जिसका कुल प्रतिफल 12000/- रुपये था। इन-सिटू हरी खाद के रूप में सिस्बेनिया और एक्स-सिटू हरी खाद के रूप में ग्लिरिसिडिया की पत्तियों ने कार्बनिक पोषक तत्व उपचार के तहत धान की उपज में नाइट्रोजन का क्रमशः 45 और 10% योगदान दिया । कुल उत्पादित 1600 किलोग्राम वर्मीकम्पोस्ट का उपयोग मछलियों को खिलाने के लिए किया गया ।

अधिकतम उपज के लिए इष्टतम अवशेष प्रतिधारण

धान-गेहूं फसल प्रणाली में गेहूं और धान के अवशेषों का उपयोग उपज के संदर्भ में बड़े लाभों का दोहन करने और मिट्टी के स्वास्थ्य में सुधार के लिए किया जा सकता है। प्रक्षेत्र परीक्षणों के परिणाम दर्शाते हैं कि बिना जुताई के साथ संतुलित उर्वरीकरण एवं धान और गेहूं के 50% तथा मूंग के 100% फसल अवशेषों के प्रतिधारण के परिणामस्वरूप धान और गेहूँ की उपज में आशातीत वृद्धि पायी गई। इस प्रकार खेती करने से पारम्परिक जुताई के साथ संतुलित उर्वरीकरण की तुलना में गेहूँ एवं धान की क्रमशः 23.5 और 44.5% अधिक अनाज उपज प्राप्त हुई। धान- गेहूँ के तीन फसल चक्रों के बाद यह पाया गया कि 50-60% फसल अवशेष प्रतिधारण के साथ संरक्षण कृषि प्रथाओं से मिट्टी के जैविक कार्बन में सुधार होता है और मृदा नमी को उच्च स्तर पर बनाए रखता है।

कृषि, मत्स्य पालन और पशुपालन में अच्छी कृषि क्रियाओं के माध्यम से छोटे किसानों की आजीविका में सुधार -एफएफपी

फार्मर्स फर्स्ट कार्यक्रम के अन्तर्गत बिहार राज्य में पूर्वी चंपारण जिले के विभिन्न चार गाँवों में महत्वपूर्ण तकनीकें जैसे रबी मौसम में गेहूं, सरसों, सब्जी-मटर और लहसुन की अधिक उपज देने वाली किस्मों तथा खरीफ मौसम में धान की अल्प एवं मध्यम-अवधि की अधिक उपज देने वाली किस्मों को लोकप्रिय बनाने के लिए फील्ड प्रदर्शन किए गए। किसानों की प्रथाओं की तुलना में विभिन्न प्रदर्शनों से उपज और शुद्ध आय में उल्लेखनीय वृद्धि दर्ज की गई। किसानो के प्रक्षेत्र में उनके पुराने तालाबों का जीर्णोद्धार करके मछली पालन आधारित चार समेकित कृषि प्रणाली मॉडल विकसित किए गए है, जिसमें प्रमुख घटक तालाब से मछली उत्पादन, फसल उत्पादन और बकरी पालन है। इन आईएफएस मॉडलों से 60610 रुपये से 140183 रुपये प्रति हेक्टेयर की शुद्ध आय प्राप्त हुई। नयी तकनीकियों को अधिक से अधिक किसानों तक पहुँचाने के लिए चार प्रक्षेत्र-दिवस और एक किसान-प्रशिक्षण कार्यक्रम आयोजित किया गया। प्रक्षेत्र प्रदर्शनों और आईएफएस मॉडलों के लिए किसानों को विभिन्न महत्वपूर्ण आदान जैसे गेहूँ और धान के बीज, वर्मीकम्पोस्टिंग के लिए बैग और केंचुआ, मछली आहार, नैपसेक स्प्रेयर, पम्प और केले के पौधे प्रदान किए गए।

बाढ़ प्रवण और जल भराव वाले क्षेत्रों का चित्रण और लक्षण वर्णन

बाढ़ कृषि के लिए एक गंभीर खतरा है और जलवायु परिवर्तन तथा शहरीकरण के कारण यह और भी गंभीर हो गया है। वर्तमान अध्ययन बाढ़ प्रभावित क्षेत्रों का मानचित्रण करने के लिए रिमोट सेंसिंग, विशेष रूप से सेंटिनल-1 सिंथेटिक एपर्चर रडार (SAR) डेटा का उपयोग करते हैं। इस अध्ययन में बाढ़ की घटनाओं से पहले और बाद में UN-SPIDER में सुझाई गई प्रक्रियाओं का पालन करते हुए बिहार में बाढ़ की स्थिति का विश्लेषण किया गया। मौसम की स्थिति के अनुकूल SAR डेटा ने बाढ़ के विस्तार का प्रभावी ढंग से पता लगाया। शोर को हटाने और बाढ़ प्रभावित क्षेत्रों को स्थायी जल निकायों से अलग करने के लिए छवियों को संसाधित किया गया। परिणामों से पता चला कि 2017 में दरभंगा और समस्तीपुर, खगड़िया, कटिहार और अन्य जिलों के कुछ हिस्सों में भारी बाढ़ आई थी। पूर्वी चंपारण में गंडक नदी बेसिन भी उल्लेखनीय रूप से प्रभावित हुआ था।

रबी मक्का में सिंचाई जल बचत की तकनीकें

उत्तर बिहार के मैदानी इलाकों में, जो हिमालय से उत्पन्न होने वाली अनेक नदियों द्वारा सींचे जाते हैं, वार्षिक वर्षा लगभग 1200 मिमी होती है। फिर भी, इस क्षेत्र में सिंचाई की 80% से अधिक मांग भूजल संसाधनों द्वारा पूरी की जाती है। इसलिए, जल-संरक्षण सिंचाई विधियों की आवश्यकता है ताकि अनाज की पैदावार और पोषक तत्वों के अवशोषण को कम किए बिना, फसल जल उत्पादकता को बढ़ाया जा सके। 'खाद्य', 'चारा' और 'पशु आहार' के रूप में मक्का के बहु-उपयोग इसे किसानों की आय और जीवनयापन को बढ़ाने के लिए एक उपयुक्त फसल बनाते हैं। उत्तरी बिहार में सर्दियों में मक्का की लोकप्रियता इसकी उच्च पैदावार क्षमता के कारण है। इसे ध्यान में रखते हुए, रबी मौसम 2023-2024 के दौरान ICAR-MGIFRI अनुसंधान फार्म पर क्षेत्रीय प्रेक्षण किया गया, जिसका उद्देश्य अधिकतम लाभ प्राप्त करने के लिए सिंचाई की प्रभावी विधि और स्तर की पहचान करना था, जो जल उपयोग दक्षता और फसल पैदावार के संदर्भ में हो। प्रयोग में कुल 15 उपचार समूह थे, जिनमें पांच सिंचाई विधियाँ और तीन सिंचाई स्तर शामिल थे। डेटा का सांख्यिकीय विश्लेषण संकेत देता है कि मक्का की अनाज पैदावार और पैदावार में योगदान करने वाले मापदंडों पर सिंचाई विधि और स्तर का महत्वपूर्ण पारस्परिक प्रभाव पड़ा। 15 सेमी की गहराई के साथ वैकल्पिक रिज-फरो सिंचाई ने अन्य सिंचाई विधियों पर काफी अधिक उपज और उच्चतम जल उपयोग दक्षता दर्ज की।

पोल्ट्री पक्षियों का अवरोध विश्लेषण और प्रदर्शन मूल्यांकन

यह अध्ययन पोल्ट्री किसानों के सामने आने वाली बाधाओं का पता लगाने और किसान के खेत में पोल्ट्री पक्षियों के मूल्यांकन के लिए आयोजित किया गया था। मौजूदा पोल्ट्री किसानों के सामने आने वाली प्रमुख बाधाएं: 0-3 सप्ताह की उम्र तक के चूजों में उच्च मृत्यु दर, इसके बाद बेहतर जर्मप्लाज्म की कमी, उचित आवास सुविधाओं की कमी, पोल्ट्री फ़ीड की उच्च लागत, आवास पर वैज्ञानिक ज्ञान की कमी, भोजन, रोग प्रबंधन, आदि। वैज्ञानिक हस्तक्षेप के लिए तीन गाँव समूहों (प्रत्येक में 30 कृषक परिवार) को लक्षित किया गया था। किसानों को मुर्गीपालन के उन्नत जर्मप्लाज्म उपलब्ध कराए गए और उन्हें तीन प्रायोगिक समूहों में बांटा गया। समूह -I: पोल्ट्री पर क्षमता निर्माण/प्रशिक्षण के बिना सिर्फ बेहतर पोल्ट्री जर्मप्लास्म, समूह -II: क्षमता निर्माण के साथ पोल्ट्री का बेहतर जर्मप्लाज्म और समूह -III: पोल्ट्री का बेहतर जर्मप्लाज्म, क्षमता निर्माण और वैज्ञानिक सुझाव। ब्रॉयलर चरण (0-6 सप्ताह की आयु) में, औसत दैनिक भर वृद्धि (ग्राम/दिन) सबसे अधिक समूह -III के मुर्गियों (28.32 ± 0.75) में दर्ज की गई, इसके बाद समूह -II (25.06 ± 1.58) और समूह -I (24.11 ± 1.61) थी । लेकिन परिणाम तुलनीय और गैर-महत्वपूर्ण था।

आर्द्रभूमि पारिस्थितिकी तंत्र में बकरी आधारित एकीकृत कृषि मॉडल

उत्तर बिहार में जलजमाव की स्थिति में छोटे और सीमांत किसानों के लिए बकरी आधारित समेकित कृषि प्रणाली (आईएफएस) मॉडल विकसित किए गए हैं। जीवित बकरी का अनुमानित मूल्य और बकरी से बने जैविक खाद से सकल राजस्व (रुपया प्रति वर्ष) क्रमशः 96,164/- और 16,426/- पाया गया । खेत की फसलें दो मौसमों में उगाई गयी थीं: रबी फसलें (गेहूं, मसूर, मक्का और सरसों) और खरीफ फसल (धान)। रबी और ख़रीफ़ फ़सलों से कुल राजस्व रु. 21898/- एवं रु. क्रमशः 20,992/-। बागवानी और मछली से कुल राजस्व क्रमशः 19580/- ुपये और 56,800/- रुपये था। प्रति हेक्टेयर भूमि क्षेत्र की कुल उत्पादकता 2,87,076/- रुपये थी और संपूर्ण आईएफएस प्रणाली से शुद्ध उत्पादकता 1,55,751/- रुपये थी। बकरी आधारित आईएफएस के लिए लाभ लागत अनुपात 2.18:1 था। बकरी आधारित आईएफएस मॉडल में विशेष रूप से क्षेत्र के छोटे और सीमांत श्रेणी के किसानों के लिए आय को लगभग दोगुना से अधिक बढ़ाने की पर्याप्त क्षमता है, जो ज्यादातर अपनी आजीविका के स्रोत के रूप में बकरियों को पालते हैं।

उत्तर बिहार की स्थितियों में चावल-गेहूं फसल प्रणाली में प्राकृतिक खेती का आकलन	संस्थान के अनुसंधान फार्म में चावल-गेहूं फसल प्रणाली में प्राकृतिक खेती का आकलन करने हेतु अध्ययन आयोजित किया गया। प्रायोगिक समूह क्रमशः T1: पारंपरिक या रासायनिक खेती, T2: जैविक खेती (FYM आधारित), T3- अर्ध पारंपरिक खेती (50% रासायनिक और 50% FYM) और T4: प्राकृतिक खेती (बिना रसायन या FYM) एवं सिर्फ एक बार जीवामृत का प्रयोग, T5: 3 गुना जीवामृत के साथ प्राकृतिक खेती, T6: 5 गुना जीवामृत के साथ प्राकृतिक खेती, T7: 7 गुना जीवामृत के साथ प्राकृतिक खेती और T8: 9 गुना जीवामृत के साथ प्राकृतिक खेती। सभी प्राकृतिक खेती (T4 से T9) में बीजामृत का उपयोग केवल एक बार किया गया । खेत की फसलों में कीट-पतंगों के संक्रमण को नियंत्रित करने के लिए आवश्यकतानुसार नीमास्त्र, अग्निआस्त्र और ब्रह्मास्त्र का उपयोग किया गया । रबी सीजन में गेहूं की किस्म एचडी 2967 को लगाया गया जिसमे T1, T2, T3, T4, T5, T6, T7, T8 समूह में गेहूं की उपज (किलो/हेक्टेयर) 1066 ± 142, 1082 ± 62, 937 ± 130, 564 ± 47, 605 ± 87, 515 ± 49 थी। 768 ± 86 और 802 ± 71 किग्रा/हेक्टेयर पाया गया । प्राकृतिक खेती के अंतर्गत T7 और T9 में उपज रासायनिक और FYM आधारित खेती के साथ तुलनीय थी। T1, T2, T3, T4, T5, T6, T7, T8 में धान की उपज (टन/हेक्टेयर) 4.73 ± 0.24, 4.67 ± 0.19, 5.39 ± 0.22, 3.78 ± 0.31, 3.15 ± 0.15, 2.98 ± 0.13 थी। 3.25 ± 0.23 और 2.86 ± 0.20 किग्रा/हेक्टेयर। टी1 में धान की उपज T2, T3 के साथ तुलनीय थी, हालांकि सभी प्राकृतिक खेती समूहों में उपज (पी<0.05) अन्य समूह (T4, T5, T6, T7, T8) की तुलना में काफी कम पाया गया ।
बाढ़ क्षेत्र पारिस्थितिकी तंत्र के तहत मछली आधारित एकीकृत खेती मॉडल का विकास और मूल्यांकन	मछली आधारित एकीकृत कृषि प्रणाली आर्द्रभूमि संसाधनों के कुशल उपयोग में महत्वपूर्ण भूमिका निभा सकती हैं। अनुसन्धान द्वारा यह पता चला कि, मछली समतुल्य उपज 3.35 टन हेक्टेयर-1 वर्ष-1, 5.80 टन हेक्टेयर-1 वर्ष-1 और 5.93 टन हेक्टेयर-1 वर्ष-1 क्रमशः, मिश्रित मछली पालन, समेकित मत्स्य पालन मॉडल-1 (मछली+मुर्गी+फलदार पौधे) तथा समेकित मत्स्य पालन मॉडल-2 (मछली+मुर्गी+बत्तख+फलदार पौधे) में दर्ज की गई। मिश्रित मछली पालन और समेकित मत्स्य पालन मॉडल से बी:सी अनुपात क्रमशः 1.32 और 1.60 पाया गया। मछली आधारित आईएफएस मॉडल से मछली, अंडा, फल आदि जैसे कई उत्पाद प्राप्त हुए जो मानव स्वास्थ्य के लिए अनिवार्य रूप से आवश्यक हैं। बाढ़ प्रभावित पारिस्थितिक तंत्र में ऐसे आईएफएस मॉडल किसानों को बेहतर आर्थिक/ पोषण सुरक्षा प्रदान कर सकते हैं।
संभावित टिकाऊ कृषि प्रणाली की पहचान बाढ़ प्रवण पारिस्थितिकी तंत्र में बाधाएं और अवसर	उत्तर बिहार में कृषि क्षेत्रों में जलभराव उत्पादकता में काफी बाधा डालता है, जिसका मुख्य कारण उच्च वर्षा, अपर्याप्त जल निकासी, नहरों से रिसाव और समतल, तश्तरी के आकार की भूमि है। पूर्वी चंपारण के कोटवा ब्लॉक के पांच पंचायतों के सर्वे में जलभराव, भूमि उपयोग, फसल और पशुधन के आंकड़े दर्ज किए गए। परिणाम बताते हैं कि लंबे समय तक जलभराव कोटवा और गोपीछपरा में फसल की वृद्धि को रोकता है। बथना के किसान गर्मियों में मूंग उगाते हैं, जबकि मच्छरगांव के किसान सर्दियों में गेहूं और गर्मियों में मूंग उगाते हैं। न्यूनतम जलभराव के साथ करिया पंचायत साल भर फसल की खेती का समर्थन करती है। आरबीक्यू विश्लेषण ने उर्वरक उपलब्धता, सिंचाई, और जंगली जानवरों की तुलना में जलभराव को मुख्य बाधा के रूप में पहचाना है।
एससीएसपी योजना	भाकृअनुप - महात्मा गांधी समेकित कृषि अनुसंधान संस्थान, पिपराकोठी, मोतिहारी, बिहार के पूर्वी चंपारण जिले में इस योजना को कार्यान्वित कर रहा है। 2023 के दौरान, 3212 (61.8%) पुरुष और 1988 (38.2%) महिलाओं सहित कुल 5210 अनुसूचित जाति के किसानों को संस्थान द्वारा प्रदान किए गए विभिन्न इनपुट वितरण और क्षमता निर्माण कार्यक्रमों से प्रत्यक्ष लाभ प्राप्त हुआ है। पूर्वी चंपारण, बिहार के अनुसूचित जाति के किसानों के लिए कुल 08 क्षमता निर्माण कार्यक्रम अर्थात प्रशिक्षण, जागरूकता-सह-एक्सपोजर दौरे, किसान मेला, पशु स्वास्थ्य शिविर आदि आयोजित किए गए। अनुसूचित जाति के किसानों के लाभ के लिए विभिन्न आदानों का भी वितरण किया गया जिसमें सब्जी- बीज, बकरी (ब्लैक बंगाल/ बारबारी) , कुक्कुट पक्षी (वनराजा/ग्रामप्रिया/सोनाली/कड़कनाथ), स्टील मग के साथ स्टील बाल्टी, अनाज/बीज भंडारण बिन, सिंचाई के लिए डिलीवरी पाइप, पशु औषधियां, तिरपाल, धान के बीज (स्वर्ण समृद्धि) और गेहूं के बीज (एचडी-2967) आदि शामिल हैं।
अनुसंधान परियोजनायें प्रकाशन, पुरस्कार और मान्यताएँ	आईसीएआर-एमजीआईएफआरआई के वैज्ञानिको द्वारा 12 संस्थान परियोजनाओं, 2 बाहरी वित्त पोषित परियोजनाओं एवं एससीएसपी परियोजना पर काम किया जा रहा है। वर्ष 2023 के दौरान, इस संस्थान के वैज्ञानिकों ने 6 शोध पत्र, 13 पुस्तक अध्याय और 4 पत्रक लेख/तकनीकी बुलेटिन प्रकाशित किए हैं। वैज्ञानिकों को पुरस्कार, सम्मान और मान्यता से सम्मानित किया गया है।
मानव संसाधन विकास, प्रशिक्षण और क्षमता विकास	संस्थान के 7 कर्मचारियों द्वारा विभिन्न संगठनों से विभिन्न विषयों पर प्रशिक्षण प्राप्त किया गया। भाकृअनुप-एमजीआईएफआरआई ने 8 प्रशिक्षण/क्षेत्रीय प्रदर्शन कार्यक्रमों, 1 पशु स्वास्थ्य शिविर, किसान मेले सहित 23 विभिन्न कार्यक्रमों एवं जागरूकता अभियान का आयोजन किया, जिससे कई किसान और अन्य हितधारक लाभान्वित हुए।
स्वच्छ भारत अभियान	भाकृअनुप-एमजीआईएफआरआई के सभी कर्मचारियों ने स्वच्छ भारत अभियान में सक्रिय रूप से भाग लिया। संस्थान परिसरों, सार्वजनिक स्थानों और गांवों में वर्ष 2023 के दौरान लगभग 45 सफाई कार्यक्रम, 6 स्वच्छता जागरूकता अभियान आयोजित किए गए। सभी वैज्ञानिकों और कर्मचारियों ने स्वच्छता पखवाड़ा 2023 में सक्रिय रूप से भाग लिया। इसके साथ ही आस-पास के गांव के लोगों और छात्रों को स्वच्छता के लिए प्रेरित करने के लिए अभियान चलाए गए।

EXECUTIVE SUMMARY

Design and development of low-cost equipment's and machineries	The research project undertakes a dual objective, firstly designing a sensor-based automatic water depth measurement system for ponds, achieving significant strides in accurate measurements and real-time monitoring through a user-friendly mobile app interface. Secondly, the focus shifts to crop production, where the development of four low-cost manual tools and machineries, including a battery-operated weeder, multi-row manual seed drill, marking tool, and finger weeder, aims to enhance efficiency and reduce costs in agriculture. These innovations address specific challenges, from weed control to precise seed planting, demonstrating a comprehensive approach to advancing sustainable water resource management and optimizing crop production through practical, cost-effective solutions.
Land Shaping for development of Horti-based IFS models	Irrespective of the models, the performance of maize among the field crops was found better than other field crops whereas in case of vegetable crops tomato performed better than other vegetable crops during 2023. Among the various fruit crops the performance of papaya was found better than other fruit crops (guava & drumstick). The net return per unit area was found from papaya (Rs.94/m2) followed by guava and drumstick. The net return was found maximum in model I (Rs.11.09/ m2) followed by in model II (₹ 10.88.m2). The return from the sunken bed was poor due to poor rainfall during this year
Post-harvest losses study of major fruit and vegetable crops	The post-harvest losses study of major fruits viz. mango & litchi and vegetables namely tomato, bhindi and cauliflower of E. Chaparan district of Motihari from 3villages each of Tirkolia, piprakothi, Chakiya/Pipra and Madhuban block were done during 2023. The PHL study of 25-30 farmers , 10-15 wholesalers and 30 retailers were carried out using structural schedule i.e. questionnaire based survey. PHL had been found in litchi (36.8%) 3 days after harvest followed by mango (25.9%). The maximum PHL was found at retailer level which was 21 & 12% respectively in litchi and mango. In case of vegetables, the total post-harvest losses was found maximum in okra (27.15%) followed by cauliflower (26.15%). The potential reason/ risk factors prioritized of post-harvest losses at field level might be lack of skill and knowledge related to harvesting, handling whereas at wholesale and retail level the perishability and lack of proper storage facility was the main problem of post-harvest losses of fruits and vegetables. Socio-demographic data revealed that most of the vegetable growers (76%) belonged to small and medium farm size category whereas in fruit crops 70% belonged to medium to large farm size category.
Organic rice-fishduck IFS model	Studies on performance of winter and rice crops under organic, organic + inorganic, and inorganic sources of nutrients revealed that application of nutrients through inorganic sources recorded significantly higher grain yield of wheat, maize and mustard during winter and rice during rainy season compared with organic sources. In case of lentil, organic sources of nutrients gave comparable grain yield to inorganic and organic + inorganic sources. Soil organic carbon and moisture content at harvest of rice was higher in organic sources of nutrients plot. Banana planted on one side of the dyke gave yield of 800 dozen banana fruit with gross return of Rs. 12000/-. Sesbania as in-situ and gliricidia leaf as ex-situ green manuring contributed 45 and 10% N of nitrogen applied to rice under organic source of nutrient treatment, respectively. A total of 1600 kg vermicompost produced was used for feeding of fishes.

Optimum residue retention for yield maximization	The residues of wheat and rice in rice-wheat cropping system may be used to harness larger benefits in terms of yield and improving soil health. Results of field experiments show that no-tillage along with balanced fertilization and retention of 50% residue of rice and wheat, and 100% of mungbean residue resulted in significantly higher grain yield of wheat and rice, and it recorded 23.5 and 44.5% higher grain yield of wheat and rice, respectively, over conventional tillage with balance fertilization. After three crop cycles of wheat-rice, conservation agriculture practice with 50-60 % residue retention improves soil organic carbon and maintains soil moisture at higher levels.
Improving livelihood of small farmers through good practices in agriculture, fisheries and animal husbandry -FFP	Field demonstration for popularization of high yielding variety of wheat, mustard, vegetable pea and garlic during rabi season and short- and medium-duration high yielding variety of paddy during kharif season were taken up in four adopted villages. Significant increase in yield and net income was recorded from various demonstrations over farmers' practice. Four fish-based integrated farming system models have been developed at farmers' field by renovating old ponds. Major component is fish production from pond, crop production and goat rearing. These IFS models recorded the net income of Rs. 60610 to Rs. 140183/ha. Four field-days and one farmers-training programme were organized. For field demonstrations and IFS models various critical inputs, viz., wheat and paddy seed, bag and earthworm for vermicomposting, fish feed, knapsack sprayer, centrifugal pump and banana saplings, were provided to farmers.
Delineation and characterization of flood-prone and waterlogged areas	Flooding poses a serious threat to agriculture and exacerbated by climate change and urbanization. Current studies use remote sensing, specifically Sentinel-1 Synthetic Aperture Radar (SAR) data, to map flood-affected areas. This study analyzed flood situation in Bihar following processes recommended in UN-SPIDER by taking before and after flooding events. SAR data, resilient to weather conditions, effectively detected flood extents. Images were processed to remove noise and differentiate flood-affected areas from permanent water bodies. Results showed significant flooding in Darbhanga and parts of Samastipur, Khagaria, Katihar, and other districts in 2017. The Gandak River basin in East Champaran was also notably impacted
Irrigation water saving techniques	The plains of north Bihar, drained by numerous rivers originating in the Himalayas, also experience a reasonably high rainfall of ~1200 mm per year. Still, more than 80% of irrigation demand in this region is met by groundwater resources. Therefore, water-saving irrigation methods are required to increase crop water productivity without reducing grain yield and nutrient uptake. The multiple utilities of maize as a 'food', 'fodder' and 'feed' makes the crop a suitable crop candidate for enhancing farmer's income and livelihoods in India. Winter maize is popular in northern Bihar due to its high yield potential. Keeping this in view, rabi maize was used as a test crop to conduct field experiment with aim to identify effective method and level of irrigation to achieve maximum benefits in terms of water use efficiency and crop yield at ICAR-MGIFRI research farm during Rabi season 2023-2024. The experiment consisted total 15 treatments combinations having five irrigation methods and three irrigation levels. Statistical analysis of the data indicated that there were significant interactive effects of irrigation method and level on grain yield and yield contributing parameters of maize. Alternate ridge-furrow irrigation with furrow depth 30 cm recorded significantly higher yield and highest water use efficiency over other irrigation methods.

