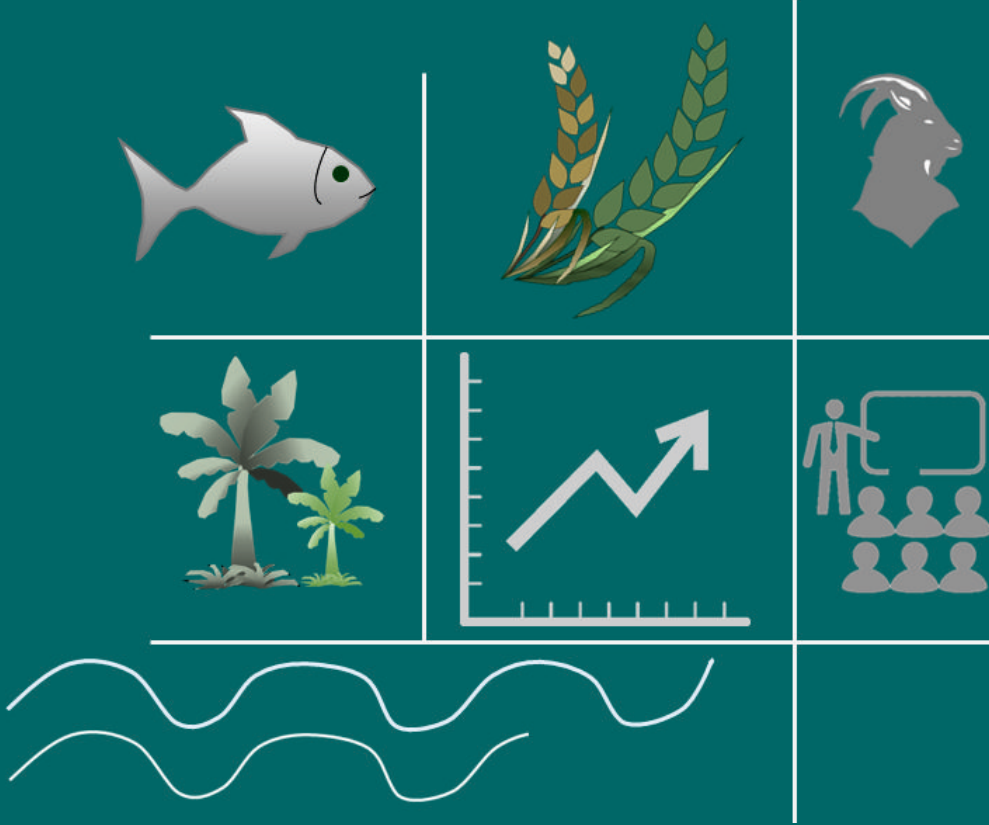


बार्षिक प्रतिवेदन
Annual Report
ICAR-MGIFRI 2022



भारतअनुप-महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान
ICAR-MAHATMA GANDHI INTEGRATED FARMING RESEARCH INSTITUTE
Piprakothe, Motihari, Bihar, India



Annual Report 2022



Indian Council of Agricultural Research

Mahatma Gandhi Integrated Farming Research Institute
(ICAR-MGIFRI)

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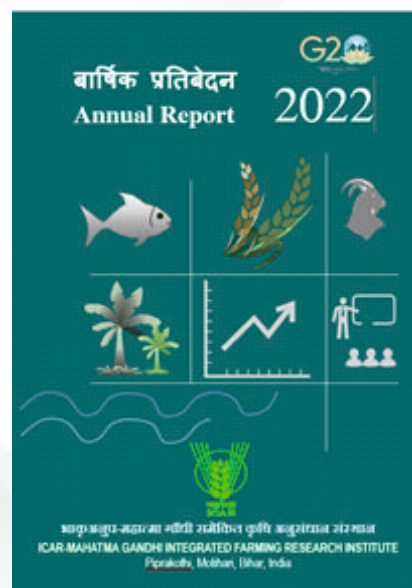
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Message From the Director

The management of natural resources is very challenging in the flood-prone, flood-affected and waterlogged ecosystems. Waterlogging mostly occurs due to high-intensity rainfall exceeding infiltration capacity (i.e., pluvial flooding), riverine floods due to dyke breaches (fluvial flooding), and flash floods. The damage due to riverine floods is widespread in Bihar, as the overflow affects rivers in their downstream. The degree of riverine flood is increased over the years due to high siltation in the river catchment areas making them disastrous. A large area in the country i.e. about 11.6 million ha is affected due to perennial and seasonal waterlogging. Consequently, those potentially productive cultivated lands and agroecosystems are not fully exploited.

The ICAR-MGIFRI, Motihari is in tune with the transformation phase of the ICAR. Keeping in mind the NIRA (National priorities, R&D thrust areas, International commitments, Actions required), Scientists of the institute are giving due importance to Diversification and Ecoregional Farming, Demand & Outcome-based research in the Farming Systems mode. Efforts are being made to the development of Integrated Farming System (IFS) models to address the problems of water-congested ecosystems. The IFS components involve field crops, horticultural crops, agroforestry, livestock, poultry and fisheries. Definitely, our efforts will cater to the needs of farmers and stakeholders in the future to enhance farmers' income with concomitant improvements in nutrition security.

The institute has already initiated research activities with 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; development of integrated farming systems (IFS) technology/ packages/ models for water-congested ecosystems; post-flood crop management, design and development of efficient water management technology; and capacity building of stakeholders including the farmers on different components of IFS. We have started a few prospective research projects quite systematically so that the mandates of the Institute are met, and impactful technologies are developed for the benefit of farmers. In addition, we are working at the farmer's field for the welfare of the farmers directly through farmers' FIRST project of the ICAR, and are involved in the SCSP scheme. Our Scientists are putting all-out efforts for capacity building of farmers and stakeholders through on-campus as well as off-campus training programmes, demonstration, organizing awareness campaigns, Kisan Gosthi, Krishi Mela, Field Days etc. During the reporting year, all Scientists have participated in activities under *Azadi Ka Amrit Mahotsav*, cleanliness drive throughout the year under *Swachh Bharat Abhiyan*.

So far, there is no independent administrative setup at the Institute; about 2/3rd of the scientific positions is lying vacant. Consequently, research activities in the multidisciplinary mode, could not be started/implemented in the full spirit. Of course, efforts are being made to establish the administrative setup with the required staff and filling-in the vacant scientific positions.

I acknowledge the valuable guidance, suggestion and support by Dr. T. Mahapatra, and Dr. Himanshu Pathak, former and present Hon'ble Secretary, DARE and Director General, ICAR, Dr. S.K. Chaudhari, Hon'ble, Deputy Director General (NRM), Dr. S. Bhaskar, Dr Rajbir Singh, former and 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, administration and finance section support from RCER, Patna for help and cooperation. I thank the publication committee for putting their efforts in compilation and preparing the Annual Report 2022 of the Institute.

Date: 05 April 2023
Motihari, Bihar


(K.G. Mandal)
Director

कार्यकारी सारांश

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

भूमि आकार देने की तकनीकों को क्रियान्वित कर निचले जलजमाव वाले क्षेत्रों के पुनर्वास के लिए ऊंचे और निचला भूमि प्रणाली में परिवर्तित किया गया। बागवानी आधारित फसल प्रणाली को विभिन्न भूमि आकार देने वाले मॉडलों जैसे मॉडल I: (1.0 मीटर गहराई), मॉडल II (1.4 मीटर गहराई) और मॉडल III (1.8 मीटर गहराई) के तहत लागू किया गया। खरीफ़ 2022 के दौरान विभिन्न मॉडलों के आर्थिक विश्लेषण से पता चला कि सबसे अधिक सकल आय मॉडल I (₹ 68325.68 हेक्टेयर⁻¹) से प्राप्त हुई, इसके बाद मॉडल II (₹ 58023.65 हेक्टेयर⁻¹) और मॉडल III (₹ 43066.73 हेक्टेयर⁻¹) का स्थान रहा। पशु घटक के तहत मॉडल II में फरवरी-मार्च 2023 के दौरान बत्तखों (50 नग) को पेश किया गया।

जैविक चावल- मछली-बतख आईएफएस मॉडल

जैविक धान उतपादन का मूल्यांकन एवम जैविक चावल-मछली-बतख आईएफएस मॉडल विकसित करने के लिए करने के लिए, पहले वर्ष के प्रयोगात्मक आंकड़ों से पता चला कि पोषक तत्वों के विभिन्न स्रोतों, यानी कार्बनिक, कार्बनिक + अकार्बनिक और अकार्बनिक, का धान की उपज कारको और पैदावार पर महत्वपूर्ण प्रभाव पड़ा। अकार्बनिक और जैविक + अकार्बनिक स्रोतों के माध्यम से पोषक तत्वों का उपयोग, जैविक स्रोत की तुलना में उल्लेखीय रूप से अधिक अनाज उपज और फसल सूचकांक दर्ज किया। जैविक स्रोतों के तहत प्राप्त अनाज की उपज क्रमशः अकार्बनिक और कार्बनिक + अकार्बनिक स्रोतों की तुलना में 25.4 और 28.1% कम थी।

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

वर्षा की प्रवृत्ति को समझने के लिए, विभिन्न प्रवृत्ति विश्लेषण विधियों की दक्षता, जैसे, मान-केंडल टेस्ट (एमके), संशोधित मान-केंडल टेस्ट (एमएमके), सेन ढलान अनुमानक (एसएस), इनोवेटिव ट्रेंड एनालिसिस (आईटीए) और लीनियर रिग्रेशन (एलआर) का परीक्षण किया गया। यह देखा गया कि खरीफ़ सीज़न में क्रमशः एलआर, एमके और एमएम-के परीक्षणों का उपयोग करके 3 (8.77%), 17 (44.74%), और 15 (39.47%) समय श्रृंखला में उल्लेखीय रुझान पाए गए और रबी मौसम में भी एक समान परिणाम देखा गया। इस प्रकार, परिणामों से संकेत मिला कि आईटीए पद्धति पारंपरिक एम-कोर, एमएम-के और एलआर परीक्षणों से बेहतर है।

कम लागत वाले उपकरणों और मशीनरी का डिजाइन और विकास

सेंसर-आधारित वास्तविक समय स्वचालित तालाब जल गहराई निगरानी प्रणाली का विकास, तालाब में पानी की गहराई को सटीक रूप से मापने और निगरानी करने के लिए उन्नत सेंसर का उपयोग करता है, जो जल स्तर पर वास्तविक समय डेटा प्रदान करता है। सिस्टम का डिज़ाइन, कार्यान्वयन और सत्यापन, तालाब के जल स्तर की निगरानी और प्रबंधन में इसकी प्रभावशीलता पर प्रकाश डालता है।

अधिकतम उपज के लिए इष्टतम अवशेष प्रतिधारण

सभी सीए आधारित उपचारों में, 2021-22 के दौरान उगाए गए गेहूं की अनाज उपज, किसान अभ्यास (टी1) की तुलना में उल्लेखीय रूप से अधिक पाई गई। 2022-23 के दौरान उगाए गए चावल के मामले में, टी7 (50% फसल अवशेष प्रतिधारण के साथ सीए) और टी8 (60% फसल अवशेष प्रतिधारण के साथ सीए) ने अन्य उपचारों की तुलना में काफी अधिक अनाज उपज दर्ज की। इसी प्रकार, सभी विकास चरणों में टी7 और टी8 में शुष्क पदार्थ संचय और पत्ती क्षेत्र सूचकांक का उल्लेखीय रूप से उच्च मूल्य दर्ज किया गया।

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

पूर्वी चंपारण क्षेत्र में कृषि, मत्स्य पालन और पशुपालन में अच्छी कृषि क्रियाओं के माध्यम से छोटे किसानों की आजीविका में सुधार। किसानों के खेतों पर विभिन्न कृषि प्रौद्योगिकियों का प्रदर्शन कर कृषि उत्पादन और आय में वृद्धि के लिए पूर्वी चंपारण जिले के ब्लॉक तेतरिया के चार चयनित गांवों, अर्थात् उझिलपुर, हसनपुर, नरहा पानापुर और बलभदरपुर में चयनित किसानों को तकनीकी ज्ञान और अन्य विभिन्न विस्तार गतिविधियों के साथ महत्वपूर्ण कृषि इनपुट प्रदान किए गए। बेहतर और अधिक उपज देने वाली उपयुक्त फसल किस्मों के साथ बीज प्रतिस्थापन उच्च निरंतर उत्पादन, आय और आजीविका प्राप्त करने में एक शक्तिशाली उपकरण के रूप में उभरा।

रबी मक्का में सिंचाई जल बचत की तकनीकें

जल उपयोग दक्षता और फसल उपज के संदर्भ में अधिकतम लाभ प्राप्त करने के लिए सिंचाई की प्रभावी विधि और स्तर की पहचान करने के उद्देश्य से रबी सीजन 2021-2022 के दौरान भा.कृ.अनु.प-महात्मा गाँधी समेकित कृषि अनुसंधान संस्थान के कृषि क्षेत्र में एक प्रयोग किया गया था। प्रयोग में पांच सिंचाई विधियों और तीन सिंचाई स्तरों वाले कुल 15 उपचार संयोजन शामिल थे जिनमें विभाजित प्लाट अभिकल्पना में तीन प्रतिकृति (Replications) शामिल थीं।

प्रमुख फल और सब्जी फसलों की तुराई उपरांत नुकसान का अध्ययन

ई. चंपारण के प्रमुख फलों आम और लीची एवम सब्जियों जैसे टमाटर, कद्दूवर्गीय, फूलगोभी की तुराई उपरांत नुकसान का अध्ययन 2022 के दौरान चकिया और पकड़ीदयाल ब्लॉक के 3-3 गांवों में किया गया। तुराई उपरांत नुकसान का अध्ययन 15-30 उत्पादकों, थोक विक्रेताओं और 30 खुदरा विक्रेताओं द्वारा एक प्रश्नावली और प्रत्यक्ष शोध आधारित सर्वेक्षण से किया गया। लीची में तुराई के 2 दिन बाद लगभग 33% नुकसान पाया गया, जबकि आम में तुराई के 5 दिन बाद यह 21% पाया गया। विभिन्न स्तरों में खुदरा विक्रेताओं के स्तर पर सबसे ज्यादा नुकसान लीची और आम में क्रमशः 21 और 12% दर्ज किया गया है। सब्जियों की फसल तुराई के बाद के नुकसान के अध्ययन में फूलगोभी में सबसे अधिक नुकसान (26.5%) दर्ज किया गया, इसके बाद टमाटर (18.7%) का पाया गया। फसल तुराई उपरांत नुकसान के संभावित कारणों में उचित सफाई और धुलाई की कमी, फसल की क्षणभंगुर्ता, भंडारण सुविधा की कमी और तुराई के बाद प्रबंधन प्रथाओं के ज्ञान और कौशल की कमी नुकसान का प्रमुख कारण बताया गया।

पोल्टी पक्षियों का अवरोध विश्लेषण और प्रदर्शन मूल्यांकन

बिहार के पूर्वी चंपारण जिले में पोल्टी पक्षियों के बाधा विश्लेषण और प्रदर्शन का मूल्यांकन, प्रश्नावली और किसानों के साथ सीधे साक्षात्कार के माध्यम से आधारभूत सर्वेक्षण के आधार पर किया गया। प्रत्येक गांव क्लस्टर/उपखंड से 30 कृषक परिवारों का चयन किया गया और उन्हें तीन समूहों (n=10) में वर्गीकृत किया गया। समूह-I: उन्नत कुक्कुट किस्म का प्रावधान; समूह-II: मुर्गी पालन+ किसानों का क्षमता निर्माण/प्रशिक्षण और समूह-III: मुर्गी पालन+ किसानों का क्षमता निर्माण + नियमित निगरानी और सलाह। चूजों का औसत प्रारंभिक शारीरिक वजन (आयु का पहला सप्ताह) 70.25 ग्राम था। 8वें सप्ताह में शरीर का वजन 0.80 से 1.25 किलोग्राम तक था। शुरुआती महीने में मृत्यु दर अगले महीने की तुलना में अधिक थी।

आर्द्रभूमि पारिस्थितिकी तंत्र में बकरी आधारित एकीकृत कृषि मॉडल

अध्ययन का उद्देश्य बकरी-आधारित दो आईएफएस मॉडल अर्थात् मॉडल I (बकरी-फसल एकीकरण) और मॉडल II (बकरी-फसल और मछली एकीकरण) की तुलना करना था। खरीफ फसलों से कुल सकल राजस्व और प्रति इकाई क्षेत्र (एम2) रु 15826 एवं रु 5.13 था। मॉडल-I में बकरी, फसल और बागवानी घटकों से सकल कुल आय रु 85,904 थी। मॉडल II में विभिन्न घटकों जैसे बकरी, फसल, बागवानी और मछली से सकल कुल आय रु 134609 से प्राप्त हुआ। मॉडल-I और मॉडल-II में प्रति यूनिट हेक्टेयर कुल राजस्व रु 214760 एवं रु 336523 क्रमशः। उत्तरी बिहार के जल-जमाव वाले पारिस्थितिकी तंत्र में प्रति इकाई क्षेत्र राजस्व सृजन के मामले में मॉडल II मॉडल I (बकरी-फसल एकीकरण) से तुलनात्मक रूप से बेहतर था।

उत्तर बिहार की स्थितियों में चावल-गेहूं फसल प्रणाली में प्राकृतिक खेती का आकलन

यह अध्ययन संस्थान अनुसंधान फार्म, आईसीएआर-एमजीआईएफआरआई, पिपराकोठी, पूर्वी चंपारण, बिहार में चावल-गेहूं फसल प्रणाली में प्राकृतिक खेती का आकलन करने के लिए आयोजित किया गया। तीन प्रतिकृति के साथ आठ उपचार भूखंडों का एक सेट (प्रत्येक भूखंड का आयाम 54 मीटर x 8.85 मीटर और 478 वर्ग मीटर का क्षेत्र था) यादृच्छिक ब्लॉक डिजाइन में आवंटित किया गया। खरीफ सीजन में, प्रत्येक प्लॉट में स्वर्ण सब 1धान किस्म की खेती की गई थी। नीमास्त्र(एनएम), अग्निआस्त्र (एजी); और ब्रह्मास्त्र (बीएम) का उपयोग प्राकृतिक खेती उपचार में कीड़ों और कीटों के संक्रमण को नियंत्रित करने की आवश्यकता के अनुसार किया गया।

बाढ़ क्षेत्र पारिस्थितिकी तंत्र के तहत मछली आधारित एकीकृत खेती मॉडल का विकास और मूल्यांकन

भारत में 0.35 मिलियन हेक्टेयर बाढ़ क्षेत्र है, जो ज्यादातर भारत के पूर्वी क्षेत्र में वितरित है। भारत के पूर्वी क्षेत्र के बाढ़ क्षेत्रों में चावल और मछली पालन प्रमुख कृषि पद्धतियाँ हैं और उनकी उत्पादकता क्रमशः 1.0-1.5 टन हेक्टेयर 'वर्ष' और 0.05-1.1 टन हेक्टेयर 'वर्ष' के बीच होती है; जो कि चावल और मछली के राष्ट्रीय औसत उत्पादकता से बहुत कम। मछली आधारित एकीकृत कृषि प्रणालियाँ बाढ़ के मैदानी आर्द्रभूमि संसाधनों के कुशल उपयोग में महत्वपूर्ण भूमिका निभा सकती हैं। इस शोध कार्य का उद्देश्य बाढ़ के मैदानों के लिए मछली आधारित आईएफएस मॉडल विकसित करना और आईएफएस मॉडल की उत्पादकता, आर्थिक आंकलन और ऊर्जा उपयोग दक्षता का आकलन करना।