Constraint analysis and performance evaluation of poultry birds	The study was conducted to find out the constraints being faced by the poultry farmers and evaluation of poultry birds at farmer's field. The major constraints being faced by the existing poultry farmers were higher mortality rate in chick up to 0-3 weeks of age followed by lack of improved germplasm, lack of proper housing facilities, high cost of poultry feed, lack of scientific knowledge on housing, feeding, disease management, etc. Three village clusters (30 farm families each) were targeted for scientific intervention. The farmers were provided with improved germplasm of poultry and allocated in three treatment groups viz. Gr-I: Improved germplasm of poultry without having capacity building/training on poultry, Gr-II: Improved germplasm of poultry with Capacity building and Gr-III: Improved germplasm of poultry, capacity building and initial supplements with scientific input. In broiler phase (0-6 weeks of age), the highest growth in terms of average daily gain (g/day) was recorded in Gr-III (28.32± 0.75) followed by the Gr-II (25.06± 1.58) and Gr-I (24.11± 1.61) but result was comparable and non-significant.
Goat based integrated farming models in wetland ecosystem	Goat-based integrated farming system (IFS) models have been developed for small and marginal farmers under waterlogged situations in North Bihar. The gross revenue (Rupee per year) from the live goat (estimated value) and goat manure in term of farmyard manure was Rs. 96,164/- and 16,426/-, respectively. The field crops were cultivated in two seasons viz. rabi crops (wheat, lentil, maize and mustard) and kharif crop (paddy). The total revenue from the rabi and the kharif crops was Rs. 21898/- and Rs. 20,992/-, respectively. The total revenues from the horticulture and fish were Rs.19580/- and Rs.56, 800/-, respectively. The gross total productivity per hectare land area was Rs.2, 87,076/- and Net productivity from the entire IFS system was Rs.1, 55,751/-. The benefit cost ratio for the goat based IFS was 2.18:1. The goat based IFS model has ample potential to increase the income by almost more than double especially for the farmers belonging to small and marginal categories in the region who mostly rear goats as their source of livelihood.
Assessment of natural farming in rice-wheat cropping system in north Bihar conditions	The study was conducted to assess the natural farming in rice-wheat cropping system at institute research farm. The treatments were T1: conventional or chemical farming, T2: Organic farming (based on use of FYM), T3- semi conventional farming (50% chemical and 50% FYM) and T4: natural farming (neither use of chemical nor use of FYM, only one-time application of Jeevamrita), T5: natural farming with 3 times Jeevamrita, T6: natural farming with 5 times Jeevamrita, T7: natural farming with 7 times Jeevamrita and T8: natural farming with 9 times Jeevamrita. The Bijamrita was used in only once in all natural farming (T4 to T9). The Neemastra, Agniastra and Brahmastra were used as per the need to control the insect and pest infestation in field crops. In Rabi season HD 2967 wheat variety was cultivated in all the treatments. The yield of wheat (kg/ha) in T1, T2, T3, T4, T5, T6, T7, T8 was 1066 ± 142, 1082 ± 62, 937 ± 130, 564 ± 47, 605 ± 87, 515 ± 49, 768 ± 86 and 802 ± 71 kg/ha. The yield was in natural farming treatment T7 and T9 was comparable with Chemical and FYM based farming. The yield of paddy (ton/ha) in T1, T2, T3, T4, T5, T6, T7, T8 was 4.73 ± 0.24, 4.67 ± 0.19, 5.39 ± 0.22, 3.78 ± 0.31, 3.15 ± 0.15, 2.98 ± 0.13, 3.25 ± 0.23 and 2.86 ± 0.20 kg/ha. The yield of paddy in T1 was comparable with T2, T3 however yield was significantly lower ($P<0.05$) in all natural farming treatment groups viz. T4, T5, T6, T7 and T8.
Development and assessment of fish-based integrated farming models under floodplain ecosystems	High density fish-poultry-on dyke fruit crops (IFS-1) and fish-poultry-duck-on dyke fruit crops (IFS-2) models were developed and assessed while comparing with control (composite fish culture). The survival rate of fish was found to be 82.5 % (in composite culture), 84.0 % (IFS-1) and 85.6 % (IFS-2). The fish equivalent yield recorded was 3.35 t ha-1 yr-1 from composite fish culture, 5.80 t ha-1 yr-1 from IFS-1 and 5.93 t ha-1 yr-1 from IFS-2 model. Economic analysis revealed B:C ratio as 1.32 and 1.60 from control and IFS models, respectively. The energy use efficiency was higher (0.69) in the IFS-2 model than IFS-1 (0.60) and composite fish culture (0.11).

Identification of potential sustainable farming system~ constraints and opportunity in flood prone ecosystem	Waterlogging in agricultural fields significantly hinders productivity in North Bihar, primarily caused by high rainfall, inadequate drainage, seepage from canals, and fla t, saucer-shaped land. A survey of Kotwa block in East Champaran, covering five panchayats, recorded data on waterlogging, land use, crops, and livestock. Findings show that extended waterlogging prevents crop growth in Kotwa and Gopichhapra. Bathna farmers grow moong in summer, while Machhargawa grows wheat in winter and moong in summer due to shorter waterlogging periods. Karariya panchayat, with minimal waterlogging, supports year-round crop cultivation. RBQ analysis identified waterlogging as the major constraint over fertilizer availability, irrigation, and wild animals.
Schedule Cast Sub Plan (SCSP)–Scheme	The ICAR-Mahatma Gandhi Integrated Farming Research Institute, Piprakothi, Motihari, Bihar, has been implementing this scheme in the East Champaran district of Bihar. During 2023, A total of 5210 Scheduled Castes farmers including 3212 (61.8%) male and 1988 (38.2%) female have received direct benefits from various input distribution and capacity building programs provided by the institute. A total of 08 number of capacity-building programs i.e. training, awareness-cum-exposure visits, kisan mela, animal health camps etc. were organized for the SC farmers of East Champaran, Bihar. Various inputs were also distributed for the benefit of SC farmers which includes vegetable seed, goat (Black Bengal/ Barbari), poultry birds (Vanraja/Grampriya/ Sonali/ Kadaknath), steel bucket with steel mug, grain/ seed storage bin, delivery pipe for irrigation, animal medicines, tarpaulin, paddy seed (Swarna Samridhi) and wheat seed (HD-2967) etc.
Research projects Publication, awards and Recognitions	Scientists of ICAR-MGIFRI are working on 12 institute project, 2 externally funded projects, SCSP project. During 2023, scientists from this institute have published 6 research papers, 13 book chapters, and 4 leaflet articles/ technical bulletins. Scientists have been recognized with awards, honours and recognitions.
HRD, training & capacity building	Our 7 staffs received training on various topics from different organizations; ICARMGIFRI conducted 8 trainings/ on field demonstration programs, 1 animal health camp, 23 different events including Kisan Mela, awareness campaign benefiting several farmers and other stakeholders.
Swachha Bharat Abhiyan	All the staffs of ICAR-MGIFRI participated actively in Swachha Bharat Abhiyan; around 45 cleaning events, 6 Swachhata awareness campaigns were conducted during 2023 at the Institute premises, public places and villages. All the scientists and staffs actively participated in Swachhata Pakhwada 2023. Simultaneously, campaigns were organized to motivate neighboring village people and, students for cleanliness.

CONTENTS

Introduction, mission & mandates

The ICAR-Mahatma Gandhi Integrated Farming Research Institute (formerly known as the National Research Center on Integrated Farming) was established on August 21, 2015, with the primary objective of spearheading research and development initiatives focused on integrated farming systems at the national level. The institute is located at Piprakothi (26° 32′ N, 84° 56′ E), Bihar, occupies a sprawling 25-acre campus, complete with its main office-cum-laboratory building, guesthouse, and auditorium. The institute's research farm, spanning an area of 8.4 ha, is nestled within the main complex.

Floods causes extensive damage to infrastructure, human settlements, public life, and the economy, with India being particularly vulnerable. Around 41.13 million hectares, or 13% of India's land, are major flood-prone zones, affecting 113 million people. States like Uttar Pradesh, Bihar, Assam, West Bengal, and Odisha are severely impacted. Bihar faces significant waterlogging from rivers like Gandak and Koshi, affecting 28 out of 38 districts. Effective natural resource management is crucial for sustainable agriculture and farmers' welfare. Additionally, South Bihar deals with excess discharges from Ganga tributaries, and Odisha struggles with cyclonic floods, leading to waterlogging and salinity in cultivable lands. Based on this background, the institute has defined objectives, mandates and major action areas.

Objectives

- To develop and demonstrate location-specific and farmer-centric integrated farming system models involving fishery and animal components.
- To act as a repository of information on all aspects of integrated farming.
- To facilitate and promote coordination and dissemination of the technology for integrated farming through network/consortia approach involving ICAR institutes, state agricultural universities, and other agencies.
- To provide scientific leadership and act as a center for vocational as well as advanced training to promote the technologies related to integrated farming.
- To collaborate with relevant national and international agencies in liaison with state and central government departments for technology dissemination.
- To provide need-based consultancy and advisory support in promoting integrated farming.

Vision-ICAR MGIFRI

Sustainable management of natural resources and diversified farming for achieving food, nutrition and livelihood security in the country

Mission-ICAR MGIFRI

Developing site-specific, cost-effective and demand-driven integrated farming systems for flood-prone and waterlogged ecosystems

Mandates

- Adaptive research for location-specific integrated farming system models (fish-based) for flooded, flood-prone and wetland ecology.
- Centre for vocational and advanced training to the farmers to promote fish-based integrated farming systems.

Five-major action areas

- Delineation, situation analysis and mapping of flood-prone, flood-affected and waterlogged areas.
- Characterization and monitoring of soils and nutrient status of water congested ecologies.
- Design and development of IFS technology/ packages/ model for water congested ecosystems.
- Post-flood crop management, design and development of efficient water management technology.
- Capacity building of farmers and other stakeholders on different components of IFS.

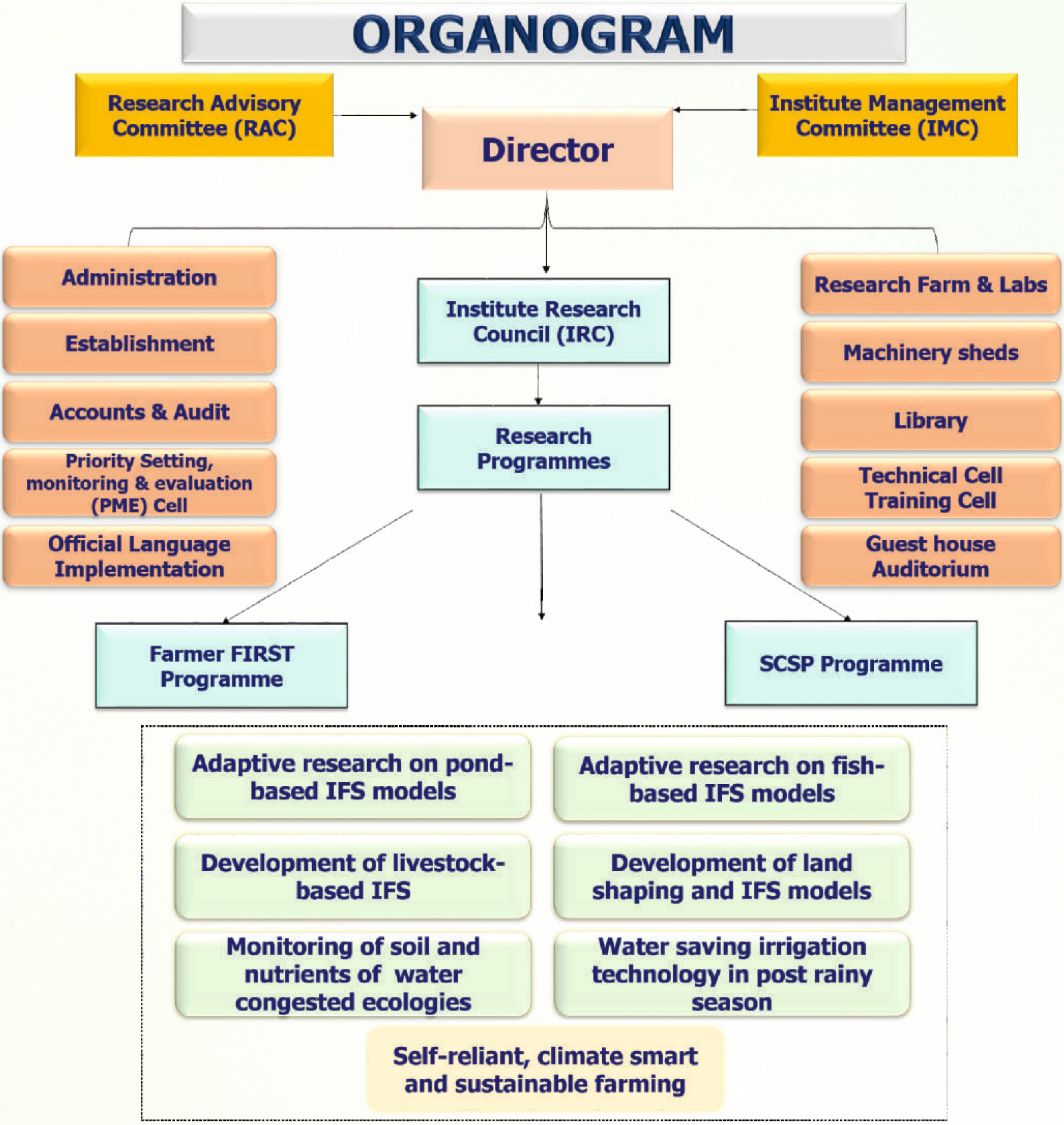


Fig. 1: An Organogram of the ICAR-MGIFRI

Research Achievements (Institute Projects)

Development and assessment of goat based integrated farming models in wetland ecosystem

Principal Investigator: Dr. P. K. Bharti

Co- Investigators: Dr. S.K. Purbey, Mr. Ravi Kumar, Dr. S.K. Samal (up to 29.03.2023)

Project Code No.: NRMAMGIFRISIL20200070010

Goat-based integrated farming system (IFS) models have been developed for small and marginal farmers in waterlogged situations in North Bihar. The IFS models involving local/Black Bengal goat, field crops, horticultural crops and fisheries were attempted in a total area of 0.8 ha (20% for goatery, 45% for field crops and 35% for horticulture); additionally, 0.2 ha area was allotted for the fishery. Horticultural crops like papaya, guava and lemon, etc. were grown on-dyke of the fish pond. The gross revenue (₹/year) from the live goat (estimated value) and goat manure in terms of farmyard manure was ₹96,164 and ₹16,426, respectively. The field crops were cultivated in two seasons viz. *rabi* crops (wheat, lentil, maize, and mustard) and *kharif* crops (paddy). The total revenue from the *rabi* and the *kharif* crops was ₹21,898 and ₹20,992, respectively. In horticulture, different kinds of vegetables were grown and on dyke fruits like papaya were cultivated. The total revenue from the horticulture and fish was ₹19,580 and ₹56,800, respectively. The gross total productivity per hectare land area was ₹2,87,076 and net productivity from the entire IFS system was ₹1,55,751. The benefit-cost ratio for the goat-based IFS was 2.18:1. The goat-based IFS model has ample potential to increase the income by almost more than double, especially for the farmers belonging to small and marginal categories in the region who mostly rear goats as their source of livelihood.

Performance of goats under IFS

The average litter size (number of newly born kids per kidding) in goats was 1.65 and the birth percentage of male and female kids was 51.44%, respectively. The total mortality was 8.69%. The goats were allowed to graze for an average period of 4.85 hr. daily on the roadside and available grazing area of the IFS unit (Fig.2). The average feed intake of adult goats for green fodder, dry roughage and concentrate mixture was 2.19 kg, 0.23 kg and 0.24 kg, respectively. The average water intake of adult goats was 2.49 lit day^{-1}. The average manure output from the adult goat was 0.41 kg day^{-1}.

Introduction of low cost goat house at farm and farmer's field

A low-cost goat house has been introduced on farms as well as in farmers' fields. The cost of constructing a goat shed ranges from ₹15,000 to ₹20,000 and can accommodate 16 to 20 goats under Integrated Farming Systems (IFS). This type of goat house can significantly reduce housing expenses by 4 to 5 times and can be easily constructed by small and marginal farmers using bamboo and locally available materials in the region (Fig. 3).

Introduction of goat feeding manger for scientific feeding

A goat-feeding manger has been designed and introduced both on the farm and in farmers' fields (Fig.4 and 5). The manger dimensions are 5 feet in length, 2 feet in width, and 2 to 2.5 feet in height. It consists of a V-shaped structure made of iron angle at the top for feeding green fodder, while a tray for feeding concentrate and dry fodder is positioned approximately 1 foot above the ground. This setup is highly beneficial for scientific feeding as it encourages the natural browsing behavior of goats. Additionally, it helps in minimizing feed wastage by 40-55%, thereby reducing feeding costs and enhancing the farmer's income.

Fig. 2: Grazing area of goat developed on raised bed

Fig. 3: Low-cost goat house made of bamboo

Fig. 4: Goat feeding manger used for feeding at Research farm

Fig. 5: Goat feeding manger used for feeding at Farmer's field

Constraint analysis and performance evaluation of poultry birds reared under backyard system in East Champaran district of Bihar

Principal Investigator: Dr. P. K. Bharti

Co- Investigators: Mr. Ravi Kumar, Dr. S.K. Samal (up to 29.03.2023)

Project Code No.: NRMAMGIFRISIL202000800011

The study aimed to analyze the constraints faced by poultry farmers and evaluate poultry farming in their fields. Out of six subdivisions, the survey targeted four subdivisions—Areraj, Chakia, Motihari Sadar, and Pakridayal—based on questionnaires administered through direct interviews. Results showed that only 54.85% of randomly surveyed poultry farmers were currently involved in poultry farming on a small or medium scale, with 45.15% leaving the business due to various constraints. Major constraints identified among existing poultry farmers (N=192) included high chick mortality rates up to 0-3 weeks of age, lack of proper housing facilities, high cost of poultry feed, insufficient scientific knowledge on housing, feeding, and disease management, as well as a lack of improved germplasm. Based on the constraints analysis, 90 farm families from 24 villages, 9 blocks, and 3 subdivisions were provided with improved poultry chicks of the Vanraja variety—a dual-purpose poultry breed. Scientific intervention targeted three village clusters in Areraj, Chakia, and Motihari subdivisions. The farmers provided with improved poultry germplasm were allocated to three treatment groups: Gr-I received improved germplasm without capacity building/training, Gr-II received improved germplasm with capacity building, and Gr-III received improved germplasm, capacity building, and initial supplements with scientific input. In the broiler phase (0-6 weeks of age), the highest growth in terms of average daily gain (g day^{-1}) was recorded in Gr-III (28.32± 0.75), followed by Gr-II (25.06± 1.58) and Gr-I (24.11± 1.61), with non-significant differences. However, mortality rates from 0-3 weeks and 3-6 weeks were significantly ($P<0.05$) reduced in Gr-III compared to Gr-II and Gr-I. The total mortality rate up to 6 weeks of age in poultry birds at farmers' fields was 27.5%, 23.7%, and 17.34% in Gr-I, Gr-II, and Gr-III, respectively.

Assessment of natural farming in rice-wheat cropping system in North Bihar conditions

Principal Investigator: Dr. P. K. Bharti

Co- Investigators: Dr. A.K. Singh

Project Code No.: NRMAMGIFRISIL202200100016

The study was conducted to assess natural farming in the rice-wheat cropping system at the ICAR-MGIFRI research farm in Piprakothi, East Champaran, Bihar. In Experiment I, the treatments were as follows (Fig. 6 and 7): T1: conventional or chemical farming, T2: Organic farming (based on use of FYM), T3- semi-conventional farming (50% chemical and 50% FYM) and T4: natural farming (neither use of chemical nor use of FYM, only one-time application of *Jeevamrita*), T5: natural farming with 3 times *Jeevamrita*, T6: natural farming with 5 times *Jeevamrita*, T7: natural farming with 7 times *Jeevamrita* and T8: natural farming with 9 times *Jeevamrita* (Fig. 8). The Bijamrita was used only once in all-natural farming (T4 to T9). The *Neemastra*, *Agniastra* and *Brahmastra* were used as per the need to control the insect and pest infestation in field crops. In *rabi* season, HD-2967 wheat variety was cultivated in all the treatments. The yield of wheat (kg ha^{-1}) in T1, T2, T3, T4, T5, T6, T7 and T8 was 1066 ± 142, 1082 ± 62, 937 ± 130, 564 ± 47, 605 ± 87, 515 ± 49, 768 ± 86 and 802 ± 71 kg ha^{-1} respectively. The yield in natural farming treatments T7 and T9 was comparable with chemical and FYM-based farming. The yield of paddy (kg ha^{-1}) in T1, T2, T3, T4, T5, T6, T7 and T8 was 4730 ± 0.24, 4670 ± 0.19, 5390 ± 0.22, 3780 ± 0.31, 3500 ± 0.15, 2980 ± 0.13, 3250 ± 0.23 and 2860 ± 0.20 kg ha^{-1} respectively. The yield of paddy in T1 was comparable with T2, T3; however, yield was significantly lower ($P<0.05$) in all natural farming treatment groups viz. T4, T5, T6, T7 and T8.


T1: Chemical farming


T2: Organic farming (FYM)


T3- semi conventional farming (50:50)


T4: Natural farming (*Jeevamrita* 01-time)

Fig. 6: A view of experimental plot natural farming in rice-wheat cropping system


T5: Natural farming (*Jeevamrita* 03-time)


T6: Natural farming (*Jeevamrita* 05-time)


T7: Natural farming (*Jeevamrita* 07-time)


T8: Natural farming (*Jeevamrita* 09-time)

Fig. 7: Paddy crop (Var: *Swarna samriddhi*) cultivated in different treatment groups


a. Preparation of *Jeevamrita*


b. Wheat crop


c. T3- semi conventional farming (50:50)

d. Comparison of crop length

Fig. 8: Wheat crop (Var: HD-2967) under natural farming

Development of organic rice-fish-duck IFS model in waterlogging situations of North Bihar

Principal Investigator: Dr. A. K. Singh

Co- Investigators: Dr. S.K. Samal (up to March 2023), Dr. Shreya Nivesh and Dr. K.G. Mandal

Project Code No.: NRMAMGIFRISIL202100200013

In North Bihar, approximately 76% of the land is affected by floods, leading to extensive areas of cultivable land experiencing varying degrees of waterlogging. As a result, the productive potential of these lands remains largely untapped. Managing waterlogging situations poses a significant challenge in natural resource management. Integrated farming systems, combined with organic cultivation of crops and fish, offer a promising solution to ensure food and nutrition security for farmers in waterlogged ecosystems. With these considerations in mind, the present study was undertaken. Field experiments were conducted by taking wheat, maize, lentil, and rapeseed & mustard (Fig.9) during winter (2022-2023) and paddy crops during the rainy season (2023) to evaluate the organic sources of nutrients. Separate field experiments for all the crops, consisting of three treatments (i. organic, ii. organic + inorganic, iii. inorganic sources of nutrients) were laid out in randomized block design with six replications. For nutrient management in winter crops, under organic sources of nutrients, a total quantity of N was applied through FYM. In organic + inorganic sources of nutrients, half of N was applied through FYM and half of N through fertilizers. In inorganic sources of nutrients, the total quantity of NPK was applied through fertilizers as per recommendation. In the paddy crop, under organic sources of nutrients, 53.9 and 12.1% of N was supplemented through *sesbania* (in-situ) and *gliricidia*-leaf (ex-situ) green manuring produced within the system, and the rest of N was given by FYM. Popular and high-yielding varieties of various crops (wheat- HD-2967, maize- P-3355, lentil- IPL-220, rapeseed and mustard- NRCHB-101, paddy- *Swarna Samriddhi*) were used. The Paddy crop was transplanted at 25 cm x 20 cm spacing. Another standard package of practices was followed for the growing of various field crops. On 3-sides of dyke, bananas, pomegranates and papaya were planted and the fruit yield of bananas was harvested. Fish fingerlings were released in the 9 pond refuge (each of 132 m^2 surface area) corresponding to the main cropland. Vermicomposting of paddy straw was done in vermi-beds.