एससीएसपी योजना

1979-80 में, छठी पंचवर्षीय योजना अवधि में, भारत सरकार ने विशेष घटक योजना (एससीपी) की शुरुआत की, जिसे अप्रैल, 2006 में अनुसूचित जाति उप-योजना का नाम दिया गया। एससीएसपी योजना का मुख्य उद्देश्य अनुसंधान, विकास और प्रौद्योगिकियों का अनुकूलन को बढ़ावा देना जिससे शहरी/ग्रामीण क्षेत्रों में अनुसूचित जाति समुदायों के जीवन की गुणवत्ता में सुधार हो। साथ ही, योजनाओं को और अधिक महत्वपूर्ण बनाने के लिए संसाधन और अन्य इनपुट प्रदान करके, गरीबी रेखा से नीचे रहने वाले अनुसूचित जाति के लिए आर्थिक प्रगति की परिवार-उन्मुख योजनाएं शुरू करना। आईसीएआर-महात्मा गांधी एकीकृत कृषि अनुसंधान संस्थान, पिपराकोठी, मोतिहारी, बिहार, इस योजना को बिहार के पूर्वी चंपारण जिले में लागू कर रहा है। एससी-एसपी के तहत विभिन्न क्षमता निर्माण और जागरूकता कार्यक्रमों, इनपुट वितरण (बीज, उर्वरक, कृषि उपकरण/ उपकरण/ मशीनरी, बकरी, चूजे, पौधे आदि) कार्यक्रम के माध्यम से 1000 से अधिक एससी किसानों/व्यक्तियों को लाभान्वित किया गया।

अनुसंधान परियोजनायें प्रकाशन, पुरस्कार और मान्यताएं

आईसीएआर-एमजीआईएफआरआई के वैज्ञानिक 12 संस्थान परियोजनाओं, 2 बाह्य वित्त पोषित परियोजनाओं, एससीएसपी परियोजनाओं सहित काम कर रहे हैं। 2022 के दौरान, इस संस्थान के वैज्ञानिकों ने 14 शोध पत्र, 5 पुस्तक अध्याय, एक प्रसार फोल्डर और 1 पत्रक लेख/बुलेटिन प्रकाशित किया है। वैज्ञानिकों को पुरस्कार, सम्मान और मान्यताएं से सम्मानित किया गया है।

मानव संसाधन विकास, प्रशिक्षण एवं क्षमता निर्माण

संस्थान के 6 कर्मचारियों ने विभिन्न संगठनों से विभिन्न विषयों पर प्रशिक्षण प्राप्त किया; आईसीएआर-एमजीआईएफआरआई ने किसानों एवम अन्य हितधारकों के लिए 11 प्रशिक्षण/क्षेत्र प्रदर्शन कार्यक्रम, तथा 28 विभिन्न कार्यक्रम आजादी का अमृत महोत्सव के तहत आयोजित किए, जिससे कई किसानों को लाभ हुआ।

स्वच्छ भारत अभियान

आईसीएआर-एमजीआईएफआरआई के सभी संबंधित व्यक्तियों ने स्वच्छ भारत अभियान में सक्रिय रूप से भाग लिया और संस्थान परिसर, सार्वजनिक स्थानों और गांवों में 2022 के दौरान 40 सफाई कार्यक्रम, 5 स्वच्छता जागरूकता अभियान आयोजित किए गए। इसके साथ ही आसपास के गांव के लोगों और विद्यार्थियों को भी स्वच्छता के लिए प्रेरित करने का अभियान चलाया गया।

EXECUTIVE SUMMARY

Land Shaping for development of Horti-based IFS models

Land shaping techniques have been executed for the rehabilitation of low-lying waterlogged areas by converting the raised and sunken bed system. Horti-based cropping system has been implemented under different land shaping models viz. model I: (1.0 m depth), Model II (1.4 m depth) & Model III (1.8 m depth). During kharif 2022 economic analysis of various models showed that the highest gross income was obtained from model I (Rs. 68325.68/ha) followed by model II (Rs. 58023.65/ha) and model III (Rs. 43066.73/ha). Under animal component ducklings (50no.) were introduced during Feb.-March 2023 under model II.

Organic rice-fish-duck IFS model

To evaluate organic rice culture and develop the organic rice-fish-duck Integrated Farming System (IFS) model, the experimental data from the first year revealed significant effects on yield attributes and rice yields based on different sources of nutrients, namely organic, organic + inorganic, and inorganic. The application of nutrients through inorganic and organic + inorganic sources resulted in significantly higher grain yield and harvest index compared to organic sources. The grain yield obtained from organic sources was 25.4% and 28.1% lower than that of inorganic and organic + inorganic sources, respectively.

Delineation and characterization of flood-prone and waterlogged areas

To understand the trend in rainfall, the efficiency of different trend analysis methods e.g., Mann-Kendall Test (MK), Modified Mann-Kendell Test (mMK), Sen's slope Estimator (SS), Innovative Trend Analysis (ITA) and Linear Regression (LR) were tested in this study. It was observed that significant trends were detected in 3 (8.77%), 17 (44.74%), and 15 (39.47%) time series using LR, MK and MM-K tests, respectively in *kharif* season, and a similar result was observed for *rabi* season. Thus, the results indicated that the ITA method is superior to the traditional M-Kor MM-K and LR tests.

Design and development of low-cost equipment's and machineries

The development of a sensor-based real-time automatic pond water depth monitoring system, utilizes advanced sensors to accurately measure and monitor the water depth in a pond, providing real-time data on water levels. The design, implementation, and validation of the system, highlighting its effectiveness in monitoring and managing pond water levels.

Optimum residue retention for yield maximization

In all the CA-based treatments, the grain yield of wheat grown during 2021-22 was found to be significantly higher than that of the farmer's practice (T1). In the case of rice grown during 2022-23, T7 (CA with 50 % crop residue retention) and T8 (CA with 60 % crop residue retention) recorded significantly higher grain yields than that of the other treatments. Similarly, significantly higher values of dry matter accumulation and leaf area index were recorded in T7 and T8 in all growth stages.

Improving livelihood of small farmers through good practices in agriculture, fisheries and animal husbandry -FFP

Improving the livelihood of small farmers through good practices in agriculture, fisheries, and animal husbandry in the East Champaran region. To demonstrate the various agricultural technologies at farmers' fields for enhancing agricultural production and income, critical inputs were made available to selected farmers in four selected villages, namely Ujhilpur, Hasanpur, Narha Panapur and Balbhadarpur of block Tetariya, district East Champaran along with technical knowledge through skill development programs, field visits and other various extension activities. Seed replacement with improved and high-yielding suitable crop varieties emerged as a powerful tool in achieving higher sustained production, income and livelihood.

Irrigation water saving techniques

A field experiment was conducted at the ICAR-MGIFRI research farm during the Rabi season of 2021-2022 to identify effective methods and levels of irrigation for achieving maximum benefits in terms of water use efficiency and crop yield. The experiment consisted of a total of 15 treatment combinations, including five irrigation methods and three irrigation levels, with three replications in to split plot design.

Post-harvest losses study of major fruit and vegetable crops

The post-harvest losses study of major fruits of E. Champaran namely mango and litchi were carried out in 2022 in 3 villages each of Chakiya and Pakridayal block. A questionnaire and direct investigation-based survey were done of 15 growers each of litchi and mango, a wholesaler, and 30 retailers. In Litchi about 33% post-harvest losses just after 2 days of harvesting whereas in the case of mango it was 21% after 5 days of harvesting. The highest loss has been recorded at the retailer level i.e. 21 & 12% respectively in litchi and mango. The PHL study of vegetables recorded highest loss (26.5%) in cauliflower followed by tomato (18.7%). The probable reasons of damage observed was lack of proper cleaning and washing, lack of storage facility and knowledge and skill of post-harvest management practices had shown major concern of losses.

Constraint analysis and performance evaluation of poultry birds

The study was aimed at constraint analysis and performance evaluation of poultry birds in the East Champaran district of Bihar. The target area of research was selected based on the baseline survey through a questionnaire and direct interviews with the farmers. Total of three sub-divisions (Areraj, Chakia and Motihari) were targeted for scientific intervention. From each village cluster/subdivision 30 farm families were selected and they were further categorized into three groups (n=10) viz. Group-I: provision of improved poultry variety; Group-II: Poultry+ capacity building/training of farmers and Group-III: Poultry+ capacity building of farmers + regular monitoring and advice. The average initial body weight of the chicks (1st week of age) was 70.25 g. The body weight in the 8th week ranged from 0.80 to 1.25 kg. Mortality in the initial month was higher than in the subsequent month.

Goat based integrated farming models in wetland ecosystem

The study aimed to compare two goat-based IFS models viz model I (goat-crop integration) and model II (goat-crop and fish integration). The overall gross revenue and per unit area (m²) from Kharif crops was Rs. 15826/- and 5.13. The gross total income from goat, yield, and horticultural components in Model-I was Rs. 85,904/-. The gross total income from various components viz. goat, crops, horticulture and fish in model II was Rs. 134609/-. The total revenue generated per unit hectare in Model-I and model-II was Rs. 214760/- and Rs. 336523/- respectively. The goat-crop-fish integration (model II) was comparatively superior to goat -crop integration in terms of revenue generation per unit area in the waterlogged ecosystem of north Bihar.

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

The study was conducted to assess the natural farming in the rice-wheat cropping system at the institute research farm, ICAR-MGIFRI, Piprakothi, East Champaran, Bihar. A set of eight experimental plots (the dimension of each plot was 54 m x 8.85 m and an area of 478 m²) was allocated for the experiment. In kharif season, the Swarna Sub I paddy variety was cultivated in each plot. The treatments were T1: conventional farming (only use of chemical fertilizer), T2: organic farming (only use of farm yard manure/cow dung), T3: semi-conventional farming (50 percent chemical fertilizer and 50 percent manure/cow dung), and T4: natural farming (no use of chemical fertilizer or manure/cow dung; Bijamrita and Jeevamrita was applied once). In order to standardize T4, it was further studied based on the frequency of applying Jeevamrita viz T5: (3 times), T6: (5 times) T7: (7 times) and T8: (9 times). Neemastra(Nm), Agniastra (Ag); and Brahmastra (Bm) were used as per the need to control the insect and pest infestation in field crops.

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

India occupies 0.35 million ha of floodplain, mostly distributed in the eastern region of India. Rice and fish farming are major farming practices in floodplains of the eastern region of India and their productivity ranged between 1.0-1.5 tonne ha⁻¹ year⁻¹ and 0.05-1.1 tonne ha⁻¹ year⁻¹, respectively; much lesser than the national average rice and fish productivity. Hence, there is immense scope not only for productivity enhancement but also income and employment. The fish-based integrated farming systems can play a vital role in the efficient utilization of floodplain wetland resources. The aim of this research work was to develop the fish-based IFS model for floodplains and to assess the productivity, economics, and energy use efficiency of the IFS model

Schedule Cast Sub Plan (SCSP)-Scheme

The socioeconomic difficulties suffered by SC communities led to the decision to implement measures to bridge the gaps and bring them into the mainstream. The need was explicitly recognized in the Constitution of India, which mandated special protection and provisions for the development of SCs/ STs. In 1979-80, sixth Five Year Plan period, the Government of India introduced the Special Component Plan (SCP) which was renamed as Scheduled Caste Sub-Plan in April, 2006. The SCSP scheme's main objective is to promote research, development and adaptation of technologies for improving the quality of life of SC communities in urban/ rural areas. Also, to introduce family-oriented schemes of economic progress of SCs below the poverty line, by providing resources and other inputs to make the schemes more significant. The ICAR-Mahatma Gandhi Integrated Farming Research Institute, Piprakothe, Motihari, Bihar, has been implementing this scheme in the east Champaran district of Bihar.

**Research projects
Publication, awards
and Recognitions**

Scientists of ICAR-MGIFRI are working on 12 institute project, 2 externally funded projects, SCSP project and 14 newly approved projects. During 2022, scientists from this institute have published 14 research papers, 3 book chapters, and 1 leaflet articles/ technical bulletins. Scientists have been recognized with awards, honours and recognitions.

**HRD, training &
capacity building**

Our 6 staffs received training on various topics from different organizations; ICAR-MGIFRI conducted 11 training/ on field demonstration programs, 28 different events including programs under Azadi Ka Amrut Mahotsav for farmers benefiting several farmers

**Swachha Bharat
Abhiyan**

All the concerned persons of ICAR-MGIFRI participated actively in Swachha Bharat Abhiyan and 40 cleaning events, 5 Swachhata awareness campaigns were conducted during 2022 at the Institute premises, public places and villages. Simultaneously, campaigns were organized to motivate neighboring village people and, students for cleanliness.

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Introduction

The ICAR-Mahatma Gandhi Integrated Farming Research Institute (erstwhile National Research Center on Integrated Farming) was established on 21 August 2015 with the aim to cater the research and development on integrated farming systems at the national level. The institute is located at Piprakothi, Bihar on a 25 acre of land along with its main office-cum-laboratory building, guesthouse and auditorium building. It is situated about 138 km north of Patna railway station and at about 143 km away from Patna Airport, and about 125 km from Darbhanga airport. The location of the Institute is at 26° 32' N, 84° 56' E. The research farm is located within the main institute complex with an area of 8.4 ha.

The foundation stone laying ceremony of the Mahatma Gandhi Integrated Farming Research Institute (MGIFRI) was held at Piprakothi, Motihari on 21 August, 2015, and the stakeholders meeting held at Patna on 17th September, 2015. An area of 25 acres (10 ha) was demarcated for the new institute which has been handed over by the state government. The site is adjacent to the national highway leading to Lucknow. Consequent to the transfer of land, the construction of office building and that of the farmer training hall and hostel was initiated by the CPWD and NPCC, respectively. The research farm of the Institute has been developed over 5.1 ha area. In May 2017, six scientists joined the institute, and the camp office of the institute was set up at KVK, Piprakothi, Motihari w.e.f. 1st July 2017. A bronze statue of Mahatma Gandhi was installed at the institute on the eve of his 150th Jayanti on 2 October 2018.

Flood is a natural disaster, which causes damage in vast areas, and destruction in the infrastructure, human settlements, public life and the economy. India is particularly prone to floods and the major flood-prone area is about 41.13

million ha, which is about 13% of 329 million ha of the geographic area as per a reliable estimate. It is a misery to about 113 million people i.e., about 9% of the population in India. Major flood-prone states in the country are Uttar Pradesh, Bihar, Assam, West Bengal and Odisha (Fig. 1).

In eastern India, waterlogging problems are associated mainly due to riverine, cyclonic floods and flash floods. In Bihar, waterlogging problem is the most serious and it occurs in about 0.8 million ha every year due to flooding from Nepal-based rivers viz. Gandak, Burhi Gandak, Bagmati, Koshi, Kamla-Balan etc. . In Bihar, 28 districts out of 38 are flood-prone, and 15 are the most vulnerable accounting for 17% of total flood-affected area of the country. Some of the major causes of waterlogging in the Gandak command include release of excess water during monsoon season in the canal system, superfluous irrigation supplies, over-irrigation, seepage from canals, causing rise in the water table, accumulation of rain and flood waters in depressed land, silting and weed growth in canals, unfavorable outfall conditions and lack of surface/ subsurface drainage. Hence, natural resource management of these agro-ecosystems is very challenging for sustainable agricultural development and farmers' welfare. Rivers carry a high volume of discharges and sediments from the Himalayas. South Bihar also is heavily affected by excess discharges in the Ganga tributaries. About 57% of the total flood-affected people in the country belong to Bihar, out of which 76% reside in north Bihar. In north Bihar, about 76% of the land is flood-affected. In Odisha, cyclonic floods are devastating; consequently, large tracts of cultivable lands are under waterlogging of different depths and the problems of salinity. The productive potential of those lands is lying untapped.

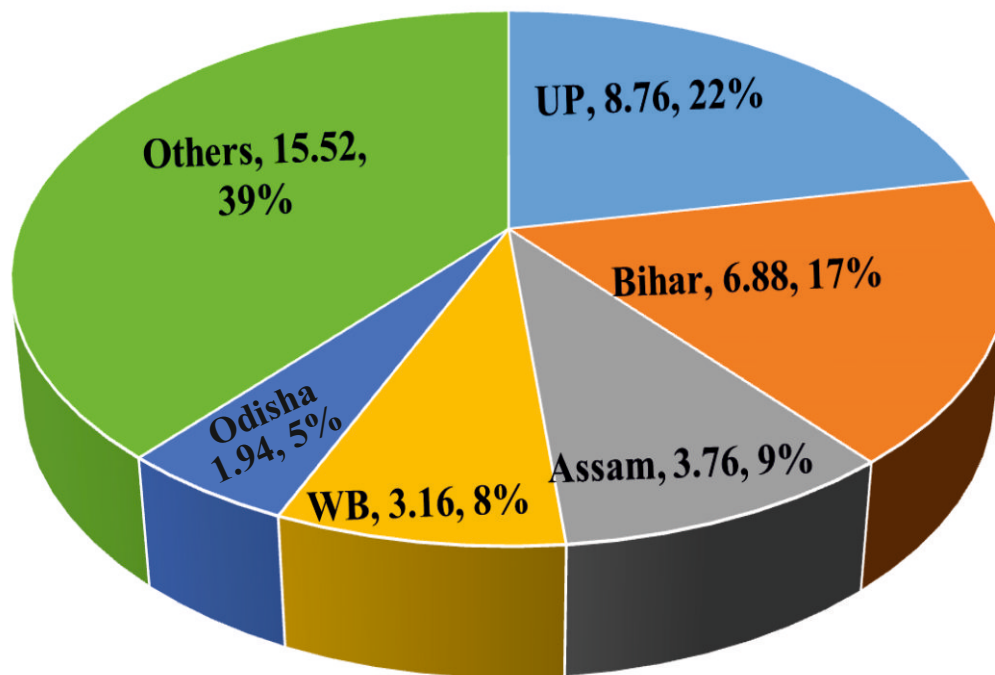


Fig. 1: Major flood-prone states in the country with area and percent of the total flood-prone area

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.

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

ORGANOGRAM



Fig. 2: Organogram of ICAR-MGIFRI

Research Achievements (Institute Projects)

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

Principal Investigator: Dr. A. K. Singh

Co- Investigators: Mr. Ravi Kumar, Dr. S.K. Samal, Dr. Shreya Nivesh, Dr. P.K. Bharti, Dr. S.K. Purbey and Dr. K.G. Mandal

Evaluation of organic rice culture to develop organic rice-fish-duck IFS model

Field experiment was conducted at ICAR-Mahatma Gandhi Integrated Farming Research Institute during the *kharif* season of 2022. The experimental soil had pH 8.57, organic carbon 0.24% and electrical conductivity 0.36 dS m⁻¹. The experiment consisting of three treatments (i. organic, ii. organic + inorganic, iii. inorganic sources of nutrients) was laid out in randomized block design with six replications using paddy variety *Swarna Samriddhi* (Fig. 3). The crop was transplanted at 25cm x 20cm spacing on 14.07.2022 and harvested on 21.10.2022. For nutrient management in paddy crop, N:P₂O₅:K₂O @120:60:40 kg ha⁻¹ was applied through various sources as per treatments. In organic sources of nutrients, the total quantity of N to be applied in paddy was applied through FYM in two splits (3/4th basal and 1/4th at tillering stage). In organic + inorganic sources of nutrients, half of the N was applied through FYM at the time of transplanting and half of the N through urea in three equal splits at transplanting, tillering and ear emergence. Balance quantity of P₂O₅ was applied through SSP. In inorganic sources of nutrients, total quantity of NPK was applied through Urea, SSP and MOP as per recommendation. FYM contained 0.5% N, 0.2% P₂O₅ & 0.5% K₂O and quantity of FYM was calculated based on N to be applied and N content in FYM.

Experimental data revealed that different sources of nutrients, i.e. organic, organic + inorganic and inorganic, had significant effect on yield attributes and yields of rice, except 1000-grain weight (Table 1 and 2). Inorganic sources of nutrients resulted significantly higher plant height, more number of reproductive panicle/hill, panicle length and number of grains/ panicle as compared with organic sources; however, it was at par with organic + inorganic sources. Organic + inorganic sources resulted in a significantly higher number of reproductive panicle/hill and panicle length as lengths to organic sources. Application of nutrients through inorganic and organic + inorganic sources, being at par, recorded significantly higher grain yield and harvest index over organic source. Straw yield was found significantly higher under inorganic sources as compared to organic sources. Grain yield obtained under organic sources was 25.4% and 28.1% lower than that of inorganic and organic + inorganic sources, respectively.

On-dyke vegetable: Bhindi

A field experiment was conducted to evaluate effect of organic, organic + inorganic and inorganic sources of nutrients on fruit yield of *bhindi* in randomized block design with six replications. The experiment was conducted on one side of dyke by developing IFS model during *kharif* season 2022 (Fig. 4). Experimental results revealed that organic + inorganic sources of nutrients resulted in significantly higher fruit yield of *bhindi* as compared to inorganic and organic sources of nutrients (Table 3). Differences in fruit yield recorded under inorganic and organic sources of nutrients were found at par. Fruit yield obtained under organic sources was

4.4% and 21.9% lower than that of inorganic and organic + inorganic sources, respectively

On-dyke fruit plantation: Banana and Pomegranate

Banana and pomegranate planting had been

done on the dykes of IFS model (Fig. 5). Banana (Grand Naine) was planted at the spacing of 1.5 m x 1.5 m in first week of August

Table 1: Yield attributes of paddy as affected by organic, organic + inorganic and inorganic sources of nutrients

Treatment	Plant height (cm)	No. of reproductive panicle/hill	Panicle length (cm)	No. of grains / panicle	1000 grain weight (g)
T1- Organic source	99.6 ^b	8.2 ^b	21.3 ^b	93.3 ^b	24.91
T2- Organic + Inorganic sources	103.7 ^{ab}	9.2 ^a	23.6 ^a	99.5 ^{ab}	25.57
T3- Inorganic sources	108.5 ^a	9.5 ^a	24.2 ^a	102.8 ^a	26.04
CD (p= 0.05)	5.4	0.75	1.6	7.8	NS

Table 2: Grain and straw yield of paddy under organic, organic + inorganic and inorganic sources of nutrients

Treatment	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest Index (%)
T1- Organic source	3.118 ^b	4.896 ^b	38.96 ^b
T2- Organic + Inorganic sources	4.180 ^a	5.744 ^{ab}	42.17 ^a
T3- Inorganic sources	4.340 ^a	5.831 ^a	42.72 ^a
CD (p= 0.05)	0.4751	0.8798	0.95

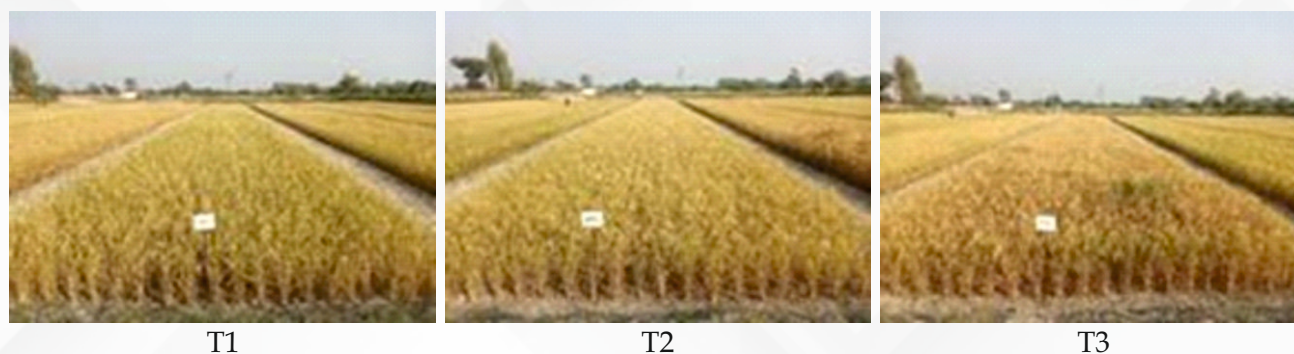


Fig. 3: Paddy crop at harvest. T1- organic source, T2- organic + inorganic sources, T3- inorganic sources

Table 3: Fruit yield of bhindi as affected by organic, organic + inorganic and inorganic sources of

Treatment	Fruit yield (t ha ⁻¹)
T1- Organic source	8.972 ^b
T2- Organic + Inorganic sources	11.484 ^a
T3- Inorganic sources	9.382 ^b
CD (p= 0.05)	1.389



Fig. 4: View of bhindi crop on dykeat different growth stages

Table 4: Growth parameters of banana and pomegranate

Growth parameters of banana and pomegranate		
A. Banana		
Parameters	September 2022	December 2022
Plant height (cm)	66.4 ± 6.28	145.0 ± 37.13
No. of leaves/plant	5.9 ± 0.68	11.9 ± 1.44
B. Pomegranate		
Plant height (cm)	38.3 ± 5.91	68.7 ± 12.16
No. of primary branches/plant	8.8 ± 3.26	5.2 ± 1.17



Banana



Pomegranate



Pomegranate



Gliricidia

Fig. 5: View of on-dyke plantation

2022. A total of three rows of banana (177 plants), two rows on top of dyke and one row on inner side slope of dyke have been planted. A total of 80 plants of *bhagawa* variety of pomegranate was planted on another dyke at spacing of 2.5m x 2m (1 row on dyke top, leaving 50cm from edge of dyke and 1 row on inner side slope of dyke) during 2nd fortnight of September. Both the fruit plants are growing well and growth parameters recorded are given in Table 4.

Gliricidia plantation on outer side of dykes

Plantation of *Gliricidia* had been raised on outer sides of dyke at plant-to-plant spacing of 1.0 m for green leaf manuring.

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

Principle Investigator: Dr. Koushik Banerjee
Co-investigators: Dr. Shreya Nivesh, Er. Vikas Paradkar, Dr. S.K. Samal, Mr. Ravi Kumar, Dr. S.K. Purbey, Dr. K.G. Mandal

An attempt is being made to identify the trend in seasonal rainfall of different districts of Bihar using time series daily rainfall data. Grided rainfall data was obtained from IMD and seasonal variation (*kharif* and *rabi*) in rainfall were observed in standard meteorological week basis for different districts of Bihar. The highest mean rainfall of *kharif* and *rabi* season was observed in Kishanganj (1973.73 mm) and Gopalganj (46.18 mm), while the lowest was recorded in Rohtas (819.17 mm), and Darbhanga (27.22 mm), respectively. In general, the rainfall variability was high ($CV > 30\%$) during the winter season in all the districts during *rabi* season. However, during *kharif* season, highest CV in rainfall was seen in Sheohar (30%) and lowest in Bhabua, Gaya and Munger (19%). To understand the trend in total rainfall, different trend analysis methods e.g., Mann-Kendall Test (MK), Modified Mann-Kendall Test (mMK), Sen's slope Estimator (SS), Innovative Trend Analysis (ITA) and Linear Regression (LR) were tested in this study. Efficiency of different methods in identifying trend in total rainfall both in *kharif* and *rabi* seasons was tested. Significant trends in monsoon rainfall (*kharif* season) in different districts were detected by ITA,

MK, MMK, SS and LR tests. Among these, ITA identified 27 districts in *kharif* season as having significant negative trend ($p < 0.05$ or $p < 0.01$), while, MK, MMK, SS and LR identified 17, 15, 15 and 3 districts respectively as having significant negative trend ($p < 0.05$ or $p < 0.01$) in *kharif* season. Similarly, in *rabi* season, ITA identified 31 districts as having significant negative trend ($p < 0.05$ or $p < 0.01$), while, MK, MMK, SS and LR identified 0, 6, 6 and 0 districts respectively as having significant negative trend ($p < 0.05$ or $p < 0.01$). The comparison between the results of trend detection by these methods is presented in Fig. 6. It was observed that significant trends were detected in 3 (8.77%), 17 (44.74%) and 15 (39.47%) time series using LR, MK and MM-K tests, respectively in *kharif* season. At the same time, ITA detected significant trends in 27 (71.05%) rainfall time series, which indicated that a large number of significant trends (especially decreasing), that were missed by MK/MM-K or LR, can be identified using the ITA method. Similarly, for *rabi* season, ITA detected 31 (highest as compared to other methods of trend analysis) number of time series rainfall data as having significant trend (81.58%). Additionally, the ITA also identified significant trends ($p < 0.05$ or $p < 0.01$) that were detected by LRA or M-K, MM-K test for different districts (or seasons). Apart from this, ITA detected trends in more time series, which cannot be detected by either LRA or M-K or MM-K tests. Our results on trend analysis in rainfall time series using the above five methods indicated that the new ITA method is superior to the traditional M-K or MM-K and LR tests.

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

Waterlogging is a condition in which excessive moisture or water content in soil deprives the crop root-zone of proper aeration.

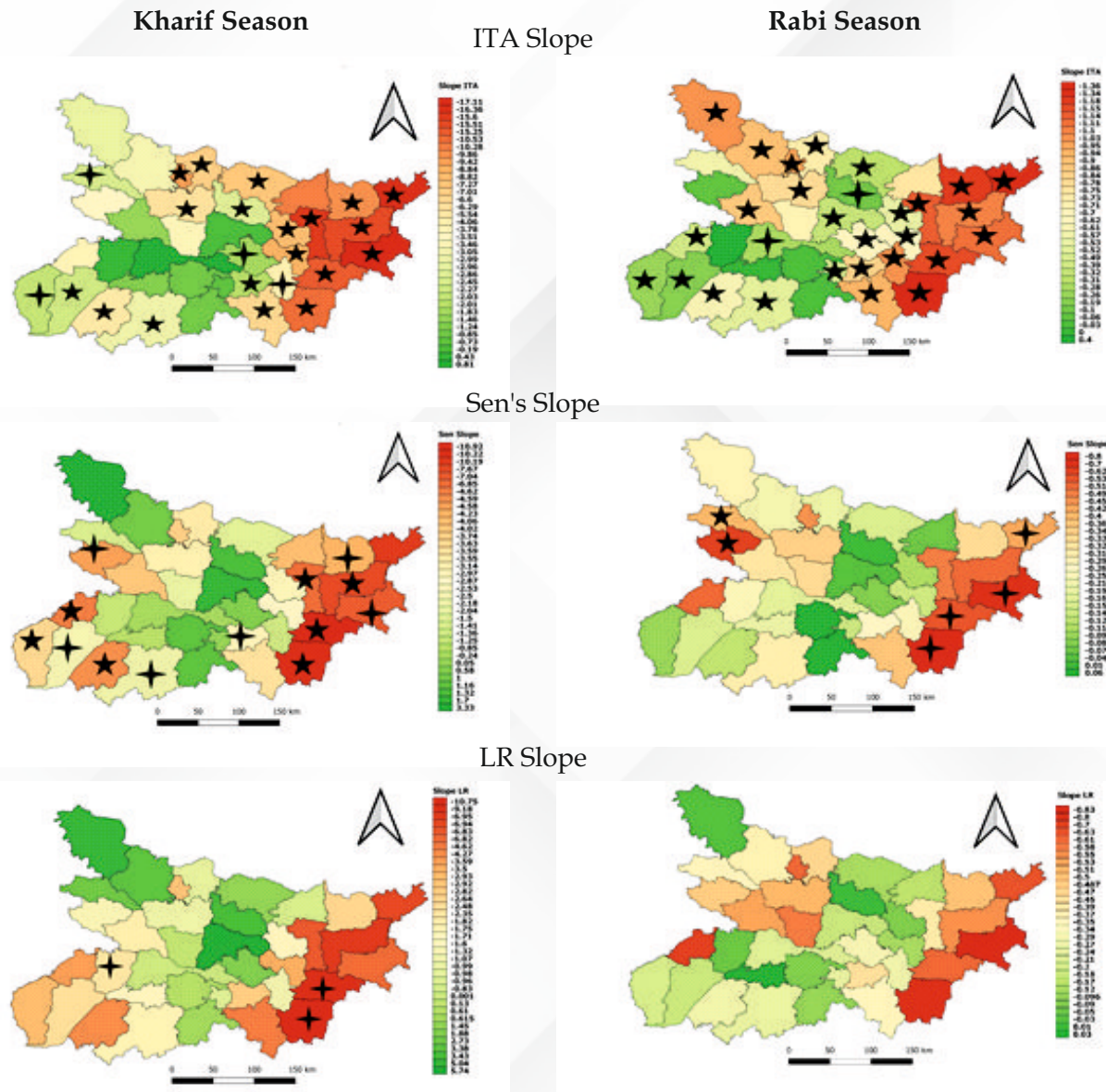


Fig. 6: Comparison of spatial variations of slope value in Kharif & Rabi seasons in Bihar★ , indicates significant at $p < 0.01$, ✦ indicates significant at $p < 0.05$)

This phenomenon is often observed in ecosystems where excess water is present, leading to two major problems - low agricultural productivity and under-utilization of excess water. In India, the decline in the per capita availability of land has led to a decrease in the operational farm area, making it necessary to manage natural resources such as land, water, and vegetation judiciously to meet the growing food requirements and maintain environmental security. The low productivity in waterlogged areas can be attributed to excess water stress during the wet season and deficit water stress in

the dry season. This has a significant impact on food producing enterprises like agriculture, horticulture, and aquaculture, which are mostly dominated by small and marginal farmers in India. To improve the productivity of these enterprises, it is essential to develop low-cost equipment and machinery that can handle labor-intensive operations such as plowing, planting, and weeding.

In rural areas of developing countries such as Sudan, Nigeria, and India, farmers often use simple implements and tools that utilize human and animal power. However, modern

agricultural equipment that can significantly improve agriculture production is often beyond the buying capacity of smallholder farmers. Therefore, there is a need to develop low-cost equipment and machinery that can handle these labor-intensive operations and increase crop production, thereby ensuring reasonable returns for farm families.

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

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

Keeping this in view, field experiment was conducted with aim to identify effective method and level of irrigation (quantity of irrigation water required) to achieve maximum benefits in terms of water use efficiency and crop yield at ICAR-MGIFRI research farm during *rabi* season 2021-2022. The experiment consisted of 15

treatments 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% ET_c) with three replications in split plot design. 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% ET_c was calculated on the basis of the CROPWAT 8.0 model and it was used in the experiment for assigning 3 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, 2021 with recommended dose of fertilizers (NPK @ 120:60:40 kg ha⁻¹). A full dose of P₂O₅ and K₂O and half of N were applied before planting. The remaining quantity of N was applied in two equal splits as per recommendation (Fig. 7). Growth observations on plant height and others were taken starting 15 days after sowing at regular intervals. Results of the study obtained from the 1st-year maize trial are shown in Table 5. Grain yield was observed maximum (8.9 t ha⁻¹) in irrigation method-F5 (Ridge-alternate furrow with furrow depth 30 cm) followed by F1 (Flat-flooding) and F4 (Ridge-alternate furrow with furrow depth 15 cm) while, in case of irrigation level, the yield was maximum in case of 80% of irrigation

Table 5: Grain yield and water use efficiency of maize (2021-2022)

Treatment Irrigation Methods	Grain yield (t ha ⁻¹)	ET (mm)	WUE (kg ha ⁻¹ mm ⁻¹)
F1 : Flat-Bed	8.60	775.0	11.09
F2 : Ridge Furrow-Furrow depth 15 cm	8.24	682.0	12.07
F3 : Ridge Furrow-Furrow depth 30 cm	8.23	650.5	12.65
F4 : Alternate Furrow-Furrow depth 15 cm	8.54	698.5	12.23
F5 : Alternate Furrow-Furrow depth 30 cm	8.90	562.0	15.83
Irrigation level			
I1: (ET _c =100%)	8.52	775.0	10.99
I2: (ET _c = 80%)	8.63	656.9	13.13
I3: (ET _c = 60%)	8.35	478.8	17.44



Maize crop at 20 Days

Maize crop at 40 Days



Maize crop at 60 Days

Maize crop at 90 Days



Maize crop at 120 Days

Maize crop at harvesting stage of crop

Fig. 7: Maize plant at different growth stages

requirement i.e., 8.63 t ha⁻¹. On the other hand, considering the water use efficiency the WUE varied from 11.09 to 17.44 kg ha⁻¹ mm⁻¹ with maximum value in case of F5 for irrigation methods and I2 in case of irrigation level. The statistical analysis of the data indicated that the results were non-significant in the case of both irrigation method and irrigation level.

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

Co-Investigator: Dr. A.K. Singh

A handful of literature is available, which shows that CA practice with crop residue retention is the superior practice for sustainable rice-wheat production in IGP. In general, 30% crop residue retention is recommended for CA practice. Therefore, the project is being carried out for determining the optimum level of crop residue retention for getting sustainable yield. The grain yield and its attributes of rice and wheat crops under different residue retention levels under conservation agriculture (CA) practice was compared with that of conventional tillage treatments. There was no significant effect of different treatments on the yield attributes data of wheat grown during 2021-22 (Table 6). However, the grain was significantly affected by the different treatments. The grain yield varied from 4.02 to 4.62 t ha⁻¹ under different treatments (Table 6). The yield of wheat under T1 was found to be significantly lower than that of all the CA based treatments and at par with that of conventional tillage based treatments.

The treatments T2 to T9 are statistically at par among themselves.

Plant height, panicle length, and 1000-grain weight were not significantly affected by different treatments in the rice grown during 2022-23 (Table 7). However, a significant alternation was recorded in the case of no. of effective panicles m⁻² and no. of grains per panicle. In all the CA-based treatments (T5-T8) significantly higher no. of effective panicles m⁻² and no. of grains per panicle were recorded as compared to the other treatments. The grain yield of rice varied from 2.77 t ha⁻¹ under T1 to 4.53 t ha⁻¹ under T7 (Table 7). Both T7 and T8 recorded significantly higher grain yields than the other treatments. Data on dry matter accumulation (DMA) and leaf Area Index (LAI) were recorded at the progressive growth stages of rice. On an average, significantly higher values of DMA and LAI were recorded in T7 (NT-RL3) and T8 (NT-RL4) in all growth stages (Fig. 8 and Fig. 9). Different small letters denote significant difference among the values, across the treatments. Soil organic carbon in the soil of the different treatments was analysed after harvest of the crop. The data revealed that in 0-15 cm soil depth, there was significantly higher SOC in T6 (NT-RL2), T7 (NT-RL3) and T8 (NT-RL4) (Fig. 10). However, no significant difference was observed among the treatments in 15-30 cm soil depth (Fig. 10). The study demonstrated that after 3-4 cropping cycle CA practice with 50-60% residue retention (Fig. 11) provides higher yield with improvement of SOC.