Performance of winter field crops under organic, organic + inorganic and inorganic sources of nutrients

Experimental data revealed that different sources of nutrients, i.e. organic, organic + inorganic, and inorganic, had a significant effect on yield attributes and yields of wheat, maize, and mustard, except 1000-grain weight (Table 1, 2, and 3). Yield and yield attributes of lentils were found at par under different sources of nutrients (Table 4). Inorganic sources of nutrients, being at par with organic + inorganic sources recorded a significantly higher number of spikes and number of grains per spike of wheat as compared with organic sources. The spike length of wheat was significantly higher in inorganic sources of nutrients as compared to organic sources and organic + inorganic sources. Almost similar trends were found for yield attributes of maize (cob length, cob weight, numbers of grains per cob, and grain weight per cob) and mustard (number of primary and secondary branches, number of seeds per silique). The grain yield of wheat was significantly higher in inorganic sources of

Table 1: Yield and yield attributes of wheat under organic, inorganic and organic + inorganic sources of nutrients (2022-23)

Treatment	No. of spike m^{-2}	Spike length (cm)	No. of grains $spike^{-1}$	1000-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Organic source	193.2^{b}	9.8^{b}	54.4^{b}	40.9	2675^{b}	3073^{b}
Organic + Inorganic sources	210.7^{ab}	10.1^{b}	58.4^{ab}	41.5	2765^{b}	3785^{a}
Inorganic sources	234.8^{a}	10.7^{a}	65.6^{a}	39.6	3812^{a}	4290^{a}
CD (p= 0.05)	27.0	0.5	7.3	NS	462.2	697.7

Table 2: Yield and yield attributes of maize under organic, inorganic and organic + inorganic sources of nutrients (2022-23)

Treatment	Cob length (cm)	Cob weight (g)	No. of grains/ cob	Grain weight / cob (g)	1000-grain weight (g)	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})
Organic source	8.2^{b}	68.9^{b}	220^{b}	59.9^{b}	242.7	3650^{b}	5388^{b}
Organic + Inorganic sources	9.1^{ab}	81.8^{ab}	248^{a}	67.9^{ab}	265.5	4456^{a}	6459^{a}
Inorganic sources	9.8^{a}	89.1^{a}	256^{a}	81.7^{a}	275.5	4581^{a}	6857^{a}
CD (p= 0.05)	1.05	14.38	26.38	14.21	NS	590.6	961.3

Table 3: Yield and yield attributes of mustard under organic, inorganic and organic + inorganic sources of nutrients (2022 23)

Treatment	Number of primary branches/ plant	Number of secondary branches/ plant	Number of silique / plant	Number of seeds/ silique	1000-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Organic source	2.7^{b}	2.0^{b}	73.6	12.4^{b}	2.9	1107^{b}	2715^{b}
Organic + Inorganic sources	3.3^{a}	2.8^{a}	77.6	13.0^{b}	3.0	1383^{a}	4243^{a}
Inorganic sources	3.5^{a}	2.7^{a}	82.0	15.2^{a}	3.0	1369^{a}	4227^{a}
CD (p= 0.05)	0.53	0.51	NS	1.06	NS	177.61	548.4

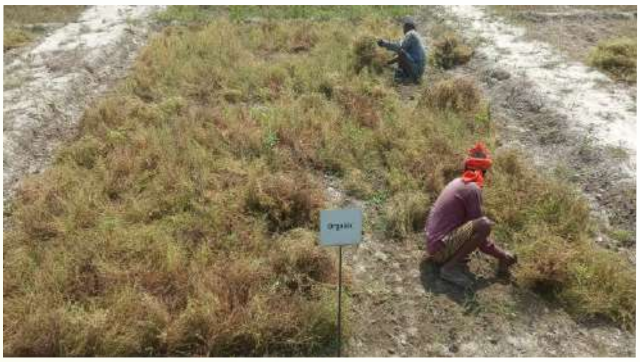
Table 4: Yield and yield attributes of lentil under organic, inorganic and organic + inorganic sources of nutrients (2022-23)

Treatment	No. of primary branches/ plant	No. of secondary branches/ plant	No. of pods / plant	No. of seeds /pod	100-grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Organic source	5.07	5.73	92.00	1.74	29.50	1203	2787
Organic + Inorganic sources	5.12	6.93	96.13	1.79	30.00	1286	3009
Inorganic sources	4.60	5.90	87.83	1.68	30.00	1199	2582
CD (p= 0.05)	NS	NS	NS	NS	NS	NS	NS

a. Wheat

b. Maize

c. Mustard



d. Lentil

Fig. 9: A view of experimental crop plots grown with organic source of nutrients

Table 5: Yield and yield attributes of rice under organic, inorganic and organic + inorganic sources of nutrients (2023)

Treatment	No. of panicle /hill	Panicle length (cm)	No. of grains / panicle	1000 grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Organic source	9.3[b]	22.4[b]	109.6[b]	24.3	3321[b]	5170[b]
Organic + Inorganic sources	10.9[ab]	24.5[a]	120.1[a]	25.1	4506[a]	6054[a]
Inorganic sources	11.2[a]	25.61[a]	125.6[a]	25.6	4858[a]	6412[a]
CD (p= 0.05)	1.1	1.9	9.5	NS	512.3	596.0

Fig. 10: A view of experimental field site at harvesting of rice

Fig. 11: A view of rice experimental plot grown with organic source of nutrients

Performance of rice under organic, organic + inorganic and inorganic sources of nutrients

Inorganic and organic + inorganic sources of nutrients, being at par recorded significantly higher numbers of panicles/hill, panicle length and number of grains/panicle in rice as compared with organic sources (Table 5). There was a non-significant difference in 1000-grain weight due to various sources of nutrients. Organic + inorganic sources of nutrients recorded significantly higher grain and straw yield of rice as compared to organic sources; however, it was at par with organic sources. Grain yield obtained under organic sources was 26.3 and 31.6% lower than that of organic + inorganic and inorganic sources, respectively (Fig.10 and 11).

Soil organic carbon and moisture content at harvest of rice under organic, organic + inorganic and inorganic sources of nutrients

Soil organic carbon ranged from 0.55 (inorganic sources) to 0.65% (organic sources) in 0-15 cm soil depth and 0.48 (inorganic sources) to 0.61% (organic sources) in 15-30 cm soil depth (Fig. 12). Soil organic carbon was significantly higher in organic sources of nutrients plot as compared to other treatments, irrespective of depth. Almost similar trends for soil moisture content after rice harvest were also observed (Fig. 13). However, lower layers of soil showed higher values of soil moisture. In 0-15 cm soil depth, it varies from 21.75 to 24.89%, whereas 27.90 to 34.11% in 15-30 cm soil depth.

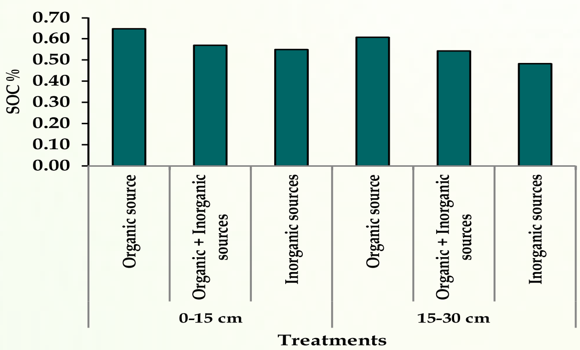


Fig. 12: Soil organic carbon (%) under various treatments for 0-15 and 15-30 cm soil depth

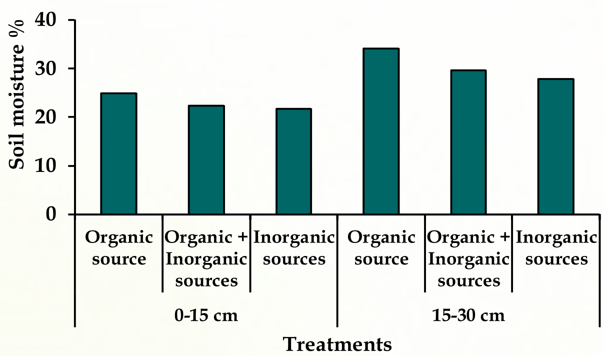


Fig. 13: Soil moisture (%, v/v) under various treatments for 0-15 and 15-30 cm soil depth

a. Banana b. Papaya c. Pomegranate

Fig. 14: A view of on-dyke fruit cultivation in experimental IFS model

On-dyke fruit production: Papaya, banana and pomegranate

Banana (G-9) planted on one side of the dyke on 06.08.2023 (177 plants) gave a yield of 800 dozen banana fruit with a gross return of ₹12,000. Papaya (Red lady) planted on another dyke (183 plants) was in fruiting stage and getting ready for sale. A total of 80 plants of pomegranate (*Bhagwa*) were planted (17.08.2022) on another side dyke and its canopy management and other practices are being followed (Fig. 14).

Fish rearing

Fish fingerlings of *catla*, *rohu*, and *mrigal* in a 1:2:1 ratio, respectively, were released in pond refuge on 13.09.2023 and the average weight was 25, 10.5, and 10.5 g, resp., at the time of release (Fig.15).

Nutrient recycling

Gliricidia has been grown at the outer sides of 3 dykes for green leaf manuring (Fig.16). *Sesbania* and *gliricidia* leaf green manuring in treatment plot organic source of nutrient in rice contributed 45 and 10% nitrogen of total nitrogen to be applied and remaining required nitrogen was applied through FYM. A total of 1600 kg of vermicompost produced was used for feeding of fishes.

Vermicomposting

Vermicomposting of 20-days pre-composted paddy residue and cow dung slurry (3:1 ratio) in two numbers of HDPE vermicompost beds (size-3mx1m) was done and 800 kg vermicompost/bag was produced in 100 days (Fig. 17).

Fig. 15: A view of releasing fish fingerlings in pond refuge

Fig. 16: A view of *Gliricidia* grown on outer side of dyke for leaf green manuring

Fig. 17: A view of vermicomposting unit in IFS model for nutrient recycling of crop residue

Estimation of optimum residue retention in rice-wheat cropping system raised on calcareous soil of middle Indo-Gangetic Plain

Principal Investigator: Dr. S.K. Samal (up to 28.03.2023), Dr. A.K. Singh (from 29.03.2023)

Co- Investigator: Dr. A.K. Singh (up to 28.03.2023)

Project Code No.:

NRMAMGIFRISIL202000400007

Improper management of residues is a major challenge in way of sustainability. The residues wasted or used inefficiently can be used to harness larger benefits in terms of yield and improving soil health. Keeping this in view, the performance of wheat and rice crops under different residue retention levels under conservation agriculture practice was studied with that of conventional tillage treatments.

Field experiments were conducted at the institute research farm, consisting of nine treatments, viz. T1: CT-FP: Conventional tillage and farmers' fertilization practice; T2: CT-BF: conventional tillage with balance fertilization; T3: CT-M: Conventional tillage with *mungbean* residue incorporation and balance fertilization; T4: CT-S: Conventional tillage with *Sesabania* residue incorporation and balance fertilization; T5: NT-RL1: No-tillage with 30% rice and wheat residue retention, 100% *mungbean* residue retention and balance fertilization; T6: NT-RL2: No-tillage with 40% rice and wheat residue retention, 100% *mungbean* residue retention and balance fertilization; T7: NT-RL3: No-tillage with 50% rice and wheat residue retention, 100% *mungbean* residue retention and balance fertilization; T8: NT-RL4: No-tillage with 60% rice and wheat residue retention, 100% *mungbean* residue retention and balance fertilization; and T9: NT-RL5: Conventional tillage with 30% rice incorporation laid out in randomized block design with three replications. Wheat (HD-2967) and rice (*Rajendra Bhagwati*) crops were sown/transplanted in the first week of November and July, respectively. *Mungbean* and *Sesbania* were sown after the harvest of wheat, and crop residue management was done as per treatments.

Enhancing crop productivity through residue management in rice-wheat cropping system

Experimental findings revealed that yield and yield attributes of wheat and rice differ significantly due to various CA and conventional tillage treatments, except number of grains/spike and 1000 grain weight in wheat and 1000 grain weight in rice (Table 6 and 7). In all the CA treatments (T1 to T9), a significantly higher number of spike m^{-2} and spike length in wheat was recorded as compared to conventional tillage treatments (T1 to T4). The grain yield of wheat varied from 2400 to 3900 kg ha^{-1} under different treatments. The yield of wheat under T7, being at par with all other CA treatments (T5, T6, T8 and T9), was significantly higher than that of all conventional tillage treatments (T1 to T4). Average wheat yield was 3900 and 3200 kg ha^{-1} in no-tillage with 50% rice and wheat residue retention along with 100% *mungbean* residue retention (T7) and conventional tillage with balance fertilization (T2) treatments, respectively, i.e., grain yield under T7 was 23.5% higher than T2. The performance of rice was almost similar to wheat under various treatments. The yield attributes of rice, viz. number of panicle m^{-2}, panicle length and number of grains/panicles were significantly higher in T7 as compared to all conventional tillage treatments; however, T7 was at par with most of the CA treatments. Treatment T7, being at par with T8, recorded significantly higher rice grain yield than that of other treatments. Maximum (4800 kg ha^{-1}) and minimum (2900 kg ha^{-1}) grain yield of rice was found in T7 and T1, respectively, and conventional tillage with balance fertilization (T2) recorded 3400 kg ha^{-1} rice grain yield, i.e., grain yield under T7 was 64.2 and 44.5% higher than T1 and T2, respectively.

Effect of residue management on soil properties

Soil organic carbon (SOC) in the soil of the different treatments was analyzed at harvest of the rice after three crop cycles of wheat-rice. The data revealed that T8 recorded the highest SOC (0.65% in 0-15 cm and 0.51% in 15-30 cm soil depth), which being at par with T6 and T7, improved SOC significantly over all other treatments in 0-15 and 15-30 cm soil depth (Fig. 18).

Table 6: Effect of various residue levels on yield and yield attributes of wheat (2022-23)

Treatment	No. of spike m^{-2}	Spike length (cm)	No. of grains /spike	1000-grain weight (g)	Grain yield (kg ha^{-1})
T1: CT-FP	178.50^{c}	9.70^{b}	45.03^{a}	38.43^{a}	2453^{c}
T2: CT-BF	181.50^{c}	9.72^{b}	52.83^{a}	38.67^{a}	3176^{b}
T3: CT-M	179.40^{c}	9.82^{b}	54.70^{a}	40.03^{a}	3259^{b}

T4: CT-S	204.00[bc]	9.88[b]	54.93[a]	39.29[a]	3319[b]
T5: NT-RL1	242.00[ab]	11.42[a]	57.47[a]	40.17[a]	3615[ab]
T6:NT-RL2	263.63[a]	11.45[a]	57.50[a]	40.75[a]	3650[ab]
T7: NT-RL3	266.57[a]	11.63[a]	57.83[a]	40.09[a]	3923[a]
T8: NT-RL4	246.40[a]	11.42[a]	57.23[a]	40.28[a]	3567[ab]
T9: CT-RL5	231.00[ab]	11.38[a]	54.93[a]	40.28[a]	3378[ab]
CD (p= 0.05)	47.18	1.36	NS	NS	554.3

Table 7: Effect of various residue levels on yield and yield attributes of rice (2023)

Treatment	No. of panicle m^{-2}	Panicle length (cm)	No. of grains /panicle	1000-grain weight (g)	Grain yield (kg ha^{-1})
T1: CT-FP	245.6[d]	23.5[d]	95.2[f]	26.3[a]	2954[f]
T2: CT-BF	253.1[d]	23.7[cd]	98.2[ef]	26.1[a]	3358[ef]
T3: CT-M	315.0[bc]	24.2b[cd]	103.4[cde]	27.0[a]	3616[de]
T4: CT-S	328.1[ab]	24.5b[cd]	103.9[cde]	27.2[a]	3787[cde]
T5: NT-RL1	332.2[ab]	25.1[abcd]	106.0[cd]	26.1[a]	3954[bcd]
T6:NT-RL2	333.8[ab]	25.3[abc]	108.9[bc]	26.4[a]	4144[bc]
T7: NT-RL3	341.9[a]	26.5[a]	117.3[a]	28.0[a]	4852[a]
T8: NT-RL4	336.0[ab]	25.5[ab]	113.4[ab]	27.1[a]	4423[ab]
T9: CT-RL5	297.3[c]	24.0[bcd]	101.3[def]	27.3[a]	3535[de]
CD (p= 0.05)	26.79	1.59	7.22	NS	490.7

Almost similar trend was obtained for soil moisture content, where soil moisture varied from 12.8 to 18.8% in 0-15 cm soil depth and 26.1 to 33.7% in 15-30 cm soil depth (Fig. 19). Soil pH and electrical conductivity were found statistically at par at harvest of the rice after three crop cycles of wheat-rice. The study demonstrated that after three crop cycles of wheat-rice CA practice with 50-60% residue retention improves soil organic carbon and maintains soil moisture at higher levels.

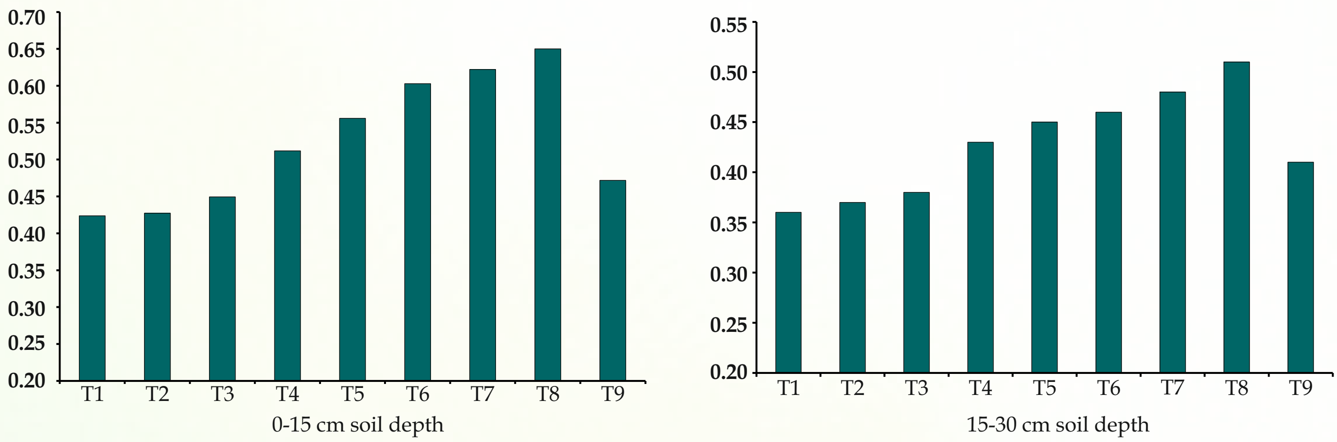


Fig. 18: Soil organic carbon (%) under various treatments for 0-15 and 15-30 cm soil depth

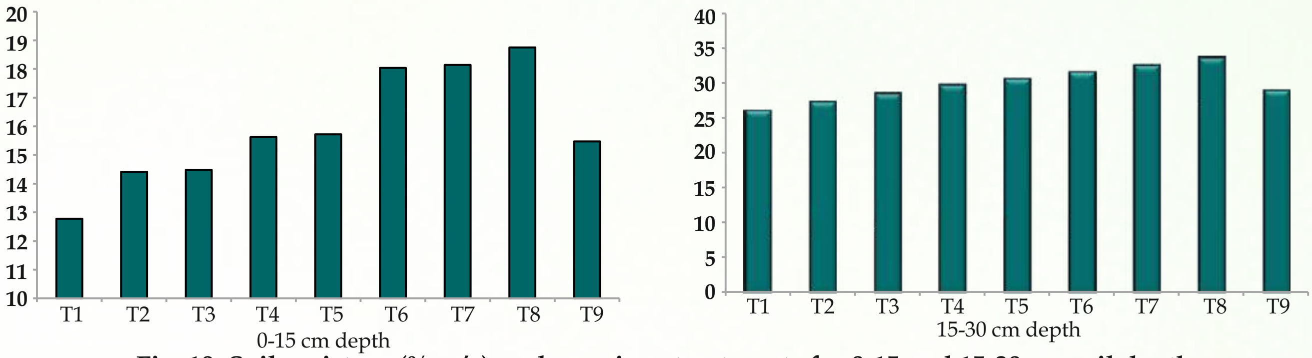


Fig. 19: Soil moisture (%, v/v) under various treatments for 0-15 and 15-30 cm soil depth

Land shaping for development of horti-based farming system model for low lying areas of Bihar

Principal Investigator: Dr. S.K. Purbey

Co- Investigators: Dr. K.G. Mandal, Dr. P.K. Bharti, Dr. Shreya Nivesh

Project Code No.: NRMAMGIFRISIL202000100004

Performance of various crops on raised beds

In low-lying areas, water is available near the earth's surface seasonally and remains for 4-5 months even more during good monsoons. This depth of waterlogging is found more during monsoon season, thus, making lands unproductive during *kharif*. Restoration of such lands is possible through various techniques of land modifications/ shaping. Under this project, Land shaping techniques have been executed for the rehabilitation of low-lying water-logged areas by converting the raised and sunken bed system to get more economic output. A crop diversification-based cropping system has been implemented under different land shaping systems viz. model I: (1.0 m depth), Model II (1.4 m depth) & Model III (1.8 m depth). Different field crops (viz. foxtail millet, maize, wheat, mustard, lentil), vegetable crops (viz. bitter gourd, ridge gourd, sponge gourd, pea, tomato, cauliflower, potato, beans) and fruit crops (viz. guava, drumstick, papaya etc.) were grown on the raised bed during 2023. In different sunken beds, depending on the availability of rainwater different crops like makhana, chestnut, rice (Fig 26) and cucurbits were grown.

Irrespective of the models, the performance of maize among the field crops was found better than other field crops whereas in the case of vegetable crops, tomato performed better than other vegetable crops during this year. Among the various fruit crops, the performance of papaya was found better than other fruit crops (guava and drumstick) and the net return per unit area was found from papaya (₹ 94 m^{-2}) followed by guava and drumstick. The net return under model I, II and III in field crops was 7.50, 9.08 and 6.18 m^{-2} whereas 13.28, 25.96 and -4.0 in fruit crops and 28.68, 8.99 and 58.10 m^{-2} in vegetable crops, respectively. Under model III, the fruit crops have not come in bearing so, the net return was found negative. Similarly, the percentage share of net income of field, fruit and vegetable crops was 17.58, 19.38 and 37.35% respectively in model I whereas it was 24.0, 41.77 & 12.4 in model II and 33.0, -16.39 & 23.03% in model III respectively under the raised bed (RB) condition (Fig. 20-24). The less net return from model III (1.8m) might be due to soil erosion caused by lack of compactness of RB III. In the sunken bed, the net return was maximum under model III (₹ 6.16 m^{-2}) followed by a model I and II. The lower rerun might be due to poor rainfall during this year due to which the performance of aquatic crops was poor and expensive.

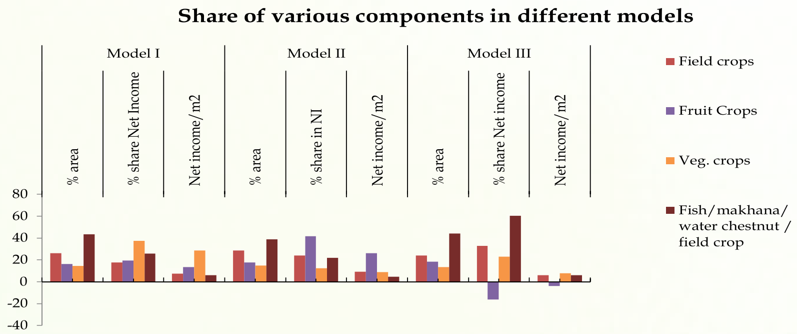


Fig. 20: Share of various components in different models

Fig.21: Fox tail (Model I)

Fig.22: Maize (Model II)

Fig.23: Fruit crops on Raised Bed II

Fig.24: A picture of Raised bed III

Fig.25: Makhana + Water Chestnut (Model II)

Fig.26: Rice (Model III)

Performance of Various crops and fish in sunken bed

Due to poor rainfall, the water stagnation in the sunken bed was about 1-1.5 feet for 20-25 days only during the experimental season. So, in model I (1.0 m), forced harvesting of fish was done in Jan. 2023 and got only 0.84 t ha^{-1} fish production. Similarly in sunken bed II (1.4 m), duck –fish farming was introduced in first half portion and *Makhana* + water chestnut farming was done in the second-half portion maintaining the water level of 1.5 feet throughout the period (Fig.25). We got 40 kg of raw *makhana* seed and 30 kg of water chestnut. In comparison to last year when sole water chestnut was grown, it was found that a sole crop of makhana is more beneficial than a mixed crop of makhana+ water chestnut.

Post-harvest losses study of major fruit and vegetable crops of East Champaran district of Bihar

Principal Investigator: Dr. S.K. Purbey
Co- Investigator: Dr. P.K. Bharti
Project Code No.: NRMAMGIFRISIL202000100005

The post-harvest losses (PHL) of fruits and vegetables are the major concern in the agriculture sector which leads to the poor return to the farmers. It has been quantified as 25-40% accounting for about ₹2.5 lakh crore annually. The East Champaran district of Bihar is a good hub of fruits (litchi & mango) and vegetables (tomato, *bhindi*, cole crops) production but farmers and traders are also facing huge post-harvest losses. Postharvest losses in the supply chain of fresh produce, are difficult to estimate as there is limited official data and there is no standard methodology to estimate the losses. Therefore, it is of paramount importance to interrogate the extent of post-harvest losses at various levels of the supply chain so that management techniques, strategies, and policies can be developed. Good post-harvest management will foster agribusiness in East Champaran, Bihar, as it will improve farmers' income, thus providing employment and other opportunities such as the export of produce.

The study was taken based on a tested structural schedule i.e. questionnaire survey of 25-30 farmers and retailers from three blocks namely Tirkolia, Chakiya/Pipra and Madhuban block for vegetables and Pakaridayal, Madhuban and Chakiya for fruit crops. Multiple regression analysis was run to determine the predictors (independent variables) that contribute to fresh produce PHL. The various types of losses namely physiological, mechanical and pathological at different levels viz. farm, handling & transportation, wholesalers, and retailers were recorded in litchi, mango, tomato, Okra, and cauliflower during 2022-23. Irrespective of the fruits and vegetables the maximum physiological and pathological losses were observed at the retailer level. In case of vegetables, the total post-harvest losses were found maximum in okra (27.15%) followed by cauliflower (26.15%) and tomato (20.45%) including all stages of the supply chain i.e. farmer, handling, wholesaler and retailer stage (Fig. 27). The maximum losses had been recorded at the retailer level (7.25-12.40%).

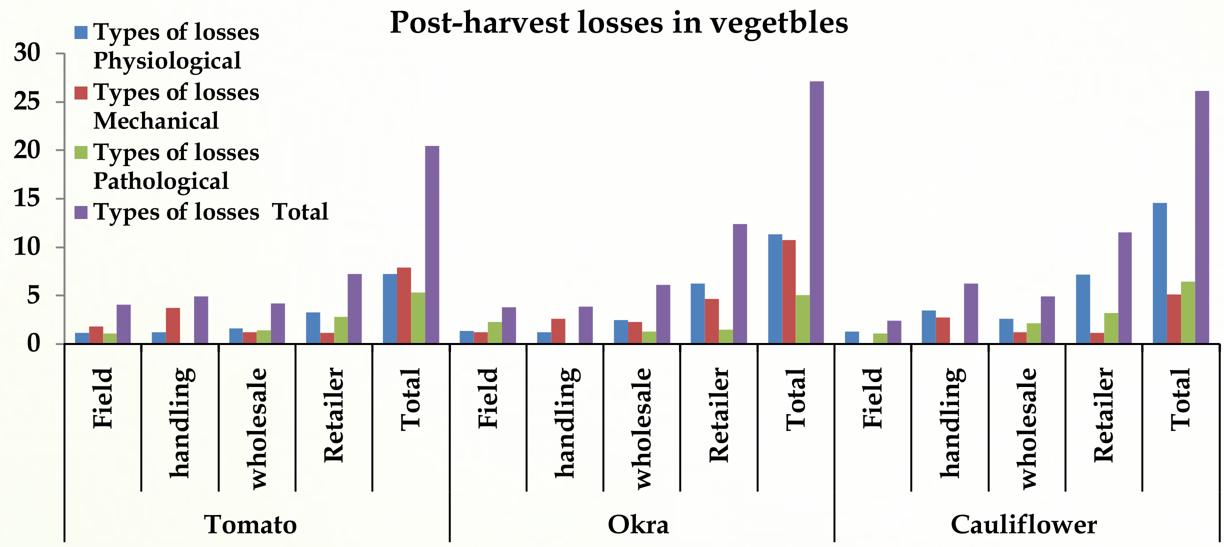


Fig.27: Post-harvest losses of vegetables at various level of supply chain

The mechanical losses were maximum (5.1-10.75%) during handling and transport whereas physiological losses were maximum (14.6%) in cauliflower followed by okra and tomato. In fruit crops, the total PHL had been found in litchi (36.8%) three days after harvest followed by mango (25.9%). The physiological loss (21.85%) was found highest in the case of litchi at all levels of the supply chain whereas in the case of mango mechanical and pathological losses were observed maximum at the handling and retailer levels respectively. Lack of storage facility and knowledge and skill of post-harvest management practices had shown a positive relationship between each dependent and independent variable. The potential reason/ risk factors prioritized for post-harvest losses at the field level might be lack of skill and knowledge related to harvesting, handling whereas at wholesale and retail levels the perishability and lack of proper storage facility were the main problems of post-harvest losses of fruits and vegetables (Fig. 28 and 29). Socio-demographic data of 90 farmers, 30 retailers and 12 local *mandis* showed that most of the farmers were male in the age group of 18-50 years having educational qualifications up to middle school. Most of the vegetable growers (76%) belonged to the small and medium farm size category whereas in fruit crops 70% belonged to the medium to large farm size category.