Table 6: Yield and its attributes of wheat as affected by treatments

Treatment	Plant height (cm)	No. of effective panicles m ⁻²	Panicle length (cm)	No. of grains per panicle	1000-grain weight (g)	Grain yield (t ha ⁻¹)
T1: CT-FP	100 ^a	325 ^a	11.4 ^a	48.2 ^a	40.1 ^a	4.020 ^b
T2: CT-BF	101 ^a	347 ^a	11.6 ^a	49.1 ^a	40.9 ^a	4.250 ^{ab}
T3: CT-M	101 ^a	351 ^a	11.5 ^a	49.2 ^a	39.5 ^a	4.300 ^{ab}
T4: CT-S	99.5 ^a	355 ^a	11.4 ^a	50.0 ^a	40.4 ^a	4.310 ^{ab}
T5: NT-RL1	100 ^a	375 ^a	11.4 ^a	53.2 ^a	39.8 ^a	4.620 ^a
T6: NT-RL2	99.3 ^a	371 ^a	11.4 ^a	51.3 ^a	39.0 ^a	4.600 ^a
T7: NT-RL3	101 ^a	362 ^a	11.4 ^a	50.9 ^a	40.5 ^a	4.600 ^a
T8: NT-RL4	99.4 ^a	369 ^a	11.5 ^a	49.8 ^a	38.8 ^a	4.530 ^a
T9: CT-RL5	99.5 ^a	353 ^a	11.4 ^a	48.8 ^a	40.0 ^a	4.300 ^{ab}

*CT-FP: Conventional tillage and farmers' fertilization practice; *CT-BF: CT with balance fertilization; *CT-M: CT with mungbean residue incorporation and balance fertilization; *CT-S: CT with *Sesabania* residue incorporation and balance fertilization; *NT-RL1: No-tillage with 30% rice and wheat residue retention, 100% mungbean residue retention and balance fertilization; *NT-RL2: NT with 40% rice and wheat residue retention, 100% mungbean residue retention and balance fertilization; *NT-RL3: NT with 50% rice and wheat residue retention, 100% mungbean residue retention and balance fertilization; *NT-RL4: NT with 60% rice and wheat residue retention, 100% mungbean residue retention and balance fertilization; *NT-RL5: Conventional tillage with 30% rice incorporation.

Table 7: Yield and its attributes of rice under conventional and conservation agriculture treatments

Treatment	No. of effective panicles m ⁻²	Panicle length (cm)	No. of grains per panicle	1000-grain weight (g)	Grain yield (t ha ⁻¹)
T1:CT-FP	232 ^b	23.1 ^b	98.7 ^b	26.7 ^a	3.05 ^e
T2: CT-BF	242 ^b	23.7 ^{ab}	103 ^{ab}	26.7 ^a	3.49 ^{de}
T3: CT-M	270 ^b	24.3 ^{ab}	105 ^{ab}	27.0 ^a	3.93 ^{cd}
T4: CT-S	277 ^b	24.1 ^{ab}	108 ^{ab}	27.6 ^a	3.96 ^{cd}
T5: NT-RL1	323 ^a	23.7 ^{ab}	110 ^a	27.7 ^a	4.11 ^{bcd}
T6: NT-RL2	326 ^a	23.8 ^{ab}	111 ^a	26.9 ^a	4.18 ^{bc}
T7: NT-RL3	338 ^a	23.9 ^{ab}	110 ^a	28.5 ^a	4.99 ^a
T8: NT-RL4	330 ^a	24.8 ^a	113 ^a	27.6 ^a	4.62 ^{ab}
T9: CT-RL5	243 ^b	24.3 ^{ab}	108 ^{ab}	27.8 ^a	3.52 ^{de}

*Different small letters denote significant difference among the values, across the treatments.

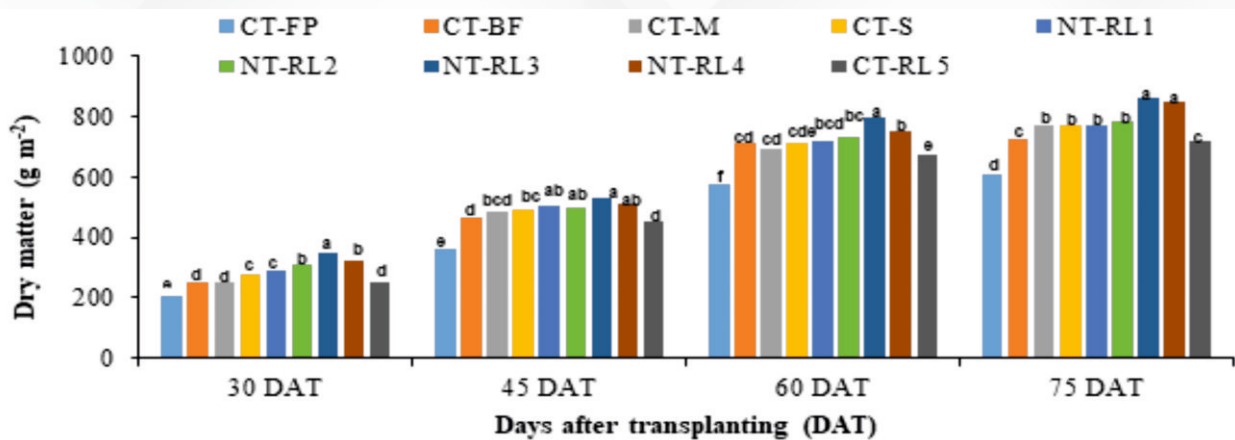


Fig. 8: Dry matter accumulation at progressive growth stages of rice grown during 2022-23. Different small letters denote significant difference among the values, across the treatment

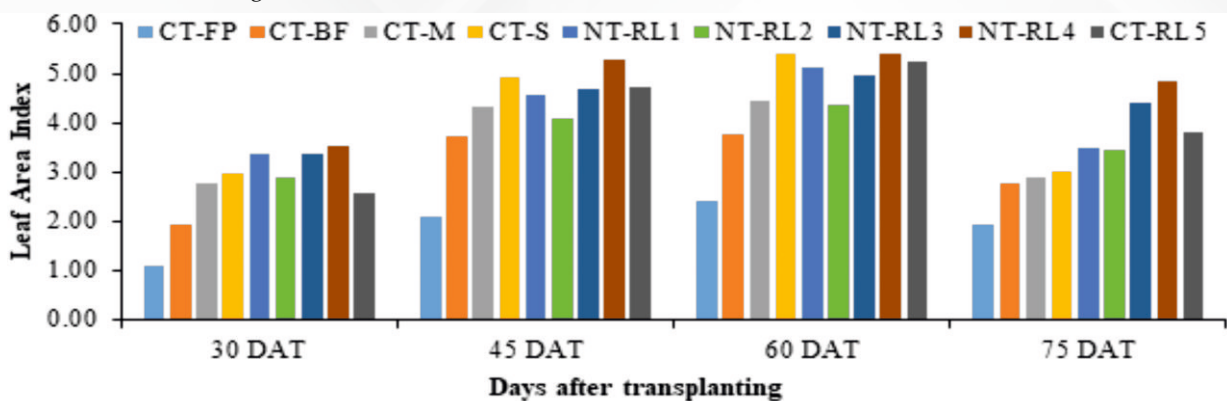


Fig. 9: Leaf area index at progressive growth stages of rice grown during 2022-23.

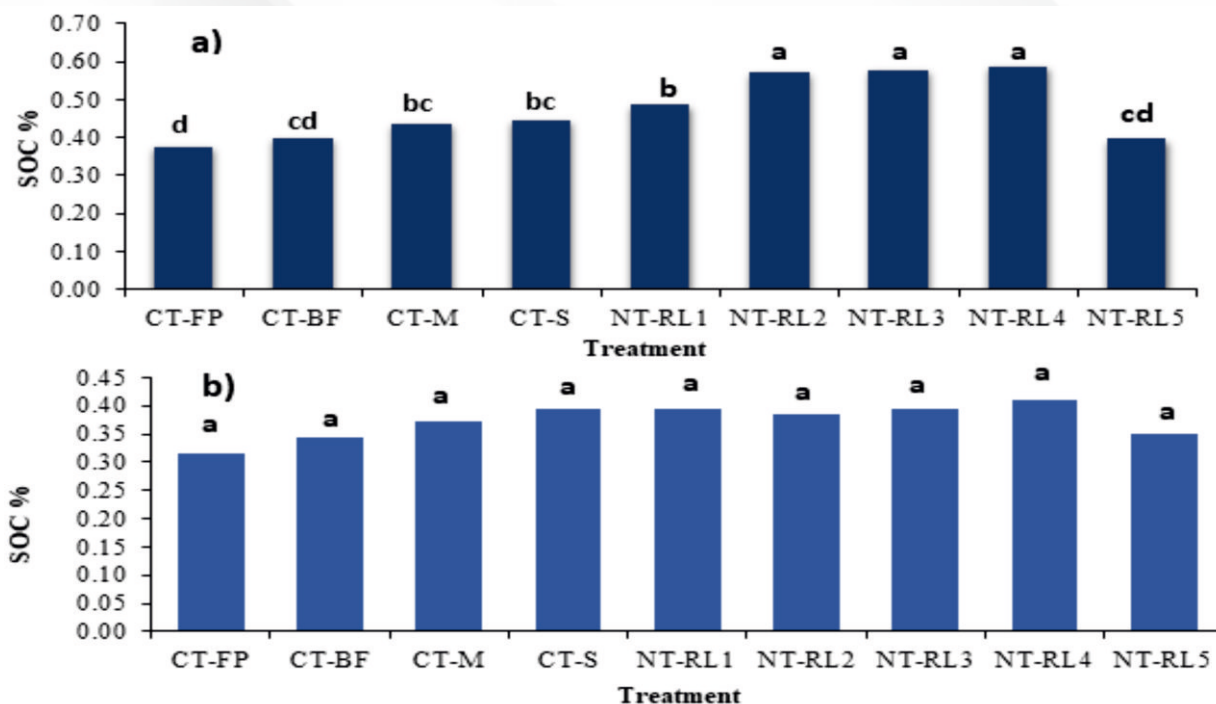


Fig. 10: Status of Soil Organic Carbon (SOC) a) in 0-15 cm and b) 15-30 cm soil depth after harvest rice crop grown during 2022-23. Different small letters denote significant difference among the values, across the treatment



Fig. 11: Field photographs of the project site

Land shaping for development of Horti-based IFS models for low-lying areas of Bihar

Principal Investigator: Dr. S.K. Purbey

Co- Investigators: Dr. P.K. Bharti, Dr. A.K. Singh, Dr. Shreya Nivesh, Dr. S.K. Samal, Mr. Ravi Kumar, Dr. K.G. Mandal

Land shaping techniques have been implemented to rehabilitate low-lying waterlogged areas by converting them into raised and sunken bed systems. A horticulture-based cropping system has been established under the land shaping system using three models: Model I (1.0 m depth), Model II (1.4 m depth), and Model III (1.8 m depth). In 2021 and 2022, various fruit seedlings were planted along both edges of the raised beds at a distance of 22 ft (Fig. 12-16). The results showed that after one year of planting, the survival

percentage and vegetative growth of jamun and bael were better compared to mango. Guava, drumstick, lemon, and papaya were also planted between the major fruit crops at a distance of 5 ft. Among the guava varieties, Allahabad Safeda performed better than Sweta and Lalit. Guava and drumstick plants started yielding in the second year after planting. In *kharif* 2022, the plantation of fruit crops such as custard apple, water apple, and mango was carried out on the embankment of the raised bed of Model III due to its greater height (1.8 m) and the lack of compaction in the newly developed land-shaped area. The initial pH values of the raised beds ranged from 8.65 to 8.35, while the organic carbon content was between 0.16% and 0.20% (at a soil depth of 5-30 cm). Similarly, the pH values of the sunken beds ranged from 8.70 to 8.75, and the organic carbon



Fig. 12: Fruit plantation on embankment of raised bed

content ranged from 0.12% to 0.16% (at a soil depth of 0-15 cm). The study on growth parameters such as height, number of primary branches, and collar diameter of various fruit plants planted on the embankment of raised beds under different models was conducted during December 2022 to January 2023. It was observed that drumstick exhibited the best performance, with a height of 390 cm and a collar diameter of 3.9 cm. Jamun followed with a height of 187.5 cm and a collar diameter of 2.08 cm, while bael achieved a height of 181.25 cm and a collar diameter of 1.51 cm. Guava and drumstick plants started yielding from the second year after planting, with guava producing an average yield of 2.35 kg per plant and drumstick producing an average yield of 1.75 kg per plant. In *kharif* 2022, fruit crops such as custard apple, water apple, and mango were planted on the embankment of raised beds in Model III, and the survival percentage ranged from 87% to 94%.

Performance of different field and vegetable crops grown on raised and fish & chestnut in sunken bed

Wheat, mustard and pigeon pea under field crop and onion, carrot, coriander, chilli, fenugreek, spinach and garden pea under vegetable component were grown on model I (1.0 m) whereas in sunken bed fish and water chestnut were cultivated during *rabi* season 2021-22. The highest yield was obtained in

spinach (19.03 t ha^{-1}) followed by onion (11.69 t ha^{-1}) and carrot (8.10 t ha^{-1}). Under field crops the highest yield was obtained from wheat (3.67 t ha^{-1}) followed by pigeon pea (2.3 t ha^{-1}). The performance of water chestnut yield (0.96 t ha^{-1}) was better than fish (0.066 t ha^{-1}) under sunken bed (1.0 m) at low water level. The performance of various field crops viz. lentil, maize, faba bean and *rajma* under model II (1.4 m) (Fig. 13) showed that maize gave highest yield (5.21 t ha^{-1}) followed by pigeon pea (2.78 t ha^{-1}) and faba bean (2.23 t ha^{-1}). Whereas in case of vegetable crops potato recorded the highest yield (12.85 t ha^{-1}) followed by radish (10.55 t/ha) and onion (7.0 t ha^{-1}). Under sunken bed again the performance of water chestnut (2.83 t ha^{-1}) was better than fish (0.083 t ha^{-1}) due to low water level during the growth period (Fig. 13). The highest yield was recorded in potato (14.43 t ha^{-1}) followed by cabbage (9.18 t ha^{-1}) and fenugreek (9.09 t ha^{-1}). In model III (1.8 m), the field crop maize, mustard, chick pea, potato, brinjal, onion, pea, radish and bottle gourd cropping sequence was adopted on raised bed whereas fish in sunken bed. Among the field crop maize gave the highest yield (4.68 t ha^{-1}) followed by pigeon pea (2.96 t ha^{-1}) and mustard (1.1 t ha^{-1}). In sunken bed the fish yield (0.38 t ha^{-1}) as compare to other two model. The highest gross income was obtained from model II ($\text{₹} 99860.16 \text{ ha}^{-1}$) followed by model I ($\text{₹} 88896.50 \text{ ha}^{-1}$) and model III ($\text{₹} 82602.32 \text{ ha}^{-1}$).



Fig. 13: Sunken bed harvested water chestnut in Model II and fish of Model III



Fig. 14: Raised bed crops during *rabi* + summer in model II



Fig. 15: Sunken and raised bed view of Model I & II

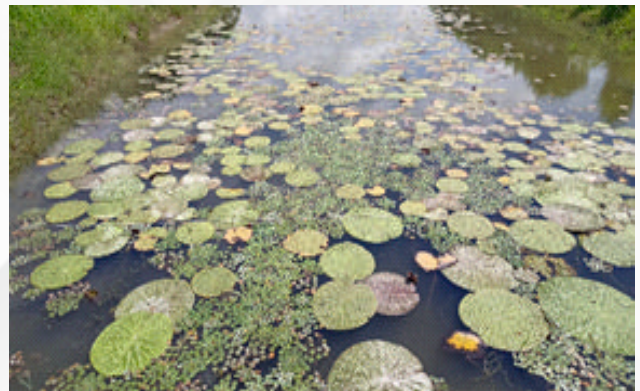
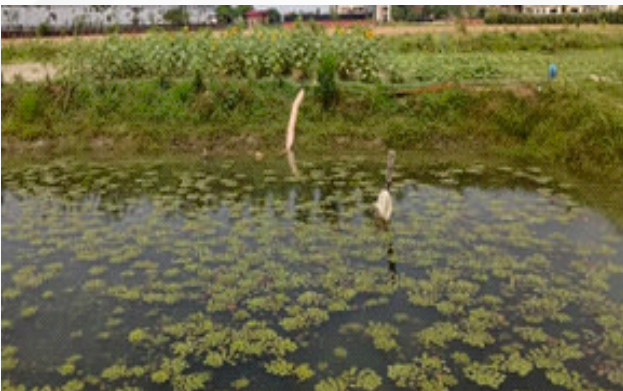


Fig. 16: Sole crop of water chestnut vs. *makhana* + water chestnut

The gross income obtained from raised bed was ₹158595 ha⁻¹ (model I), ₹ 151386.42 ha⁻¹ (model II) and 101911.575 ha⁻¹ (model III) whereas in sunken bed it was ₹ 85000.20 ha⁻¹ (chestnut) or 11667.6 ha⁻¹ (fish); ₹ 43983.80 ha⁻¹ (fish) and ₹ 28890 ha⁻¹ (water chest nut) or ₹ 9506 ha⁻¹ (fish) from model II, III and I respectively during *rabi* + summer season 2021-22. In sunken bed, about 1.5 feet water depth was maintained throughout the growing period.

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

During summer (April-June) the post-harvest losses study of tomato, and cucurbitaceous vegetables has been carried out in Pipra, Madhuban and Mahuawa village of Chakiya block. Multiple regression analysis was run to determine the predictors (independent variables) that contribute to fresh produce PHL. The critical concerns for the cause of post-harvest losses at producer level were; damage during harvest (2-3%), damaged due to diseases & insect (3-5% during summer). Whereas at *mandi* and retailer level the mechanical damage (4-7%) and pathological damage (9-12%) has been recorded. The probable reasons of damage observed was lack of proper cleaning and washing which showed a positive relationship between each independent variable and the dependent variable. Lack of storage facility and knowledge and skill of post-harvest management practices had shown major concern of losses at *mandi*/market and retailer level.

The post-harvest losses study of major fruits of E. Champara namely mango and litchi were carried out during May – July 2022 in 3 villages of Chakiya block. A questionnaire based survey was done of 15 growers each of litchi and mango, whole seller and 30 retailers. In litchi the physiological losses was recorded maximum (18%) followed by pathological losses (9%) and 6% of mechanical losses just after 3 days of harvesting. The maximum losses was observed at retailer level (21%) followed by wholesaler and farmers level. Whereas, in case of mango the pathological losses has been recorded highest (11%) followed by mechanical and

physiological losses. Again, the maximum loss (12%) was observed at retailer stage followed by wholesaler and field level. The potential risk factors prioritized for post-harvest losses of fruits might be lack of pack house unit including storage facility (55%) was the major reason, followed by processing unit (32%) and skill and knowledge related to harvesting, handling etc.(13%). The post-harvest losses study of tomato, cauliflower and cabbage was carried out in three villages of Kotwa and Tirkolia block of E. Champaran during October 2022 to March 2023. A questionnaire-based survey of 120 farmers, 10 local *mandi*/wholesale markets and 30 retailers were done and it has been found that among the respondents 72% belonged to small farm size category followed by medium (24%) and 4% belonged to the large farm size. The total post-harvest losses was found maximum in cauliflower (26.5%) followed by tomato (18.7%) and cabbage (15.6%) including all stages of supply chain i.e. farmer, wholesaler and retailer stage. The maximum losses have been recorded at the retailer level (18-28%). The physiological losses were maximum (7-10%) during handling and transport whereas pathological losses were maximum (13-21%) at retailer level. The potential reason/ risk factors prioritized of post-harvest losses might be lack of skill and knowledge related to harvesting, handling and at field level was the major constraint whereas at wholesale and retail level the perishability and lack of proper storage facility was the main problem of post-harvest losses of vegetables.