Fig.28: Handling and Marketing of vegetables

Fig.29: Handling of litchi at field

Evaluation of irrigation water saving techniques in winter Maize in rice maize system under North Bihar conditions

Principal Investigator: Dr. Shreya Nivesh

Co- Investigators: Dr. A. K. Singh, Er. Vikas Paradkar, Dr. Koushik Banerjee

Project Code No.: NRMAMGIFRISIL202100100012

Maize is one of the dominating crops of Bihar after rice and wheat, grown by the majority of marginal and small farmers. Winter maize, which is the most popular and productive season of maize in Bihar, requires frequent irrigation and mostly it is fulfilled from groundwater resources. In general, more than 80% of the irrigation demand in the north Bihar region is met by groundwater resources. Therefore, water-saving irrigation methods are required to increase crop water productivity (CWP) without reducing the grain yield of maize and nutrient uptake.

Keeping this in view, a field experiment was conducted to identify effective methods and level of irrigation (quantity of irrigation water required) to achieve maximum benefits in terms of water use efficiency and crop yield at the ICAR-MGIFRI research farm during the *rabi* season 2022-2023. The experiment consisted of a total of 15 treatment combinations having five irrigation methods (Flat-flooding, Ridge-furrow with furrow depth of 15 cm, Ridge-furrow with furrow depth of 30 cm, Ridge-alternate furrow with furrow depth of 15 cm, Ridge-alternate furrow with furrow depth 30 cm) and three irrigation levels (100, 80 and 60% ETc) with three replications in a split-plot design (Fig.30). The crop was sown in lines at row-to-row spacing of 45 cm and plant-to-plant spacing of 30 cm in flat beds. Ridge and furrow were made manually with a spade at 45 days after sowing as per treatments. Maximum irrigation level (100%) i.e. 100% ETc was calculated based on the CROPWAT 8.0 model and it was utilized in the experiment for assigning three levels of irrigation as per treatment. In all the levels of irrigation, four numbers of irrigation were given as per treatment. Maize crop (hybrid Variety-Pioneer-3526) was sown on 26 November 2022 with a recommended dose of fertilizers (120:60:40 kg NPK ha^{-1}). A full dose of P_2O_5 and K_2O and half of N was applied before planting. The remaining quantity of N was applied in two equal splits as per recommendation. Growth observations on plant height and others were taken starting 15 days after sowing at regular intervals. Results obtained from 2nd maize trial grown in 2022-2023 are:

- ❖ Results indicate that both the irrigation method and level had significant effects on crop dry matter, thousand-grain weight, and water use efficiency of maize.
- ❖ Alternate furrow irrigation (AFI) at 30 cm depth gives the highest grain yield of 8.07 t ha^{-1} with a water use efficiency of 43 $kg^{-1}mm^{-1}$ resulting in a water-saving of 54% compared to flooding irrigation.
- ❖ Alternate furrow irrigation (AFI) at 30 cm depth increased the grain yield of *Rabi* maize by 38% compared to flood irrigation.

- The AFI and Traditional Furrow Irrigation (TFI) techniques (with irrigation amounting to 100 % of ETc) can result in a similar yield at 30 cm depth.
- Results showed that AFI is an effective water-saving technique, which can increase crop water productivity without a significant reduction in grain yield of maize crops.

Flat-flooding Method

Flat-flooding Method

Flat-flooding Method

Replication-I

Replication-II

Replication-III

Fig.30: A View of Experimental Farm

Delineation and characterization of flood-prone and waterlogged areas of Eastern India and development of IFS plans

Principal Investigator: Dr. Koushik Banerjee

Co- Investigators: Dr. Shreya Nivesh, Er. Vikas Paradkar, Dr. S.K. Samal (up to 31.03.2023), Mr. Ravi Kumar, Dr. S.K. Purbey, Dr. K.G. Mandal

Project Code No.: NRMAMGIFRISIL202100400015

Flooding seriously threatens the physical integrity and sociocultural value of heritage sites around the world. In recent decades, floods have become increasingly destructive due to increased impervious surfaces, climate change, and global warming. Remote sensing technologies and new sensors for disaster observations have been widely used in risk analysis. In this study, mapping of flood-affected areas is based on the Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) with the Sendai Framework Terminology on Disaster Risk Reduction (United Nations, 2023) as a standard directly applicable to assessing flood impacts. Based on the methodology by UN-SPIDER, mapping of flood-affected areas was done by taking before and after flood imageries over Bihar state. Since, the occurrence of heavy rainfall is one of the major reasons for the occurrence of floods, the use of optical imagery was avoided because of its proneness to cloud. On the other hand, SAR data is weather-independent and provides a robust reliable way to detect floods. Thus, in this study, Sentinel-1 Synthetic Aperture Radar (SAR) GRD: C-band image data were acquired both before and after the flood occurrence for Bihar state. C band SAR data is available both during day and night and can penetrate the cloud, having a spatial resolution of 10m and temporal resolution of 6-12 days, can transmit signal either horizontal (H) or vertical (V) polarization and then receive both H and V polarization.

Sentinel 1 provides polarized images that are available in HH, HV, VV, and VH bands. Among the three different operational modes, i.e., interferometric width swath (IW), extra width swath (EW), and strip map (SM), IW is commonly used for flood area mapping over land and coastal areas. In the current study, mapping of flood-affected areas was done using the best practices (well-tested and verified) recommended by UN-SPIDER. Sentinel SAR images were collected from image collection before and after the flood event. Later speckle filter was applied to the selected radar images to remove salt and pepper noise. Subsequently, the extent of the affected area was delineated by differencing the after and before images. Later, the mask was applied to remove permanent water bodies, isolated pixels, and steppe areas. A brief flow diagram of the methodology is given in Fig 31 a,b,c. A pixel is classified as a flood pixel if the difference is more than the threshold value, while, a permanent water pixel is classified when the pixel value is less than the threshold value for that pixel. Based on this principle, permanent/ semi-permanent water bodies and flood-inundated areas were classified for the year 2017 using the Google Earth engine platform as shown in Fig 31 a. The blue-colored area highlights permanent or semi-permanent water bodies and red colored area shows the flooded area. From Fig 31 b, it can be seen that Darbhanga was the most affected district due to the flood in August 2017. Apart from this, the eastern part of Samastipur, Khagaria, Katihar, Purnia, Bhagalpur, East Champaran, Munger, and Muzaffarpur were affected by floods in 2017. Similarly, flood conditions and affected areas in the East Champaran district were also assessed (Fig 31 c). The northern part of East Champaran district was found to be affected mostly by flooding during August 2017. Additionally, the southern part of the district, falling under the Gandak River basin, was also affected by flood.

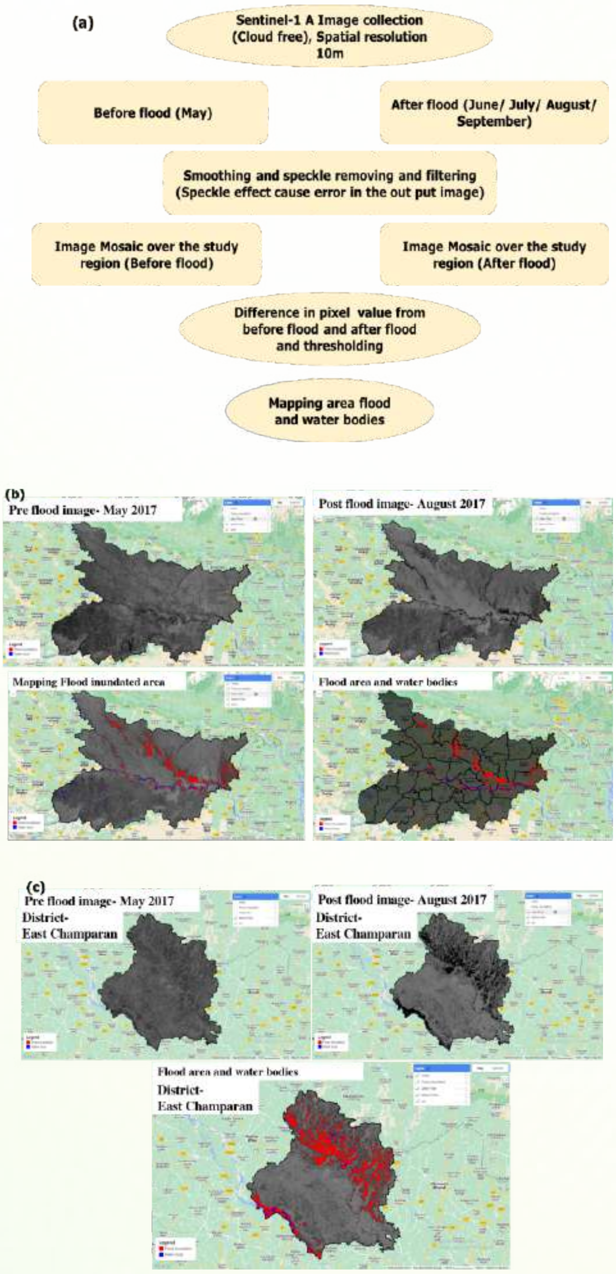


Fig. 31: a) details of the methodology followed to map flooded and water bodies, b) pre/ post flooded map of Bihar, c) pre/ post flooded map of East Champaran district.

Development and assessment of fish-based integrated farming models under floodplain ecosystems

Principal Investigator: Mr. Ravi Kumar

Co- Investigators: Dr. P.K. Bharti, Dr. S.K. Purbey, Dr. S.K. Samal (up to 31.03.2023)

Project Code No.: NRMAMGIFRISIL202000300006

High-density fish-poultry-on dyke fruit crops (IFS-1) and fish-poultry-duck-on dyke fruit crops (IFS-2) models were developed and assessed while comparing with control (composite fish culture without integration). The fish fingerlings were stocked at the rate of 10000 nos. ha^{-1} of an average body weight of 30.5±0.8g comprised of surface feeder *Catla catla* (30%), column feeder *Labeo rohita* (20%) and Ctenopharyngodon idella (20 %) and bottom feeder *Cirrhinus mrigala* (15%) and *Cyprinius carpio* (15 %). For the plankton production, basal dose of urea (16.7 kg ha^{-1} yr^{-1}), DAP (16.7 kg ha^{-1} yr^{-1}), MOP (6.7 kg ha^{-1} yr^{-1}) and $ZnSO_4$ (3.3 kg ha^{-1} yr^{-1}) were applied in the pond. The dung manure was applied at the rate of 15000 kg ha^{-1} yr^{-1} in the control pond whereas approximately 12000 kg ha^{-1} yr^{-1}poultry manure and poultry+duck manure was applied in the IFS-1 and IFS-2 models, respectively. The supplementary fish feed (mustard oil cake, rice bran, and floating pelleted feed with crude protein 24% and fat 4% was supplied at the rate of 1% of the total fish biomass daily. In the IFS-1, poultry birds (*Vanraja*) were stocked at the rate of 800 number ha^{-1} yr^{-1}, and on-dyke fruit crops (banana, lemon, and guava) were cultivated. In the IFS-2, Khaki Campbell ducks were added along with the poultry birds at the rate mentioned in the IFS-1. Water quality parameters like pH, temperature, dissolved oxygen, alkalinity and hardness were evaluated.

After one year, in the control pond, the minimum and maximum average live body weight of fish was recorded as 302.0±16.2 g with a growth rate of 0.71 g day^{-1} of *C. mrigala*, and 641.5±18.6 g with a growth rate of 1.63 g day^{-1} of *C. idella* (Fig. 32). In the IFS-1, the minimum and maximum average body weight was recorded as 362.5±37.9 g with a growth rate of 0.89 g day^{-1} of *C. mrigala* and 632.5±35.5 g with a growth rate 1.62 g day^{-1} of *C. catla* (Fig. 33). In the IFS-2, the minimum and maximum average live body weight was recorded as 362.5±35.9 g with an average growth rate of 0.89 g day^{-1} of *C. mrigala* and 624.5±35.3 g with an average growth rate of 49.4 g day^{-1} of *C. catla* (Fig. 34).

Survival, productivity, economic & energy efficiency

The survival rate of fish was found to be 82.5 % (in composite culture), 84.0% (IFS-1), and 85.6% (IFS-2). The fish equivalent yield was recorded as 3.35 t ha^{-1} $year^{-1}$ from the control system,

5.80 t ha^{-1} $year^{-1}$ from IFS-1 and 5.93 t ha^{-1} $year^{-1}$ from IFS-2 model. Economic analysis revealed the B: C ratio as 1.32 and 1.60 from the control and IFS models, respectively. The energy use efficiency was higher (0.69) in the IFS-2 model than in IFS-1 (0.60) and control (0.11). Further, the fish-based IFS models produced multiple outputs like fish, eggs, fruits, etc. which are essentially required for human health. Such IFS models in waterlogged/flood-affected ecosystems can provide better economic/ nutritional/ health security to the farmers.

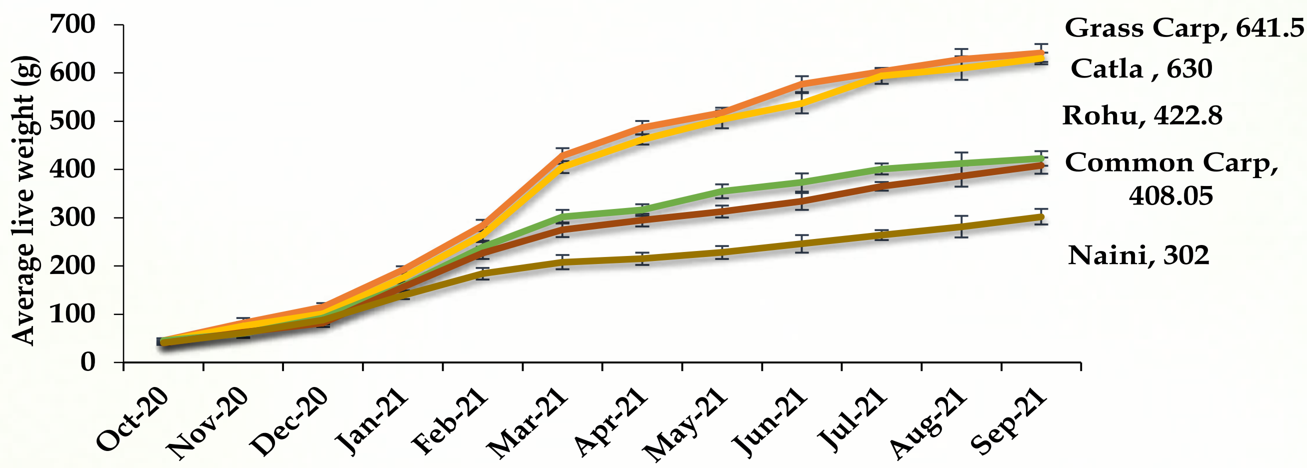


Fig. 32:. Monthly average live weight of fishes in control pond

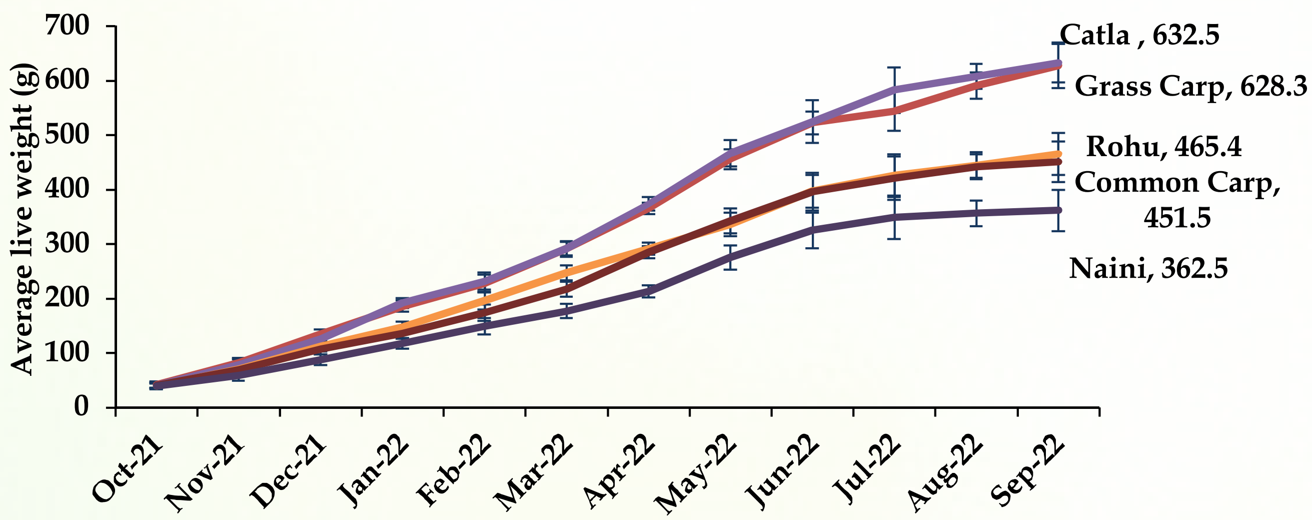


Fig. 33: Monthly average live weight of fishes in IFS-1

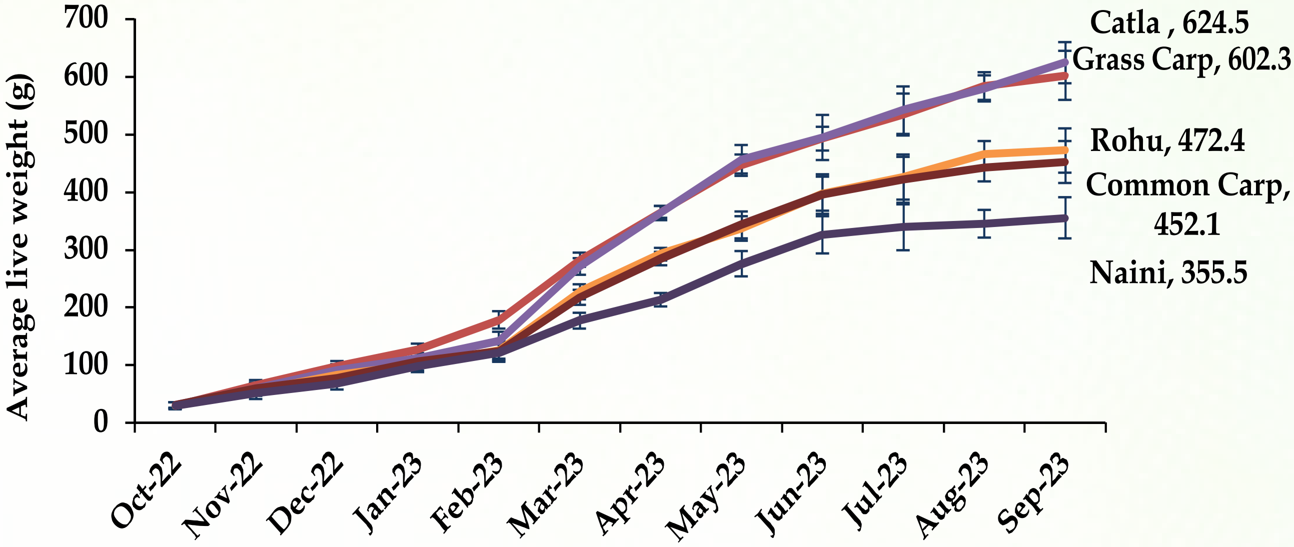


Fig. 34: Monthly average live weight of fishes in IFS-2

Design and development of low cost equipment's and machineries for water logged situations

Principal Investigator: Er. Vikas Paradkar

Co- Investigators: Mr. Ravi Kumar and Dr.Shreya Nivesh

Project Code No.: NRMAMGIFRISIL202100300014

The goal of the project is to design and develop an integrated solution for water resource management. This involves the development of a sensor-based automatic water depth measurement system for ponds. The primary objectives are to provide accurate depth measurements, quantity assessments, and real-time water quantity monitoring through user-friendly interfaces.

Research Achievements

1. Automatic Water Depth Measurement System: The research successfully led to the design and development of an automatic water depth measurement system using ultrasonic sensor sensors (Fig. 35).
2. Mobile App Graphic User Interface (GUI): An integral component of the project involved displaying depth data along with quantity measurements in centimeters on a mobile app graphic user interface. This user-friendly interface allows users to access real-time data easily. The integration of a mobile app enhances the accessibility and applicability of the system for end-users.

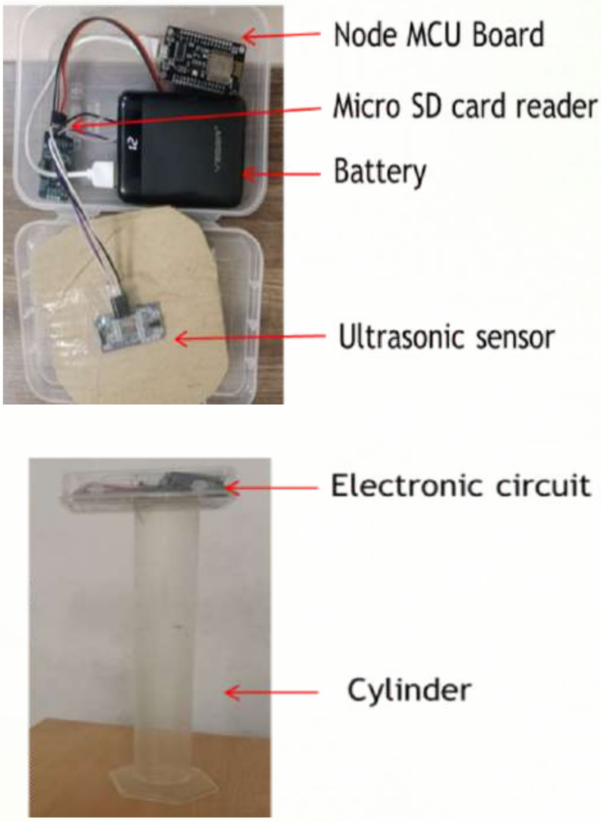


Fig.35: Water depth measurement system

3. Battery Operated Weeder: The design and development of a battery-operated weeder have been successfully executed (Fig. 36). This machine represents a significant advancement in weed control for agricultural fields. Its

innovative features aim to provide farmers with an efficient and cost-effective solution for weed management. The machine is currently undergoing trial and testing phases to validate its performance in real-world agricultural scenarios.

4. Multi-Row Manual Seed Drill: A multi-row manual seed drill has been designed to streamline and expedite the seed planting process (Fig. 37). This tool addresses the crucial need for precision and efficiency in sowing, offering farmers a cost-effective solution to optimize seed placement and spacing. The design emphasizes simplicity and ease of use, contributing to improved crop yield. Field trials will be conducted to assess its practical applicability and effectiveness.

5. Marking Tool: The development of a marking tool has been accomplished to enhance the overall efficiency of crop production (Fig. 38). This tool plays a vital role in ensuring accurate marking of planting rows, contributing to uniform crop spacing. The design prioritizes simplicity and cost-effectiveness, making it accessible to a wide range of farmers. This tool is poised to facilitate subsequent agricultural operations by providing a reliable reference for planting.

6. Finger Weeder: The design of a finger weeder addresses the challenges associated with manual weeding in crop fields. This tool offers a cost-effective alternative to traditional weeding methods while promoting precision and reducing labor-intensive efforts. Initial trials have demonstrated its potential to enhance weed removal without adversely affecting crops. Ongoing testing will further validate its efficiency and practicality in diverse agricultural settings.

The research project has made significant strides in advancing water resource management solutions by successfully developing an integrated sensor-based automatic water depth measurement system and a pond water quality monitoring system. The inclusion of a Mobile App GUI enhances the user experience by providing accessible depth and quantity data. The comprehensive nature of the project, covering both depth measurement and water quality monitoring, underscores its potential impact on sustainable water resource management.

Fig.36: Battery operated weeder

Fig.37: Multi-row seed drill

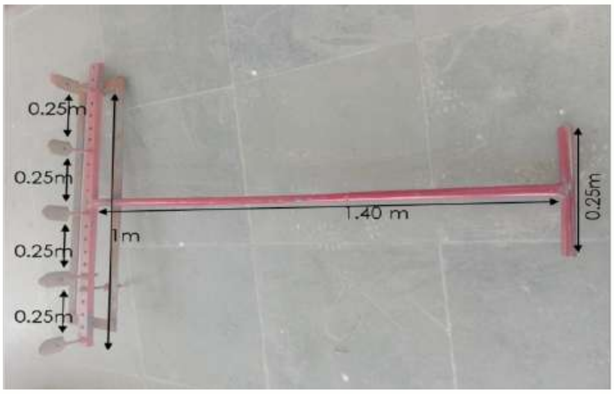


Fig.38: Marking tool

Identification of potential sustainable farming system~ constraints and opportunity in flood prone ecosystem

Principal Investigator: Dr. S. K. Samal (up to 31.03.2023), Dr. Koushik Banerjee (from 01.04..2023)

Co- Investigators: Er. Vikas Paradkar, Dr. Neela Madhav Patnaik

Project Code No.: (NRMAMGIFRISIL202000600009)

Waterlogging or excess water in agricultural fields is a major constraint in North Bihar which restricts increasing agricultural productivity. High rainfall in short periods, inadequate drainage, seepage from canal and irrigation channels, the rise of the water table due to irrigation network, flat land, saucer-shaped physiography of the land, and ingestion of seawater are a few major causes of waterlogging in Bihar. Different villages in the Kotwa block in East Champaran districts, covering 5 panchayats i.e., Kotwa, Bathna, Gopichhapra, Machhargawa, and Karariya, were surveyed to address this issue. The data related to the waterlogging situation, land holding, crops grown, animal reared, fish reared, use of crop residues, and animal excreta was recorded based on the information given by the farmers in the concerned panchayat through random sampling method. Farmers grow different crops according to the situation of waterlogging. Farmers in Kotwa and Gopichhapra panchayat cannot grow any crop due to extended periods of waterlogging. In Bathna panchayat farmers grow moong in the summer season. While, due to comparatively less period of waterlogging in Machhargawa Panchayat, most of the farmers grow wheat in the rabi season and moong in the summer season. On the other hand, due to the very short period of waterlogging in Karariya panchayat, farmers grow crops in almost all seasons including paddy, wheat, maize, mustard, sugarcane, etc. However, in upland situations, the farmer grows all crops e.g., paddy, wheat, mustard, maize, moong, and vegetables in their field. By and large, in waterlogged areas summer moong is the major crop, whereas in the upland situation, paddy, wheat, and mustard are the major crops. For identifying flood-prone areas of the East Champaran district, sentinel 1A SAR images were collected before the flood and after the flood situation for different years. Code was written in the Google Earth engine, and delineation/ mapping of flood-affected areas was identified. To identify the major constraints in flood-prone and waterlogging conditions, RBQ (Rank Based Quotient) analysis was done using the survey data following the formula below;

$$R.B.Q = \frac{\Sigma f_i (n+1-i) \times 100}{N \times n}$$

Where,

fi = Frequency of farmers reporting a particular problem under ith rank

i= concerned rank

N = number of farmers

n = number of problems identified to be ranked.