Constraints 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

The research work was conducted in East Champaran district of Bihar. The target area for the study was selected based on the base line survey through questionnaire and direct interview with the farmers involved directly or indirectly in poultry farming in the East Champaran district. Approximately 350 poultry farmers were randomly surveyed through direct interview and questionnaire. A minimum of 10 farmers from one village, two villages from one

block and two blocks from each sub-division were targeted to collect data. The farm family or beneficiaries for each cluster of villages was 30, hence total 90 farm families were targeted for intervention. The selected farm families/beneficiaries will be categorized based on their economic conditions viz. small, marginal farmers and landless etc. A total of 90 farmers were selected (30 from each village cluster/sub-division) and categorized in three groups viz. Gr-I: only improved germplasm was given without capacity building/training, Gr-II: poultry+ capacity building along and Gr-III: poultry+ capacity building + needful monitoring and supplements were given. Poultry was distributed in three village clusters one in each subdivision of Areraj, Chakia and Motihari. Each farm family was provided with improved germplasm of poultry in form of chicks for *Vanaraja* varieties @40 birds per family. Some basic inputs like maintenance feed,

cages for brooding/layers, supplementary medicine, vaccine and other need-based equipment was provided.

The average initial body weight of the chicks at 1-2 weeks was 60-75 g. The body weight was taken at monthly intervals from the field. The body at 2 month of age ranged from 0.80 to 1.25 kg. The initial mortality in chicks up to 1 month was 22% higher and gradually it decreased to 15%. The study is being continued for further evaluation of birds at field condition.

Introduced poultry hutch for promoting poultry farming in the region

A poultry hutch (Fig. 17) with three layered systems was designed and developed in view of rearing poultry birds and promoting poultry production by resource poor farmers having no proper housing facilities for birds.



Fig. 17: Newly introduced poultry hutch



Fig. 18: Coat colour diversity in Black Bengal goat kid



Fig. 19: Flock of goat grazing on raised bed

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

The study was aimed to compare two goat-based IFS models viz model-1 and model-2. The overall gross revenue and per unit area (m^2) from *kharif* crops during the 2022-23 was ₹ 15826 and 5.13. Four types of *rabi* crops viz Wheat, Mustard, Lentil and maize was cultivated in the allocated area for field crops under goat-based IFS models. The overall gross revenue and per unit area (m^2) from *rabi* crops during the 2022-23 was ₹ 16,173 and 5.25. A total of 20 kidding in goats was recorded with total number of kids born 33. The

average litter size was 1.65.

The estimated gross revenue from goat (live animal excluding parental stock) was ₹ 82,500 during the period. The gross production of goat manure was ₹ 4488 and its estimated revenue was ₹ 13,464. In model -II, the estimated gross revenue from fish was ₹ 56,800. The revenue from fish per unit area ($₹ m^2$) was 94.66. The total revenue from production of vegetables was ₹ 34,490. The vegetable revenue productivity per unit area ($₹ m^2$) was 13.79. Based on allocation area for various components under goat-based IFS models (Model-I: goat-crop and Model-II: goat-crop and fish). The gross total income from goat, crop and horticultural components in Model-I was ₹ 85,904. The gross total income from various components viz. goat, crops, horticulture and fish unit was ₹ 34609 (Fig. 18, 19). The total revenue generated per

unit hectare in Model-I and model-II was ₹ 214760 and ₹ 336523 respectively. Construction work for making of raised bed and trenches near goat shed for grazing during waterlogged condition. A total area of 900 m².

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, Dr. S.K. Samal

The study was conducted to assess the natural farming in rice-wheat cropping system at institute research farm, ICAR-MGIFRI, Piprakothi, East Champaran, Bihar. A set of eight experimental plots were prepared through ploughing and harrowing in the field. In each cropping season, (*kharif* or *rabi*) two sets of experiments were conducted simultaneously. In first experiment, natural farming was compared with other farming practices viz. conventional/chemical, semi-conventional, organic farming in rice-wheat cropping system. The treatments in experiment I were, T1: conventional farming, T2: Organic farming, T3- semi conventional farming and T4: natural farming with only one-time application of *Jeevamrita*.

The treatments in experiment II were based on the frequency of applying *Jeevamrita* with other protocol remained same as T4 in filed crop viz T5: 3 times *Jeevamrita*, T6: 5 times *Jeevamrita*, T7: 7 times *Jeevamrita* and T8: 9 times *Jeevamrita*. The *Bijamrita* was used in all treatments only once in natural farming and *Neemastra*(Nm), *Agniastra* (Ag); and *Brahmastra* (Bm) were used as per the need to control the insect and pest infestation in field crops. The methodology of making *Bijamrita*, *Jeevamrita*, *Neemastra* is mentioned as below.

Preparation of *Bijamrita* (BJM)

It was used to treat the seed before sowing in the field. It was prepared by using water, indigenous cow dung, cow urine, lime and soil from the crop field. 5 kg of local cow dung was taken and bound it in a cloth. A tape or rope was tied and cloth with dung was hung in a container or bucket filled with 20 lit of water up to 12 h (Fig 20, 21). 50-gram lime was added in one liter water and kept for stabilization overnight. Next

morning the bundle of cow dung was squeezed thrice (03 times) so that all essence of cow dung got accumulated in water. A handful of soil was added in water and stir properly. *Bijamrita* was spread over the seed, mixed with hand and dried well before sowing. It was usually used once a time during the crop duration. *Jeevamrita* (JVM) was used to promote the biological activity in soil and nutrient availability to the crop. It was prepared using water, local cow dung, local cow urine, jaggery, flour of any pulse, and soil from the crop field or farm. The entire procedure was almost similar to the procedure as mentioned for *Bijamrita*. In a drum, 200-liter water was taken and 10 kg cow dung and 10 litre urine was mixed. After that 2 kg jaggery, 2 kg pulse flour and handful of soil and mixed in a heap and allow it to ferment for 48 h (2 day-night). This solution was used @ 10% or mix with irrigation water in crop filed at certain interval as per the schedule.

Preparation of *Jeevamrita* (JVM)

Jeevamrita was used to promote the biological activity in soil and nutrient availability to the crop. It was prepared using water, local cow dung, local cow urine, jaggery, flour of any pulse, and soil from the crop field or farm. The entire procedure was almost similar to the procedure as mentioned for *Bijamrita*. In a drum 200 litre water was taken and 10 kg cow dung and 10 litre urine was mixed. After that 2 kg jaggery, 2 kg pulse flour and handful of soil and mixed in a heap and allow it to ferment for 48 h (2 day-night). This solution was used @ 10 percent or mix with irrigation water in crop filed at certain interval as per the schedule.

Establishment of cattle unit at MGIFRI Research Farm

In order to carry out experiment on natural farming, a cattle unit was established at institute research farm. A total of five (05) indigenous (desi) cow of Sahiwal breed was purchased and maintained at cattle unit. All cows were healthy and pregnant with advanced stage while their procurement from farmer's door.



Fig. 20: Preparation of *Bijamrita* for seed treatment under natural farming



Fig. 21: Preparation of *Jeevamrita* for filed application under natural farming



Fig. 22: A view of cattle in the outdoor and in cattle shed

Performance of Sahiwal cow and revenue generation at farm

The first calving of cow was observed on 1st March 2022 and thereafter all other cows delivered healthy neonatal calves successfully till 22.04.2022. The gross total cow milk production was 4896 L during the reporting year w.e.f. from the month of March-2022 onwards (Fig. 22). The net sale of milk was 4532 L and the remaining part was used for experimental feeding to neonatal cow calves, orphan goat-kids and laboratory analysis of milk samples (Fig. 23). The total revenue collection from cow milk and sale of milk product viz. paneer was ₹ 1,84,364 and ₹

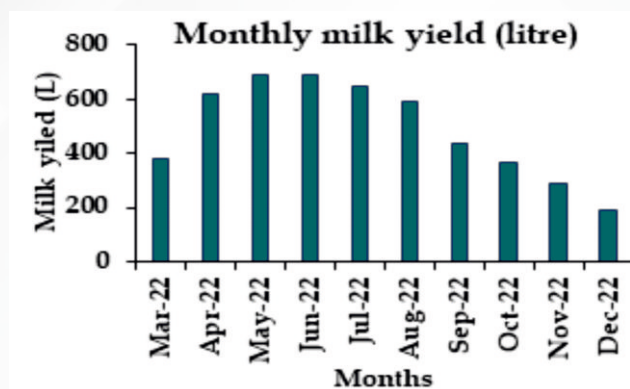


Fig. 23: Monthly milk yield

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

High density fish-cum-poultry- cum-on dyke fruit crops IFS model was 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 30.5±0.8 g 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 production of plankton (natural fish food), the fertilization of the pond was done using 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 ZnSO₄ (3.3 kg ha⁻¹ yr⁻¹). The dung manure was applied at the rate of 15000 kg ha⁻¹ yr⁻¹ in control pond whereas approximately 12000 kg ha⁻¹ yr⁻¹ poultry manure was applied in the IFS model. 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. In the IFS model, poultry birds (*Vanraja*) were stocked at the rate of 800 number $\text{ha}^{-1} \text{yr}^{-1}$, and on-dyke fruit crops (banana, lemon and guava) were cultivated. Water quality parameters like pH, temperature, dissolved oxygen, alkalinity, hardness and electrical conductivity were evaluated (Table 8). After a period of one year, in control pond the minimum and maximum average live body weight of fishes was recorded as 394.8 g with a growth rate of 29.5 g month^{-1} of *C. mrigala* and 705.2 g with a growth rate 55.5 g month^{-1} of *C. idella*. In fish-poultry-on dyke fruit IFS model, the minimum and maximum average body weight was recorded as 415.5 g with a

growth rate of 31.4 g month^{-1} of *C. mrigala* and 810.4 g with a growth rate 64.1 g month^{-1} of *C. catla*. After a culture period of one year the fish survival rate was found to be 82.5% (in control) and 88.7% (in IFS). The fish productivity was recorded as 4.25 $\text{t ha}^{-1} \text{yr}^{-1}$ from the control system, and 5.67 $\text{t ha}^{-1} \text{yr}^{-1}$ from the IFS model. Moreover, poultry eggs, poultry, banana, lemon and guava were produced additionally (Fig. 24). Therefore, the fish equivalent yield of the fish-cum-poultry-cum-on dyke fruit IFS model was recorded as 7.61 $\text{t ha}^{-1} \text{yr}^{-1}$. Economic analysis revealed the B:C ratio as 1.65 and 1.58 from the control and IFS model, respectively. The energy use efficiency was higher (0.86) in the IFS model than control (0.12).

Table 8. Annual average water quality parameters

Parameter	Control	Fish IFS
pH	8.35±0.48	8.24±0.36
Temperature (°C)	24.5±8.24	23.8±8.61
Alkalinity (ppm)	176.50±7.21	168.21±8.27
Hardness (ppm)	206.40±5.82	185.62±7.94
DO (ppm)	5.93±1.12	5.23±0.82
EC (mS/ cm)	1.79±0.28	1.64±0.46



Fig. 24: Different components of IFS model

Research Achievements (External Funded Projects)

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

Principal Investigator: Dr. A.K. Singh (from June 2022), Dr. A. Raizada (up to May 2022)

Co- Investigators: Dr. S.K. Purbey, Dr. P.K. Bharti, Dr. S.K. Samal, Mr. Ravi Kumar, Dr. Shreya Nivesh, Dr. Koushik Banerjee, Er Vikas Paradkar

Extension activity under this programme was implemented in four selected villages, namely i) Ujhilpur, ii) Hasanpur, iii) Narha Panapur* and iv) Balbhadarpur** of block Tetariya, district East Champaran (*Only in Narha Mallah Tola; **only in Hanuman Nagar) to provide and promote improved agricultural practices by providing inputs and demonstration in farmer fields for enhancing agricultural production and income.

Seed replacement with improved and high yielding

suitable crop variety is one of the important technological gaps in the region in achieving higher sustained production, income and livelihood. Field demonstrations of high yielding suitable varieties of field and vegetable crops, and fruit plants were conducted to showcase the technology. Besides, field demonstrations of other technologies, viz. balance use of fertilizers, irrigation water management, etc. were conducted on farmers' field. All the critical inputs for various demonstrations were provided to farmers with all the technical knowledge on its production through skill development programmes, field visits and other extension activities. Major findings of the extension activities were given below:

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.25). Details of inputs provided were given in Table 9.

Table 9: Details of inputs provided to farmers

Date	Inputs	Quantity	No. of beneficiary
17.02.2022	Multi-vegetable crop seed packet (Lady's finger- green, Lady's finger-red, onion and bottle guard)- 200 g	8.0 kg	40
23.02.2022-03.03.2022	Fertilizer- Urea (45 kg bag)	250 bag	250
23.02.2022-03.03.2022	Fertilizer- Zinc sulphate (1 kg bag)	1000 bag	200
23.02.2022-03.03.2022	Fertilizer- DAP (50 kg bag)	125 bag	125
26.02.2022	Mungbean seed (Virat IPM-205-7)	300 kg	81
05.05.2022	Papaya saplings (Red lady)	48 plants	15
03-04.06.2022	Paddy seed (Pusa Basmati 1121, MTU 7029 and Swarna sub-1)	1240 kg	213
07.07.2022	Irrigation plastic pipe	27 bundle	113
05.09.2022	Urea and Natural K	460 bag	258
20.09.2022	DAP	230 bag	230
21.09.2022	Pea Seed (PSM 3)	115 kg	55
21.09.2022	Fish seed- fingerlings (Rohu, Catla, Mrigal)	20 kg	4
06.10.2022	Wheat seed (HD 2967, DBW 187)	6000 kg	252
14.11.2022	Garlic seed (local)	210 kg	73
13.11.2022	Mustard seed (Pukhraj)	110 kg	78
Total nos. of beneficiary			1987



Multi-vegetable seed packets



Papaya sapling



Paddy seed



Irrigation pipes



Fertilizer



Wheat seed



Pea seed



Mustard seed

Fig. 25: Views of input distribution

Performance of paddy varieties- Pusa Basmati 1121, MTU-7029 and Swarna Sub-1 on farmers' field

A total of 1240 kg of paddy seed (180 kg Pusa Basmati, 400 kg MTU 7029 and 660 kg Swarna Sub 1) was made available to 213 farmers, covering all four villages in the project area. Pusa Basmati 1121 is a landmark variety among basmati rice in the country and grown in about 70% of the total area under basmati rice. It is a semi-dwarf variety (110-120 cm), matures in 140-145 days and yield potential is up to 5.5 t ha⁻¹. MTU 7029 matures in 150-155 days and yields 5.5-6.0 t ha⁻¹. Swarna Sub-1 has tolerance to complete submergence up to 15-17 days and suitable for shallow low lands and flood prone areas. It is semi-dwarf (105-110 cm), matures in

140-145 days and yield potential is up to 5.5 t ha⁻¹. From the total number of beneficiaries to whom paddy seed was distributed, total 20 number of beneficiary was selected for field demonstrations (6 nos. of Pusa Basmati and 7 each of MTU 7029 and Swarna Sub 1) covering the four villages to evaluate the performance of paddy varieties (Table 10). Pusa Basmati 1121 resulted in higher yield and net return over varieties grown by farmers. Yield of variety PB 1121 was lower as compared to its yield potential, however farmers liked this variety and shown their keen interest to grow this variety in next season. MTU 7029 and Swarna Sub-1 could not perform better (Fig.26), probably due to very less amount of rainfall received during the season and farmers didn't apply irrigation water in the crop.

Table 10: Yield and net return of paddy varieties on farmers' field

Variety	Yield (t ha ⁻¹)		Net return (₹ ha ⁻¹)		Increase/decrease in yield (%)	Increase/decrease in net return (%)
	Demo plot	Farmers' practice	Demo plot	Farmers' practice		
Pusa Basmati 1121	3.75	3.35	3.00	1.37	11.66	118.45
MTU-7029	2.76	3.36	4.26	1.38	-17.82	-69.23
Swarna Sub-1	2.80	3.17	4.80	1.08	-11.81	-55.56

1. Yield and net return reported is based on mean of all the demonstrations.
2. Market price of Pusa Basmati 1121 @ Rs. 20 kg⁻¹, and MTU 7029 and Swarna Sub 1 @ Rs. 16kg⁻¹
3. Varieties grown in in farmers' practice were Rajendra Bhagwati, Saraju 52, Pusa 1509 and Pusa 1612.



Fig. 26: View of Pusa Basmati 1121 at farmers' field

Balance use of fertilizers in paddy crop

Most of the small and marginal farmers of the region apply mostly urea fertilizers. Very few farmers apply Diammonium Phosphate (DAP) and rarely apply Muriate of Potash (MOP) and micronutrients. Farmers' knowledge about fertilizers is limited. They do not know about the right fertilizers and its right dose, time and place

of application. To aware the farmers on balanced use of fertilizers, a total of 480 bag of urea, 355 bag of DAP, 230 kg Natural K and 1000 kg zinc sulphate was made available to about 1000 beneficiaries in 4 villages; and out of these beneficiaries, twenty-one was selected for field demonstrations in paddy crop for balance use of fertilizers. For demonstrating the balanced use

of fertilizer, NPKZn @120:60:40:8.25 kg ha⁻¹ was applied. Full dose of P₂O₅, K₂O and Zn, and half dose of N was applied at transplanting, and remaining dose of N was applied in two equal splits at tillering and ear emergence. Under

farmers' practice, 207-223:0-46:0-90:0-9 kg NPKS along with or without FYM ha⁻¹ was applied at varied stages. Balance use of fertilizers recorded 17.7% higher grain yield of paddy (Table 11).

Table 11: Yield performance of paddy under balance use of fertilizers on farmers' field

Village	No. of demonstrations	Yield (t ha ⁻¹)		Increase in yield under demonstration over farmers' practice (%)
		Demonstration plot	Farmers' practice plot	
Ujhilpur	5	4.40	3.58	22.70
Hasanpur	6	4.94	4.33	13.94
Narha Panapur	5	4.86	4.09	18.57
Balbhadarpur	5	5.02	4.279	17.33
Mean	-	4.81	4.088	17.72

Irrigation through plastic pipes in paddy crop

Efficient irrigation water delivery to the crop fields help to reduce evaporation and conveyance losses from the open irrigation channels, and improve water use efficiency. Suitable irrigation plastic pipes help farmers use lesser amount of water, uniform distribution while also preventing leakage, water run-off and reduced labour costs. A farmer thus, saves both water and soil. Less water usage helps to lower

the energy usage required for pumping, reducing electricity costs. To aware the farmers on irrigation through plastic pipes, 27 bundles of irrigation plastic pipes (each with size 4 inch, weight 10 kg and approximate length 180 feet) was made available to 23 groups of farmers in 4 villages, and out of these, eleven beneficiaries was selected for field demonstrations in paddy crop (Table 12). On an average 12.78% saving of.

Table 12: Irrigation water saving in paddy crop through irrigation pipes on farmers' field

Village	No. of demonstrations	Yield (t ha ⁻¹)		Increase in yield under pipe irrigation over channel (%)	Water saving under pipe irrigation over channel (%)
		Pipe irrigation	Channel irrigation		
Ujhilpur	5	3.11	3.06	1.50	12.46
Hasanpur	2	3.75	3.71	0.94	12.36
Narha Panapur	2	3.44	3.43	0.29	12.95
Balbhadarpur	2	3.27	3.22	1.71	13.37
Mean	-	3.39	3.35	1.11	12.78

water was recorded under pipe irrigation over channel irrigation

Skill development programme

A three-days training program on "Production techniques of winter crops under integrated farming systems for increasing soil and crop productivity and farmers' income" was organized at Village - Ujhilpur (Tetariya, East Champaran) during 02 - 04 November, 2022. This training programme had been specially organized for

more than 80 farmers of four adopted villages (Ujhilpur, Hasanpur, Narha Panapur and Balbhadarpur) of project. The training programme was inaugurated by Sri Shyambabu Prasad Yadav, Hon'ble MLA, Pipra (East Champaran) in presence of scientists of the institute and he emphasized on providing knowledge and developing skills of farmers to enable them to exploit additional source of income from various enterprises of integrated farming system along with the crop production (Fig. 27).



Fig.27: View of skill development programme and media coverage

During all the three days, interactive lectures on all aspect of production techniques of winter crops were delivered by the experts/scientists. Participants shared their views on major problems. Major gap in the skill of farmers was identified as lack of knowledge of suitable variety of crops and vegetables; weed management practices; integrated nutrient management; identification of damage caused by insect/pathogens; recent recommended herbicides, insecticides and fungicides; and other agriculture based sources to generate additional income.

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, Dr. Shreya Nivesh, Dr. Koushik Banerjee, Er. Vikas Paradkar

Approximately 6530 scheduled castes farmers benefitted during the calendar year 2022 through various capacity building programs and input distribution. The institute organized a *Kisan Goshthi*-cum-input distribution program for the scheduled caste farmers on 14.04.2022 under SCSP scheme. The chief guest of the occasion, Shri Radha Mohan Singh, Hon'ble MP, Motihari and former Cabinet Minister, Agri. & Farmers Welfare, Govt. of India, addressed the gatherings. Technical sessions on goat/ poultry/ fish/vegetables farming and management were organized on the occasion. Around 230 SC farmers participated in the program. A three-days

training program on “Waste to wealth and crop production under integrated farming systems for increasing farmers' income” was organized by ICAR - Mahatma Gandhi Integrated Farming Research Institute under the Scheduled Caste Sub Plan (SCSP) Scheme during 13-15 September, 2022. This training programme was organized at Dhekawa Bela village (block- Paprakothi and district- East Champaran) especially for more than 56 scheduled caste farmers of the same village.

A three-days training program on “Crop residue management of sustainable crop production and reduction in use of chemical fertilizer” was organized under SC-SP scheme at Village - Jhakhra (Piprakothi, East Champaran) during 09-11 November, 2022. Fifty farmers from the village participated in the training programme. Various topics like in-situ crop residue technique, composting, vermi composting, green manuring and balanced use of fertilizers were covered during the programme. Farmers were taught about the ways to reduce the use of chemical fertilizers by help of crop residue management. Another three-days training program on “Irrigation Water Saving Techniques for Crop Production during Rabi Season” was organized during 21-23 November, 2022 for schedule caste farmers under schedule caste sub-plane (SCSP) scheme. About 50 number of farmers including 38 female and 12 male from two blocks: chakiya and piprakothi attended the programme (Fig. 28, 29, 30).



Fig. 28: Critical input distribution to the SCSP farmers



Fig. 29: Three days training conducted under SCSP programme at different villages and input distribution to the SCSP farmers

The training was conducted on the cited topic at village Bela Karariya, Piprakothi, East Champaran from 27 Feb to 1 March 2023. As we know, 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 sustainably using existing natural resources through crop and livestock production systems to achieve long-term higher productivity and farm incomes under climate variabilities. Thus, the training focused on different strategies for IFS models, which can be used for climate smart agricultural practices.



जल बचत तकनीक पर तीन दिवसीय प्रशिक्षण का समापन पीपराकोठी । स्थानीय महात्मा गाँधी समेकित वि अनुसंधान संस्थान में बुधवार को रबी मौसम में फसल उत्पादन हेतु जल बचत तकनीक पर अनुसूचित जाति उपयोगना के अंतर्गत तीन दिवसीय प्रशिक्षण कार्यक्रम का आयोजन समापन हुआ । इस प्रशिक्षण में जिले के लगभग 50 प्रशिक्षुओं ने जिसमें 38 महिलाएं व 12 पुरुष शामिल थे । प्रशिक्षण कार्यक्रम में संस्थान के निदेशक डॉ. के. जी. मंडल ने रबी मौसम में विभिन्न फसलों के उत्पादन में कम से कम जल का प्रयोग कर कैसे अधिक उपज ले सकते हैं विषय पर प्रकाश डाला ।



Knapsack sprayer distribution



Wheat seed distribution

Fig. 30: Training & capacity building activity along with input distribution to the SCSP farmers

Weather Variability 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, 26.5486° N, 84.9341° E) for 2022 is shown in Fig 31. During winter 2022 (Nov, Dec, Jan, Feb), an average air temperature was found between 15.45-21.44 °C with T Min ranged from 9.42-11.95 °C and T Max ranged from 21.49 to 27.93°C. During summer (March, April, May), an average air temperature of 31.20°C was recorded with average T-max ranging from 35.26-41.36°C.

The onset date of monsoon in Bihar is around 10-15th June. The location is blessed with receiving abundant of rainfall in the monsoon season. During 2022, the location received 687.03 mm of total rainfall. Among the three season, total rainfall received during *monsoon* (June, July, August and September) was of 497.33 mm (72.38%), while during summer and winter, total rainfall received were 1.55 mm and 188.15 mm respectively. The station received 54 rainy days (rainfall >2.5 mm) during 2022. Maximum number of rainy days were recorded in September (16 days).

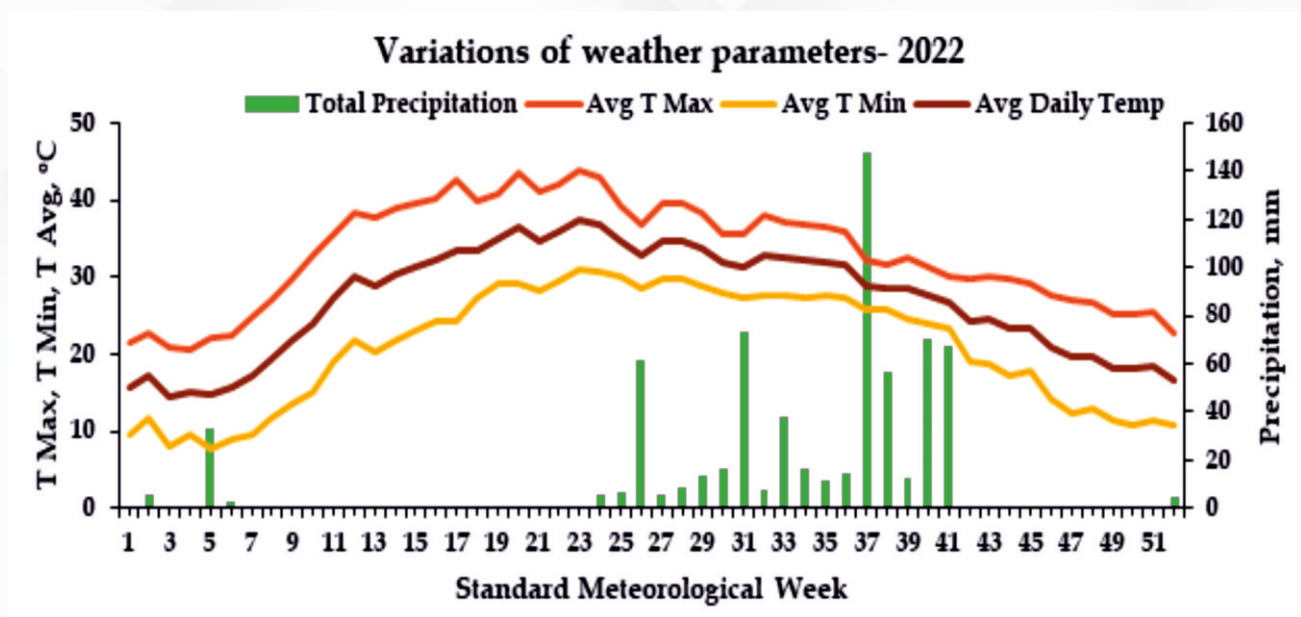


Fig.31: Average values of different weather parameters of Piprakothi, Motihari, Bihar during 2022

List of Publications

Peer reviewed paper

- Bharti, P.K., Biswal, P., Kamal, R., Devi, B. and Dutt, T., 2018. Effect of weaning on performance of dairy buffaloes in tropical conditions-A review. *Indian Journal of Animal Sciences*, 92(11), p.1258.
- Biswal. P., Dutt. T., Kumar. A., Gaur. G. K., Singh. M., Bharti. P. K., Bisht. D., Stephen. F. and Harini. K.R. 2022. Effect of FMD vaccination on differential leukocyte counts of Murrah, Tharparkar and Vrindavani calves. *The Pharma Innovation Journal*; SP-11 (11): 1407-1410.
- Choudhary, M., Datta, S.P., Golui, D., Meena, M.C., Nogiya, M., Samal, S.K., Mishra, R. 2022. Variability of Metal and Metalloid Content in Sludge as Affected by Sources and Seasons. *Journal of the Indian Society of Soil Science*, 70 (3): 338-346.
- Kochewad, S.A., Gaur, G.K., Maurya, V.P., Bharti, P.K., Sahoo, N.R., Pandey, H.O., Singh, M. and Verma, M.R., 2022. Effect of milking environment enrichment through music on production performance and behaviour in cattle. *Tropical Animal Health and Production*, 54(4), p.219.
- Kumar, R., Dey, A. and Kumar, S. 2022. Energy efficiency of integrated crop-livestock-fish farming system for lowland irrigated ecology of eastern region, India. *Indian Journal of Agricultural Sciences*, 92(8), pp.970-973.
- Mandal, K.G., Thakur, A.K., Mohanty, R.K., Mishra, A., Sinha, Subhas, Biswas B. 2022. Policy perspectives on agricultural water management and associated technologies suitable for different agro-climatic zones of West Bengal, India. *Current Science*, 122 (4): 386-395
- Maurya. V., Singh, M., Bharti, P.K., Maurya. V.P., and Channa. G.R. 2022. Blood biochemistry and hormonal profiles of crossbred calves during hot-humid season under modified roofing systems. *Journal of Livestock Science*. 13: 67-75. doi. 10.33259/JLivestSci.2022.67-75
- Nivesh, S., Negi, D., Kashyap, P. S., Aggarwal, S., Singh, B., Saran, B., Sawant, P. N. and Sihag, P. (2022). Prediction of river discharge of Kesinga sub-catchment of Mahanadi basin using machine learning approaches. *Arabian Journal of Geosciences*, 15(16), 1369.
- Nivesh, S., Patil, J. P., Goyal, V. C., Saran, B., Singh, A. K., Raizada, A., Malik, A. and Kuriqi, A. 2022. Assessment of future water demand and supply using WEAP model in Dhasan River Basin, Madhya Pradesh, India. *Environmental Science and Pollution Research*, 1-14.
- Singh, R.N., Krishnan, P., Singh, V.K. and Banerjee, K., 2022. Application of thermal and visible imaging to estimate stripe rust disease severity in wheat using supervised image classification methods. *Ecological Informatics*, 71, p.101774
- Thakur, A.K., Mandal, K.G., Mohanty, R.K. and Uphoff, N. 2022. How agroecological rice intensification can assist in reaching the Sustainable Development Goals. *International Journal of Agricultural Sustainability*, 20(2):216-230.
- Verma, K.K., Singh, M., Narwaria, U.S., Patel, B.H.M., Verma, M.R. and Bharti, P.K., 2022. Microclimate modification in Murrah

buffalo (*Bubalus bubalis*) heifers during summer: Effect on intake, growth and hematobiochemistry. *Journal of Thermal Biology*, 104, p.103163.

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Extended abstract/ summary

Ahmed, A., Raman, R.K., Singh, A.K., Brahmanand, P.S. and Upadhyaya, A. 2022. Flood in North Bihar and its impact on cropland. D. Mandal, Gopal Kumar, P.R. Ojasvi, M. Madhu, D.K. Shahi, Raman Jeet Singh, Uday Mandal and Rajesh Bishnoi (eds), National Conference on Landscape management for preventing flood and reservoir sedimentation, A Compendium of Abstract of Papers- LMPFRS 2022 of Indian Association of Soil and Water Conservationists, Dehradun, Uttarakhand, pp.33.

Banerjee. K., Krishnan, P., Kumar, A., Barman, A. 2022. Combination of thermal, RGB imaging and multivariate techniques for screening wheat genotypes under salinity stress condition. in book of abstract on National Seminar on Agrophysics for Smart Agriculture. 22-23 February 2022, NASC Complex, New Delhi. pp35.

Bharti, P. K., Purbey, S. K., Singh, A. K., Kumar. R., and S. K. Samal. 2022. Development and evaluation of goat based integrated farming system for small and marginal farmers of north Bihar. (In) National conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022) organized by Indian Association of Soil and Water

Conservationists, Dehradun; held at Birsa Agricultural University (BAU), Ranchi wef 22-24 September 2022. P41.

Foundation, Meerut (UP) India in offline/online on GRISAAS-2022 during 21-23 November 2022 at Birsa Agricultural University (BAU), Ranchi, Jharkhand India.

Kamal. R., Chandran. P C., Dey. A., Kumari. R. and Bharti. P.K. Production performance of ducks under extensive system of management in middle gangetic plain (MGP) of Bihar. (In) proceedings of VIIth International conference on Global Research Initiatives for sustainable agriculture and allied sciences wef 21-23 November 2022 organized by Astha Mandal, K.G., 2022. Prospective agricultural technology solutions for flood-prone and waterlogged ecosystems. E-synopsis on 7th India Water Week 2022 under the theme, 'Managing Water Related Disaster- Floods and Drought', held at India Expo Centre, Greater Noida, 01-05 Nov 2022, p. 119

Nivesh, S., Kashyap, P. S. and Singh, A. K. (2022). Assessment of Varying Water Demand under Different Scenarios using Water Evaluation and Planning System Model in Bundelkhand Region of Madhya Pradesh. In: Proceedings of the National Conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022); 2022 September 22-24; Ranchi, Jharkhand, India.

Paradkar, V., Kumar, R., Nivesh, S. and Purbey, S.K. 2022. An intelligent system for fish pond water quality monitoring under water congested ecosystem of Eastern India. In book of Abstract on national conference on Landscape management for preventing flood and reservoir sedimentation (LMPFRS 2022) during 22 - 24 September, 2022 at Birsa Agricultural University, Ranchi, Jharkhand. Published by Indian Association of Soil and water Conservationists, Dehradun, Uttarakhand, India, pp. 94.

Purbey, S.K., Mandal, K.G., Kumr. R., Samal. S.K., Nivesh, S. and Paradkar, V. 2022. Land shaping for development of horti-based IFS models for low lying areas of Eastern India. In books of Abstract on national conference on Landscape management for preventing flood and reservoir sedimentation (LMPFRS 2022)" during 22 - 24 September, 2022 at Birsa Agricultural University, Ranchi, Jharkhand. Published by Indian Association of Soil and water Conservationists, Dehradun, Uttarakhand, India, pp. 82.

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Book Chapter

Banerjee, K. and Das, B., 2022. Application of Remote Sensing Technology for Estimation of Soil Moisture. In Soil Management For Sustainable Agriculture (pp. 231-258). *Apple Academic Press*

Mandal, K.G. and Banerjee, K. 2022. Water management in rice-fallow production systems, In: Choudhary, A.K., Kumar, Rakesh, Kumar Saurabh (Eds.) Rice Fallow Management in India. *International Books & Periodical Supply Service (Publisher of Scientific Books)*, New Delhi, pp. 71-92.

Mandal, K.G. and Purbey, S.K. 2022. Sustainable Land Management Perspectives in Flood-Prone and Waterlogged Ecosystems, In: *Souvenir Natl. Conf. 'Landscape Management for Preventing Flood and Reservoir Sedimentation'*, IASWC, Dehradun, 22-24 Sep 2022, at BAU, Ranchi, pp. 124-130.

Leaflet

Bharti. P. K., Kumar, R., Banerjee, K. 2022. Scientific goat farming for enhancing livelihood of farmers in north Bihar. The Director, ICAR-Mahatma Gandhi Integrated farming research Institute, Piprakothi.

Research Projects

Institute ongoing research projects

Sl. No.	Project Title	PI Name
1	Development and assessment of fish-based integrated farming models under floodplain ecosystems	Mr. Ravi Kumar
2	Post-harvest losses study of major fruits and vegetables in East Champaran district of Bihar	Dr. S. K. Purbey
3	Constraint analysis and performance evaluation of poultry birds reared under backyard system in East Champaran district of Bihar	Dr. P. K. Bharti
4	Development of horti-based farming system model for low lying areas of Bihar	Dr. S. K. Purbey
5	Development and assessment of goat based integrated farming models in wetland ecosystem	Dr. P. K. Bharti
6	Estimation of optimum residue retention in rice-wheat cropping system raised on calcareous soil of middle Indo-Gangetic Plains	Dr. S. K. Samal
7	Evaluation of irrigation water saving techniques in winter Maize under North Bihar conditions	Dr. Shreya Nivesh
8	Delineation and characterization of flood-prone and waterlogged areas of Eastern India and development of IFS plans	Dr. Koushik Banerjee
9	Development of organic rice-fish-duck IFS model in waterlogging situations of North Bihar	Dr. A. K. Singh
10	Design and development of low-cost equipment and machineries for waterlogged situations	Er. Vikas Pardkar

New research projects

Sl. No.	Project Title	PI Name
1	Assessment of natural farming in rice-wheat cropping system in north Bihar conditions	Dr. P. K. Bharti

Externally funded research projects

Project Title	Budget (Rs in lakh)	Duration	PI Name	Funded by
Development of fish-based integrated farming system models for water congested ecologies of eastern India	94.14	Feb 2019 to Mar 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)	26.62	2022-23	Dr. A.K. Singh (from June 2022), Dr. A. Raizada (up to May 2022)	ICAR, New Delhi

Awards, Honours & Recognitions

ICAR-MGIFRI received 2nd best Institute stall award during Pashu Arrogya sah Krishi Unnati Mela evam Uddyan Mahotsav-2022 at KVK, Piprakothi 15-17 April 2022.

ICAR-MGIFRI received the best exhibition award during the National conference of LMPFRS-2022 held at BAU, Ranchi, Jharkhand, 22-24 September 2022.

K.G. Mandal received Dr. B.P. Pal Memorial Best Scientist Award of National Academy of Biological Sciences (NABS), Chennai

K.G. Mandal received Fellowship of Indian Water Resources Society (IWRS), Roorkee.

A. Raizada received Dr. D.N. Puri Award by IASWC, Dehradun by IASWC, Dehradun 2022

Koushik Banerjee received IARI Merit Medal for outstanding contribution in academics and research during PhD in February 2022.

Shreya Nivesh received best oral presentation on in national conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022), BAU, Ranchi, Jharkhand, 22-24 September 2022.

P.K. Bharti received best oral presentation in national conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022), BAU, Ranchi, Jharkhand, 22-24 September 2022.

K.G. Mandal Chaired a Technical Session in the National Conference on 'Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022)' held at Birsa Agricultural University, Ranchi during 22-24 September 2022.

K.G. Mandal was invited as a Chief Guest in the Inaugural function on 28 March 2022 of ICAR sponsored Winter School on 'Climate Smart

Agriculture for Sustainable Production" from 28 March to 17 April 2022 at Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar.

K.G. Mandal: acted as a Member of the Evaluation and Selection Committee for Best KVK Award and Best Farmer Award of the University at Dr. RPCAU, Pusa, Samastipur, Bihar, on 11-12 January 2022.