Farmers were asked to rank the four problems they reported in order of preference. From the Rank Based Quotient (RBQ) analysis, it was found that waterlogging is the major problem (Table 8) of the area as compared to the timely availability of fertilizer, irrigation problems and wild animals (Fig.39).

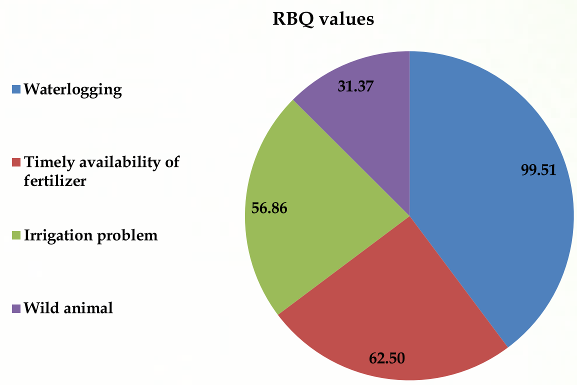


Fig.39: RBQ (Rank Based Quotient) analysis of major constraints in flood-prone and waterlogging conditions

Table 8: RBQ analysis of major constraints in flood-prone and waterlogging conditions

Constraints	Rank
Waterlogging	1
Timely availability of fertilizer	2
Irrigation problem	3
Wild animal	4

Research Achievements (External funded Projects)

Schedule Cast Sub Plan (SCSP)–Scheme
Principle Investigator: Mr. Ravi Kumar
Co-Investigators: Dr. S.K. Purbey, Dr. A.K. Singh, Dr. P.K. Bharti, Dr. S.K. Samal, (up to 31.03.2023), Dr. Shreya Nivesh, Dr. Koushik Banerjee, Er. Vikas Paradkar

A total of 5210 Scheduled Castes farmers including 3212 (61.8%) male and 1988 (38.2%) female have received direct benefits from various input distribution and capacity building programs provided by ICAR- MGIFRI, Piprakothi during the calendar year 2023 (Table 9). A total of 08 number of capacity-building programs i.e. training, awareness-cum-exposure visits, *kisan mela*, animal health camps etc. were organized for the SC farmers of East Champaran, Bihar. Various inputs were also distributed for the benefit of SC farmers which includes vegetable seed, goat (*Black Bengal*/ *Barbari*), poultry birds (*Vanraja/ Grampriya/ Sonali/ Kadaknath*), steel bucket with steel mug, grain/ seed storage bin, delivery pipe for irrigation, animal medicines, tarpaulin, paddy seed (*Swarna Samridhi*) and wheat seed (HD-2967) etc.

Table 9. Executive summary of the activities done under SCSP during calendar year 2023, and number of SC farmers benefitted

S.N.	Activity	Qty.	Beneficiary
1	Training programs/exposure visit/awareness program/animal health camp etc.	08 no.	2587
2	Vegetables' seed	500 packet	295
3	Goat (*Black Bengal/ Barbari*)	40 no.	14
4	Poultry chicks (*Vanraja/ Sonali/ Kadaknath*)	6600 no.	172
5	Steel bucket with steel mug	1450 no.	1432
6	Grain/ seed storage bin	150 no.	144
7	Delivery pipe for irrigation	80 no.	59
8	Medicine	250 doses	102
9	Tarpaulin	5000 m^2	116
10	Paddy seed (*Swarna Samridhi*)	1980 kg	161
11	Wheat seed (HD-2967)	4000 kg	128
		Total beneficiary	5210

Training/ awareness/ animal health camp/ kisan mela/ exposure visit program organized:

A total of eight training/ awareness/ animal health camps/ exposure visits/ kisan mela programs were organized for Scheduled Caste farmers of East Champaran, Bihar during the calendar year 2023 (Table 10). A total of 2587 SC farmers (1633 male & 954 female) actively participated in the programs. The programs were conducted on various aspects of integrated farming systems under waterlogged/flood-prone ecosystems, climate-smart agriculture, mushroom production, goatry, poultry farming, fish farming etc. The details of the programs organized are mentioned below

Table 10. Executive Summary of Programs Organized under SCSP during Calendar Year 2023

SN	Program organized	Number of Beneficiary			Venue	Date/ duration
		Total	Male	Female		
1.	Training program on 'climate smart soil and water management strategies for sustainable agriculture under waterlogged conditions'	61	23	38	Kararia Bairagi Tola, Kotwa, East Champaran	09-11 January 2023

2	Training program on 'IFS- an approach towards climate smart crop production under waterlogged condition'	60	40	20	Bela Kararia, Kotwa, East Champaran	27 February- 01 Mar 2023
3	Kisan Mela: Pashu Arogya, Krishi Unnati evam Udyaniki Mahotsav	1500	1000	500	Dr, RPCAU, KVK, Piprakothi	15-17 April 2023
4	Animal health camp organized at village Dhekahan, Piprakothi, East Champaran, Bihar	102	50	52	Dhekahan, Piprakothi, East Champaran	25 March 2023
5	Workshop - cum - awareness programme on "farmers - scientists interaction-cum-SC farmers labharthi sammelan	87	60	37	MGIFRI, Piprakothi	19 June 2023
6	Training program on "integrated farming practices to improve income generation in flood-prone and waterlogged ecosystems	55	15	40	MGIFRI, Piprakothi	20-24 June 2023
7	Awareness-cum-exposure visit program on integrated farming systems & management	30	10	20	MGIFRI, Piprakothi	06 September 2023
8	Training program on "livelihood improvement through mushroom cultivation"	41	29	12	MGIFRI, Piprakothi	12-14 December 2023
	Total	**2587**	**1633**	**954**		

Training on climate smart soil and water management strategies for sustainable agriculture under waterlogged conditions:

A three-day training program on "climate-smart soil and water management strategies for sustainable agriculture under waterlogged conditions" was organized at village Kararia Bairagi Tola, Block Kotwa, East Champaran from 9-11 January 2023 by Dr. Shreya Nivesh (Scientist, Soil and Water Conservation and Engineering) and Dr. Koushik Banerjee (Scientist, Agricultural Meteorology), ICAR-MGIFRI (Fig. 40). This program was specially organized for scheduled caste farmers under the scheduled caste sub-plan (SCSP) scheme. About 61 farmers including 38 females and 23 males attended the program. The training program was inaugurated by Dr. K. G. Mandal, Director ICAR-MGIFRI along with the concerned scientists of the institute and he threw light on how sustainable agricultural water management could be achieved in waterlogged areas using climate-smart strategies.

Fig.40: A three-day training program

During all three days, interactive lectures on how soil and crops should be managed for efficient utilization of water under flooded conditions and different aspects of weather-based irrigation strategies for crop production. Management and significance of fish, poultry, cattle, goats, and duck, as a component of the IFS model were discussed. Trainees shared their views on major problems that arise due to changes in weather conditions and the effects of climate on livestock, crops, soil, and water. A major limitation in the skill of farmers was identified as a lack of knowledge of a suitable technique for particular crops, vegetables and fruits as per the soil type, weather and environmental conditions. Participant farmers showed keen interest in learning advanced techniques for managing crops and livestock not only in the *Rabi* season but all the seasons.

Training on IFS - an approach towards climate smart crop production under waterlogged condition

The training was coordinated on the above-cited topic at village Bela Karariya, Piprakothi, East Champaran from 27th Feb to 1st March 2023 by Dr. Koushik Banerjee (Scientist, Agricultural Meteorology) and Dr. Shreya Nivesh, scientist (Scientist, Soil and Water Conservation and Engineering), ICAR-MGIFRI (Fig. 41). Indian farming is highly dependent on rainfall, which continues to defy projections and has been increasingly erratic in recent years. Global warming is a major factor in this game, as climate shocks impact food and water security. Adverse climate events have a major impact on all life, especially in developing nations. The need to address the issue of food security requires the promotion of an equitable and healthy food cycle, particularly for the most vulnerable countries. Climate-smart agriculture is an approach that includes sustainability using existing natural resources through crop and livestock production systems to achieve long-term higher productivity and farm incomes. Thus, the training focused on different strategies for IFS models, which can be used for climate-smart agricultural practices. Experts having backgrounds in agricultural meteorology, agronomy, horticulture, fishery, animal science, and soil science shared their knowledge with the farmers. Different adaptation strategies and some valuable technologies related to crop-animal-fishery were shared among the farmers. Around 60 farmers participated in this training program. Each day, a separate question-and-answer session was held where farmers discussed their farming-related problems and got needed solutions. Many farmers were found interested in receiving new information on this topic, and they also urged to conduct such kind of farmers' scientist interactions in the future for the benefit of the farming community particularly of scheduled caste. For the benefit of SC farmers and to endorse vegetable cultivation, kits containing seeds of 13 varieties of vegetables i.e., cucumber, palak, brinjal, french bean, bhindi, ridgegourd, dolichos, bottlegourd, chiili, corainder, cowpea, bittergourd etc for kitchen gardening were distributed.

Fig.41: Photographs of the training programme

An awareness-cum-exposure visit program on integrated farming systems & management

An awareness-cum-exposure visit program was conducted on 'integrated farming systems and management' for scheduled caste farmers under the SCSP scheme on 06th September 2023 (Fig. 42). A total of 30 SC farmers of Kundia Bangari village, Chakia, East Champaran, Bihar participated in the aforesaid program including 20 female and 10 male participants. The farmers were made aware of different components of integrated farming systems as per the locality. Thereafter, farmers visited the experimental field of MGIFRI where they saw different IFS models like fish-based, goat-based, horti-based, and rice-fish IFS models and their components i.e. fish, goat, poultry, crops, vegetable, fruit crops etc.

Training program on "Livelihood Improvement through Mushroom Cultivation" under SCSP scheme

Three days training program on "livelihood improvement through mushroom cultivation" under the SCSP scheme was coordinated by Dr. S.K. Purbey (Pr. Scientist, Horticulture) and Dr. Neela Madhav Patnaik (Scientist, Agricultural Extension) from 12 to 14 December, 2023 (Fig. 43). A total of 41 trainees actively participated in the training. The majority (70%) of the trainees were women i.e. 29 in number whereas 30% were males i.e. 12 male trainees. Out of the total participants, about 63% of the trainees were youth i.e. below the age of 35 years. The main objective of the training program was to improve the livelihood of SC beneficiaries by adopting mushroom cultivation which can be started with minimum investment. The training program covered the aspects related to the importance of mushroom cultivation, types of mushrooms, spawn and substrate preparation technique, disease and pest management of mushrooms, and light, humidity and temperature control techniques in mushroom cultivation. The hands-on training was provided to the participants on the preparation of compost for button mushrooms and the bagging technique of oyster mushrooms.

A progressive mushroom farmer was also part of this training program for demonstrating the nitty-gritty of mushroom enterprise, the field problems associated with mushroom cultivation and the steps to overcome them. The farmers were also trained on the prospect of integrating mushroom enterprise with their existing farming practices. Oyster mushroom spawns were distributed to some women beneficiaries to motivate them to undertake mushroom cultivation which will act as a tool for women's empowerment. The feedback of the trainees was highly positive towards the course curriculum of the training program, facilities of the institute, enriched knowledge and skills gained on mushroom cultivation practices.

Fig. 43: A few photographs of the training program

Farmers FIRST Programme- Improving livelihood of farmers through good practices in agriculture, fisheries and animal husbandry in the East Champaran region

Principle Investigator: Dr. A.K. Singh

Co-Investigators: Dr. S.K. Purbey, Dr. P.K. Bharti, Mr. Ravi Kumar, Dr. S.K. Samal (up to 31.03.2023), Dr. Shreya Nivesh, Dr. Koushik Banerjee and Er. Vikas Paradkar

Project No: NRMAMGIFRICOL202000500008

Extension activity under this program was implemented in four selected villages, namely i) Ujhilpur, ii) Hasanpur, iii) Narha Panapur* and iv) Balbhadarpur** of block Tetariya, district East Champarann (*Only in Narha Mallah Tola; **only in Hanuman Nagar) to promote adoption of improved agricultural practices by conducting skill development programs and field demonstrations in farmer fields along with facilitating critical inputs for enhancing agricultural production and income.

Critical inputs provided to Farmers

To demonstrate the various technologies and extension activities, critical inputs were made available to selected farmers in four selected villages (Fig. 44). Details of inputs provided during January to December 2023 are given in Table 11.

Table 11: Details of inputs provided to farmers under FFP

Date	Inputs	Quantity	No. of beneficiary
07.02.2023	Knapsack sprayer	35 Nos.	265 (35)
07.02.2023	Centrifugal pump	10 Nos.	70 (9)
13.02.2023	Fish feed (40 kg bag)	24 bag	6
22.03.2023	Vermicomposting bag	19 Nos.	14
30-31.05.2023	Paddy seed (*Swarna Smriddhi, Swarna Unnat, Swarna Shreya and Swarna Purvi Dhan* 3)	600 kg	94
16.11.2023	Wheat seed: DBW 187	2400 Nos.	120
07.11.2023	Earthworm for vermicomposting	95	16
23.09.2023	Banana Saplings	100 Nos.	7
Total nos. of beneficiary			592

a.Knapsack sprayer

b. Centrifugal pump

c. Fish feed

d. Vermicomposting bag

e. Paddy seed

f. Wheat seed

g. Earthworm

Fig.44: Views of critical inputs provided to farmers; a. Knapsack sprayer, b. Centrifugal pump, c. Fish feed, d. Vermicomposting bag, e. Paddy seed, f. Wheat seed, g. Earthworm

Performance of wheat variety HD-2967

Poor productivity in wheat is one of the major concerns due to poor seed replacement rate, delay in sowing, imbalanced fertilization, and other traditional system of cultivation like improper weed and water management. Wheat variety HD 2967 along with balanced use of fertilizers coupled with proper weed and water management practices as well as other package of practices was intervened along with critical input support. Other technical support was provided through on-farm training programs, field days and regular field visits.

A total of 38 varietal field demonstrations were conducted covering an area of 50 ha (Fig. 45). For this purpose, 5000 kg of wheat seed (HD-2967) was made available to 222 farmers, covering all four villages in the project area during 2022-23. Wheat variety HD-2967 grown with balanced use of fertilizers and another standard package of practices recorded 23.3% and ₹ 6789 ha^{-1} higher yield and income over farmers' practice, respectively (Table 12). In general grain yield of wheat was lesser due to sudden rainfall and hailstorms at the time of maturity. Wheat variety HD-2967 is gaining popularity in the adopted villages. Initially, the concerned farmers were reluctant to accept this variety but within a short period, HD 2967 has gained momentum owing to better adaptability. Farmers are now harvesting reasonable crop yields ranging from 3-5 t ha^{-1} as against the earlier average of 2.5-3.5 t ha^{-1}.

Table 12: Yield and net return of wheat (HD-2967) on farmers' field

Variety	Yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Ujhilpur	3620	2870	38390	24190
Hasanpur	1944	1638	7394	4144
Narha Panapur	1240	1005	3325	2310
Balbhadarpur	2115	1720	14030	5340
Mean	2230	1808	15785	8996

a. HD-2967 b. DBW-187

Fig.45: A View of wheat varieties (HD-2967, DBW-187) at farmers' field

Performance of wheat variety DBW 187

For field demonstration of newly developed wheat variety DBW 187 (*Karan Vandana*) which is suitable for early and timely sowing for irrigated conditions, a total of 10 varietal field demonstrations were conducted covering an area of 10 ha with critical input as 1000 kg of wheat seed (DBW 187) provided to 30 farmers, covering all the four villages during 2022-23. On average, a 24.4% and ₹ 10817 ha^{-1} increase in yield and net return was recorded by variety DBW 187 over farmers' practice under the adverse weather conditions at maturity (Table 13).

Performance of mustard variety SR yellow

A total of 17 varietal field demonstrations were conducted covering an area of 14 ha (Fig. 46). For this purpose, 110 kg of mustard seed was made available to 78 farmers, covering all four villages in the project area during 2022-23. Mustard variety SR yellow grown with a standard package of practices recorded 17.2% and ₹ 9563 ha^{-1} higher yield and income over farmers' practice, respectively (Table 14).

Table 13: Yield and net return of wheat (DBW 187) on farmers' field

Variety	Yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Ujhilpur	3033	2567	24900	14633
Hasanpur	1783	1400	14050	5617
Balbhadarpur	2713	2088	20300	6550
Mean	2510	2018	19750	8933

Table 14: Yield and net return of mustard on farmers' field

Variety	Yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Ujhilpur	1310	1080	42300	30800
Hasanpur	1125	1000	31750	25500
Narha Panapur	1400	1190	43500	33000
Balbhadarpur	1370	1170	44300	34300
Mean	1301	1110	40463	30900

a. mustard b. vegetable pea

Fig.46: A View of mustard and vegetable pea at farmers' field

***Performance of vegetable pea variety* PSM 3**

To create awareness among farmers to include a new variety of vegetable pea in their cropping system instead of traditional low-yielding varieties, a total of 14 field demonstrations in a 1.5 ha area was conducted with critical input of 115 kg seed covering 55 farmers during 2022-23. There was a 26.2% and ₹ 15427 ha^{-1} increase in yield and net return, respectively, recorded by variety PSM 3 over traditional varieties (Table 15).

Performance of field demonstration on garlic

Healthy selected cloves of variety Yamuna Safed 4 along with organic + inorganic nutrient management and other standard package of practices was demonstrated in a 1.2 ha area (17 demonstrations) with critical inputs such as 210 kg garlic seed involving 73 farmers during 2022-23 (Fig.47). Garlic grown in demonstration plots with a standard package of practices recorded 32.1% and ₹ 28625 ha-1 higher yield and income over farmers' practice, respectively (Table 16).

Table 15: Green pod yield and net return of vegetable pea (PSM-3) on farmers' field

Variety	Green pod yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Ujhilpur	8125	6563	58750	43125
Hasanpur	7750	6625	46500	35250
Narha Panapur	7083	5000	43833	23000
Balbhadarpur	6800	5400	37800	23800
Mean	7440	5897	46721	31294

Table 16: Clove yield and net return of garlic on farmers' field

Variety	Green pod yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Ujhilpur	2950	2600	94850	82008
Hasanpur	3083	2283	62667	33700
Narha Panapur	3213	2400	73975	44201
Balbhadarpur	3520	2380	87120	44204
Mean	3192	2416	79653	51028

Fig.47: A View of garlic cultivation with standard package of practices at farmers' field

Performance of rice varieties- Swarna Samriddhi, Swarna Unnat, Swarna Shreya and Swarna Purvi Dhan 3

A total of 43 varietal field demonstrations of rice were conducted including 19, 8, 8, and 8 demonstrations of varieties *Swarna Samriddhi, Swarna Unnat, Swarna Shreya, and Swarna Purvi Dhan* 3, covering areas of 9.5, 3, 3 and 3 ha, respectively (Fig. 48). For this purpose, 600 kg of seed (300 kg *Swarna Samriddhi*, 100 kg *Swarna Unnat*, and 100 kg *Swarna Shreya* and 100 kg *Swarna Purvi Dhan* 3) was made available to 94 farmers, covering all four villages in the project area. *Swarna Samridhhi* matures in 135-140 days with an average yield potential is 5500-6000 kg ha-1 and it is recommended for drought-prone as well as flood-prone areas. Whereas, the other three varieties mature in 115-120 days and their average yield potential is 4500- 5500 kg ha^{-1}.

Swarna Unnat and Swarna Purvi Dhan 3 gave the highest yield and net return over the other two varieties of rice at farmers' fields. There was an improvement by 19.7, 19.7, 19.3 and 24.2% in yield and ₹ 9438, 914, 10644 and 10718 ha^{-1} in net income by *Swarna Samriddhi, Swarna Unnat, Swarna Shreya and Swarna Purvi Dhan* 3, respectively, over local varieties (Table 17).

Table 17: Yield and net return of rice varieties on farmers' field

Variety	Yield (kg ha^{-1})		Net return (₹ ha^{-1})	
	Demonstration plot	Farmers' practice	Demonstration plot	Farmers' practice
Swarna Samriddhi	4098	3424	36390	26952
Swarna Unnat	5050	4219	43263	34069
Swarna Shreya	4288	3594	39075	28431
Swarna Purvi Dhan3	4969	4000	43081	32363

a. *Swarna Samriddhi* b. *Swarna Unnat* c. *Swarna Shreya* d. *Swarna Purvi Dhan*

Fig.48: A View of rice crop at farmers' field

Performance of integrated farming system models

Four fish-based integrated farming system models have been partially developed at farmers' fields in two villages (Ujhilpur and Balbhadarpur) by renovating old ponds, having an area of 0.436 ha to 1.636 ha. At present, a major component is fish production from ponds, crop production and goat rearing. Demonstration of these IFS models recorded net income of ₹ 60610 to 140183 ha^{-1}. Details of four IFS models along with production and income are given below in Tables 18 to 21.

1. Pond-crops-goat IFS (Shri Rambabu Prasad, Ujhilpur) (Fig.49)

Total IFS model Area: 1.636 ha

- ❖ Pond size and area (with dykes): 20 m x 18 m = 360 m^2

2. Pond-crops-goat IFS (Shri Deepak Kumar, Ujhilpur) (Fig.50)

- ❖ Total IFS model Area: 0.881 ha
- ❖ Pond size and area (with dykes): 30 m x 27 m = 810 m^2

3. Pond-crops IFS (Shri Sanjay Sahni, Balbhadarpur) (Fig.51)

- ❖ Total IFS model Area: 1.0475 ha
- ❖ Pond size and area (with dykes): 25 m x 19 m = 475 m^2

4. Pond-crops-goat IFS (Shri Rameshwar Sahni, Balbhadarpur) (Fig.52)

- ❖ Total IFS model Area: 4360 m^2 (0.436 ha),
- ❖ Pond size and area (with dykes): 30 m x 12 m = 360 m^2

Table 18: Production and income of IFS model (Shri Rambabu Prasad, Ujhilpur)

Components		Crops	Area (m^2) or number of animals	Production	Market rate (₹)	Gross income (₹)	Cost of production (₹)	Net income (₹)
Cereal		Rice	16000 m^2	76000 kg	16.50	125400	88000	37400
		Wheat	12000 m^2	48000 kg	22.00	105600	42000	63600
		Maize	1000 m^2	400 kg	17.00	6800	4000	2800
Inter-cropping	Maize + potato	Maize	1200 m^2	420 kg	17.00	7140	9000	5340
		Potato		1200 kg	6.00	7200		
Fruit Plants		Papaya on-dyke	20 plants	200 kg	20	4000	1000	3000
Vegetables		Pumpkin	200 m^2	400 nos.	40	16000	4000	12000
		Bhindi	400 m^2	700 kg	20	14000	3000	11000
Animal		Goat	8 nos.	10 kids	2000	20000	4000	16000
Fish pond		Common carp, rohu	277.5 m^2	190 kg	200	38200	23550	14650
Cost and income on IFS model area basis						344340	178550	165790
Cost and income on per ha basis						210477	109138	101339

a. Fish pond b. Fish fingerlings c. Fish harvesting d. Goat rearing

Fig.49: A View of main component of fish-crops-goat IFS (Shri Rambabu Prasad, Ujhilpur)

Table 19: Production and income of IFS model (Shri Deepak Kumar, Ujhilpur)

Components	Crops	Area (m²) or number of animals	Production	Market rate (₹)	Gross income (₹)	Cost of production (₹)	Net income (₹)
Cereal	Rice	8000 m²	4000 kg	17.00	68000	48000	20000
	Wheat	6000 m²	900 kg	22.00	19800	24000	-4200
	Maize	1000 m²	400 kg	17.00	6800	6000	800
Inter-cropping Maize + potato	Maize	1000 m²	450 kg	17.00	7650	7500	4950
	Potato		800 kg	6.00	4800		
Animal	Goat	4 nos.	4 kids	5000	20000	4000	16000
Fish pond	Common carp, rohu	624.75 m²	410 kg	200	82000	44650	37350
Cost and income on IFS model area basis					209050	134150	74900
Cost and income on per ha basis					237557	152443	85114

a. Fish pond b. Fish fingerlings c. Fish harvesting

Fig.50: A View of main component of fish-crops-goat IFS (Shri Deepak Kumar, Ujhilpur)

Table 20: Production and income of IFS model (Shri Sanjay Sahni, Balbhadarpur)

Components	Crops	Area (m²) or number of animals	Production	Market rate (₹)	Gross income (₹)	Cost of production (₹)	Net income (₹)
Cereal	Rice	10000 m²	5000 kg	16.00	80000	40000	40000
	Wheat	6000 m²	900 kg	22.00	19800	27000	-7200
	Maize	1200 m²	300 kg	24.00	7200	5000	2200
Inter-cropping Maize + potato	Maize	2000 m²	600 kg	17.00	10200	5000	5200
	Potato		4000 kg	6.00	24000	13000	11000
Fruit Plants on dyke	Lemon	17 tree	*			1020	-1020
	Banana	19 tree	*			800	-800
Vegetables	Pumpkin	400 m²	**			3000	-3000
	Bhindi	400 m²	**			2500	-2500
	khira	200 m²	**			2000	-2000
Fish ponds	Common carp, rohu	385 m²	248 kg	200	49600	27840	21760
Cost and income on IFS model area basis					190800	127160	63640
Cost and income on per ha basis					181714	121105	60610
* Not fruiting, **Damaged due to rain/ hailstorm							

a. Fish pond

b. fish fingerlings

c. Fish harvesting

d. paddy

Fig.51: A View of main component of fish-crops IFS (Shri Sanjay Sahni, Balbhadarpur)

Table 21: Production and income of IFS model (Shri Rameshwar Sahni, Balbhadarpur)

Components	Crops	Area (m^2) or number of animals	Production	Market rate (₹)	Gross income (₹)	Cost of production (₹)	Net income (₹)
Cereal	Rice	4000 m²	2000 kg	16.00	32000	16000	16000
	Wheat	2000 m²	400 kg	22.00	8800	7000	1800
Inter-cropping	Maize	1000 m²	500 kg	17.00	8500	5000	3500
Maize + potato	Potato		2000 kg	7.00	14000	8000	6000
Fruit Plants	Mango	2 tree	*			200	-200
	Banana	39 plants	*			1600	-1600
	Lemon	30 plants	*			1500	-1500
	Guava	5 plants	*			300	-300
Vegetables	Pumpkin	400 m²	**			3000	-3000
	Bhindi	200 m²	**			2500	-2500
	Karela	400 m²	**			3000	-3000
Animal	Goat	16	20 kids	2500	50000	18000	32000
Fish pond	Common carp, rohu	283.5 m²	192 kg	200	38400	24480	13920
Cost and income on IFS model area basis					151700	90580	61120
Cost and income on per ha basis					347936	207752	140183

* Not fruiting, **Damaged due to rain/ hailstorm

a. Fish Pond

b. Releasing fingerlings in pons

c. Fish harvesting

d. Goat rearing

e. Vermicomposting

Fig. 52: A View of main component of fish-crops-goat IFS (Shri Rameshwar Sahni, Balbhadarpur)

Weather report of the Research farm

Variations in different weather parameters e.g., total rainfall, daily average temperature, average maximum temperature and average minimum air temperature in different standard meteorological week (SMW) of the location (Piprakothi, 26.54° N, 84.93° E) for 2023 is shown in Fig. 53. During winter 2023 (Nov, Dec, Jan, Feb), the average air temperature varied between 17.03-22.67 °C with T Min ranging from 9.71-17.51 °C. During summer (March, April, May), the average air temperature varied between 25.83-36.19 °C with average T-max ranging from 24.34 to 42.24 °C.