P.K. Bharti received best oral presentation award for paper entitled "Production performance of ducks under extensive system of management in middle gangetic plain (MGP) of Bihar" authored by Reena Kamal, P.C. Chandran, Amitava Dey, Rajni Kumari and P.K. Bharti" during VIIth International conference on Global Research Initiatives for sustainable agriculture and allied sciences GRISAAS-2022 at Birsa Agricultural University (BAU), Ranchi, Jharkhand -21-23 November 2022.

P.K. Bharti received 1st Prize for essay writing, 1st for translation in Hindi and santwana for typing in Hindi award during Hindi Pakhwada 14-28 September 2022.

K.G. Mandal attended (online) the Agronomy Journal (AJ) Editorial Board Meeting of the American Society of Agronomy, Madison, WI, USA as an Associate Editor of the Journal, on 21 January 2022.

P.K. Bharti was invited as a member of Animal evaluation committee during Pashu Arrogya sah Krishi unnati mela evam Uddyan Mahotsav-2022 organized at KVK, Piprakothi 15-17 April 2022.

K.G. Mandal was invited as an external examiner for Ph.D. thesis evaluation, and viva-voce examination at BCKV, Mohanpur, Nadia on 19 April 2022 and 9 June 2022.

P.K. Bharti was invited as an external thesis evaluator of MVSc students at CVSC, Aizawl.

A.K. Singh conferred 2nd prize for 'Hindi Translation' event of 'Hindi Pakhwada' organized by ICAR-MGIFRI, Motihari during 14-28 September 2022.

Vikas Paradkar received first prize in the extempore event, organised at the institute on Foundation day of the institute.

Vikas Paradkar received best poster presentation in national conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022), BAU, Ranchi, Jharkhand, 22-24 September 2022.

Vikas Paradkar received certificate with grade A on successful completion FOCARS training by ICARNAARM.

S.K. Samal received the best poster award in national conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022), BAU, Ranchi, Jharkhand, 22-24 September 2022.

Shreya Nivesh was invited as an expert for delivering lecture in the National seminar on Impacts of civil engineering projects and practices on the sustainability of environment, on 28 April, 2022 at Invertis University Bareilly, (U.P.)

S.K. Purbey was invited as an expert member (Nominee DG, ICAR) in assessment Committee



Team ICAR MGIFRI bagged best exhibition award during National conference of LMPFRS-2022 held at BAU, Ranchi, Jharkhand, 22-24 September 2022.

constituted for considering and assessing the scientist, at ICAR-RCER, Patna pertaining to the ARS discipline of Fruit Science under the CAS of ICAR from level 11 to 12 on 10.02.2022.

S.K. Purbey acted as a Chairman, Technical session Committee in Pashu Arogya sah Krishi Unnati Mela evam Udhyaan mahotsav 2022" at KVK, Piprakothi during 15-17 April 2022.

S.K. Purbey acted as a Chairman Horticulture Show Judging Committee in "Pashu Arogya sah Krishi Unnati Mela evam Udhyaan mahotsav 2022" at KVK, Piprakothi during 15-17 April 2022.

S.K. Purbey invited as a Co-organising Secretary of "Pashu Arogya sah Krishi Unnati Mela evam Udhyaan mahotsav 2022" at KVK, Piprakothi during 15-17 April 2022.

S.K. Purbey invited as a Chairman, Screening Committee for Compassionate Appointment of SSS conducted by ICAR-NRC on Litchi, Muzaffarpur, Bihar on 22.04.2022.

S.K. Purbey received 1st prize in Carom Competition organized at ICAR-MGIFRI, Motihari during 18-20 Aug. 2022.

S.K. Purbey acted as an expert member (Nominee DG, ICAR) in Assessment Committee constituted for considering and assessing the promotion case of two Scientists at ICAR-RCER, Patna pertaining to the ARS discipline of Fruit Science under the CAS of ICAR.



Dr. Koushik Banerjee receiving IARI Merit Medal from Hon'ble agricultural minister for outstanding contribution in academics and research during PhD in February 2022.

Research Management Meeting (RAC/IRC/IMC)

Meeting of the Institute Research Council (IRC)

The institute organized two IRCs during 2022-2023. The 4th IRC Meeting of ICAR-Mahatma Gandhi Integrated Farming Research Institute (ICAR- MGIFRI), Motihari was held on 30th June 2022 and 20.07.2022 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 Sh. Ravi Kumar, Scientist for his promotion to higher grade and Dr. Koushik Banerjee for receiving IARI Ph.D. Award and for some excellent publications by the scientists of the Institute. He opined that IRC is one of the most important meetings of any institute where research works are comprehensively discussed. He further said that research projects are the bread and butter of any scientist in a R&D institute, so top priority should be given project accomplishments. He had given the emphasis on the following points for delivering quality research works and overall development of the institute.

- The Institute has very good multidisciplinary team of Scientists to work and being in a new institute a lot of areas are still to be unexplored as per our institute mandate and objectives.
- He mentioned the five major research areas where we have to give more focus and hard work to develop at least 2 technologies in the coming 2-3 years.
- Laboratory works are required to be fastened along with field-based research. As we don't

have any technical staff, so requirement of quality YPs should be proposed and utilized properly.

- He had shown dissatisfaction over the late submission of various project-related documents and stressed timely submission to expedite and streamline the research works.
- It is required to develop the habit of reading good research papers, quantitative approach to interpret the research data and for awards and recognitions etc. If expertise in any field is required Scientist may apply for training in the related field.

After opening remarks by the Chairman, the research progress report was presented by the Member Secretary. The project-wise research progress reports were presented by Scientists and major 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:

- Systematic study along with the quality presentation and statistically analyzed data are required for appropriate scientific interpretation of data
- Timely submission of all project related documents is highly important
- Development of technology within 2-3 years is required as per our SFC commitment.
- Good quality publication in high rate journals are required.



The 5th IRC Meeting of ICAR-Mahatma Gandhi Integrated Farming Research Institute (ICAR-MGIFRI), Motihari was held on 30 Dec 2022 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 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/ pics 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.
- Systematic study along with quality presentation and statistically analyzed data are required; scientists should try for good quality publications in high-impact factor journals.

Research Advisory Committee-RAC

A new team of RAC for ICAR- MGIFRI, Motihari has been nominated by the Council as given in the following table

Dr. C.L. Acharya Ex-Director, ICAR-IISS, Bhopal 28, Nagarkot Colony, Thakurdwara, PO Maranda, Palampur 176 102 (HP)	Chairman
Dr. Masood Ali Ex-Director, IIPR, Kanpur Flat No. 305, Ratan Presidency-2, Parvati Bagla Road, Tilak Nagar, Kanpur 208002, U.P	Member
Dr. D.K. Kundu Ex- Head, Crop Production Division, ICAR-CRIJAF, Barrackpore Flat No. 4A Bhawani Enclave, Panchavati Complex, VIP Road, Kolkata- 700052	Member
Dr. S.K. Singh Principal Scientist & Head, Division of Fruits and Horticultural Technology, ICAR-Indian Agricultural Research Institute, New Delhi 110012	Member
Dr. Ved Prakash Saini, Professor & Dean, College of Fisheries, Bihar Animal Science University, Arrabari Kishanganj-855107, Bihar	Member
Dr. B.C. Roy Professor & Head, Dept of Agril Economics, Institute of Agriculture (PSB), Visva-Bharati University, Sriniketan, PIN 731236, West Bengal	Member
ADG (Agron, AF & CC), NRM Division, ICAR, New Delhi-110012 KAB-II, Pusa, New Delhi	Member
Dr. S.K. Purbey, Principal Scientist, ICAR-MGIFRI, Piprakothe, Motihari Bihar- 845429	Member Secretary

Human Resource Development

Training & capacity building undergone by the employee of ICAR-MGIFRI

Official designation	Subject	Organization	Period
Dr. Koushik Banerjee	Training program on analysis of experimental data	ICAR-NAARM, Hyderabad	17-22 January 2022
Dr. P K Bharti	Attended online training programme on Advances in Web and Mobile Application Development	ICAR-NAARM, Hyderabad	02-06 August 2022
Dr. K.G. Mandal	Capacity building training on 'EDP on Leadership Development' (Batch-II (Domestic component))	ICAR-NAARM, Hyderabad	04-09 July 2022
Mr. Ravi Kumar	Pathways for successful implementation of SC sub-plan scheme in ICAR	ICAR-NAARM, Hyderabad	18-19 August 2022
Er. Vikas Paradkar	Advances in web and mobile application development	ICAR-NAARM, Hyderabad	05-09 December 2022
Dr. Shreya Nivesh	Training on 'Climate change and hydrological impact assessment'	NIH, Roorkee	12-17 December 2022

Training & capacity building of stakeholders/ farmers

Sl No	Duration	Title of the training	Location	Total participants	Coordinators
1	12-14 January 2022	Natural Farming for sustainable Integrated Farming System	Jasualipatti (Kotwa)	56	Dr. A. K. Singh Dr. S.K. Samal Dr. P. K. Bharti
2	06-08 June 2022	Livelihood security of rural youth through Mushroom cultivation	ICAR-MGIFRI	26	Dr. S. K. Purbey
3	13-15 September 2022	Waste to wealth and crop production under integrated farming system for increasing farmers' income	Dekanha Bela, Piprakothi	56	Dr. A. K. Singh Dr. K. G. Mandal Dr. S. K. Samal Dr. P. K. Bharti
4	14-16 September 2022	Scientific way of poultry farming for increasing farmer's income.	ICAR-MGIFRI	45	Dr. P. K. Bharti
5	02-04 November 2022	Production Techniques of winter crops under integrated farming systems for increasing soil and 6crop productivity and farmers' income	Ujhilpur, Tetriya	82	Dr. A.K. Singh, Dr. S.K. Purbey Dr. S.K. Samal
6	05-07 November 2022	Soil sampling and fertilizer recommendation for field crops and horticultural crops under integrated farming	ICAR-MGIFRI	50	Dr. S. K. Samal Dr. A.K. Singh

7	07-09 November 2022	Training Programmed on how to increase income of small and limited farmers with the help of Fish farming.	ICAR-MGIFRI	58	Mr. Ravi Kumar Dr. P. K. Bharti
8	09-11 November 2022	Crop residue management of sustainable crop production and reduction in use of chemical fertilizer	Jhakhra	50	Dr. S.K. Samal Er. Vikash Paradkar
9	21-23 November 2022	Traning Programme on water saving technique of Rabi crop.	ICAR-MGIFRI	50	Dr. Shreya Nivesh Dr. Koushik Banerjee
10	05-07 December 2022	Soil sampling and fertilizer recommendation for field crops and horticultural crops under integrated farming	ICAR-MGIFRI	35	Dr. S.K. Samal Dr. A.K. Singh
11	13-15 December 2022	Climate resiliant agriculture for increasing farmer's income under SCSP scheme	Dekanha Bela	57	Dr. Koushik Banarjee Er. Vikas Paradkar

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



Awareness Campaign on *Kisan Bhagidari Prathamikta Hamari* on 25-30 April 2022



National Campaign on Farm Mechanization from 28 March to 4 April 2022



National Programme on Efficient and Balanced use of Fertilizers including Nano-Fertilizers, organized at ICAR MGIFRI, on 21 June 2022



Meeting-cum-Awareness Programme of the Internal Complaints Committee (ICC) of the Institute, on 02 July 2022



National Fish Farmers Day celebration, 10 July 2022



World Soil Day Celebration with students of SNS College on 5 December 2022



Farmers Training on Natural Farming at vill-Jasaulipatti, E Champaran 12-14 January 2022



One day awareness-cum-training programme on IFS for Bettiah farmers on 23 July 2022



3 days On-farm training on the topic Waste to Wealth from 13-15 September 2022



3 days training on Poultry Farming under SCSP, 14-16 September 2022



3-days Training Programme Integrated Fish Farming (7-9 November 2022) On-campus



3-days Training Programme on Crop Residue Management, 9-11 November 2022



3-days Training Programme on Irrigation Water Saving for Rabi Season Crops 21-23 Nov 2022



Animal Health Camp organized at FFP village on 14 March 2022



Pashu Arogya Mela, Krishi Unnati Mela and Udyan Mahotsav on 15-17 April 2022 at KVK, Piprakothi



Exhibition stall of ICAR MGIFRI in national conference at BAU, Ranchi September 22-24, 2022



RAWE student orientation programme 24 November 2022 Tirhut College of Agriculture



Orientation and Farm Visit Programme for students (Class- X) of St Francis Academy, Motihari on 9 December 2022



MoA signed between ICAR-MGIFRI, Motihari and a-IDEA, Assoc. Innovation Development for Entrepreneurship in Agriculture, Centre for Agri-Innovation, ICAR-NAARM, Hyderabad on 08 July 2022



MoU signed between ICAR-MGIFRI, Motihari and ICAR-NRC Litchi, Muzaffarpur for Collaborative Research and Training on IFS on 08 September 2022

Various input distribution to the farmers during 2022 at ICAR-MGIFRI



Hon'ble MP, Shri Radha Mohan Singh, SCSP distribution of Grain Storage Bins (300 numbers), Steel Bucket (300 nos), Measuring Mugs- steel (300 nos.) on 25 February 2022



Hon'ble MP, Shri Radha Mohan Singh, under SCSP scheme, distributed Grain Storage Bins on April 14, 2022



Vegetable seed distribution at village Ujhilpur under FFP programme on Feb 17, 2022



Chicks distribution to the farmers October 18, 2022



Distribution of steel buckets and mugs under SCSP training programme on November 21-23, 2022

Lecture delivered as resource person in training outside the institute

SI No	Scientist	Lecture given in	Total lecture	Location
1	Dr. A.K. Singh	15 days training on integrated nutrient management	13	KVK, Piprakothi
2	Dr. A.K. Singh	Description of utility of soil test fertilizer recommendation (STFR) meter	1	KVK, Madhopur
3	Dr. Koushik Banerjee	15 days training on integrated nutrient management	2	KVK Piprakothi
4	Dr. K.G. Mandal	Winter School 'Climate Smart Agriculture for Sustainable Production',	1	Dr RPCAU, Pusa, Samastipur, Bihar.
5	Dr. K.G. Mandal	15 days training on integrated nutrient management	13	KVK Piprakothi

6	Er. Vikas Paradkar	Unnati Krishi by Integrated Farming System	1	KVK, Piprakothi
7	Dr. S.K. Samal	15 days training on integrated nutrient management	17	KVK, Piprakothi
8	Dr. Shreya Nivesh	Impacts of civil engineering works on the quality of land and water resources	1	Invertis university Bareilly, U.P.
9	Dr. Shreya Nivesh	15 days training on integrated nutrient management	6	KVK Madhopur
10	Dr. S.K. Purbey	Usage and Importance of Horticulture based Integrated Farming in respect of Value Addition for doubling the farmers income	1	Dr RPCAU, Pusa, Piprakothi, Bihar
11	Dr. S.K. Purbey	15 days training on integrated nutrient management	8	KVK, Piprakothi
12	Dr. S.K. Purbey	Role of biofertilizers for disease and pest management of horticulture crops	1	PDUCHF, Piprakothi
13	Dr. S.K. Purbey	Lecture Litchi Processing - Bihar Krishi Nivesh Protsahan Niti	1	Dept. of Ag. Motihari
14	Dr. P K Bharti	Natural farming and Pashu Arogya Mela wef 15-17 April 2022	1	KVK, Piprakothi
15	Dr. P K Bharti	Delivered guest lecture on two days' webinar on the topic "scope and opportunities in dairy industries"	2	College of Agriculture & Research Station, Kunkuri Jashpur College of Horticulture, Jashpur, Chattishgarh
16	Dr. P K Bharti	Lecture delivered in two days training programme on " Entrepreneurship development in Goat Production and its value addition" under NAHEP-IG Project.	1	Bihar Veterinary College, Patna

Participation in Seminar/ Symposium/ Conference/ Workshop/ Webinar

Sl No	Scientist	Seminar/ Symposium/ Conference/ Workshop	Date	Organizer
1	Dr. A.K. Singh	National Conference on 'Landscape management for preventing flood and reservoir sedimentation'	22-24 September 2022	BAU, Ranchi
2	Dr. Shreya Nivesh	National Conference on 'Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022).'	22-24 September 2022	Ranchi, Jharkhand
3	Dr. Koushik Banerjee	National Seminar on Agrophysics for Smart Agriculture.	22-23 February 2022	ICAR-IARI New Delhi.
4	Dr. Koushik Banerjee	AAPARI knowledge management workshop	3 July 2022	ICAR, New Delhi
5	Dr. S. K. Samal	National Conference on 'Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022).'	22-24 September 2022	Ranchi, Jharkhand
6	Dr. K.G. Mandal	National Conference on 'Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022).'	22-24 September 2022	Ranchi, Jharkhand
7	Dr. K.G. Mandal	Managing Water Related Disaster- Floods and Drought' during the 7 th India Water Week 2022	01-05 November 2022	Greater Noida, New Delhi
8	Dr. K.G. Mandal	National Symposium on 'Self-reliant Coastal Agriculture' at ICAR-CCARI, Goa (online)	11-13 May 2022	ICAR-CCARI, Goa
9	Dr. K.G. Mandal	National Conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022) at Birsa Agricultural University, Ranchi during 22-24 September, 2022	22-24 September 2022	IASWC, Dehradun & ICAR-MGIFRI, Motihari

10	Dr. K.G. Mandal	ICAR Institute Director's Conference	13 April 2022	ICAR-NASC complex, New Delhi
11	Dr. K.G. Mandal	Pre-Launch Workshop of TDC-NICRA cum Action Plan Finalization	07 February 2022	KVK, Jale, Darbhanga, Bihar
12	Dr. K.G. Mandal	Inaugural session of 5 th Annual Zonal Workshop of KVKs (Zone IV)	6 August 2022	ICAR-ATARI, Patna at Rajgir
13	Dr. K.G. Mandal	Attended (Online) the XXVI Meeting of ICAR Regional Committee-IV (UP, Bihar, Jharkhand), Chaired by DG, ICAR	7 November 2022	ICAR-IIVR, Varanasi
14	Dr. K.G. Mandal	Attended the 22nd Coordination Committee meeting (under Bihar)	23 February 2022	ICAR-RCER, Patna
15	Dr. K.G. Mandal	Attended online ICAR 94 th Foundation Day Celebration & ICAR Award Ceremony	16 July 2022	NASC Complex, ICAR, New Delhi,
16	Dr. K.G. Mandal	4 th SAC Meeting of KVKs under Dr. RPCAU, Pusa, Samastipur, Bihar	7 September 2022	KVK, Parsauni
17	Er. Vikas Paradkar	National Conference on "Promotion of Kishan Drones"	2 nd May, 2022	NASC Complex, New Delhi
18	Er. Vikas Paradkar	Hindi Sangoshthi	24-25, August 2022	ICAR-CRIJAF, Barrackpore
19	Er. Vikas Paradkar	National conference on Landscape Management for Preventing Flood and Reservoir Sedimentation (LMPFRS-2022)	22-24 September 2022	BAU, Ranchi (Jharkand)
20	Er. Vikas Paradkar	Workshop on Online Financial Transaction and security Measures	06 October 2022	ICAR
21	Dr. S.K. Purbey	Managing soil for food and climate security and advance SDGs of the UN organized by ICAR lecture series under Azadi Ka Amrut Mahotsav	02 May 2022	ICAR MGIFRI
22	Dr. S.K. Purbey	"BIRAC BIG" organized by a-IDEA ICAR-NAARM	25 July 2022	ICAR-NAARM
23	Dr. S.K. Purbey	"Future Indian horticulture"	7 August 2022	Brahma Singh Horticulture Foundation (BSHF)
24	Dr. S.K. Purbey	Soil Health Management in Horticultural Ecosystem"	10 August 2022	ICAR-CISH, Lucknow
25	Dr. S.K. Purbey	Technology for future fruit production"	6 November 2022	BSHF
26	Dr. S.K. Purbey	Special lecture on "Soil: Where Food begins" by Dr. Himanshu Pathak, Secretary (DARE) & Director General (ICAR) on World Soil Day	5 December 2022	ICAR
27	Dr. S.K. Purbey	"Protected Horticulture" organized by BSHF	18 December 2022	BSHF
28	Dr.P.K. Bharti	Attended exhibition for judging of goat/sheep	16 March 2022	Bihar Veterinary College, Patna.
29	Dr.P.K. Bharti	National sensitization programme cum workshop on "Agricultural knowledge Management in Networked Digital Environment: Awareness of Plagiarism, e-Resource, Research metrics Tools & Techniques" organized by National Knowledge Management Centre for Agricultural Education & Research (NKMC4AER)	19 March 2022	ICAR-IVRI
30	Dr.P.K. Bharti	Attended and delivered during National conference on "Landscape management for preventing flood and reservoir sedimentation (LMPFRS-2022)"	22-24 September 2022	Birsa Agricultural University, Ranchi (Jharkhand)