The onset date of monsoon in Bihar is around 10-15th June. The location is blessed with abundant rainfall in the monsoon season. During 2023, the location received 1032.24 mm of total rainfall. Among the three seasons, total rainfall received during the monsoon (June, July, August and September) was 884.05 mm (85.64%), while during summer and winter, total rainfall received was 56.75 mm and 5.48 mm respectively. The station received 81 rainy days (rainfall ≥ 2.5 mm) during 2023. Maximum number of rainy days were recorded in August (21 days).

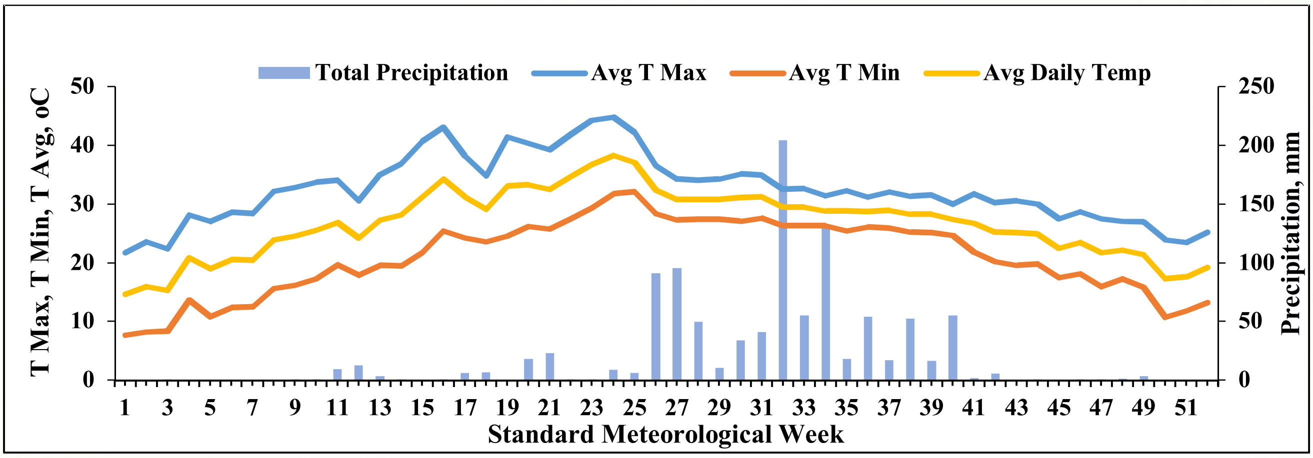


Fig.53: Variations of weather parameters-2023

Significant Achievements Publications

Peer reviewed paper

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Purbey, S.K., Mandal, K.G., Singh, A.K., Banerjee, K and Bharti, P.K. 2023. Performance of small millets in North Bihar condition. In National seminar on "Abiotic Stress Management for Sustainable Millet based Production Systems" organised by Society for Agricultural Research on Abiotic Stress (SARAS) ICAR-National Institute of Abiotic Stress Management (NIASM) Department of Agriculture, Government of Maharashtra Krishi Vigyan Kendra, Baramati during 22-23 August 2023 at Baramati, Maharashtra, pp: 156

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Book Chapter

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Awards, Honours & Recognitions

Dr. K.G. Mandal: Received the Fellowship of the Indian Society of Oilseeds Research (ISOR), Hyderabad, during the International Conference on Vegetable Oils (ICVO 2023), held on 16-21 January, 2023 at Hyderabad.

Dr. K.G. Mandal: Received the Dr. B.P. Pal Memorial Best Scientist Award (BSA) of the National Academy of Biological Sciences (NABS) for the year 2019 in recognition of his outstanding contributions in the field of Agricultural Sciences & Forestry, during the 13th NABS National Conference held on 23-25 January, 2023 at Periyar University, Salem, Tamil Nadu.

Dr. K.G. Mandal: Received the Fellowship of the Indian Society of Coastal Agricultural Research (ISCAR) for the year 2022, ICAR-CSSRI RRS, Canning Town, during the 13th ISCAR National Symposium held on 22-25 February, 2023 at RARS, Tirupati, ANGRAU, Andhra Pradesh.

Dr. K.G. Mandal: Received a Certificate of Excellence for distinguished services, conferred by the News Nation Channel, India on 28 August, 2023.

Dr. K.G. Mandal: Received the ISA Gold Medal Award for the year 2021 of the Indian Society of Agronomy, during the ISA XXII Biennial National Symposium, held during 22-24 November, 2023 at ICAR-CCARI, Goa.

Dr. K.G. Mandal: delivered an Invited Lead lecture on '*Integrated farming for water-congested ecosystems*' under the Theme Agriculture & Ecosystems in the 13th NABS National Conference on 'Current Perspectives for Sustainable Development in Life Sciences, Environment and Agriculture' held during 23-25 January, 2023 at Periyar University, Salem, Tamil Nadu.

Dr. K.G. Mandal: Chaired a Plenary Session in the 13th NABS National Conference on '*Current Perspectives for Sustainable Development in Life Sciences, Environment and Agriculture*' held during 23-25 January, 2023 at Periyar University, Salem, Tamil Nadu.

Dr. K.G. Mandal: delivered an Invited Plenum lecture on '*Efficient water management and cropping system intensification in coastal areas and waterlogged ecosystems*' in 13th ISCAR National Symposium on '*Fostering Resilient Coastal Agro-Ecosystems*' during 22-25 February, 2023 at RARS, Tirupati, ANGRAU, Andhra Pradesh.

Dr. K.G. Mandal: Co-Chair a Technical Session on *Water Harvesting and Enhancing Water Productivity*, under the Theme "*Nature-based Solutions for Sustainable Agri-food Systems*" in the XVI Agricultural Science Congress of the NAAS, 'Transformation of Agri-Food Systems for Achieving Sustainable Development Goals' held on 10-13 October, 2023 at ICAR-CMFRI, Kochi, Kerala.

Dr. K.G. Mandal: delivered an Invited Lead lecture on '*Efficient water management and crop intensification*' in the ISA XXII Biennial National Symposium, 'Climate Smart Agronomy for Resilient Production Systems and Livelihood Security' held on 22-24 November, 2023 at ICAR-CCARI, Goa.

Dr. K.G. Mandal: Panelist in a Technical Session, Panel Discussion on *Farming System Approach for One Health*, and submitted recommendations during the ISA XXII Biennial National Symposium, 'Climate Smart Agronomy for Resilient Production Systems and Livelihood Security' held on 22-24 November, 2023 at ICAR-CCARI, Goa.

Pipaliya Geeta and team received First prize for Hindi Research Paper entitled **'लेक्टोबेसिलस प्लांटेरम की जीवन क्षमता पर विभिन्न उश्मायन तापमानो का प्रभाव'** during Hindi Pakhwada-2023, organized by ICAR-CARI, Bareilly, during 14-29 September, 2023.

KG Mandal got selected as a Fellow ISOR, Hyderabad

KG Mandal received ISA Gold Medal

KG Mandal got selected as a Fellow ISCAR

KG Mandal received BP Pal Award

Dr. S.K. Purbey acted as Jury of Horticulture Show Judging Committee in “Pashu Arogya sah Krishi Unnati Mela evam Udhyaan mahotsav 2022” at KVK, Piprakothi during 18-20 February, 2023.

Dr. S.K. Purbey acted as Co-organising Secretary of “Pashu Arogya sah Krishi Unnati Mela evam Udhyaan Mahotsav 2022” at KVK, Piprakothi, Motihari during 18-20 February, 2023.

Dr. S.K. Purbey acted as chairman Inquiry Committee of ICAR-NRC on Litchi, Muzaffarpur, Bihar on 12.06.2023.

Dr. S.K. Purbey acted as an expert for EDP on post-harvest management of litchi fruits at ICAR-NRC on Litchi, Muzaffarpur, Bihar during 5-7 July, 2023.

Dr. S.K. Purbey appointed as Vigilance Officer of ICAR-MGIFRI, Motihari since 16.06.2023.

Dr. S.K. Purbey invited as resource person and jury member in national Children science congress at Muzaffarpur

Dr. A. K. Singh invited as a Member of IMC of ATARI, Patna

Dr P. K. Bharti acted as a jury member at Bihar Veterinary College, BASU, Patna on 01.02.2023

Dr P. K. Bharti invited as an external examiner for conducting oral comprehensive examination and setting of question paper for PhD student, Dr. Priti Ranjan at LPM department, Bihar Veterinary Dr P. K. Bharti College, BASU, Patna on 31.3.2023

Dr P. K. Bharti Acquired life membership of the society National Academy of Biological Sciences (NABS) with membership number LM-011-2023 on 27.02.2023

Dr P. K. Bharti recognized as an assessor for NABL

Dr P. K. Bharti recognized as reviewing team member for International Journal of Animal Science and Technology

Dr P. K. Bharti received Certificate of Reviewing in recognition of the review contributed to the Journal "Applied Animal Behavior Science"

Dr P. K. Bharti Acquired founder membership of the society "Society for Animal Welfare, Production and Health (SAWPH), registered under Society Registrikaran Adhiniyam, 1973 (No.:44-1973), Office- College of Veterinary Science & A.H., Rewa (NDVSU, Jabalpur), Madhya Pradesh wef 29.11.2023

Ongoing research projects

Sl. No.	Project Title (Project Code)	PI Name
1	Development and assessment of fish-based integrated farming models under floodplain ecosystems (*NRMAMGIFRISIL202000300006*)	Mr. Ravi Kumar
2	Post-harvest losses study of major fruits and vegetables in East Champaran district of Bihar (*NRMAMGIFRISIL202000100005*)	Dr. S. K. Purbey
3	Constraint analysis and performance evaluation of poultry birds reared under backyard system in East Champaran district of Bihar (*NRMAMGIFRISIL202000800011*)	Dr. P. K. Bharti
4	Land shaping for development of horti-based farming system model for low lying areas of Bihar (*NRMAMGIFRISIL202000100004*)	Dr. S. K. Purbey
5	Development and assessment of goat based integrated farming models in wetland ecosystem (*NRMAMGIFRISIL202000700010*)	Dr. P. K. Bharti
6	Estimation of optimum residue retention in rice-wheat cropping system raised on calcareous soil of middle Indo-Gangetic Plains (*NRMAMGIFRISIL202000400007*)	Dr. S.K. Samal (up to 28.03.2023), Dr. A.K. Singh (from 29.03.2023)
7	Evaluation of irrigation water saving techniques in winter Maize under North Bihar conditions (*NRMAMGIFRISIL202100100012*)	Dr. Shreya Nivesh
8	Delineation and characterization of flood-prone and waterlogged areas of Eastern India and development of IFS plans (*NRMAMGIFRISIL202100400015*)	Dr. Koushik Banerjee
9	Development of organic rice-fish-duck IFS model in waterlogging situations of North Bihar (*NRMAMGIFRISIL202100200013*)	Dr. A. K. Singh
10	Design and development of low-cost equipment and machineries for waterlogged situations (*NRMAMGIFRISIL202100300014*)	Er. Vikas Paradkar
11	Assessment of natural farming in rice-wheat cropping system in north Bihar conditions (*NRMAMGIFRISIL202200100016*)	Dr. P. K. Bharti
12	Identification of potential sustainable farming system~ constraints and opportunity in flood prone ecosystem (*NRMAMGIFRISIL202000600009*)	Dr. S.K. Samal (up to 28.03.2023), Dr. Koushik Banerjee (from 29.03.2023)

Externally funded research projects

Project Title	Budget (in lakh)	Duration	PI Name	Funded by
Development of fish-based integrated farming system models for water congested ecologies of eastern India	94.14	February 2019-March 2022	Mr. Ravi Kumar	MoFA&D, GoI, New Delhi
Improving livelihood of small farmers through good practices in agriculture, fisheries and animal husbandry in the East Champaran region (Farmer FIRST Project; *NRMAMGIFRICOL202000500008*)	26.62	2023-24	Dr. A.K. Singh	ICAR, New Delhi

Research management meetings (RAC/IRC/IMC)

Meeting of the Institute Research Council (IRC)

The institute organized two IRCs during 2023. The 5th IRC Meeting of ICAR-Mahatma Gandhi Integrated Farming Research Institute (ICAR-MGIFRI), Motihari was held on 3rd Jan 2023 and 27th & 30th Jan 2023 under the Chairmanship of the Director. The meeting was started with the welcome address by the IRC Member Secretary, Dr. S.K. Purbey, Pr. Scientist (Horticulture) followed by opening remarks by the Director, ICAR-MGIFRI, Motihari & Chairman, IRC. In his opening remarks, Dr. K.G. Mandal, Director of the Institute showed satisfaction over the timely conducting the second IRC meeting in a year. He opined that IRC is one of the most important meetings of any institute where research projects- objectives, actions and achievements are comprehensively discussed. He has explained in detail the various aspects of NIRA i.e. national priorities, international commitments, R&D thrust areas and actions required. He had given the emphasis on the commitments of the ICAR and the Institute, One Scientist One Product (OSOP), greater responsibilities of researchers for the benefit of farmers especially in the field of agriculture and allied sectors, and the professional growth of the Scientists. The Chairman also reminded all the members about the five action areas of the institute and technology/ product delivery to be made in the current and forthcoming years. He wished all Scientists for a very healthy and productive scientific discussion.

After opening remarks by the Chairman, the status of different research projects, and the involvement of Scientists as PI & Co-PI was presented by the Member Secretary.

The project-wise research progress reports were presented by Scientists and major remarks/ recommendations were provided. The Chairman congratulated all the Scientists for the successful presentation and scientific discussion in the IRC meeting. However, he has given instructions to all Scientists the following:

- ❖ Co-PIs in a project should contribute significantly;
- ❖ Timely submission of write-ups/ manuscripts/ pies etc. for the Annual Report of the Institute;
- ❖ Inclusions of financial implications in the RPPs of the project i.e. manpower with salary and wages, research/ recurring contingency, equipment/ capital item, any special facility required, and budget details, with justification;
- ❖ Timely submission is highly essential for all project-related documents (RPP-I, II and III), materials for ARMS, TIMS, etc.; now the deadline is 20 Feb 2023;
- ❖ Systematic study along with quality presentation, and statistically analyzed data are required for appropriate scientific interpretation of findings; scientists should try for good quality publications in high-impact factor journals.

Meeting of the Research Advisory Council (RAC)

The meeting of the Second Research Advisory Committee of the ICAR-MGIFRI, Motihari was held under chairmanship of Dr. C. L. Acharya, Former Director, IISS, Bhopal during 27-29th Oct. 2023. The 3-day meeting comprised of deliberations, a visit to the institute research farm, farmers' field in East Champaran district, and interaction with the scientists, administrative staff and fanners, was held on 27-29th Oct. 2023 in presence of Director. The meeting started at 9:30 am on the 27th October at the Seminar Hall of the ICAR-MGIFRI, Motihari. The Member Secretary welcomed the Chairman, Members, Director and Scientists of the Institute. Dr. K.G. Mandal, the Director of the Institute gave a brief introduction about the chairman and members of RAC and welcomed them. This was followed by a brief presentation of the Progress Report and appraisal of the institute's activities by the Director, MGIFRI. Action Taken Report (ATR) was presented by the Member Secretary on the recommendations of the last RAC meeting. The Chairman and the members of RAC expressed their views and offered suggestions for further improvement in research and extension activities of the institute.

Dr. S.K. Singh emphasized on aqua-horticulture along with makhana, water chestnut and spirulina cultivation in water-logged areas as it has very good potential and prospects. He has opined that benchmark research should start from the farmer's field/ real situation. He emphasized the need of short-duration, high-value vegetables and horticultural crops in the IFS mode. There is also a need to identify, fruit species that can be grown in flood-prone and waterlogged areas, which are also simultaneously compatible with water-congested ecologies.

Dr. D.K. Kundu urged for the characterization and mapping of waterlogged areas by the real-time depth and duration of flood and wetness of the soil profiles. He also suggested initiating a study on the impact of waterlogging on the environment and human and animal health. He emphasized for assessment of hydro physical properties and fertility status of the waterlogged soils. He urged for developing collaboration with NR SA for the eastern region (ISRO) for mapping of the waterlogged areas and continuous monitoring of ground water (GW).

Dr. V.P. Saini suggested goat farming with the IFS system; the nutrient content of goat droppings and its potential use as fish pond manure; and the need for raising fodder for goats on pond embankment during floods. He highlighted the need for refinement of the stocking densities (for IFS) of fish fingerlings as per the water depth available in the region. There is a need for a fish nursery/hatchery for the production of stunted fish fingerlings. Further, he pointed out that the development of fish diseases under waterlogged conditions required thorough investigation. The population of ducks per unit area requires to be standardized. The number of animals/ birds should be kept at an optimum level otherwise the problem of water pollution and fish disease may create great problems.

Dr. Masood Ali emphasized an urgent need to delineate, map and characterize resources (soil, crop, vulne*rabi*lity to abiotic stresses) of flood-prone and waterlogged areas. PRA should be carried out to identify production and socioeconomic constraints faced by farmers before designing IFS module and assessment. There is also a need to determine water/irrigation requirements in cropping system mode and their budgeting. A comprehensive study on crop residue management should be taken up. Major emphasis should be on proper drainage, crop diversification, and choice of appropriate crops/ varieties for flood-prone areas. Post-flood management practices especially for diara and chaur land should be developed in IFS framework. The research programme should preferably be carried out in a farmer's participatory mode.

Dr. C.L. Acharya, Chairman of the RAC urged to undertake a holistic investigation of the probability of occurrence of flood, depth, and duration of waterlogging/stagnation. Characterization of this event for the whole year should be done before suggesting any IFS models for a particular location. Water stagnation depth and duration of a specific area /location at regular intervals is required as a benchmark study for initiating the development of various IFS models/ technologies. He emphasized depth-wise characterization of basic soil properties, viz. physical, chemical and biological components of soil health, infiltration, and water retention characteristics of flood-prone areas for post-flood water availability and suggesting suitable IFS module for enhancing land and water productivity. Collection of data may be done in collaboration with IMD, SAU and ICAR institutes to analyze and prepare scenarios of floods, droughts, and unexpected climatic events. He suggested to re-appropriate machinery for managing post-flood situations for seeding and production of agricultural crops. The effect of waterlogged situations on animal health and the incidence of insects/pests is also required to be studied. Backyard poultry promotion in flood-prone and waterlogged areas is also required to be done.

On 28th October 2023 RAC members had an interaction with group of local farmers and visited their fields where some IFS models have been developed by this institute in the participatory mode. On 29th Oct. the RAC meeting ended with concluding remarks, recommendations and vote of than





A few Photographs of the RAC meeting

Meeting of the Institute Research Council (IRC)

The 6th IRC Meeting of ICAR-Mahatma Gandhi Integrated Farming Research Institute (ICAR-MGIFRI), Motihari was held on 24-25th July 2023 under the Chairmanship of the Director. The meeting was started with the welcome address by the Member Secretary, Dr. S.K. Purbey followed by opening remarks by the Director, ICAR-MGIFRI, Motihari. In the opening remarks, Dr. K.G. Mandal, Director of the Institute congratulated all the new Scientists for becoming ARS Scientist of the ICAR and for the successful completion of the 1st Phase of FOCARS training at NAARM, Hyderabad. He has also welcomed those for becoming members of IRC of this Institute. He opined that IRC is one of the most important meetings of any institute where research projects, research progress and extension activities are discussed elaborately and comprehensively. He delivered a lecture on transforming research findings into meaningful interpretations, quantifying output, outcome and impacts of research, importance of on-farm research on IFS for the benefit of farmers. He has comprehensively explained the various aspects of IFS and its resource flow, energy input-output, economics etc. The Chairman emphasized the commitments, research endeavors of this Institute, and also the professional growth of the Scientists as well as the benefit of farmers.

After opening remarks by the Chairman, the Member Secretary presented the institute's mandate, objectives, mission and major action areas, along with the role of PME. This was required to the new Scientists, who were undergoing Institute Orientation Training programme. Then, the project coding was presented by the Member Secretary.

The project-wise research progress reports were presented by Scientists and major remarks/ recommendations were provided. The Chairman congratulated all the Scientists for the successful presentation and scientific discussion in the IRC meeting. However, he has given instructions to all Scientists the following;

- ❖ Effective and significant contributions of Co-PIs would be essential for research and development on IFS, which is a multidisciplinary in nature
- ❖ More systematic study and quality presentation would be required along with statistically analyzed data for appropriate scientific interpretation
- ❖ All project-related documents (RPP-I, II and III etc.) must be submitted timely

- ❖ Good quality publications are required considering the 'one scientist one product' target
- ❖ Laboratory works are required to be fastened along with field-based research.
- ❖ The annual reports (since the start of the project) of the SCSP and FFP are not available, hence be submitted by the Nodal Officer and PI, respectively as soon as possible

7th IRC meeting of the institute 21-22 December, 2023

Meeting of the Institute Research Council (IRC)

The 7th IRC Meeting of ICAR-Mahatma Gandhi Integrated Farming Research Institute (ICAR-MGIFRI), Motihari was held on 21-22 December 2023 under the Chairmanship of the Director. The meeting was started with the welcome address by the Member Secretary, Dr. S.K. Purbey followed by opening remarks by the Director, ICAR-MGIFRI, Motihari. The project-wise research progress reports were presented by Scientists and major remarks/ recommendations were provided. In the opening remarks, Dr. K.G. Mandal, Director of the Institute congratulated all the new Scientists for successfully completing professional attachment training (PAT). He opined that now ICAR is transforming and government expectations are more from the scientists. That's why emphasis should be given on focused research activities towards development of need-based technologies (bankable). It was also asked to revenue generation, utilization of corpus fund, and submission of research project proposal for external funding. After the opening remarks by the chairman, the scientist area asked to present concept notes for undertaking new research proposal as per the institute's mandate, objectives and mission.

The Chairman congratulated all the Scientists for the successful presentation and scientific discussion in the IRC meeting. However, he has given instructions to all Scientists the following;

- ❖ New scientists have been asked to submit RPP-1 as early as possible so that each scientist will have one project as PI and one product in coming year.
- ❖ A review meeting with all the scientist will be required to develop roadmap for this institute for the coming 5 years.
- ❖ A discussion with cooperate sector, central and stare departments for collaborative works.
- ❖ Systematic study along with the quality presentations and statistically analyzed data are required for appropriate scientific interpretation of findings.
- ❖ Timely submission of all project related documents (RPP-I, II, III) is essentially required.
- ❖ Pro-activeness to utilized corpus fund of the institute is required as well as good quality publications in high rated journals are also required.
- ❖ Laboratory works are required to be fastened along with filed research. The annual reports of the SCSP and FFP are required to be submitted since from the beginning of the projects.
- ❖ Year wise training and other research development plans are required to be developed.
- ❖ The IRC meeting on both days ended with a vote of thanks by Dr. Koushik Banerjee.