31	Dr.P.K. Bharti	Attended online lecture on topic "In silico approach for understanding the molecular mechanism of diseases"	22 December 2022	DBT, GOI, CVSc., Khanapara, Guwahati
32	Dr.P.K. Bharti	Attended Pashu Arrogya sah Krishi unnati mela evam Uddyan Mahotsav-2022 and	15-17 April 2022	KVK, Piprakothi
33	Dr.P.K. Bharti	Webinar on "Diagnostic & Therapeutic Procedures in Small Animal Renal Diseases" organized by	11 December 2022	Oriheal Lifesciences Pvt. Ltd.
34	Dr.P.K. Bharti	Workshop of CeRA, organized by Agricultural Education Division (HRD),	21 November 2022	ICAR, KAB-II, Pusa, New Delhi

Events Organized (Meeting/ Training/ Exhibition/ Workshop/Seminar)

Sl. No	Date	Name of the event (Location)	Coordinators
1	1 January 2022	Pradhan Mantri Kisan Samman Nidhi release Programme at the Institute.	Dr. S.K. Purbey Dr. S.K. Samal Mr Ravi Kumar
2	10 February 2022	World Pulses Day- <i>Kisan Gosthi</i> : Possibilities of increasing pulse production for self-reliance at the Institute.	Dr. A.K. Singh Dr. S.K. Samal and Er. V. Paradakar
3	12 March 2022	Prakshetra Diwas: Udyan Aadharit Samekit krishi Pranali (Vill Dhekhan, Bela)	Dr. S.K. Purbey
4	1 April 2022	Mechanization Practice for Crop Residue Management under National Campaign on Farm Mechanization at the Institute.	Dr. S.K. Samal Dr. Shreya Nivesh
5	14 April 2022	Kisan Goshthi for scheduled caste farmers under SCSP at the Institute.	Mr Ravi Kumar Dr. P. K. Bharti
6	28 April 2022	Kisan Bhagidari Prathmikta Hamari at the Institute.	Dr. S. K. Purbey Dr. A.K. Singh Dr. S.K. Samal Er. Vikas Paradkar
7	16 May 2022	Goat Farming & Management under waterlogged ecosystem for SC farmers at the Institute.	Dr. P.K. Bharti Mr. Ravi Kumar
8	21 May 2022	Anti-Terrorism Day at the Institute.	Dr. S.K. Samal
9	22 May 2022	Awareness programme on "Goat farming and management under waterlogged ecosystem for SC farmers" at the Institute.	Dr. P. K. Bharti Mr Ravi Kumar
10	31 May 2022	Har ghar Tiranga Programme at the Institute.	Dr. A. K. Simgh Er. Vikas Paradkar
11	21 June 2022	Organized programme on yoga practice as during the international yoga day-2022 at the Institute.	Dr. P. K. Bharti
12	21 June 2022	Kisan gosthi on 'efficient and balanced use of fertilizers including nano-fertilizers' at the Institute.	Dr. S. K. Samal Dr. Koushik Banerjee Dr. Shreya Nivesh Dr. A. K. Singh
13	2 July 2022	Organized a meeting cum awareness programme on "Prevention of sexual harassment of women at the Institute.	Dr. P. K. Bharti Dr. Shreya Nivesh
14	11 July 2022	National campaign on emerging aquaculture systems and practices on occasion of National Fish Farmers day at the Institute.	Mr. Ravi Kumar Dr. S. K. Samal

15	21 July 2022	<i>Kishan Gosthi</i> on Efficient and Balanced use of fertilizers (including Nano-fertilizers) at the Institute.	Dr. S.K. Samal, Dr. Koushik Banerjee Dr. Shreya Nivesh, Dr. A.K. Singh
16	23 July 2022	Capacity building training on Integrated Farming System at the Institute.	Dr. S. K. Purbey Dr. A.K. Singh Dr. Koushik Banerjee
17	5 August 2022	Organized “Kisan Jagrukta evam Samman Samaroh” Programme at the Institute.	Dr. A.K. Singh Dr. P. K. Bharti Mr. Ravi Kumar
18	21-23 August 2022	8 th Foundation Day Ceremony- Organized brain storming programme on “Integrated farming system approach for waterlogged ecosystem to enhance the livelihood security of the farmers” at the Institute.	Dr. S. K. Purbey Dr. A.K. Singh Dr. P. K. Bharti Mr. Ravi Kumar
19	10 September 2022	Farmers awareness cum input distribution" under SCSP scheme.	Mr. Ravi Kumar
20	14-28 September 2022	Hindi Chetna Pakhawara 2022 at the Institute.	Dr. S. K. Purbey Dr. Shreya Nivesh Dr. Koushik Banerjee
21	19 September 2022	Institute Seminar at the Institute, delivered by Dr. K.K. Rout, Prof. Soil Science & Ex Dean, College of Agriculture, OUAT, Bhubaneswar	Dr. S. K. Purbey & Seminar committee
22	17 October 2022	PM Agri Startuo Conclave and Kisan Samman Sammelan. Theme: Badalte Krishi Paridrishya Aur Takneek. (ICAR-MGIFRI) (Changing Agricultural Scenario and Technology) at the Institute.	Dr. S. K. Purbey Dr. A.K. Singh
23	31 October 2022	Integrity Pledge for observance of vigilance awareness week-2022 at the Institute.	Dr. S.K. Samal
24	10 November 2022	A field organized on “Livelihood improvement through mushroom production”. (Vill Kankatti, Tetariya block, E. Champaran)	Dr. S. K. Purbey
25	24 November 2022	Conducted exposure visit at different units of MGIFRI for RAWE students from TCA, Dholi, RPCAU at the Institute.	Dr. P. K. Bharti Mr Ravi Kumar
26	5 December 2022	World Soil Day Campaign-2022 at the Institute.	Dr. S.K. Samal Dr. Shreya Nivesh
27	7 December 2022	Institute Seminar at the Institute, Speaker, Dr. A.K. Thakur, Pr. Scientist, IIWM, Bhubaneshwar	Dr. S. K. Purbey & Seminar committee
28	23 December 2022	Kisan Diwas-2022 at the Institute.	Dr. S.K. Samal Dr. Shreya Nivesh Er. Vikash Paradkar

Various Events organized at ICAR-MGIFRI, 2022



Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) 01 January 2022



Celebrated 73rd Republic Day at the Institute on 26 January 2022



Celebrated World Pulses Day at the Institute on 10 February 2022



Minister, addressed the nation, highlighted third anniversary of the launch of PM-KISAN 24 February 2022



Celebrated Dr. B.R. Ambedkar Jayanti on 14 April 2022



Celebrated and Observed the Anti-Terrorism Day on 21 May 2022



International Day of Yoga - Theme: Yoga for Humanity 21 June 2022



Har Ghar Tiranga Swagat Karykram of Shri Raj Kumar Singh ji, Minister on at the Institute on 14 August 2022



Celebration of 76th Independence Day at the Institute, National flag hoisting (Director) on 15 August 2022



8th Foundation Day Celebration of the Institute 21st August 2022



Gandhi Jayanti Celebrated 'Fit India Freedom Run 3.0' with the slogan 'Azadi Ke 75 Saal, Fitness Rahe Bemisaal' on 2 October 2022



Hindi Pakhwada (14-28 September 2022) and Hindi Puraskar concluding ceremony 11 October 2022; Fr Bipin Kujur, Principal, St Francis Academy Chief Guest



Programme on Special Campaign 2.0 started on 2 October 2022 (Swachhta Camapign)



PM Kisan Samman Sammellan Live Telecast on 17 October 2022



Hon'ble DDG's visit 21-22 October 2022, DR PC Sharma, Dr BP Bhat, Dr A Upadhyay, inaugurated the Cowshed and Store

राजभाषा हिंदी चेतना पखवारा

14-28 सितम्बर 2022

भा.कृ.अनु.प -म. गाँ. स. कृ. अनु. सं. पिपराकोठी में राजभाषा हिन्दी के प्रचार-प्रसार एवं कार्यालय में हिन्दी प्रयोग के बढ़ावा हेतु दिनांक 14-28 सितम्बर 2022 तक हिन्दी चेतना पखवाड़ा का आयोजन किया गया। दिनांक 14 सितम्बर 2022 को हिन्दी दिवस के अवसर पर एक हिन्दी कार्यशाला का आयोजन हुआ जिसमें " राष्ट्र निर्माण में हिन्दी भाषा का योगदान" विषय पर डॉ अजय कुमार सिंह (प्रधान वैज्ञानिक, एम. जी. आइ. एफ. आर. आइ.) ने व्याख्यान दिया। राज्यभाषा हिन्दी चेतना पखवाड़ा आयोजन समिति के अध्यक्ष डॉ सुशील कुमार पुर्वे (प्रधान वैज्ञानिक, एम. जी. आइ. एफ. आर. आइ.) ने संस्थान में हिन्दी प्रयोग का संक्षिप्त रिपोर्ट प्रस्तुत किया। इस अवसर पर केंद्र के निदेशक डॉ के. जी. मंडल ने कार्यालय में ज्यादा से ज्यादा हिन्दी प्रयोग करने पर जोर दिया साथ ही सभी सूचनापट्ट, नामपट्ट एवं प्रोफोर्मा आदि को द्विभाषी बनाने का आदेश दिया। हिन्दी चेतना पखवाड़ा के अंतर्गत हिन्दी इनपुट सॉफ्टवेयर द्वारा हिन्दी टाइपिंग, हिन्दी अनुवाद, हिन्दी निबंध, हिन्दी प्रश्न मंच, हिन्दी काव्य पाठ आदि प्रतियोगिताओं का आयोजन किया गया। दिनांक 21 सितम्बर 2022 को राजकीय बुनियादी उच्च विद्यालय पिपराकोठी के कक्षा अष्टम के बीस विद्यार्थियों ने हिन्दी अनुवाद और हिन्दी काव्य पाठ प्रतियोगिता में भाग लिया। जवाहर नवोदय विद्यालय पिपराकोठी के अष्टम एवं एकादश के चौबीस विद्यार्थियों ने

दिनांक 23 सितम्बर 2022 को हिन्दी प्रश्नोत्तरी और हिन्दी काव्य पाठ प्रतियोगिता में भाग लिया। पुनः दिनांक 27 सितम्बर 2022 को हिन्दी कार्यशाला का आयोजन किया गया जिसमें मुख्य वक्ता के रूप में प्रो. अंजनी कुमार श्रीवास्तव, अध्यक्ष सह स. प्रो. हिन्दी विभाग एवं प्रो. प्रसुन्न दत्त सिंह अध्यक्ष सह स. प्रो. संस्कृत विभाग, महात्मा गांधी केंद्रीय विश्व विद्यालय, पूर्वी चंपारण आमंत्रित किए गए। हिन्दी कार्यशाला का विषय "प्रशासनीय कार्य में राज्यभाषा हिन्दी" विषय पर दोनों वक्ताओं ने अपने विचार प्रकट किए। इस कार्यक्रम में संस्थान के सभी वैज्ञानिक गण, कर्मचारी गण एवं नवोदय विद्यालय से तीस छात्र-छात्राओं ने भी भाग लिया। हिन्दी चेतना पखवाड़ा का समापन एवं पुरस्कार वितरण समारोह 11 अक्टूबर 2022 को सम्पन्न हुआ जिसमें मुख्य अतिथि फादर बिपिन कुजूर (प्राचार्य संत फ्रांसीस अकादमी मोतीहारी) थे। इस अवसर पर मुख्य अतिथि ने बड़े-बड़े विद्वानों से हिन्दी में पुस्तक लिखने का आग्रह किया एवं कहा कि हिन्दी ही एक मात्र भाषा है जिससे राष्ट्रीय चेतना का विकास किया जा सकता है। डॉ के. जी. मंडल (निदेशक भा. कृ. अनु. सं.) ने कहा कि हिन्दी जब ज्ञान एवं विज्ञान की भाषा होगी तो यह विश्वभाषा बन कर उभरेगी। सभी विजेताओं एवं उत्कृष्ट प्रतिभागियों को प्रमाण-पत्र के साथ पुरस्कृत किया गया।

विभिन्न प्रतियोगिताओं का परिणाम

प्रतियोगिता का नाम	विजेता का नाम
1. युनिकोड हिन्दी टंकन (16.09.2022)	क. प्रथम :- श्री रवि कुमार, वैज्ञानिक ख. द्वितीय :- श्री धीरज कुमार, वाइ पी II ग. तृतीय :- श्री आलोक प्रभात, वाइ पी II घ. सांत्वना:- डा. पी. के. भारती, वरिष्ठ वैज्ञानिक ड. सांत्वना:- श्री मनिष कुमार, वाइ पी I
2. हिन्दी अनुवाद (17.09.2022)	1. प्रथम :- डा. पी. के. भारती, वरिष्ठ वैज्ञानिक 2. द्वितीय :- डा. . ए. के. सिन्हा, प्रधान वैज्ञानिक 3. तृतीय :- सुश्री कल्पना अंशु, वाइ पी II 4. सांत्वना:- श्री मुकेश कुमार, वाइ. पी I 5. सांत्वना:- श्री मृत्युंजय नंदन झा:

<p>3. हिन्दी निबंध (वैज्ञानिक और वाइ पी वर्ग) (19.09.2022)</p>	<p>1.प्रथम :- डा. पी. के. भारती, वरिष्ठ वैज्ञानिक 2.द्वितीय :- श्री आलोक प्रभात, वाइ पी ॥ 3.तृतीय :- श्री ओम प्रकाश, वाइ. पी । 4.सर्वना: श्री धीरज कुमार, वाइ पी ॥ एवम श्री आलोक राज वाइ पी ॥</p>
<p>4. हिन्दी प्रश्नोत्तरी (26.09.2022)</p>	<p>हिन्दी निबंध (संविदा कर्मी) क. प्रथम:- श्री सत्यम कुमार चौरसिया ख. द्वितीय:- श्री सोनु कुमार ग. तृतीय:- श्री मृत्युंजय नंदन झा: घ. प्रोत्साहन:- श्री अर्विंद कुमार , मो. नौसाद, श्री मनोज कुमार बसक</p>
<p>5. हिन्दी शब्दाक्षरी (26.09.2022)</p>	<p>1.प्रथम :- श्री धीरज कुमार, वाइ पी ॥ 2.द्वितीय :- डा. श्रेया निवेश, वैज्ञानिक 3.तृतीय :- सुश्री कल्पना अंशु, एवम श्री आलोक प्रभात, वाइ पी ॥</p> <p>क. प्रथम:- ई. विकास पराडकर, वैज्ञानिक, श्री ओम प्रकाश, एवम श्री सत्यम चौरसिया ख. द्वितीय:- श्री धीरज कुमार, श्री अंशुमन कुमार, श्री सोनु कुमार/ मनोज कुमार बसक ग. तृतीय:- डा. श्रेया निवेश, वैज्ञानिक, डा. कौशिक वनर्जी, एवम् श्री आलोक प्रभात घ. प्रोत्साहन:- श्री आलोक राज, श्री मनिष कुमार, श्री अजित कुमार, श्री विशाल कुमार</p>



27 सितंबर 2022 को हिंदी चेतना पखवाड़ा के दौरान हिंदी कार्यशाला का आयोजन



11 अक्टूबर 2022 को हिंदी चिंता पखवाड़ा का समापन एवं पुरस्कार वितरण समारोह

Joining, Promotion, Superannuation & Transfer



**Mr. Ravi Kumar, Scientist
(Fisheries Resource Management)
has been promoted from
RGP level 6000 to RGP 7000**



**Dr. P.K. Bharti, Sr. Scientist
(Livestock Production & Management)
has been promoted to Sr. Scientist SS.**



**Dr. Anurag Raizada
Pr. Scientist
(Agroforestry) has been transferred to
ICAR-CCARI, Goa on 31st March 2022**

Personnel

As on 31.12.2022 Scientific

SN	Name	Designation	Subject
1	Dr. K.G. Mandal	Director	Agronomy
2	Dr. S.K. Purbey	Principal Scientist	Fruit Sciences
3	Dr. A.K. Singh	Principal Scientist	Agronomy
4	Dr. P.K. Bharti	Senior Scientist	Livestock Production & Management
5	Dr. S.K. Samal	Scientist	Soil Science
6	Dr. Ravi Kumar	Scientist	Fisheries Resource Management
7	Dr. Shreya Nivesh	Scientist	Soil and Water Conservation and Engineering
8	Dr. Koushik Banerjee	Scientist	Agricultural Meteorology
9	Er. Vikas Pardkar	Scientist	Farm machinery and Power engineering

Administration

SN	Name	Designation
1	Sh. Vipul Raj*	Administrative Officer
2	Md. Sajid Mustaque*	Assistant Administrative Officer (upto 31 August 2022)
3	Sh. Rajat Kr. Das*	Finance & Accounts Officer (Addl. charge)

*supported from ICAR-RCER, Patna

Swachha Bharat Abhiyan

The Director and staff of ICAR-MGIFRI, Motihari participated actively in *Swachha Bharat bhayan*. Cleanliness programmes were conducted monthly to keep the institute campus clean. *Swachhta* awareness programmes were also conducted time to time in institute and village levels to create an awareness about the swachhta among the local people. As per the directive received

from the council and under the guidance of the Director of the institute, *Swachhata Pakhwada* was celebrated during last fortnight of December 2022. During the period composting and on-farm residue management technology was demonstrated to the farmers. They were made aware about the farm waste to wealth conversion. Swachhta activities were also conducted at village level and nearby area of the institute.

A brief account on *Swachha Bharat Abhiyan* at ICAR-MGIFRI, Motihari in the year 2022

Sl. No.	Nature of event	No. of event	No. of staff/farmer participated
1	Regular <i>swachhata</i> activity at the institute	2	40
2	<i>Swachhata Pakhwada</i>	16	50
3	Special campaign 2.0	22	30



Budget & Expenditure

(Financial year-2022-2023)

Head	Other than NEH, SCSP & TSP		SCSP	
	Allocation	Expenditure	Allocation	Expenditure
Grant-in-Aid-Capital	47.41	47.15	20	19.98
Grant-in-Aid-General	175.94	175.93	30.2	30.18
Grant-in-Aid-Salaries	225.69	225.27	0	0
Grant-in-Aid-Pension	0	0	0	0
Total Allocation & Expenditure	449.04	448.35	50.2	50.16



भाकृअनुप-महात्मा गाँधी समेकित
कृषि अनुसंधान संस्थान

**ICAR-MAHATMA GANDHI INTEGRATED
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