Human Resource Development

Training & capacity building undergone by scientists

Name & designation	Subject	Organization	Duration
Dr. P.K.Bharti, Senior Scientist (LPM)	NABL Assessor's Training Course on ISO/IES17025:2017"	By NABL at ICAR-CIFRI, Barrakpore, West Bengal	17 to 21 January 2023
Dr. S.K. Purbey, Pr. Scientist (Fruit Science)	Competency enhancement programme for effective implementation of training functions by HRD Nodal Officers of ICAR	ICAR-NAARM, Hyderabad	27 February to 01 March 2023
Mr. Jadhav Amol Kailas, Scientist (Fruit Science)	112th FOCARS training	ICAR-NAARM, Hyderabad	11 April 2023 to 10 July 2023
Mr. Rakesh N Scientist (Agricultural Economics)	112th FOCARS training	ICAR-NAARM, Hyderabad	11 April 2023 to 10 July 2023
Dr. Geeta, Scientist (Poultry Science)	112th FOCARS training	ICAR-NAARM, Hyderabad	11 April 2023 to 10 July 2023
Dr. Neela Madhav Patnaik, Scientist (Agricultural Extension)	112th FOCARS training	ICAR-NAARM, Hyderabad	11 April 2023 to 10 July 2023
Ms. Haritha Mohan M Scientist (Plant Pathology)	Institute orientation training	ICAR-MGIFRI, Motihari, Bihar	1 May2023 to 31 May 2023
Mr. Jadhav Amol Kailas, Scientist (Fruit Science)	Institute orientation training	ICAR-MGIFRI, Motihari	21 July 2023 to 21 August 2023
Mr. Rakesh N Scientist (Agricultural Economics)	Institute orientation training	ICAR-MGIFRI, Motihari	21 July 2023 to 21 August 2023
Dr. Geeta, Scientist (Poultry Science)	Institute orientation training	ICAR-MGIFRI, Motihari, Bihar	21 July 2023 to 21 August 2023
Dr. Neela Madhav Patnaik, Scientist (Agricultural Extension)	Institute orientation training	ICAR-MGIFRI, Motihari	21 July 2023 to 21 August 2023
Ms. Haritha Mohan M Scientist (Plant Pathology)	113th FOCARS training	ICAR-NAARM, Hyderabad	18 July2023 to 17 October 2023
Mr. Jadhav Amol Kailas, Scientist (Fruit Science)	Professional Attachment Training	ICAR-IIHR, Bengaluru	24 August 2023 to 23 November 2023
Mr. Rakesh N Scientist (Agricultural Economics)	Professional Attachment Training	ICAR-NAARM, Hyderabad	24 August 2023 to 23 November 2023
Dr. Geeta, Scientist (Poultry Science)	Professional Attachment Training	ICAR-CARI, Bareilly	24 August 2023 to 23 November 2023
Dr. Neela Madhav Patnaik, Scientist (Agricultural Extension)	Professional Attachment Training	ICAR-CIFA, Bhubaneswar	24 August 2023 to 23 November 2023

Dr. P.K.Bharti, Senior Scientist (LPM)	Online training/Hindi workshop on "Application of Statistical Software for Analysis of Agricultural and Survey Data"	Organized by ICAR-IASRI, New Delhi	6 to 13 September, 2023
Dr. S.K. Purbey, Pr. Scientist (Fruit Science)	Online workshop cum training on "Application of statistical software for analysis of agricultural and survey data	ICAR-IASRI, New Delhi	6 to 13 September 2023
Ms. Haritha Mohan M Scientist (Plant Pathology)	Professional attachment training	ICAR-IIHR Bengaluru	19 October 2023 to 18 January 2024

Training and capacity building for the famers

Sl No	Duration	Title of the training	Location	Total participants	Coordinators
1	9 to 11 January 2023 (3 days)	Training programme on Climate smart soil and water management strategies for sustainable agriculture under waterlogged conditions	Bela Karariya, Piprakothi, East Champaran	61	Dr. Shreya Nivesh Dr. Koushik Banerjee
2	27 February to 1 March 2023 (5 days)	Training programme on IFS an approach towards climate smart crop production under waterlogged conditions	Machhargaon Nankar, East Champaran	60	Dr. Koushik Banerjee Dr. Shreya Nivesh
3	10 to 14 April 2023 (5 days)	Integrated Farming System (IFS) for enhancing farmers income under flood-prone and waterlogged ecosystem	Organized at institute under External funded: ATMA, Palamu, Jharkand	25	Dr. S.K. Purbey Dr. A.K. Singh Er. Vikas Paradkar Dr. Koushik Banerjee
4	11 May 2023	Field-day on 'Integrated Farming System' (FFP)	Ujhilpur (Tetaria)	24	Dr. A. K. Singh
5	20 to 24 June 2023 (5 days)	Integrated Farming practices to improve income generation in flood prone and waterlogged ecosystem under SCSP scheme	Organized at institute under SCSP	55	Er. Vikas Paradkar Dr. Koushik Banerjee
6	7 to 9 November 2023 (3 days)	Integrated Farming Systems (IFS) for Enhancing Farmers Income under Flood-prone and Waterlogging Ecosystems	Sponsored training (ATMA, Muzaffarpur, Bihar sponsored)	27	Dr. K.G. Mandal Dr. S.K. Purbey Dr. P.K. Bharti Er. Vikas Paradkar
7	6 November 2023	Training on 'Vermicomposting for recycling natural resources'	Ujhilpur (Tetaria)	24	Dr. Koushik Banerjee Dr. A. K. Singh
8	12 to 14 Dec. 2023 (3 days)	Livelihood improvement through Mushroom Cultivation	ICAR-MGIFRI	41	Dr. S.K. Purbey Dr. Neela Madhav Patnaik

Participation in Seminar/ Symposium/ Conference/ Workshop/ Webinar/ Kisan Mela

Sl No	Scientist	Seminar/ Symposium/ Conference/ Workshop	Date	Organizer
1	Dr. K.G. Mandal	International Conference on '*Vegetable Oils (ICVO 2023)- Research, Trade, Value and Policy*', at Hyderabad	16 to 21 January, 2023	Indian Society of Oilseeds Research (ISOR) & ICAR-Indian Institute of Oilseeds Research, Hyderabad
2	Dr. K.G. Mandal	13th NABS National Conference on '*Current Perspectives for Sustainable Development in Life Sciences, Environment and Agriculture*', at Periyar University, Salem, Tamil Nadu	23 to 25 January, 2023	National Academy of Biological Sciences (NABS), Chennai & Periyar University, Salem, Tamil Nadu
3	Dr. Koushik Banerjee	National Symposium on Digital Farming: The Future of Indian Agriculture.	02 to 03 February, 2023	ICAR-IISS-Bhopal in association with Indian society of agrophysics
4	Er. Vikas Paradkar	Participated as exhibition showcase in Pashu sanrakshan, Udyan Pradarshani evam Atmanirbhar Krishi Mahotsav	18 to 20 February, 2023	KVK, Piprakothi
5	Dr. K.G. Mandal	13th ISCAR National Symposium on '*Fostering Resilient Coastal Agro-Ecosystems*' at RARS, Tirupati, ANGRAU, Andhra Pradesh	22 to 25 February, 2023	Indian Society of Coastal Agricultural Research (ISCAR), Canning Town, under ICAR-CSSRI, Karnal
6	Dr. P.K.Bharti	Online workshop on topic "Genome editing in farm animals for improved productivity and health"	03 March, 2023	Animal Biotechnology Division, ICAR NDRI, Karnal
7	Dr. K.G. Mandal	ICAR Institute Director's Conference; ICAR-Industry Stakeholders Meet by Agri-Innovate India Ltd., at ICAR-NASC, New Delhi	04 to 06 March, 2023	ICAR & Agri-Innovate India Ltd., ICAR, New Delhi
8	Dr. K.G. Mandal	National Workshop on "*Agricultural Water Management in Changing Climate*" at ICAR-RCER, Patna	27 March, 2023	ICAR-RCER, Patna
9	Dr. S.K. Purbey,	Workshop on "Bihar Krishi Nivesh Protsahan Niti Yojna	27 March 2023	District Horticulture office, Motihari, Bihar
10	Dr. K.G. Mandal	6th Annual Zonal Workshop of ICAR-ATARI, Patna held at Ranchi, Jharkhand	08 to 10 July, 2023	ICAR-ATARI, Patna
11	Dr. K.G. Mandal	95th Foundation Day of the ICAR & Technology Days, ICAR-Industry Interface Meet during at NASC, Pusa, New Delhi	16 to 18 July, 2023	ICAR, New Delhi
12	Dr. S.K. Purbey	Online workshop cum training on "Application of statistical software for analysis of agricultural and survey data	06-13 September, 2023	ICAR-IASRI, New Delhi
13	Er. Vikas Paradkar	Application of AI and ML in Agricultural Engineering-unleashing the potential for Food Security	04 to 05 September, 2023	ANGRAU, Bapatla, Andhra Pradesh
14	Dr. P.K.Bharti	Two days' state level workshop on Natural farming	17 to 18 September, 2023	KVK, Piprakothi at Gandhi Auditorium, Raja Bazar, Kacharhari Chowk, Motihari, East Champaran

15	Mr. Rakesh N (Scientist)	International Conference on "Global Insights on Research and Development in Agriculture, Horticulture and Allied Sciences"	05 to 07 October, 2023	G. H. Raisoni University, Saikheda (MP)
16	Dr. Neela Madhav Patnaik	Online Training Programme on "Design Thinking in Agricultural Research and Education"	09 to 13 October, 2023	ICAR-NAARM, Hyderabad
17	Dr. K.G. Mandal	XVI Agricultural Science Congress of the NAAS, '*Transformation of Agri-Food Systems for Achieving Sustainable Development Goals*', at CMFRI, Kochi, Kerala	10 to 13 October, 2023	NAAS, ICAR, New Delhi & ICAR-CMFRI, Kochi
18	Mr. Jadhav Amol Kailas	Participated in International Seminar on "Exotic and Underutilized Horticultural Crops: Priorities and Emerging Trends"	17 to 19 October 2023	ICAR-IIHR, Bengaluru
19	Dr. P.K.Bharti & Mr. Ravi Kumar	Regional stakeholder consultation meeting for potential entrepreneurship of eastern region	06 November, 2023	DRPCAU, Samastipur at KVK, Madhopur (West Champaran)
20	Dr. K.G. Mandal	ISA XXII Biennial National Symposium on '*Climate Smart Agronomy for Resilient Production Systems and Livelihood Security*', at ICAR-CCARI, Goa.	22 to 24 November, 2023	Indian Society of Agronomy (ISA), New Delhi
21	Dr. A.K. Singh	National Workshop of Farmers FIRST Programme at CSKHPKV, Palampur	28-30 November, 2023	Extension Division, ICAR
22	Dr. Shreya Nivesh & Dr. P.K. Bharti	International conference on impact of climate changes on global food, livestock, livelihood and environmental security: advanced approaches and mitigation strategies	28-30 December, 2023	Navsari Agricultural University, Navsari, Gujarat

Lecture delivered as resource person in training outside the institute

Sl No	Scientist	Lecture topic	Total lecture	Location
1	Dr. S.K. Purbey	15 days training on integrated nutrient management	03	KVK, Piprakothi
2	Dr. S.K. Purbey	Litchi Prasanskaran	01	Krishi Bhavan, Dist. Agriculture office, Motihari, Bihar
3	Dr. S.K. Purbey	Principles and practices of post-harvest management of litchi fruits	01	ICAR-NRC on Litchi, Muzaffarpur, Bihar
4	Dr. S.K. Purbey	Preparation of various beverages from litchi fruits	01	ICAR-NRC on Litchi, Muzaffarpur, Bihar
5	Dr. A.K. Singh	Methods of application of fertilizers, manures and biofertilizers in 15 days training on integrated nutrient management	4	KVK, Piprakothi
6	Dr. A.K. Singh	Micronutrients fertilizers and their applications	1	KVK, Piprakothi
7	Mr. Ravi Kumar	Integrated fish farming systems and management	10	Off-campus/ on-campus

8	Dr. Shreya Nivesh	15 days training on integrated nutrient management	2	KVK, Piprakothi
9	Er. Vikas Paradkar	Maximizing Nutrient efficiency through Integrated Farm Machinery and Power Engineering in 15 days training on integrated nutrient management	3	KVK, Piprakothi
10	Er. Vikas Paradkar	Modern Farm Machinery and Power: revolutionizing agricultural practices in 15 days training on integrated nutrient management	1	KVK, Piprakothi
11	Dr. Koushik Banerjee	Weather based irrigation scheduling for better water use efficiency in 15 days training on integrated nutrient management	2	KVK, Piprakothi
12	Dr. Koushik Banerjee	Contingent Crop Panning for aberrant weather conditions in North Bihar region in 15 days training on integrated nutrient management	1	KVK, Piprakothi
13	Dr. Koushik Banerjee	Climate smart crop management practices for increasing farmers income in 15 days training on integrated nutrient management	1	KVK, Piprakothi
14	Dr. Koushik Banerjee	Weather based management of *Rabi* Crops in 15 days training on integrated nutrient management	1	KVK, Piprakothi
15	Dr. Koushik Banerjee	Impact of climate change on crop production in 15 days training on integrated nutrient management	1	KVK, Piprakothi

National Campaign/ Awareness activity/ Workshop & Capacity building organized at ICAR-MGIFRI

3 days on-farm training on Soil water management under SCSP, 9-11 January 2023

3 days on-farm training on IFS as climate smart practice under SCSP, 27 February – 1 March 2023

Pashu Sanrakshan, Udyan Pradarshani evam Krishi Unnati Mela on 18-20 February 2023 at KVK, Piprakothi

Animal Health Camp organized at Dekhan Bela village on 25 March 2023

5 days sponsored training (ATMA, Palamu, Jharkhand) on IFS, 10-14 April 2023

5 days training on IFS for water-logged area under SCSP, 20-24 June 2023

Awareness Programme World Environment Day Celebration with students Jawahar Navodaya Vidyalaya, on 5 June 2023

ICAR MGIFRI observed Swachhata Hi Sewa on the theme Garbage Free India on 1 October 2023

Celebrated and Observed the Ekta diwas on 31st October 2023

ICAR-MGIFRI took pledge on the eve of Vigilance awareness week on 30 October 2023

3 days sponsored training (ATMA, Muzaffarpur, Bihar) on 7-9 November 2023

Awareness program on National Ayurveda Day on 10 November 2023

Hands-on Training and Demonstration on Vermicomposting at Farmers First Project (FFP) village on 6 November 2023

Hands-on Training and Demonstration on Mushroom cultivation at the institute on 12-14 December 2023

World Soil Day Celebration with students of PM Shri Kendriya Vidyalaya on 5 December 2023

Awareness campaign on IFS and management under SCSP scheme on 6 September 2023

Glimpses of institute activities

Events organized

Sl No	Date	Name of the event & location	No. of participant	Coordinators
1	4 January to 3 February 2023	Training programme "Integrated Farming System" for B.Sc, (Hon) Agriculture at ICAR-MGIFRI	02	All the scientists
2	5 January 2023	Exposure visit of different project sites at MGIFRI for RHWE students from PDDUCoH&F, Piprakothi	25	Dr. S.K. Purbey Dr. P.K.Bharti
3	7 February 2023	Field day for providing advisory on nutrient, water management and crop specific agromet advisory on wheat and Maize at FFP village	30	Dr. Shreya Nivesh, Dr. Koushik Banerjee
4	15 February 2023	Exposure visit on Integrated farming system for D.El.Ed student from S.N.S Teachers training college, Motihari	54	Dr. S.K. Purbey Dr. Shreya Nivesh,
5	18 to 20 February 2023	ICAR-MGIFRI participated in the exhibition to showcase institute's activities in Pashu Sanrakshan, Udyan evam Atmanirbhar Krishi Mahotsav organized at KVK, Piprakothi	1500	Dr. Koushik Banerjee Er. Vikas Paradkar
6	22 March 2023	Field day cum assessment of crop loss due to sudden rainfall and hailstorm	65	Dr. Koushik Banerjee Er. Vikas Paradkar
7	25 March 2023	Organized animal health camp under SCSP	102	Dr. P.K.Bharti Mr. Ravi Kumar Dr. Shreya Nivesh Er. Vikas Paradkar
8	5 June 2023	World Environment Day-2023; was celebrated on the theme "Planting of trees to reduce the impact of pollution" at the institute	52	Dr. A.K. Singh Mr. Ravi Kumar Dr. Shreya Nivesh Er. Vikas Paradkar
9	19 June 2023	Workshop-cum-awareness programme on Farmers-scientists Interaction-cum-SC Farmers Labharthi Sammelan	100	Dr. Shreya Nivesh, Dr. Koushik Banerjee, Er. Vikas Paradkar
10	16 August 2023	Parthenium awareness week	25	Dr. Koushik Banerjee
11	17 August 2023	Field day cum exposure visit on Integrated Farming System under Farmers' FIRST Programme	6	Dr. Shreya Nivesh
12	21 August 2023	Farmer- scientist interaction and 9th Foundation Day Ceremony organized at the Institute.	50	Dr. S.K. Purbey Dr. A. K. Singh, Dr. P. K. Bharti, Dr. Shreya Nivesh, Dr. Koushik Banerjee, Er. Vikas Paradkar, Dr. Geeta Shri Ashwini kumar

13	6 September 2023	An awareness-cum-exposure visit program on integrated farming systems & management for SC farmers	30	Er. Vikas Paradkar, Dr. Shreya Nivesh, Dr. Koushik Banerjee, Mr. Ravi Kumar, Dr. P.K. Bharti
14	14-28 September 2023	*Hindi Pakhwada* programme 2023	15	Er. Vikas Paradkar Dr. Koushik Banerjee
15	19 September 2023	Exposure visit and demonstration to students of Class-X and XII from Jawahar Navodaya Vidyalaya (JNV), Piprakothi	45	Dr. P.K.Bharti Dr. Shreya Nivesh
16	1 October 2023	Swachhata Hi Sewa	35	Dr. Koushik Banerjee
17	2 October 2023	Organized Gandhi Jyanti Programme	50	Dr. Koushik Banerjee Er. Vikas Paradkar
18	3-10 October 2023	One-week training programme of Mr. Abhay Kumar Gupta, B.Sc, Agri. 7th Semester student of Global Group of Institute, Amritsar, Punjab on "Integrated Farming System"	01	All Scientists of ICAR-MGIFRI
19	31 October 2023	Exposure visit cum demonstration programme for students of Class IX and X from Vidya Bharti Vidyalaya, Kamal-Amal Saraswati Vidya Mandir, Areraj, East Champaran	40	Dr. P.K.Bharti Dr. Shreya Nivesh Dr. Koushik Banerjee
20	10 November 2023	Organized one-day awareness programme as coordinator on "Ayurveda for One Health: Ayurveda for everyone on every day; organized on	40	Dr. P.K.Bharti
21	13 November 2023	Organized exposure visit cum interaction with BSc (Ag)-RAWE students of TCA Dholi	30	Dr. S.K. Purbey Dr. P.K.Bharti
23	5 December 2023	Coordinated exposure Visit to ICAR-MGIFRI for the student of KV school, Battiha	40	Dr. Koushik Banerjee Er. Vikas Paradkar

Various Events organized at ICAR-MGIFRI, 2023

Celebrated 74th Republic Day at the Institute on 26 January 2023

Inauguration of Kisan Gandhi Tableau by Hon'ble Union Minister of State for Agriculture and Farmers Welfare Shri Kailash Choudhary on 18 February 2023

ICAR-MGIFRI participated in ICAR Sports meet at ICAR-IVRI Bareilly 24-27 April 2023

Celebrated International Day of Yoga - 21 June 2023

Dr. N.P. Sahu, Joint Director ICAR-CIFE Mumbai visited the institute on 11 July 2023

Hon'ble Governor Shri Rajendra Vishwanath Arlekar acted as chief guest in Farmers-Scientists interaction cum Kisan Labharthi Sammelan on 19 June 2023

Celebration of 77th Independence Day at the Institute on 15 August 2023

ICAR-MGIFRI observed “Parthenium Awareness Week” a campaign Swachha Bharat Abhiyan during 16-22 August 2023

9th Foundation Day Celebration of the Institute 21st August 2023

Orientation and Farm Visit Programme for students of Jawahar Navodaya Vidyalaya, on 19th September 2023

Horticultural student orientation programme 15th December 2023, Pt. Deen Dayal Upadhyay College of Horticulture

ICAR-MGIFRI participated in ICAR Sports meet at ICAR-NRRI Cuttack 13-16th December 2023

Orientation and Farm Visit Programme for students of PM Shri Kendriya Vidyalaya, on 20th December 2023

Celebration of Rastriya Kisan Diwas on 23rd December 2023

Celebration of Gandhi Jayanti on 2nd October 2023

Programme on Special Campaign 3.0 started on 9 October 2023 (Swachhata Camapign)

Orientation and Farm Visit Programme for students of Saraswati Vidya Mandir, on 31st October 2023

राजभाषा हिंदी चेतना पखवाड़ा 14–28 सितम्बर 2023

Celebration of Hindi Pakhwada during 14-28th September, 2023

हिन्दी दिवस हर साल 14 सितंबर को मनाया जाता है, जिसका उद्देश्य भाषा के बारे में जागरूकता बढ़ाना है और उस समय को भी याद करना है जब इसे भारत की आधिकारिक भाषाओं में से एक के रूप में अपनाया गया था। भाकृअनुप–महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान में 14 सितंबर, 2023 को सुबह 11:30 बजे से दोपहर 1:00 बजे तक संगोष्ठी कक्ष में संस्थान के सभी कर्मचारियों, परियोजना कर्मचारियों और संविदा कर्मचारियों की उपस्थिति में हिंदी दिवस मनाया गया। कार्यक्रम की शुरुआत इंजी. विकास पराड़कर, वैज्ञानिक द्वारा हमारे जीवन में हिंदी दिवस के महत्व पर परिचयात्मक व्याख्यान के साथ हुई। हिन्दी के प्रयोग को बढ़ावा देने और इसे मजबूत करने में अपना योगदान देने का संकल्प पढ़ा, जिसका पालन संस्थान के सभी कर्मचारियों ने किया। रवि कुमार वैज्ञानिक द्वारा भाषण दिया गया। डॉ. रवि कुमार ने बताया कि हिन्दी के प्रयोग तथा जनभाषा का महत्व बताया साथ ही हिंदी पखवाड़ा के महत्व को भी बताया कि डॉ. पी. के. भारती वरिष्ठ वैज्ञानिक ने हिंदी के इतिहास और महत्व पर भाषण दिया। उन्होंने हमें अवगत कराया कि भारत की संविधान सभा ने 1949 में देश की आधिकारिक भाषा के रूप में ‘‘देवनागिरी लिपि में लिखी गई हिंदी–एक इंडो–आर्यन भाषा’’ को मान्यता दी और अपनाया। प्रधान वैज्ञानिक डा. ए. के. सिंह ने हमें देश के विकास में हिंदी के महत्व के बारे में जानकारी दी। उन्होंने कहा कि हिन्दी ही एकमात्र ऐसी भाषा है जिसके माध्यम से हम अपने देश में विद्यमान बुराइयों को आसानी से पहचान सकते हैं। संस्थान के निदेशक डा. के. जी. मंडल. द्वारा हिंदी के इतिहास की जानकरी प्रदान की गई साथ ही कैसे हिंदी को महत्वपूर्ण रूप से बढ़ावा दिया जाए व इसके महत्व को कैसे बढ़ाया जाए उन्होंने सभी कर्मचारियों से अधिक से अधिक राजभाषा हिन्दी का उत्तरोत्तर प्रयोग करने का आग्रह किया। दिनाँकः 19-09-2023 को संगोष्ठी कक्ष में हिंदी अंग्रेजी अनुवाद प्रतियोगिता का आयोजन किया गया। दोपहर 2:30 बजे संश्थान के सभी वैज्ञानिक, अधिकारी, YP’S व संविदा कर्मचारियों ने कार्यक्रम में भाग लिया। कार्यक्रम का नेतृत्व ई. विकास पराड़कर व कौशिक बनर्जी ने किया। कार्यक्रम दोपहर करीब 2:30 बजे शुरू हुआ और 3:30 बजे के करीब समाप्त हुआ। हिंदी अनुवाद प्रतियोगिता के बाद सभी प्रतिभागियों के लिए हिन्दी तात्कालिक भाषण का आयोजन किया गया। श्री डी. के. सापरा और ई. विकास पराड़कर जूरी के सदस्य थे। कार्यक्रम दोपहर करीब 2:30 बजे शुरू हुआ और शाम साढ़े चार बजे तक चला। दिनाँकः 29-09-2023 को हिन्दी पखवाड़ा का आज अंतिम दिन है, आज संगोष्ठी कक्ष में हिंदी प्रश्नोत्तरी प्रतियोगिता का आयोजन किया गया जिसमें संस्थान के ही सभी कर्मचारियों द्वारा प्रश्नोत्तरी में भाग लिया गया। कार्यक्रम दोपहर में करीब 2:30 बजे शुरू हुआ और शाम 3:00 बजे तक चला। प्रतियोगिता में लगभग 20 प्रश्न (सामान्य ज्ञान, करंट अफेयर्स और हिंदी) पूछे गए थे। दोपहर 3:30 बजे से कार्यक्रम समापन समारोह शुरू हुआ। शुरुआत में कार्यक्रम समाप्ति पर सर्वप्रथम डा. पी के भारती जी ने अपने विचार व्यक्त करे उसके बाद श्री डी. के. सपरा जी ने हिंदी के विकास और उसके अनुप्रयोग के बारे में जानकारी दी तत्पश्चात संस्थान के निदेशक द्वारा कृषि के क्षेत्र में हिंदी और रोजगार के अवसरों के महत्व के बारे में बताया गया। ई. बिकास पराड़कर के द्वारा अंत में धन्यवाद् प्रस्ताव देकर कार्यक्रम को समाप्त किया गया।

Mission LiFE

An awareness programme on "Planting of trees to reduce the impact of pollution" on the occasion of World Environment Day-2023" was organized in the campus of ICAR-Mahatma Gandhi Integrated Farming Research Institute, Piprakothi, Motihari on 5th June, 2023. The Chief Guest of the programme was Shri S. Thiyagarajan, Principal, Jawahar Navodaya Vidyalaya, Piprakothi. A total of 52 participants including 25 students & teachers participated in the event. Programme was inaugurated by Principal, Jawahar Navodaya Vidyalaya and the Director, ICAR-MGIFRI along with all the Scientists. The Principal highlighted the solutions to use of plastics under the campaign "Beat Plastic Pollution". During the day interactive lectures on the significance of World Environment Day-2023 were delivered by various Scientists and teachers with a focus on the Mission Life which stands for Lifestyle for Environment. The aim was to encourage people to adopt sustainable lifestyle practices to protect the environment. On this occasion total 500 saplings of Ashoka plant (*Polyalthiya longifolia*) was planted.

A few photographs of World Environment Day-2023 celebrated at ICAR-MGIFRI, Motihari

Vigilance awareness

ICAR- Mahatma Gandhi Integrated Faming Research Institute, Motihari took vigilance oath on 31st October 2023. The objective of this event campaign was to create awareness among the employees to work towards instituting corruption-free attitude and maintain absolute integrity and devotion to duty

Distinguished visitors at ICAR-MGIFRI during 2023

Hon'ble Governor Shri Rajendra Vishwanath Arlekar acted as chief guest in Farmers-Scientists interaction cum Kisan Labharthi Sammelan on 19 June 2023

Inauguration of Kisan Gandhi Tableau by Hon'ble Union Minister of State for Agriculture and Farmers Welfare Shri Kailash Choudhary on 18th February 2023

Hon'ble MP, Shri Radha Mohan Singh visited at the institute on the eve of 154th Birthday of Mahatma Gandhi on 02 October 2023

RAC team constituting Dr. C.L. Acharya, Ex-Director, ICAR-IISS, Bhopal, Dr. Masood Ali, Ex-Director, IIPR, Kanpur, Dr. D.K. Kundu, Ex- Head, Crop Production Division, ICAR-CRIJAF, Barrackpore, Dr. S.K. Singh, Hon'ble DDG Horticulture and Ex director ICAR-IIHR, Bengaluru, Dr. Ved Prakash Saini, Professor & Dean, College of Fisheries, Bihar Animal Science University visited the institute for conducting 1st meeting of 2nd RAC from 27-29 December 2023

Dr. N.P. Sahu, Joint Director ICAR-CIFE Mumbai visited the institute on 11 July 2023

Swachha Bharat Abhiyan

The Director and staff of ICAR-MGIFRI, Motihari participated actively in Swachha Bharat Abhiyan, sanitation drive, and Swachhata awareness programs under Swachh Bharat Abhiyan from January to December 2023. Swachhata awareness programs were conducted regularly at the institute and village levels to create awareness about the swachhata among the local people. The institute also actively participated in a cleanliness and sanitation drive in Swachhata hi Sewa on 01.10.2023. The institute and the army from SSB freed local area at Piprakothi from garbage. On the eve of the birth anniversary of Mahatma Gandhi and Lal Bahadur Shastri on 2nd October 2023, the director of the institute administered a pledge on the 'Swacchata Abhiyan' programme to all staff members of the Institute and holistically called on swacchata so that it fulfills its objective of taking the nation to a newer height. Following the guidance of the esteemed Director General-ICAR and Secretary-DARE, and under the directive of the institute's director, a cleanliness drive for the eradication of Parthenium hysterophorus (carrot grass) weed inside the main campus of the Institute was undertaken during 'Parthenium Awareness Week' (August 16-22, 2023). Approximately 20 persons including Scientists, Young Professionals (YPs), and contractual staff actively engaged in an awareness programme to eliminate Parthenium from the institute's premises. A total area of approximately 1078 square meters was successfully cleared of Parthenium infestation. The participants displayed great enthusiasm, and all staff members are now comprehensively aware of the significance of parthenium eradication. As per the directive received from the council and under the guidance of the Director of the institute, Swachhata Pakhwada was celebrated during the last fortnight of December 2023. Sanitation and SWM were conducted both at the institute and outside the institute. Composting and on-farm residue management technology were demonstrated to the farmers and the Swachhata Awareness campaign was also conducted at the local level. They were made aware of the farm waste to wealth conversion. Coupled with this, the staff of ICAR-MGIFRI is also involved in cleaning public places and communities, village awareness programmes, campus beautification, landscaping, pruning of trees, sanitization drives, etc. With the guidance of the director, ICAR-MGIFRI organized a special day Kisan Diwas on 23.12.2023. Dr. K. G. Mandal, director of the institute administered the Swachhata Shapath to all the farmers, participants, and staff of the institute and felicitated farmers on this special day. Later, he delivered a special talk on the importance of green technology and waste-to-wealth practices among the farmers. Dr. Koushik Banerjee, nodal officer 'Swacchata Abhiyan' shared his experience on different activities conducted during Swachhata pakhwada with the farmers.

A brief account on *Swachha Bharat Abhiyan* at ICAR-MGIFRI, Motihari in the year 2023

Sl. No.	Nature of event	No. of event	No. of staff/farmer participated
1	Basic maintenance	15	65
2	Cleaning and beautification of the surrounding area	45	23
3	Composting/vermicomposting/residue management and other activities on generation of wealth from waste	02	15
4	*Swachhata* awareness at local level	06	55
5	Involvement of print and electronic media	04	-
6	No. of VIP/VVIPs involved in the activities	02	04
7	Sanitization of office and campus of ICAR-MGIFRI	Daily	10
8	Swachhata pledge	02	75

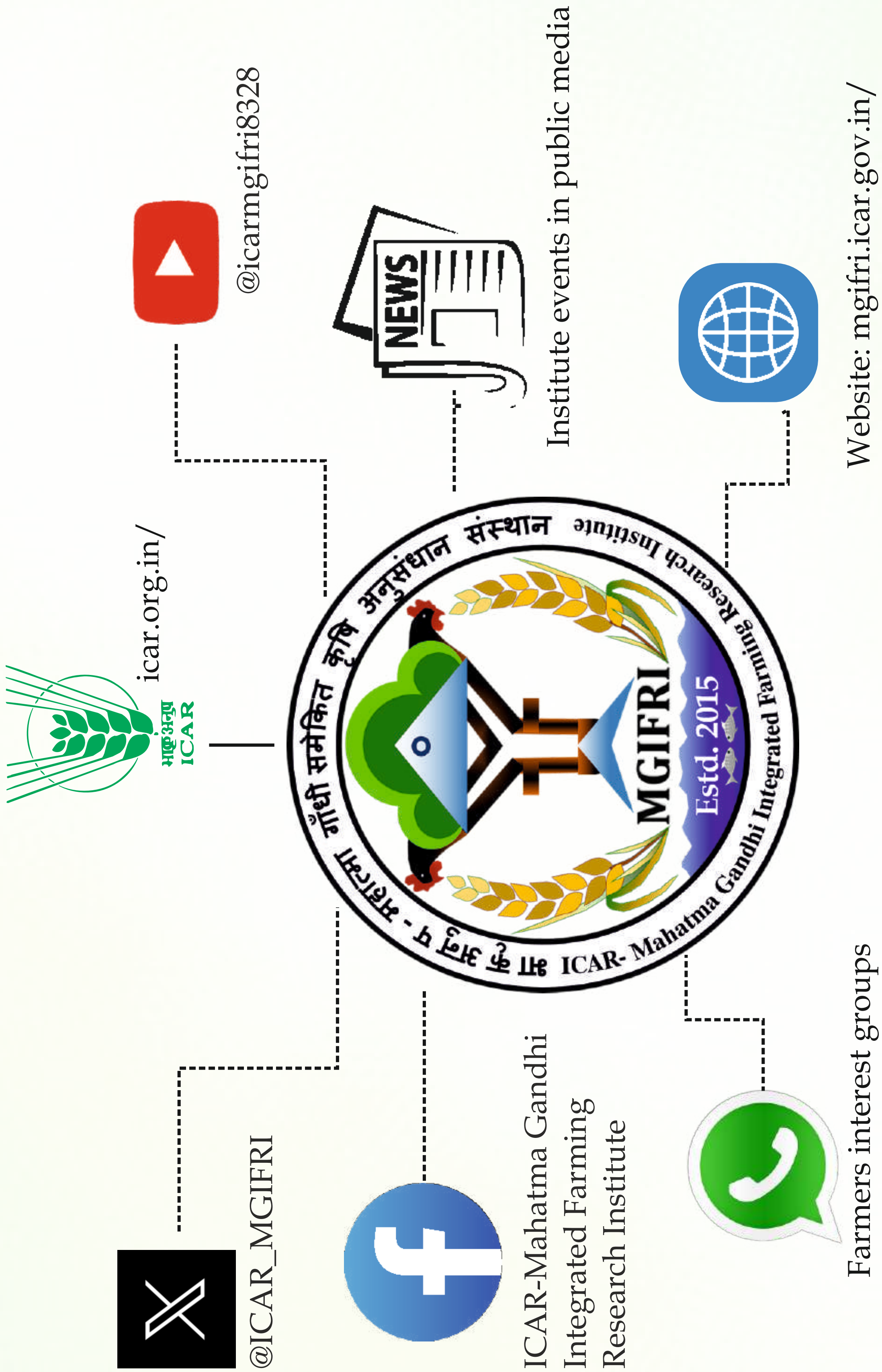






A few photographs of the event

ICAR-MGIFRI in Media



Newspaper reports of ICAR-MGIFRI

महात्मा गांधी इंटीग्रेटेड और एसएनएस के बीच एमओयू

मोतिहारी, निज प्रतिनिधि। शहर के श्री नारायण सिंह कॉलेज के इंडस्ट्रियल फिश एंड फिशरीज व महात्मा गांधी इंटीग्रेटेड फार्मिंग रिसर्च इंस्टीट्यूट, पिपराकोठी द्वारा मेमोरेंडम ऑफ़ अंडरस्टैंडिंग (एम ओ यू) पर हस्ताक्षर किया गया।

इस मौके पर दोनों शैक्षणिक संस्थानों के प्रमुखों ने हस्ताक्षर कर इस समझौते पर मुहर लगायी। एम ओ यू में छात्रों के एक्सचेंज, परिणाम आधारित प्रशिक्षण, संबंधित शैक्षणिक गतिविधियों पर समझौते किए गए। दोनों पक्षों की सोच है कि इस समझौते से छात्र-छात्राओं को कौशल विकास तथा प्रायोगिक ज्ञान संवर्धन में सहायता मिलेगी। नए विचारों का आदान प्रदान होगा जिससे स्टूडेंट्स को जॉब लेने में आसानी होगी। महात्मा गांधी इंटीग्रेटेड फार्मिंग रिसर्च इंस्टीट्यूट की ओर से स्वयं निदेशक डॉ के जी मण्डल, प्रिंसिपल साइंटिस्ट डॉ एस के पुरवे व फिशरीज़ विभाग में वैज्ञानिक रवि कुमार उपस्थित रहे।

इस अवसर पर एस एन एस महाविद्यालय के शिष्टमण्डल में प्राचार्य प्रो (डॉ) प्रदीप कुमार के साथ इंडस्ट्रियल फिश एंड फिशरीज के को-ऑर्डिनेटर डॉ सुरेश नारायण, आईक्यूएसी को-ऑर्डिनेटर डॉ मनीष कुमार यादव व भौतिक विज्ञान के प्राध्यापक डॉ सी के पांडेय उपस्थित रहे।

महात्मा गांधी ने अंग्रेज निलहों से चम्पारण के किसानों को मुक्ति दिलायी : राधामोहन

आईसीएआर में पुष्प अर्पित कर किया नमन

पीपराकोठी/पू.च/सं। आइसीएआर पीपराकोठी में गांधी जी की प्रतिमा पर पुष्प अर्पित करते पूर्व केंद्रीय कृषि मंत्री राधामोहन सिंह व अन्यो ने पुष्प अर्पित कर नमन किया। उन्होंने कहा कि अंग्रेज निलहों के अत्याचार से चम्पारण के किसान काफी परेशान थे। जिसको लेकर राष्ट्र पिता महात्मा गांधी ने चंपारण आकर यहीं से सत्याग्रह की बिगुल फूंकी थी। तब देश आजाद हुआ। उनके स्मृति में पिछली सरकार ने कुछ नहीं किया। परंतु जब केंद्र में मोदी सरकार शासन में आई तो महात्मा गांधी के नाम पर महात्मा गांधी राष्ट्रीय शोध एवं अनुसंधान संस्थान की स्थापना की और बापू की भव्य प्रतिमा का निर्माण हुआ। आज हम सभी उनके जयंती के अवसर पर उन्हें श्रद्धा से याद भी कर रहे हैं। मौके पर मुख्य रूप से विधायक प्रमोद कुमार, निदेशक डा केजी मंडल, केविके प्रमुख डॉ. अरविंद कुमार सिंह, वैज्ञानिक नेहा पारीक, गौरव कुमार, आरबी शर्मा, राजू सिंह, कुमार राजेश सिंह, राजकिशोर सिंह, सहित कई लोग मौजूद थे।

दैनिक भास्कर मोतीहारी 12-05-2023

समेकित कृषि प्रणाली पर हुआ तीन दिवसीय प्रशिक्षण

पीपराकोठी. स्थानीय महात्मा गांधी समेकित कृषि अनुसंधान संस्थान के सभागार में आत्मा मुजफ्फरपुर द्वारा किसानों की आय बढ़ाने के लिए समेकित कृषि प्रणाली पर संपोषित तीन दिवसीय प्रशिक्षण कार्यक्रम गुरुवार को संपन्न हुआ।

प्रशिक्षण कार्यक्रम में मुजफ्फरपुर जिला के विभिन्न प्रखंडों से लगभग 30 किसानों ने भाग लिया. प्रशिक्षण कार्यक्रम के दौरान तीन दिनों तक कुल 18 पाली में समेकित कृषि प्रणाली के विभिन्न विषयों पर विस्तार से चर्चा हुई. उद्घाटन सत्र में पाठ्यक्रम निदेशक डॉ सुशील कुमार पूर्वे ने प्रशिक्षुओं को संस्थान के स्थापना का महत्व एवं यहां पर चल रही अनुसंधान परियोजनाओं से अवगत कराया. मुख्य अतिथि कॉलेज ऑफ़ हॉर्टिकल्चर एंड फॉरेस्ट्री के अधिष्ठाता डॉ कृष्ण कुमार सिंह ने समेकित कृषि की व्याख्यान की और बदलते जलवायु पारिस्थितिकी में समेकित कृषि प्रणाली को समय की मांग बताया. मौसम का महत्व, पशुधन आधारित समेकित कृषि मॉडल की जरूरत, भूमि संसाधनों का प्रभावी उपयोग, जैविक खेती में मृदा प्रबंधन, चावल- मछली- बतख वाला समेकित कृषि, आधुनिक कृषि उपकरण, प्रक्षेत्र उत्पाद प्रसंस्करण आदि. समापन सत्र के दौरान पर संस्थान के कार्यवाही निदेशक डा सुशील कुमार पूर्वे, प्रधान वैज्ञानिक डा एके सिंह, डा. पीके भारती, रवि कुमार, प्रियंका मीणा, इंजीनियर विकास पराडकर, आत्मा मुजफ्फरपुर से आये ए.टी.एम प्रकाश कुमार आदि उपस्थित रहे.

कार्यक्रम • मत्स्य पालन, पौधरोपण, बकरी पालन, कुकुट पालन के लिए किसानों को प्रोत्साहित किया

किसानों के साथ प्रक्षेत्र दिवस का आयोजन किया समेकित कृषि प्रणाली के फायदे के बारे में बताया

भास्कर न्यूज|तेतरिया

प्रखंड क्षेत्र के मेघुआ पंचायत के उझिलपुर व नाहो पानापुर पंचायत के हनुमान नगर गांव में स्थानीय किसानों की उपस्थिति में महात्मा गांधी कृषि अनुसंधान केंद्र पिपराकोठी के वैज्ञानिकों ने प्रक्षेत्र दिवस का आयोजन किया। किसानों को फार्मर फर्स्ट परियोजना अंतर्गत आमदनी दोगुनी करने के उद्देश्य से सरकार द्वारा चलाए जा रही परियोजना से किसानों को अवगत कराया। साथ-साथ समेकित कृषि प्रणाली से किसानों को मिल रहे फायदों के बारे में भी विस्तृत जानकारी दी। फार्मर फर्स्ट परियोजना के आईसीआर डॉ अजय कुमार सिंह ने किसानों को बताया कि गांव में फार्मर फर्स्ट परियोजना के तहत किसानों को अधिक से अधिक पोखर का निर्माण कर, मत्स्य पालन, पोखर के किनारे पौधरोपण, बकरी पालन, कुकुट पालन करने के लिए प्रोत्साहित किया। उझिलपुर के युवा किसान संतोष कुमार, हनुमान नगर के किसान अरुण कुमार बताते हैं कि क्षेत्र में अब तक प्रोत्साहित कर 4 किसानों को इस योजना के द्वारा नवनिर्मित पोखर की सफाई कर मछली का जीरा देकर प्रोत्साहित किया गया। जिसमें उझिलपुर गांव के दीपक कुमार, रामबाबू प्रसाद, हनुमान नगर गांव के रामेश्वर सहनी, संजय सहनी इस परियोजना के अंतर्गत समेकित कृषि प्रणाली का बेहतर लाभ ले रहे हैं। ये किसान खेती के साथ-साथ बतख पालन, बकरी पालन,मत्स्य पालन कर अपनी आमदनी दोगुनी कर रहे हैं। कृषि वैज्ञानिक डॉक्टर हरिता एम मोहन बताती हैं कि किसान खेती के साथ-साथ समेकित खेती के अंतर्गत किसान खेती के साथ-साथ मत्स्य पालन, कुकुट पालन, बकरी पालन कर अपनी आमदनी दुगनी कर सकते हैं। इसके लिए उन्होंने किसानों को पोखर के किनारे उन्नत किस्म के पपीता, केला लगाने की सलाह दी। उन्होंने बताया कि किसान फसल उत्पादन के साथ पशुपालन तथा फल का उत्पादन कर बेहतर आमदनी कर सकते हैं। उन्होंने किसानों को इसके लिए पौधे के मुफ्त बीज दिए जा जाने की बात कही। उन्होंने गिर नस्ल की गायों के पालन पर विशेष जोर दिया।

किसानों को जानकारी देते वैज्ञानिक।

मछली पालन पर तीन दिवसीय प्रशिक्षण की शुरुआत

पीपराकोठी। स्थानीय महात्मा गांधी समेकित कृषि अनुसंधान संस्थान में सोमवार को समेकित मत्स्य पालन द्वारा छोटे और सीमांत किसानों की आजीविका में सुधार विषय पर तीन दिवसीय प्रशिक्षण कार्यक्रम का शुरुआत किया गया। जिसमें 55 किसानों ने भाग लिया किसानों की आय बढ़ाने के लिए बाढ़ ग्रसित जगहों में तालाब निर्माण, प्रबंधन, मछली का संचय, स्वास्थ्य व आहार आदि विषयों पर किसानों को प्रशिक्षण दिया जा रहा है। इस प्रशिक्षण में मछली के साथ-साथ समेकित .षि प्रणाली जानकारी दी जा रही है। जिसमें मछली मुर्गी पालन, मछली बकरी पालन व बागवानी फसलों का उत्पादन एवं प्रबंधन आदि विषय पर जानकारी दी जा रही है। किसान इस प्रकार के समेकित खेती कर अपनी आमदनी को बढ़ा सकते है। मौके पर संस्थान के निदेशक डॉ. केजी मंडल, प्रधान वैज्ञानिक डॉ. एसके पूर्वे, वैज्ञानिक डॉ. पीके भारती, डॉ. रवि कुमार, डॉ. विकास पराडकर व मनीष मौजूद थे।

दैनिक भास्कर मोतीहारी 07-11-2023

वर्मी कंपोस्ट निर्माण के बारे में बताया

तेतरिया | प्रखंड क्षेत्र की मेघुआ पंचायत के उझिलपुर गांव में भारतीय कृषि अनुसंधान परिषद के तत्वावधान में महात्मा गांधी समेकित कृषि अनुसंधान केंद्र पिपराकोठी द्वारा फार्मर फर्स्ट कार्यक्रम परियोजना अंतर्गत दो दर्जन से अधिक किसानों को वर्मी कंपोस्ट बनाने के लिए प्लास्टिक किट दिया गया तथा किसानों को वर्मी कंपोस्ट तैयार करने का प्रशिक्षण भी दिया गया इस दौरान कृषि पदाधिकारी ने बताया कि प्रखंड के उझिलपुर, [illegible] गांव के किसानों को प्लास्टिक किट में [illegible] को एकत्र कर वर्मी कंपोस्ट बनाने का प्रशिक्षण दिया गया है. पदाधिकारियों ने बताया कि वर्मी कंपोस्ट के उपयोग से पहले सफल खेतों में 25 से 50फीसदी रासायनिक खाद का उपयोग कम करना होगा। वहीं लगातार तीसरे साल वर्मी कंपोस्ट के उपयोग से खेतों की उर्वरा शक्ति पूरी तरह मजबूत हो जाएगी।

पेड़ों को बचाने का लिया संकल्प

प्रतिनिधि,पीपराकोठी

स्थानीय महात्मा गांधी समेकित कृषि अनुसंधान संस्थान के सभागार में सोमवार को विश्व पर्यावरण दिवस के अवसर पर कार्यक्रम का आयोजन किया गया. कार्यक्रम की शुरुआत आइसीएआर गीत व अतिथियों के स्वागत से किया गया. मुख्य अतिथि के रूप में जवाहर नवोदय विद्यालय के प्राचार्य एस त्यागराजन थे. मुख्य अतिथि श्री त्यागराजन ने अपने संबोधन में कहा कि पर्यावरण को संतुलित रखने के लिए हमें पेड़ों को बचाना होगा और ज्यादा से ज्यादा पेड़ों को लगाना होगा. उन्होंने कहा कि आज जरूरत है कि हमें किसी भी अवसर पर प्रत्येक व्यक्ति को कम से कम एक पेड़ को अवश्य लगाये ताकि पर्यावरण को संतुलित रखा जा सके. वहीं प्रधान वैज्ञानिक डा एके सिंह ने उपस्थित लोगों को पर्यावरण के महता पर प्रकाश डालते हुए सभी को वृक्ष लगाने की बात कही. जबकि वैज्ञानिक डा पीके भारती ने पशुओं के उचित देखभाल व संतुलित आहार देने से संबंधित जानकारी की दिया. अंत में अतिथियों के साथ स्कूली छात्र छात्राओं ने परिसर में वृक्षारोपण किया. मौके पर मुख्य रूप से वैज्ञानिक रवि कुमार, श्रेया निवेश, कौशिक बनर्जी सहित कई वैज्ञानिक व छात्र छात्रा मौजूद थे.

प्रतियोगिता का भी आयोजन किया गया. जिसमे अव्वल आने वाले विद्यार्थियों को केविके के वरीय वैज्ञानिक सह प्रधान डॉ अरविन्द कुमार सिंह से पुरस्कार प्राप्त हुआ है. इसके साथ प्राकृतिक खेती करने

केंचुआ से वर्मी कंपोस्ट बनाने का दिया प्रशिक्षण

तेतरिया (पूर्वी चंपारण), संवाद सहयोगी : कृषि अनुसंधान केंद्र पीपराकोठी के तत्वाधान में फार्मर फर्स्ट परियोजना के तहत सोमवार को उझीलपुर में एक दिवसीय प्रशिक्षण शिविर का आयोजन किया गया। इस दौरान कृषि विज्ञान केंद्र से आए वैज्ञानिक डा. अभय कुमार सिंह, डा. कौशिक बनर्जी एवं डा. प्रियंका मीणा ने किसानों को प्लास्टिक बैग में केंचुआ के सहारे पुआल, भूसा आदि फसल अवशेष, कूड़ा-कचड़ा एवं गोबर से वर्मी कंपोस्ट बनाने की तरीका सिखाया। उन्होंने बताया कि रसायनिक खाद के ज्यादा प्रयोग करने से खेतों की उर्वरा शक्ति कम हो जाती है। कंपोस्ट के प्रयोग से रासायनिक खाद की कमी 25 से 50 प्रतिशत तक पूरी की जा सकती है। वहीं, कम खर्च में अधिक उपज के बारे में भी विस्तार से जानकारी दी गई। मौके पर प्रोजेक्ट पदाधिकारी आलोक राज, संतोष कुमार, आलोक कुमार, कृषि सलाहकार सुरेश प्रसाद आदि थे।

Joining, Promotion, Superannuation & Transfer

Mr. Jadhav Amol Kailas
Scientist (Fruit Science) has joined on 21 July, 2023

Mr. Rakesh N
Scientist (Agricultural Economics) has joined on 21 July, 2023

Dr. Geeta
Scientist (Poultry Science) has joined on 21 July, 2023

Ms. Haritha Mohan M
Scientist (Plant Pathology) has joined on 01 May 2023

Dr. Neela Madhav Patnaik
Scientist (Agricultural Extension) has joined on 21 July, 2023

Dr. S.K. Samal
Scientist (Soil Science) has been transferred to ICAR-IISWC , RS Koraput, Orissa

Mr. Deleep Kumar Sapra
Administrative Officer has joined on 30 June 2023.

Mr. Ashwini Kumar
Finance and Account Officer has joined on 11 April 2023

Mr. Sanjib Kumar
Assistant Administrative Officer has joined on 16 October 2023

Personnel

As on 31.12.2023

Scientific

SN	Name	Designation	Subject
1	Dr. K.G. Mandal	Director	Agronomy
2	Dr. S.K. Purbey	Principal Scientist	Fruit Science
3	Dr. A.K. Singh	Principal Scientist	Agronomy
4	Dr. P.K. Bharti	Senior Scientist	Livestock Production & Management
5	Dr. Ravi Kumar	Scientist	Fisheries Resource Management
6	Dr. Shreya Nivesh	Scientist	Land and Water Management Engineering
7	Dr. Koushik Banerjee	Scientist	Agricultural Meteorology
8	Er. Vikas Paradkar	Scientist	Farm machinery and Power Engineering
9	Mr. Jadhav Amol Kailas	Scientist	Fruit Science
10	Dr. Neela Madhav Patnaik	Scientist	Agricultural Extension
11	Ms. Haritha Mohan M	Scientist	Plant Pathology
12	Dr. Geeta	Scientist	Poultry Science
13	Mr. Rakesh N	Scientist	Agricultural Economics

Administration

SN	Name	Designation
1	Mr. Deleep Kumar Sapra	Administrative Officer
2	Mr. Sanjib Kumar	Assistant Administrative Officer
3	Mr. Ashwini Kumar	Finance & Accounts Officer

Budget & Expenditure

(Financial year-2023-2024)

ICAR-Mahatma Gandhi Integrated Farming Research Institute, Motihari			
		(Rupees in lakhs)	
2023-24			
S.no.	Major Heads of Account	Other than NEH, TSP & SCSP	SCSP
(A)	Capital		
1	Building & Original works	41.83	0.00
2	Equipment (Laboratory & Farm Equipment including plant & machinery)	22.97	11.46
3	Vehicles & Vessels	0.00	0.00
4	Information Technology & ICT	19.07	2.04
5	Livestock	0.00	0.00
6	Library	0.00	0.00
7	Furniture & Fixture	17.13	0.00
	SUB-TOTAL (A)	**101.00**	**13.50**
(B)	REVENUE		
1	Research and operational Expenses	127.43	25.10
2	Administrative Expenses	184.62	0.00
I).	Travelling Expenses	12.49	0.00
3	Miscellaneous Expenses	11.46	0.00
	SUB-TOTAL (B)	**336.00**	**25.10**
(C)	Establishment Expense	**283.99**	**38.60**
	GRAND TOTAL (A+B+C)	**720.99**	**38.60**

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@ICAR_MGIFRI





भाकृअनुप-महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान

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